



ACADEMIC GUIDEBOOK

UNDERGRADUATE PROGRAMME

ENGLISH VERSION FOR LOCAL STUDENT

ACADEMIC SESSION 2024/2025
FACULTY OF COMPUTER SCIENCE AND MATHEMATICS

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FACULTY OF COMPUTER SCIENCE AND MATHEMATICS



Penerbit UMT
Universiti Malaysia Terengganu
21030 Kuala Nerus
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Words from the Dean

Alhamdulillah...

Congratulations to the Academic Guidebook Committee of the Faculty of Computer Science and Mathematics (FSKM) for their successful preparation of an Academic Guidebook for the FSKM undergraduate programme in 2024. This guidebook is published specifically for new students at FSKM for the 2024/2025 intake session as a reference and guide throughout their studies at Universiti Malaysia Terengganu (UMT).

I would like to take this opportunity to extend a warm welcome to the new students at FSKM, UMT. As a faculty that was just established on January 1, 2024, you are extremely fortunate to have been able to enter the university and join the FSKM community. This is the place where you acquire knowledge and develop into a human being who is outstanding both intellectually and morally.

Dear students...

Thus, I anticipate you to take this wide-open opportunity to the best of your ability to build your identity, trust, ethical and polish high innovative skills. Use today's actions as a starting point to keep achieving success in the future with the commitment to become an excellent graduate that parents are proud of and contribute to the nation and the country.

Lastly, I wish that you will always lead a healthy lifestyle and never lose interest in learning to achieve both physical, emotional, and spiritual excellence. Prove to your family that you will bring home a degree in 3 and a half years. Boost your performance and protect UMT's reputation at all times.

Thank you and good luck to all the students.

Prof. Ts. Dr. Muhammad Suzuri Hitam

Dean

Faculty of Computer Science and Mathematics



About UMT

Universiti Malaysia Terengganu (UMT) started with a Fisheries and Ocean Science Centre in 1979, which offers training facilities to students of the Fisheries and Ocean Science Programme in addition to providing research facilities to lecturers. Through the restructuring of the academic programme at Universiti Putra Malaysia (UPM), the entire Faculty of Fisheries and Ocean Sciences was transferred to Terengganu and given a new name, the Faculty of Science and Technology (FST) starting in June 1996. The Faculty of Science and Specialized Arts (FSSI) and the Matriculation Study Centre (PPM) were also established.

From June 1996, this campus was recognized as a centre of responsibility and named Universiti Putra Malaysia Terengganu Branch (UPMT) and headed by a Rector. On 5 May 1999, the council of ministers agreed to approve the proposal for the establishment of Terengganu University College (KUT). KUT becomes an affiliated campus of UPM, where KUT students graduate from UPM. KUT officially changed its name to Kolej Universiti Sains dan Teknologi Malaysia (KUSTEM) on 1 July 2001.

Starting on 1 February 2007, equivalent to 13 Muharram 1428 H, another history was created in the education system in Malaysia. In an effort to strengthen the position of the National Public University, six university colleges have gone through rebranding. Now KUSTEM is known as Universiti Malaysia Terengganu.

UMT has eight academic responsibility centres and four research institutes namely;

1. Faculty of Computer Science and Mathematics
2. Faculty of Ocean Engineering Technology
3. Faculty of Fisheries and Food Science
4. Faculty of Science and Marine Environment
5. Faculty of Business, Economics and Social
6. Faculty of Maritime Studies
7. Centre for Foundation and Continuing Education
8. STEM Foundation Centre
9. Institute of Oceanography and Environment
10. Institute of Tropical Aquaculture and Fisheries
11. Institute of Climate Adaptation and Marine Biotechnology
12. Institute of Tropical Biodiversity and Sustainable Development

Vision, Mission, Objectives and Slogan of UMT

A marine-focused university,
reputed nationally and
respected globally.

Vision

Generating knowledge for the
prosperity of the community
and world sustainability.

Mission

Slogan

"Ocean of Discoveries, for
Global Sustainability"

Objectives

- Explores all areas related to Science, Technology and Natural Resource Management through research.
- Provides the latest facilities (laboratories, libraries, computing and environment) to support the development of knowledge, learning and scholarship.
- Offers excellent programmes of study that meet current and future needs. Produces graduates who are responsible, knowledgeable, confident and competent.
- Plays an active role in the development of social, economic and education through the expansion services specifically to the local community of the East Coast Peninsular and to the Malaysians, in general.

SECTION A

Information of Faculty of Computer Science and Mathematics



About FSKM

The Faculty of Computer Science and Mathematics (FSKM) was officially established on 1 January 2024, as a result of the restructuring of the Faculty of Ocean Engineering Technology and Informatics. FSKM is an academic entity at UMT that provides high-quality education in the field of computing and mathematics at both undergraduate and postgraduate levels.

The establishment of FSKM is to bring together expertise in the fields of software engineering, maritime informatics, mobile computing, applied mathematics, financial mathematics, and data analytics under one centre of responsibility in supporting the main thrust of the university in line with the vision and mission of UMT.

In line with the faculty's mission, FSKM's target is to produce graduates who are moral, skilled, trained, competitive, and have an identity to meet the needs of the country's workforce.

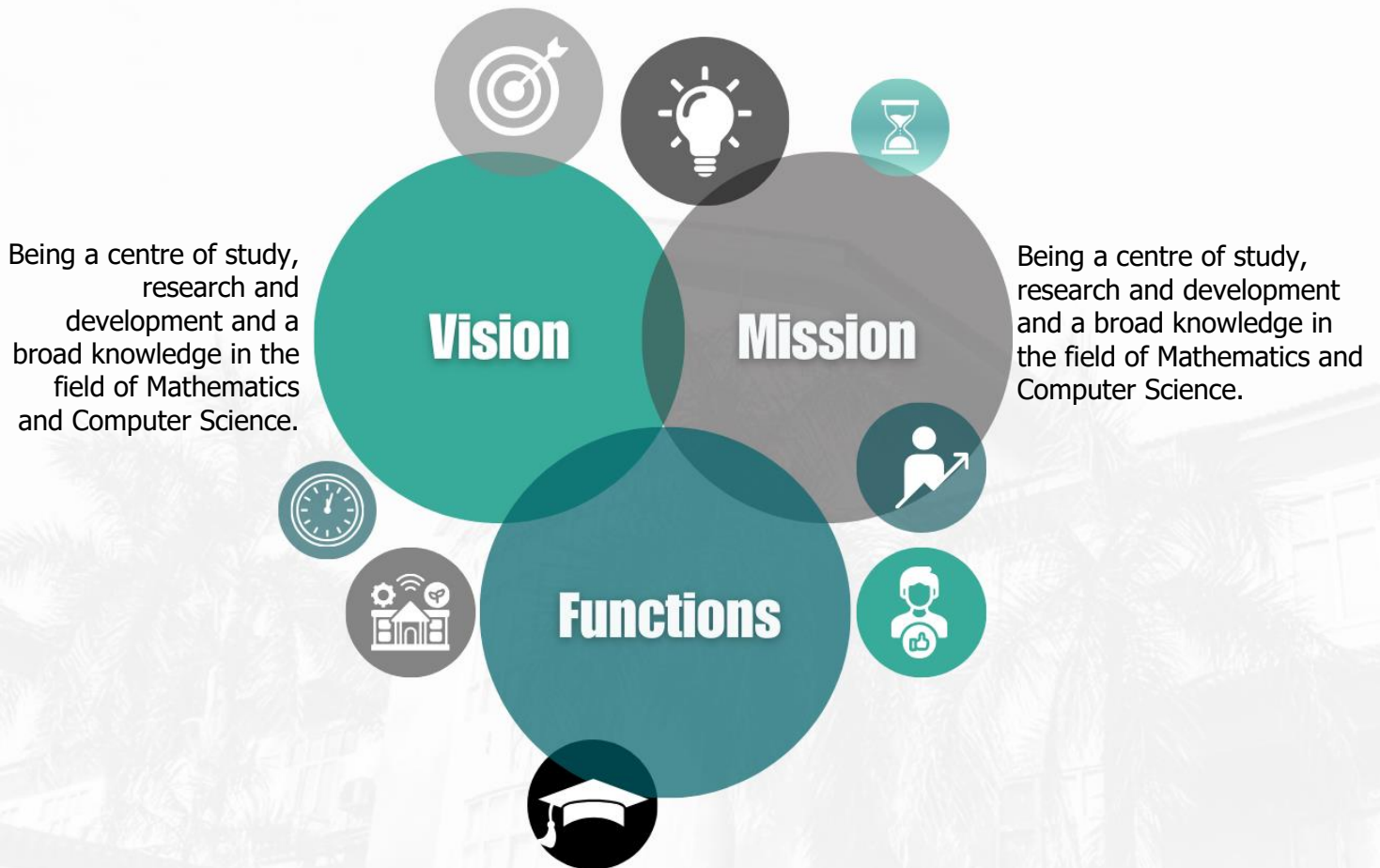
FSKM offered 6 undergraduate programmes with the duration of the study being 7 semesters (3.5 years). The programmes that FSKM offers are as follows:-

1. Bachelor of Computer Science (Software Engineering) with Honours
2. Bachelor of Computer Science with Maritime Informatics (Honours)
3. Bachelor of Computer Science (Mobile Computing) with Honours
4. Bachelor of Science (Applied Mathematics) with Honours
5. Bachelor of Science (Financial Mathematics) with Honours
6. Bachelor of Science (Data Analytics) with Honours

In addition, FSKM also offers postgraduate study programmes either through coursework or research, as follows:-

1. Master of Mathematics (by Coursework)
2. Master of Statistics in Marine Science (by Coursework)
3. Master of Computer Science (by Coursework)
4. Master of Information Technology (by Coursework)
5. Master of Science (Research)
6. Doctor of Philosophy (Research)

Vision, Mission and Functions of FSKM



- Supports the mission of the university to become the premier centre of learning and research by contributing to the progress of humankind and exploration of knowledge and to the creation of wealth and national development.
- Provides trained manpower with professional skills, high self-discipline and positive work ethics.
- Produces graduates who are sensitive to management ideas, responsive to change and become a role-model for students and community.
- Serves society through the dissemination of ideas and new practices and seek solutions to current problems in society.
- Establishes relationships with other universities, institutions and the industry for mutual benefit and the national development.
- Supports the mission of the university to become an organised centre of research and learning as well as providing good services and exploring in a new technology.

Management Committee of FSKM

1 Prof. Ts. Dr. Muhammad Suzuri Hitam
DEAN

2 Assoc. Prof. Ts. Dr. Rosmayati Mohemad
DEPUTY DEAN (ACADEMIC & STUDENT AFFAIRS)

3 Dr. Ilyani Abdullah
DEPUTY DEAN (TALENT & RESEARCH)

4 Assoc. Prof. Ts. Dr. Wan Nural Jawahir Hj Wan Yussof
**HEAD OF PROGRAMME, BACHELOR OF COMPUTER SCIENCE
(SOFTWARE ENGINEERING) WITH HONOURS**

5 Assoc. Prof. Ts. Dr. Zuriana Abu Bakar
**HEAD OF PROGRAMME, BACHELOR OF COMPUTER SCIENCE
WITH MARITIME INFORMATICS (HONOURS)**

6 Assoc. Prof. Ts. Dr. Amir Ngah
**HEAD OF PROGRAMME, BACHELOR OF COMPUTER SCIENCE
(MOBILE COMPUTING) WITH HONOURS**

7 Ts. Dr. Arifah Che Alhadi
CHAIR OF COMPUTER

8 Assoc. Prof. Dr. Shalela Mohd Mahali
**HEAD OF PROGRAMME, BACHELOR OF SCIENCE
(APPLIED MATHEMATICS) WITH HONOURS**

9 Assoc. Prof. Dr. Ahmad Termimi Ab Ghani
**HEAD OF PROGRAMME, BACHELOR OF SCIENCE
(FINANCIAL MATHEMATICS) WITH HONOURS**

10 Assoc. Prof. Dr. Muhamad Safiih Lola
**HEAD OF PROGRAMME, BACHELOR OF SCIENCE
(DATA ANALYTICS) WITH HONOURS**

11 Dr. Fatimah Noor Harun
CHAIR OF MATHEMATICS

12 Mr. Zolarman Muhamad
SENIOR ASSISTANT REGISTRAR

13 Miss Haszailianawaty Mat Razali
ASSISTANT REGISTRAR

14 Mr. Mohd Arizal Shamsir Mat Rifin
VOCATIONAL TRAINING OFFICER



Academicians of the Computer Science Programme

**HEAD OF PROGRAMME
BACHELOR OF
COMPUTER SCIENCE
(SOFTWARE
ENGINEERING)**



Assoc. Prof. Ts. Dr. Wan Nural Jawahir Hj Wan Yussof
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Computer Vision, Image Processing

**HEAD OF PROGRAMME
BACHELOR OF
COMPUTER SCIENCE
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COMPUTING)**



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Software Engineering, Software Maintenance and Testing

**HEAD OF PROGRAMME
BACHELOR OF
COMPUTER SCIENCE
WITH MARITIME
INFORMATICS**



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PhD (UQ, Australia), MSc (UPM), BSc (UTM)
Human and Computer Interaction, Information System,
Computer Forensic, Data Mining

CHAIR OF COMPUTER



Ts. Dr. Arifah Che Alhadi
PhD (UMT), MIT, BIT (Hons) (UKM), Dip.IT (KUSZA)
Information Retrieval, Information System

PROFESSORS

DEAN



Prof. Ts. Dr. Muhammad Suzuri Hitam
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Artificial Intelligence, Image Processing



Prof. Dato' Ts. Dr. Aziz Deraman
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Software Engineering and Management, Software Quality, ICT
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PhD (Manchester), MSc, BSc (UPM)
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Academicians of the Computer Science Programme

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STUDENT AFFAIRS)**



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Software Engineering, Formal Modelling, Algorithm & Data, e-Learning



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Parallel Computing, Computational Biology



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Swarm Intelligent, Optimization Algorithm



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Academicians of the Mathematical Science Programme

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Mathematical epidemiology



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Academicians of the Mathematical Science Programme

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Stochastic Modelling and Financial Mathematics



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MSc, BSc (UKM)
Biostatistics and Management Mathematics



Madam Siti Madhiah Abdul Malik

MSc (UKM), BSc (KUSTEM)
Time Series Forecasting

INTERNATIONAL LECTURER



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PhD (Essex), MSc, BSc (UGM, Indonesia)
Numerical Analysis, Artificial Neural Networks, Machine
Learning

SECTION B

General Information, Rules for Student Dress Code and Appearance



General Information

1) Studying System

UMT practices a semester-based system. There are two common semesters for each academic year and the duration for each semester is 19 weeks, the breakdown is as follows:

Activity	Semester I	Semester II
Lecture	7 Weeks	7 Weeks
Mid-semester Break	1 Week	1 Week
Lecture	7 Weeks	7 Weeks
Revision Break	1 Week	1 Week
Final Examination	3 Weeks	3 Weeks

2) Programme Curriculum Structure

The curriculum structure for undergraduate students is designed in accordance with the UMT philosophy and vision, which is to produce knowledgeable graduates, competent with multiple skills including entrepreneurship and leadership. There are three course components in the programme curriculum namely University Core, Programme Core, and University Elective.

- **University Core**
The university's core components comprise several courses that are compulsory for all UMT undergraduates to enrol in and pass the courses. These courses aim to provide general knowledge to students.
- **Programme Core**
Programme core components comprise courses related to the major programme and determined by the corresponding faculty which is offering the respective programme. The students are compulsory to undertake their respective core programme courses.
- **University Elective**
University Elective components comprise selected courses chosen by students after discussing with their academic advisor/mentor/head of programme. The credit hours for elective courses are counted and the score point is given.

3) **Credit Transfer**

Students are allowed to apply for credit transfer through Credit Transfer System online on the MyNemo Student portal (subject to conditions and approval from the Course Lecturer/ Head of Programme). Credit transfer is the process of transferring course credits taken by a student in a programme to another programme that leads to the awarding of a qualification offered by the same institution or a different institution. This process allows the credit for the course to which the credit is transferred to be counted as part of the programme's graduate credit requirement. Credit transferable courses are courses that are equivalent to courses in the programme leading to the award of a qualification subject to the prescribed conditions. Refer to the UMT Academic Regulations Book: Bachelor and Diploma Programmes (10th Edition) for more information.

4) **Mentor-mentee System**

Mentor-mentee system is introduced in UMT to replace the academic advisor system. A mentor is an academician who is responsible for providing consultation on academic matters to the students (mentees) and also for advising the students if the students encounter any problems with their studies or personal issues. Each student is obliged to meet their mentor for consultation and the appointment can be set in advance, depending on the availability of the mentor.

- **Implementation**

Faculty will assign a lecturer as a mentor for each student who enrolls in the programme. The students can meet their mentor to seek for advice on academic matters or any other matters.

- **Mentor Roles**

- i) Assisting students to understand the curriculum, semester system, registration system, examination system, and course exemption;
- ii) Assisting students to plan their studies structure;
- iii) Assisting students to select courses;
- iv) Giving advice on academic issues faced by students;
- v) Identify problems which may affect the academic progress of the student and directly refer to an expert who has the skill to solve the encountered problems;
- vi) Sign and certify certificates and any documents regarding student academics;
- vii) Become a mentor and motivate students;
- viii) Hold meetings with students at least twice each semester; and
- ix) Keep and update student records and files.

5) Grading System, Grade and Point Average

The grading scheme, Alphabetical Grade, Grade Point Value, and Grade Description are as shown in the following table:

Marks	Alphabet Grade	Grade Point Value	Grade Description
80 – 100	A	4.00	Excellent
75 - 79	A-	3.75	
70 - 74	B+	3.50	Good
65 - 69	B	3.00	
60 - 64	B-	2.75	
55 - 59	C+	2.50	Satisfactory
50 - 54	C	2.00	
45 - 49	C-	1.75	Poor
40 - 44	D	1.00	
Less than 39	F	0.00	Fail

6) Academic Standing

Students will be given the academic standing in every semester based on the following status:

Standing	Description
Passed (L)	Achieved a minimum CGPA of 2.00 and passed all courses.
Repeat (LMK)	Achieved a minimum CGPA of 2.00 and failed any of the courses.
Warning (W)	Achieved a CGPA between 1.00 and 1.99
Warning (WMK)	Achieved a CGPA between 1.00 and 1.99 and failed any of the course.
Probation (P)	Fail to achieve a minimum CGPA 2.00 during Warning status (two consecutive semesters with Warning status).
Failed and Dismissed (GB)	Obtained a CGPA below 0.99 in any one semester; or Failed to attain the required minimum CGPA of 2.00 in the semester following the one in which he/she was placed on probation.
Deferment (TG)	Student whose application for deferment has been granted.
Graduated (IJZ)	Fulfilled all requirements as specified by the programme.

7) Degree Classification

CGPA	Classification	
	In Bahasa Malaysia	In English
3.67 – 4.00	<i>Cemerlang</i>	Distinction
2.00 – 3.66	<i>Kepujian</i>	Honours

Rules for Student Dress Code and Appearance

1) Dress Code Introduction

This rule is based on Rule 3(a) and Rule 26, Universiti Malaysia Terengganu Rules (Student Discipline) 2009. It aims to inform students about the UMT dress code.

2) General Rules of UMT

- i) It is mandatory for all students to show their matric card while on campus.
- ii) All students are prohibited from wearing clothing or accessories that signify certain groups or associations that might cause disharmony on campus.
- iii) All students are prohibited from showcasing any elements that might contradict ethics and morale or wearing any attire that might contain designs of words or phrases that are not parallel with good norms or values.
- iv) All students are restricted with dress code rules as specified by laboratory guidelines or any other place on campus with its own specified guidelines.

3) Dress Code in the Residential College Area and Attending Official Programmes/Events

▪ General Dress Code

- i) Every student must dress appropriately as a university student by showing **neatness** and **politeness**.
- ii) Students are not allowed to wear tight or sparse clothing, expose the body (any part from the chest to the knees), and dress conspicuously. Students are prohibited from dressing as below when attending lectures or any official event:
 - a) Skirt above knee
 - b) Wearing jeans
 - c) Flip-flops
 - d) Tight pants/skirts
 - e) Sleeveless dress/ shirt
 - f) T-shirt without sleeve collar

Note: The above list is not final and is subject to the university's current regulations.

- iii) Due to safety factors, face covering (purdah/niqab) while in the residential college area or at official events is prohibited.
- iv) Students are prohibited from displaying tattoos on any part of the body.
- v) Piercing and wearing jewellery for men is strictly prohibited and excessive piercing is also prohibited for female students.



Examples of Dress Code for Male and Female Students

- **Official Programmes/Events**

- i) Students are required to dress appropriately when dealing in the Residence College Office or any official event;
 - a) Shirts, collared T-shirts, corporate shirts, batik shirts;
 - b) Wearing shoes;
 - c) Loose trousers;
 - d) Long skirt below knee;
 - e) Wearing a traditional Malay dress or wearing decent clothes by wearing a shirt past the butt level.
- ii) Students are also not allowed to wear **hats** or **bandanas** when doing official matters at the university office or in the lecture hall.

- **Sports Attire**

- i) Students must dress in accordance with the chosen sportswear code.
- ii) Students are prohibited from dressing as listed below when in the residential college area, generally multi-purpose courts A, B.
 - a) Leggings without additional pants;
 - b) Short pants above knee without tight-fit pants;
 - c) Flip flops.

4) Hair Style

- i) Students should always have neat and tidy hair.
- ii) Male students are not allowed to keep long hair and tails in front or back. Hair should not reach the shirt collar.
- iii) Exaggerated hair fashion for men (partial patterned hairstyles/qaza') and women is prohibited.
- iv) Hair colouring is strictly prohibited.

SECTION C

Academic Programmes Offer



Bachelor of Computer Science (Software Engineering) with Honours

Introduction

The Bachelor of Computer Science (Software Engineering) with Honours is offered to both local and international students with a particular emphasis on STPM, Matriculation, and Diploma graduates or their equivalents. This programme aims to provide students with an understanding of development theory and the application of software systems. This includes skills in problem-solving, software system design, software testing and software maintenance. Aligned with the progress of the Industrial Revolution 4.0 (IR4.0), the fields of computer science and information technology are drivers of social development, capable of fostering an informed society. Both fields are crucial for industrial competitiveness. Therefore, digital talent in software engineering is highly required in various sectors to drive the economic growth of the country.

Programme Educational Objective (PEO)

This programme is offered for students to achieve the following objectives:

- PEO1 : Applying knowledge (LO1), technical (LO2) and digital (LO10) skills in Software Engineering in accordance with industry standards.
- PEO2 : Ability to solve computing problem in team with accountability (LO5) and able to communicate (LO4) effectively with the rest of the team members and the client.
- PEO3 : Be ethical (LO6) with integrity in carrying out the trust in the current career.
- PEO4 : Exhibit the ability in mastering management and lead computing project (LO9) using up-to-date scientific, technical (LO3) and numerical (LO11) skills.
- PEO5 : Ability to adapt to changes (LO7) of economy, politics, and social environment, as well as having entrepreneurship (LO8) skills in area related to information technology and communication.

Career Prospects

Among the careers that can be pursued by graduates of computer science programmes are as follows:

- Software Engineers
- Software Developer
- Software Tester
- System Analyst
- Web Designer/ Developer
- Programmer/ Programme Analyst
- System Administrator
- Postgraduate Opportunity
- Network Administrator
- Database Administrator
- Information Technology Officer
- IT Consultant
- Network Engineer
- IT Lecturer
- IT Trainer

PROGRAMME CURRICULUM
BACHELOR OF COMPUTER SCIENCE (SOFTWARE ENGINEERING) WITH HONOURS

Total Credit for Graduation

The minimum amount of credit required to graduate is 122 credit hours. The distribution of credit hours by course category is as follows:

Category	Credit Hour	Percentage
University Core Course	14	11
Programme Core Course	46	38
Specialization Core Course	30	25
Final Year Project	8	6
Industrial Training	12	10
University Elective Course	12	10
Total	122	100

University Core Courses

Students must complete all **SIX** courses at the University Core level, which total 14 credit hours.

No.	Course Code	Course Name	Credit Hour	Prerequisite
1.	CCXXXXX	Co-Curriculum	2(0+2)	None
2.	BBB3033	English for Occupational Purposes	3(3+0)	None
3.	MPU3132	Appreciation of Ethics and Civilization	2(2+0)	None
4.	MPU3142	Philosophy and Current Issues	2(2+0)	None
5.	MPU3223	Basic Entrepreneurship	3(3+0)	None
6.	MPU3352	Integrity and Anti-Corruption	2(2+0)	None

Programme Core Courses

To meet the requirements for graduation, students must take and pass all **FIFTEEN** Programme Core courses totalling 46 credit hours.

No.	Course Code	Course Name	Credit Hour	Prerequisite
1.	CSF3003	Discrete Structure	3(3+0)	None
2.	CSF3013	Data Structure and Algorithm	3(2+1)	None
3.	CSF3023	System Thinking and Logic	3(3+0)	None
4.	CSF3034	Programming	4(3+1)	None
5.	CSF3043	Object-Oriented Programming	3(2+1)	None
6.	CSF3113	System Analysis and Design	3(2+1)	None
7.	CSF3123	Database	3(2+1)	None
8.	CSF3133	Web-Based Interface Design	3(2+1)	None
9.	CSF3143	Basics of Software Engineering	3(3+0)	None
10.	CSF3213	Operating System	3(3+0)	None
11.	CSF3223	Networking	3(2+1)	None
12.	CSF3233	Cyber Security	3(2+1)	None
13.	CSF3243	Computer Organisation and Architecture	3(3+0)	None
14.	CSF3253	Intelligent System	3(3+0)	None
15.	MTK3053	Introduction to Statistics	3(3+0)	None

Specialization Core Courses

To meet the requirements for graduation, students must take and pass all **TEN** Specialization Core courses, which amount to 30 credit hours.

No.	Course Code	Course Name	Credit Hour	Prerequisite
1.	CSE3023	Web-Based Application Development	3(2+1)	None
2.	CSE3203	Software Requirement Engineering	3(3+0)	None
3.	CSE3403	Software Project Management	3(2+1)	None
4.	CSE3413	Software Testing	3(3+0)	None
5.	CSE3423	Software Quality Assurance	3(3+0)	None
6.	CSE3433	Software Architecture	3(3+0)	None
7.	CSE3443	Software Maintenance and Evolution	3(3+0)	None
8.	CSE3453	Ethics and Professional Practices	3(3+0)	None
9.	CSE3953	Application System Development Project	3(0+3)	None
10.	CSM3313	IoT Computing	3(2+1)	None

Final Year Project Courses

Students must complete and pass **TWO** Final Year Project courses for a total of 8 credit hours in order to graduate.

No.	Course Code	Course Name	Credit Hour	Prerequisite
1.	CSF4984	Final Year Project I	4(0+4)	None
2.	CSF4994	Final Year Project II	4(0+4)	CSF4984

Industrial Training Course

Students must complete and pass an Industrial Training course for a total of 12 credit hours in order to graduate.

No.	Course Code	Course Name	Credit Hour	Prerequisite
1.	CSF49712	Industrial Training	12(0+12)	None

University Elective Courses

Students may select 12 credit hours from any of the courses listed as University Elective by the Centre for Foundation and Continuing Education and related faculties.

Notes:

- i) The number of elective course credit hours that must be taken by students in the programme of study is subject to the number of elective credit hours set by the programme of study to meet graduate qualifications and is not subject to the number of elective courses taken.
- ii) The list of elective courses that can be taken by students in the programme of study refers to the course offerings listed in the handbook of the study programme of the faculty and other faculties.

Credit Transfer

- 1) Student needs to refer to *Peraturan Akademik Universiti Malaysia Terengganu (Program Diploma dan Sarjana Muda)*.
- 2) In addition, the following three (3) Core Programme courses are exempted from credit transfer:
 - i) CSF3034 Programming;
 - ii) CSF3013 Data Structure and Algorithm; and
 - iii) CSF3123 Database.

COURSE SCHEME
BACHELOR OF COMPUTER SCIENCE (SOFTWARE ENGINEERING) WITH HONOURS

CODE	COURSE NAME	CREDIT HOUR	PRE REQUISITE	CODE	COURSE NAME	CREDIT HOUR	PRE REQUISITE
SEMESTER 1				SEMESTER 2			
CSF3003	Discrete Structure	3(3+0)	-	CSE3203	Software Requirement Engineering	3(3+0)	-
CSF3023	System Thinking and Logic	3(3+0)	-	CSF3043	Object-Oriented Programming	3(2+1)	-
CSF3034	Programming	4(3+1)	-	CSF3213	Operating Systems	3(3+0)	-
CSF3143	Basics of Software Engineering	3(3+0)	-	MPU3132	Appreciation of Ethics & Civilization	2(2+0)	-
CSF3243	Computer Organisation and Architecture	3(3+0)	-	MPU3352	Integrity and Anti-Corruption	2(2+0)	-
CCXXXXX	Co-Curriculum	2(0+2)	-	MTK3053	Introduction to Statistics	3(3+0)	-
MPU3142	Philosophy and Current Issue	2(2+0)	-		Elective 1	3	-
TOTAL		20		TOTAL		19	
SEMESTER 3				SEMESTER 4			
CSF3013	Data Structure and Algorithm	3(2+1)	-	CSE3023	Web-Based Application Development	3(2+1)	-
CSF3113	System Analysis and Design	3(2+1)	-	CSE3413	Software Testing	3(3+0)	-
CSF3123	Database	3(2+1)	-	CSE3433	Software Architecture	3(3+0)	-
CSF3133	Web-Based Interface Design	3(2+1)	-	CSE3953	Application System Development Project	3(0+3)	-
	Elective 2	3	-	CSF3223	Networking	3(2+1)	-
	Elective 3	3	-	MPU3223	Basic Entrepreneurship	3(3+0)	-
TOTAL		18		TOTAL		18	
SEMESTER 5				SEMESTER 6			
BBB3033	English for Occupational Purposes	3(3+0)	-	CSE3443	Software Maintenance and Evolution	3(3+0)	-
CSE3403	Software Project Management	3(2+1)	-	CSE3453	Ethics and Professionalism Practices	3(3+0)	-
CSE3423	Software Quality Assurance	3(3+0)	-	CSF3233	Cyber Security	3(2+1)	-
CSF3253	Intelligent System	3(3+0)	-	CSF4994	Final Year Project II	4(0+4)	CSF4984
CSF4984	Final Year Project I	4(0+4)	-		Elective 4	3	-
CSM3313	IoT Computing	3(2+1)	-				
TOTAL		19		TOTAL		16	
SEMESTER 7							
CSF49712	Industrial Training	12(0+12)	-				
TOTAL		12					
TOTAL CREDIT						122	

Note:

- 1) Students are required to undertake the **Survival and Water Safety Programme** as a **condition to graduate**.
- 2) The number of elective course credit hours that must be taken by students in the programme of study is subject to the **number of elective credit hours** set by the programme of study to meet graduate qualifications and **is not subject to the number of elective courses taken**.
- 3) The list of elective courses that can be taken by students in the programme of study refers to the course offerings listed in the handbook of the study programme of the faculty and other faculties.

Bachelor of Computer Science with Maritime Informatics (Honours)

Introduction

The Bachelor of Computer Science with Maritime Informatics (Honours) is offered to both local and international students with a particular emphasis on STPM, Matriculation, and Diploma graduates or their equivalents. This programme is an interdisciplinary programme that provides opportunities for students to apply their knowledge and skills in computer technology application development to the maritime industry. Apart from developing maritime applications, among other branches in maritime informatics that can be explored are maritime data management, maritime information systems, maritime analytics, and maritime data visualization. Along with the development of the Industrial Revolution 4.0, it is critical to empower digital technologies, robotics, artificial intelligence, and big data to support the maritime shipping and transportation sector. Therefore, there is an increasing demand for computer science graduates with maritime expertise. As such, the programme seeks to produce graduates who are holistic in meeting the needs of the high-tech industry and advancing development and research, particularly in the maritime industry.

Programme Educational Objective (PEO)

This programme is offered for students to achieve the following objectives:

- PEO1 : Having knowledge (LO1), technical (LO2) and digital (LO10) skills in Maritime Informatics in accordance with industry standards.
- PEO2 : Ability to solve computing problem in team with accountability (LO5) and able to communicate (LO4) effectively with the rest of the team members and the client.
- PEO3 : Ethical (LO6) with integrity in carrying out trust and current career.
- PEO4 : Exhibit the ability in mastering management and leading computing project (LO9) by utilizing latest scientific, technical (LO3) and numerical (LO11) skills.
- PEO5 : Ability to adapt to changes (LO7) of economy, politics, and social environment, while at the same time having entrepreneurship (LO8) skills in area related to information technology and communication.

Career Prospects

Among the careers that can be pursued by graduates of computer science programmes are as follows:

- Maritime System Analyst
- Maritime Intelligence Analyst
- Maritime Business Development Specialist
- Maritime Business Support System and Business Executives
- Software Developer
- Information Technology Officer
- IT Consultant
- Programme Analyst
- Web Designer
- Network Engineer
- Network Administrator
- Database Administrator
- Software Tester
- IT Trainer
- System Administrator
- Computer Science/ IT Lecturer
- Postgraduate Opportunities

PROGRAMME CURRICULUM
BACHELOR OF COMPUTER SCIENCE WITH MARITIME INFORMATICS (HONOURS)

Programme Core Course	46	38
Specialization Core Course	30	25
Final Year Project	8	6
Industrial Training	12	10
University Elective Course	12	10
Total	122	100

University Core Courses

Students must complete all **SIX** courses at the University Core level, which total 14 credit hours.

No.	Course Code	Course Name	Credit Hour	Prerequisite
1.	CCXXXXX	Co-Curriculum	2(0+2)	None
2.	BBB3033	English for Occupational Purposes	3(3+0)	None
3.	MPU3132	Appreciation of Ethics and Civilization	2(2+0)	None
4.	MPU3142	Philosophy and Current Issues	2(2+0)	None
5.	MPU3223	Basic Entrepreneurship	3(3+0)	None
6.	MPU3352	Integrity and Anti-Corruption	2(2+0)	None

Programme Core Courses

To meet the requirements for graduation, students must take and pass all **FIFTEEN** Programme Core courses totalling 46 credit hours.

No.	Course Code	Course Name	Credit Hour	Prerequisite
1.	CSF3003	Discrete Structure	3(3+0)	None
2.	CSF3013	Data Structure and Algorithm	3(2+1)	None
3.	CSF3023	System Thinking and Logic	3(3+0)	None
4.	CSF3034	Programming	4(3+1)	None
5.	CSF3043	Object-Oriented Programming	3(2+1)	None
6.	CSF3113	System Analysis and Design	3(2+1)	None
7.	CSF3123	Database	3(2+1)	None
8.	CSF3133	Web-Based Interface Design	3(2+1)	None
9.	CSF3143	Basics of Software Engineering	3(3+0)	None
10.	CSF3213	Operating System	3(3+0)	None
11.	CSF3223	Networking	3(2+1)	None
12.	CSF3233	Cyber Security	3(2+1)	None
13.	CSF3243	Computer Organisation and Architecture	3(3+0)	None
14.	CSF3253	Intelligent System	3(3+0)	None
15.	MTK3053	Introduction to Statistics	3(3+0)	None

Specialization Core Courses

To meet the requirements for graduation, students must take and pass all **TEN** Specialization Core courses, which amount to 30 credit hours.

No.	Course Code	Course Name	Credit Hour	Prerequisite
1.	CSA3003	Maritime Informatics Technology and Professional Ethics	3(3+0)	None
2.	CSA3013	Modelling and Simulation	3(2+1)	None
3.	CSA3023	Web-Based Application Development	3(2+1)	None
4.	CSA3953	Application Software Development Project	3(0+3)	None
5.	CSE3203	Software Requirement Engineering	3(3+0)	None
6.	CSE3403	Software Project Management	3(2+1)	None
7.	CSM3313	IoT Computing	3(2+1)	None
8.	MMM3763	Principle of Maritime Management	3(3+0)	None
9.	MMM3843	Global Shipping and Port Management	3(3+0)	None
10.	MMT3073	Shipping and Port Technology	3(3+0)	None

Final Year Project Courses

Students must complete and pass **TWO** Final Year Project courses for a total of 8 credit hours in order to graduate.

No.	Course Code	Course Name	Credit Hour	Prerequisite
1.	CSF4984	Final Year Project I	4(0+4)	None
2.	CSF4994	Final Year Project II	4(0+4)	CSF4984

Industrial Training Course

Students must complete and pass an Industrial Training course for a total of 12 credit hours in order to graduate.

No.	Course Code	Course Name	Credit Hour	Prerequisite
1.	CSF49712	Industrial Training	12(0+12)	None

University Elective Courses

Students may select 12 credit hours from any of the courses listed as University Elective by the Centre for Foundation and Continuing Education and related faculties.

Notes:

- i) The number of elective course credit hours that must be taken by students in the programme of study is subject to the number of elective credit hours set by the programme of study to meet graduate qualifications and is not subject to the number of elective courses taken.
- ii) The list of elective courses that can be taken by students in the programme of study refers to the course offerings listed in the handbook of the study programme of the faculty and other faculties.

Credit Transfer

- 1) Student needs to refer to *Peraturan Akademik Universiti Malaysia Terengganu (Program Diploma dan Sarjana Muda)*.
- 2) In addition, the following three (3) Core Programme courses are exempted from credit transfer:
 - i) CSF3034 Programming;
 - ii) CSF3013 Data Structure and Algorithm; and
 - iii) CSF3123 Database.

COURSE SCHEME
BACHELOR OF COMPUTER SCIENCE WITH MARITIME INFORMATICS (HONOURS)

CODE	COURSE NAME	CREDIT HOUR	PRE REQUISITE	CODE	COURSE NAME	CREDIT HOUR	PRE REQUISITE
SEMESTER 1				SEMESTER 2			
CSF3003	Discrete Structure	3(3+0)	-	CSA3003	Maritime Informatics Technology and Professional Ethics	3(3+0)	-
CSF3023	System Thinking and Logic	3(3+0)	-	CSE3203	Software Requirement Engineering	3(3+0)	-
CSF3034	Programming	4(3+1)	-	CSF3043	Object-Oriented Programming	3(2+1)	-
CSF3143	Basics of Software Engineering	3(3+0)	-	CSF3213	Operating Systems	3(3+0)	-
CSF3243	Computer Organisation and Architecture	3(3+0)	-	MPU3132	Appreciation of Ethics & Civilization	2(2+0)	-
CCXXXXX	Co-Curriculum	2(0+2)	-	MPU3352	Integrity and Anti-Corruption	2(2+0)	-
MPU3142	Philosophy and Current Issue	2(2+0)	-	MTK3053	Introduction to Statistics	3(3+0)	-
TOTAL		20		TOTAL		19	
SEMESTER 3				SEMESTER 4			
CSF3013	Data Structure and Algorithm	3(2+1)	-	CSA3023	Web-Based Application Development	3(2+1)	-
CSF3113	System Analysis and Design	3(2+1)	-	CSA3953	Application System Development Project	3(0+3)	-
CSF3123	Database	3(2+1)	-	CSF3223	Networking	3(2+1)	-
CSF3133	Web-Based Interface Design	3(2+1)	-	MPU3223	Basic Entrepreneurship	3(3+0)	-
MMM3763	Principle of Maritime Management	3(3+0)	-		Elective 2	3	-
	Elective 1	3	-		Elective 3	3	-
TOTAL		18		TOTAL		18	
SEMESTER 5				SEMESTER 6			
CSE3403	Software Project Management	3(2+1)	-	BBB3033	English for Occupational Purposes	3(3+0)	-
CSF3253	Intelligent System	3(3+0)	-	CSA3013	Modelling and Simulation	3(2+1)	-
CSF4984	Final Year Project I	4(0+4)	-	CSF3233	Cyber Security	3(2+1)	-
CSM3313	IoT Computing	3(2+1)	-	CSF4994	Final Year Project II	4(0+4)	CSF4984
MMM3843	Global Shipping and Port Management	3(3+0)	-		Elective 4	3	-
MMT3073	Shipping and Port Technology	3(3+0)	-				
TOTAL		19		TOTAL		16	
SEMESTER 7							
CSF49712	Industrial Training	12(0+12)	-				
TOTAL		12					
TOTAL CREDIT						122	

Note:

- Students are required to undertake the **Survival and Water Safety Programme** as a **condition to graduate**.
- The number of elective course credit hours that must be taken by students in the programme of study is subject to the **number of elective credit hours** set by the programme of study to meet graduate qualifications and **is not subject to the number of elective courses taken**.
- The list of elective courses that can be taken by students in the programme of study refers to the course offerings listed in the handbook of the study programme of the faculty and other faculties.

Bachelor of Computer Science (Mobile Computing) with Honours

Introduction

The Bachelor of Computer Science (Mobile Computing) with Honours is offered to all local and international students especially STPM leavers, Matriculation and Diploma graduates or equivalent. This programme prepares students with the knowledge and skills needed to develop mobile and web applications. The programme applies the 2u2i elements through the implementation of 2.5 years of study in the university (university component) and 1 year of study in the industry (industrial component). A total of 4 industry component courses in the form of Work Based Learning (WBL) are offered in the final year of study involving learning in a real industrial environment. The implementation of the 2u2i Mode will expose students to actual learning and practice directly from relevant industry practitioners. In addition to produce graduates, who can meet current and future workforce needs, the programme enhances the prospects and career paths of graduates through new job functions resulting from changes in the ICT landscape following the transition to mobile technology and IR4.0.

Programme Educational Objective (PEO)

This programme is offered for students to achieve the following objectives:

- PEO1 : Having knowledge (LO1), technical (LO2) and digital (LO10) skills in Mobile Computing in accordance with industry standards.
- PEO2 : Ability to solve computing problem in team with accountability (LO5) and able to communicate (LO4) effectively with the rest of the team members and the client.
- PEO3 : Exhibit integrity values, endurance and high-level work ethic (LO6) in organization.
- PEO4 : Exhibit the ability in mastering management and lead computing project (LO9) by utilizing latest scientific, technical (LO3) and numerical (LO11) skills.
- PEO5 : Ability to adapt to changes (LO7) of economy, politics, and social environment, while at the same time having entrepreneurship (LO8) skills in area related to information technology and mobile computing.

Career Prospects

Among the careers that can be pursued by graduates of computer science programmes are as follows:

● IOS Application Developer	● Information Technology Officer
● Android Application Developer	● System Administrator
● Front-End/Full Stack Developer	● Database Administrator
● Software System Developer	● Network Administrator
● Software Engineer	● IT Consultant
● Web Designer	● IT Lecturer
● System Analyst	● IT Trainer
● Programmer/Programme Analyst	● Postgraduate Opportunities

PROGRAMME CURRICULUM
BACHELOR OF COMPUTER SCIENCE (MOBILE COMPUTING) WITH HONOURS

Total Credit for Graduation

The minimum amount of credit required to graduate is 123 credit hours. The distribution of credit hours by course category is as follows:

Category	Credit Hour	Percentage
University Core Course	14	11
Programme Core Course	46	37
Specialization Core Course	35	28
Final Year Project*	8	7
Industrial Training*	8	7
University Elective Course	12	10
Total	123	100

University Core Courses

Students must complete all **SIX** courses at the University Core level, which total 14 credit hours.

No.	Course Code	Course Name	Credit Hour	Prerequisite
1.	CCXXXXX	Co-Curriculum	2(0+2)	None
2.	BBB3033	English for Occupational Purposes	3(3+0)	None
3.	MPU3132	Appreciation of Ethics and Civilization	2(2+0)	None
4.	MPU3142	Philosophy and Current Issues	2(2+0)	None
5.	MPU3223	Basic Entrepreneurship	3(3+0)	None
6.	MPU3352	Integrity and Anti-Corruption	2(2+0)	None

Programme Core Courses

To meet the requirements for graduation, students must take and pass all **FIFTEEN** Programme Core courses totalling 46 credit hours.

No.	Course Code	Course Name	Credit Hour	Prerequisite
1.	CSF3003	Discrete Structure	3(3+0)	None
2.	CSF3013	Data Structure and Algorithm	3(2+1)	None
3.	CSF3023	System Thinking and Logic	3(3+0)	None
4.	CSF3034	Programming	4(3+1)	None
5.	CSF3043	Object-Oriented Programming	3(2+1)	None
6.	CSF3113	System Analysis and Design	3(2+1)	None
7.	CSF3123	Database	3(2+1)	None
8.	CSF3133	Web-Based Interface Design	3(2+1)	None
9.	CSF3143	Basics of Software Engineering	3(3+0)	None
10.	CSF3213	Operating System	3(3+0)	None
11.	CSF3223	Networking	3(2+1)	None
12.	CSF3233	Cyber Security	3(2+1)	None
13.	CSF3243	Computer Organisation and Architecture	3(3+0)	None
14.	CSF3253	Intelligent System	3(3+0)	None
15.	MTK3053	Introduction to Statistics	3(3+0)	None

Specialization Core Courses

To meet the requirements for graduation, students must take and pass all **TEN** Specialization Core courses, which amount to 51 credit hours.

No.	Course Code	Course Name	Credit Hour	Prerequisite
1.	CSE3203	Software Requirement Engineering	3(3+0)	None
2.	CSM3023	Web-Based Application Development	3(2+1)	None
3.	CSM3103	Front-End Programming	3(2+1)	None
4.	CSM3114	Framework based Mobile Application Development	4(3+1)	None
5.	CSM3123	Native Mobile Programming	3(2+1)	None
6.	CSM3313	IoT Computing	3(2+1)	None
7.	CSM4908-I	Industrial Project Management	8(0+8)	None
8.	CSM4918-I	Industrial Project Development	8(0+8)	None
9.	CSM4928-I	Integrated Industrial Project Management	8(0+8)	None
10.	CSM4938-I	Integrated Industrial Project Development	8(0+8)	None

University Elective Courses

Students may select 12 credit hours from any of the courses listed as University Elective by the Centre for Foundation and Continuing Education and related faculties.

Notes:

- i) The number of elective course credit hours that must be taken by students in the programme of study is subject to the number of elective credit hours set by the programme of study to meet graduate qualifications and is not subject to the number of elective courses taken.
- ii) The list of elective courses that can be taken by students in the programme of study refers to the course offerings listed in the handbook of the study programme of the faculty and other faculties.

Credit Transfer

- 1) Student needs to refer to *Peraturan Akademik Universiti Malaysia Terengganu (Program Diploma dan Sarjana Muda)*.
- 2) In addition, the following three (3) Core Programme courses are exempted from credit transfer:
 - i) CSF3034 Programming;
 - ii) CSF3013 Data Structure and Algorithm; and
 - iii) CSF3123 Database.

COURSE SCHEME
BACHELOR OF COMPUTER SCIENCE (MOBILE COMPUTING) WITH HONOURS

CODE	COURSE NAME	CREDIT HOUR	PRE REQUISITE	CODE	COURSE NAME	CREDIT HOUR	PRE REQUISITE
SEMESTER 1				SEMESTER 2			
CSF3003	Discrete Structure	3(3+0)	-	CSE3203	Software Requirement Engineering	3(3+0)	-
CSF3023	System Thinking and Logic	3(3+0)	-	CSF3043	Object-Oriented Programming	3(2+1)	-
CSF3034	Programming	4(3+1)	-	CSF3213	Operating Systems	3(3+0)	-
CSF3143	Basics of Software Engineering	3(3+0)	-	MPU3132	Appreciation of Ethics & Civilization	2(2+0)	-
CSF3243	Computer Organisation and Architecture	3(3+0)	-	MPU3352	Integrity and Anti-Corruption	2(2+0)	-
CCXXXXX	Co-Curriculum	2(0+2)	-	MTK3053	Introduction to Statistics	3(3+0)	-
MPU3142	Philosophy and Current Issue	2(2+0)	-		Elective 1	3	-
TOTAL		20		TOTAL		19	
SEMESTER 3				SEMESTER 4			
CSF3013	Data Structure and Algorithm	3(2+1)	-	CSF3223	Networking	3(2+1)	-
CSF3113	System Analysis and Design	3(2+1)	-	CSM3023	Web-Based Application Development	3(2+1)	-
CSF3123	Database	3(2+1)	-	CSM3103	Front-End Programming	3(2+1)	-
CSF3133	Web-Based Interface Design	3(2+1)	-	CSM3313	IoT Computing	3(2+1)	-
	Elective 2	3	-	MPU3223	Basic Entrepreneurship	3(3+0)	-
	Elective 3	3	-		Elective 4	3	-
TOTAL		18		TOTAL		18	
SEMESTER 5				SEMESTER 6			
BBB3033	English for Occupational Purposes	3(3+0)	-	CSM4908-I	Industrial Project Management	8(0+8)	-
CSF3233	Cyber Security	3(2+1)	-	CSM4918-I	Industrial Project Development	8(0+8)	-
CSF3253	Intelligent System	3(3+0)	-				
CSM3114	Framework based Mobile Application Development	4(3+1)	-				
CSM3123	Native Mobile Programming	3(2+1)	-				
TOTAL		16		TOTAL		16	
SEMESTER 7							
CSM4928-I	Integrated Industrial Project Management	8(0+8)	-				
CSM4938-I	Integrated Industrial Project Development	8(0+8)	-				
TOTAL		16		TOTAL CREDIT		123	

Note:

- 1) Students are required to undertake the **Survival and Water Safety Programme** as a **condition to graduate**.
- 2) The number of elective course credit hours that must be taken by students in the programme of study is subject to the **number of elective credit hours** set by the programme of study to meet graduate qualifications and **is not subject to the number of elective courses taken**.
- 3) The list of elective courses that can be taken by students in the programme of study refers to the course offerings listed in the handbook of the study programme of the faculty and other faculties.

COURSE SYNOPSIS

BACHELOR OF COMPUTER SCIENCE (SOFTWARE ENGINEERING) WITH HONOURS BACHELOR OF COMPUTER SCIENCE WITH MARITIME INFORMATICS (HONOURS) BACHELOR OF COMPUTER SCIENCE (MOBILE COMPUTING) WITH HONOURS

CSA3003 **Maritime Informatics Technology and Professional Ethic**
Credit **3 (3+0)**
Prerequisite **None**

This course introduces students to the basic concepts of information and communication technology (ICT) in the maritime sector such as in the area of marine science, port and shipping management, logistics and security. Students are also exposed to ethics in digital security, intellectual property, and professional ethics. This course emphasizes students to apply information technology ethically and professionally to solve problems in Maritime Informatics.

CSA3013 **Modelling and Simulation**
Credit **3 (2+1)**
Prerequisite **None**

This course introduces the concept of modelling and simulation of dynamic systems. It includes the fundamentals of simulation, system dynamics, data collection and analysis methods, model building, model validation and verification, output analysis and subsequently comparing the performances of different system and its optimization. This main emphasis of this course is to expose students to the fundamental modelling and simulation methods used in problem solving.

**CSA3023/CSE302/
CSM3023** **Web-Based Application Development**
Credit **3 (2+1)**
Prerequisite **None**

The course provides all aspects of knowledge related to dynamic web development. Throughout this course, students will spend most of the time focusing on server-side components. Students will learn J2EE technologies such as Java Server Page (JSP), JavaBeans, Servlets and Java Database Connectivity (JDBC). They will also learn Model-View-Controller (MVC) design pattern using Java Servlet and will communicate with database for any kind of data transactions. Students will develop an interactive web-based application on the topic of their choice for the final project.

CSA3953/CSE3953 **Application System Development Project**
Credit **3 (0+3)**
Prerequisite **None**

This course strengthens the students' knowledge in programming by the group application development. Students are divided into small groups to develop certain applications. Focus is given to the knowledge transfer among students in the group through the application that will be built.

CSE3203 **Software Requirement Engineering**
Credit **3 (3+0)**
Prerequisite **None**

This course introduces students to the basic concepts of software requirements analysis and the approaches used to analyse requirements in software development. Several approaches to requirements elicitation and gathering are studied in detail. Students will be exposed to methods of writing requirements documents as well as requirements management. A case study will be assigned to students to be completed in groups, followed by producing a report on the study.

CSE3403 Software Project Management
Credit 3 (2+1)
Prerequisite None

This course introduces the concept, functions, and responsibilities of a software management project and how to manage a software development project. The emphasis is on the production of quality product in time, meet the scope and within budget. It covers project scheduling and planning, cost estimation, risk management, human management, document production, quality management and software maintenance. This course is essential for providing an understanding of scope management methods, work scheduling, time management, costs, and human resources in software project management.

CSE3413 Software Testing
Credit 3 (3+0)
Prerequisite None

This course introduces basic concepts, principles and techniques related to software testing. Students will become acquainted with both the strengths and limitations of various functional and structural testing methods. Topics include black-box and white-box test case design strategies, incremental integration testing techniques, inspections and reviews. Students will have the opportunity to practice the techniques presented in class via project exercises and case studies.

CSE3423 Software Quality Assurance
Credit 3 (3+0)
Prerequisite None

This course introduces function, procedure, and method that are exercised in controlling and assuring software quality. These include elements and the role of quality assurance, quality inspection, software testing and introduces some basic tools in software quality.

CSE3433 Software Architecture
Credit 3 (3+0)
Prerequisite None

This course introduces students to aspects of software architectures. These include middleware architecture such as COM and CORBA, aspect-oriented architecture, model driven architecture, Service-Oriented Architecture (SOA), components and design patterns. Students are also exposed to the basics behind the software architecture process, design, and analysis.

CSE3443 Software Maintenance and Evolution
Credit 3 (3+0)
Prerequisite None

This course covers fundamental aspects of software maintenance and evolution, including concepts and techniques, software changes and impact analysis, testing for software maintenance, process models for system evolution, software reuse and current issues in software maintenance.

CSE3453 **Ethics and Professional Practices**
Credit **3 (3+0)**
Prerequisite **None**

This course analyses ethical and societal issues in relation to the usage and development of information technology and communication (ICT). Brief introduction on the issues of theory, ethics, social and laws pertaining to ICT is given. Emphasis is also given on the specific problems such as privacy, reliability, security, responsibility in using ICT and also both the advantages and disadvantages of ICT. Students ought to be exposed to these issues prior to be qualified and ethical ICT practitioners and entrepreneurs. The development of ICT must be human-centred, beneficial to society and finally able to better the civilization of mankind. Concerns are also given to various ethical violations in using ICT. Cyber laws and acts in Malaysia are made known to educate students that the unethical used of ICT will invite problems. Professional code of ethics and responsibility in using the Internet and several solutions to the problems are discussed.

CSF3003 **Discrete Structure**
Credit **3 (3+0)**
Prerequisite **None**

This course discusses the concepts of discrete mathematics and how to use them in computer science environment. It covers the fundamentals topics such as the principle of counting, fundamentals of logic, set, mathematical induction, relations and functions, recurrence relations, and graphs. The course is significant because it emphasises the preparation and reinforcement of the fundamentals of computing and programming for students.

CSF3013 **Data Structure and Algorithm**
Credit **3 (2+1)**
Prerequisite **None**

This course introduces programming methods to solve problems. Topics for this course include the introduction to data structure such as linked list, stack, queue, tree, graph, sorting techniques and searching methods. Emphasis will be given on modular programming technique. This course also introduces algorithm time complexity as a measuring technique of an efficient algorithm. In addition, the time complexity algorithm as an efficient algorithm measurement technique will also be introduced.

CSF3023 **System Thinking and Logic**
Credit **3 (3+0)**
Prerequisite **None**

This course discusses the concepts of programming logic and design and how to use them in computer science environment. It covers the fundamentals topics such as decisions, looping, arrays, file handling, modularization and object-oriented programming. The course is significant because it emphasises the preparation and reinforcement of computing and programming fundamentals for students, as well as improving understanding of programme logic construction and analysis methods in Computer Science.

CSF3034 **Programming**
Credit **4 (3+1)**
Prerequisite **None**

This course contains basic programming and programming language; Problem solving techniques; flow diagram and structured algorithm; Programme coding techniques and instructions to solve formal problems. Hands-on programming exercises will be given to strengthen students programming knowledge. The availability of this course is critical for exposing students to the fundamental concepts of programming.

CSF3043 **Object – Oriented Programming**
Credit **3 (2+1)**
Prerequisite **None**

This course introduces object-oriented programming concepts. Students will be taught object concept and its differences with procedural technique and elementary Java language, including class and object, inheritance, polymorphism, interface, exception handling and GUI components. This course is critical for students to learn how to use object-oriented programming to solve computing problems.

CSF3113 **System Analysis and Design**
Credit **3 (2+1)**
Prerequisite **None**

This course introduces object-oriented concepts in system development. Project management and planning, systems analysis, systems design, systems implementation and operation will be discussed in detail. The student also will be taught on analysis and design the object-oriented design by using the Unified Modified Language (UML) notation and particular tools. This course is necessary because it introduces object-oriented concepts in system modelling and development using the UML notation.

CSF3123 **Database**
Credit **3 (2+1)**
Prerequisite **None**

This course introduces database concepts (goals of DBMS, relationships, physical and logical organization, schema and subschema); data models, normalisation (until BCNF), canonical schema and data independence; data description language; query facilities, query functions; design and translation strategies; and data integrity and reliability. This course is important because it focuses on the fundamental concepts of integrated databases.

CSF3133 **Web-Based Interface Design**
Credit **3 (2+1)**
Prerequisite **None**

This course offers the knowledge of integrating a basic concept of Human Computer Interaction (HCI) with web design. This course also, practically, will expose students to the two (2) core technologies for building web sites which are Hypertext Markup Language (HTML) and Cascading Style Sheets (CSS). Before the end of this course, students will develop a simple web site by applying the principles and methods to the design of user-centred web sites. This course is critical for exposing students to the fundamentals of web interface design and web programming.

CSF3213 **Operating System**
Credit **3 (3+0)**
Prerequisite **None**

This course introduces operating system concepts as well as discusses the mechanisms necessary for the protection and security of computer systems. Major topics in operating systems cover process, thread, and multiprogramming concepts (scheduling, synchronization, deadlock etc.), memory management, storage management and file management. Students will also be exposed to the current technologies in operating system through a case study. By including this course as a core component of the Computer Science programme, students will gain exposure to the latest operating systems and their primary components.

CSF3223 **Networking**
Credit **3 (2+1)**
Prerequisite **None**

This course exposes students to the architecture, structure, functions, and components of the Internet and other computer networks. By the end of the course, students will be able to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes. This course is important for students in the Computer Science programme because it introduces them to protocols, data networks, and network configurations.

CSF3233 **Cyber Security**
Credit **3 (2+1)**
Prerequisite **None**

This course introduces cybersecurity, especially the Internet. The usage of the cryptography technique will be discussed. This course also introduces to the student the form of threat to the Internet. Several defence applications, such as firewall and network analysis tools will be introduced to the student. This course is essential as the core of the Computer Science programme because it introduces students to cybersecurity threats and techniques that can be used to improve cybersecurity.

CSF3243 **Computer Organization and Architecture**
Credit **3 (3+0)**
Prerequisite **None**

This course introduces the structure and organization of digital computers which includes Central Processing Unit (CPU), Main Memory (MM) and Input/Output (I/O). Functions and relationship between these components in instruction execution will also be discussed. In addition, students will also be exposed to basic digital logics, structure and organization of multiprocessors. The teaching and learning approach of this course incorporates Academic 4.0 criteria which is online learning environment (blended learning). This course is offered as the foundation of the Computer Science programme to introduce students to the architecture and organization of computer systems.

CSF3253 **Intelligence System**
Credit **3 (3+0)**
Prerequisite **None**

This course introduces the fundamental concept of intelligent system and its applications. It covers the fundamental topic in intelligent system such as expert system, fuzzy logic, artificial neural network, computer evolution, hybrid system, data mining and intelligent agent. This course is offered as the core of the Computer Science programme to introduce students to the concept of intelligent systems, how to use basic intelligent system techniques in solving a given problem, and how to apply the concept of intelligent systems in software design.

CSF3503 **Special Topics in Maritime Informatics**
Credit **3 (3+0)**
Prerequisite **None**

This course will introduce students to the latest technologies and issues of computing in maritime informatics. At the end of the course, students will be able to analyse and apply the latest methods, techniques and technologies in maritime informatics. This course is important as an elective of the Computer Science programme to introduce students to the latest technology in maritime informatics.

CSF3513 **Special Topics in Software Engineering**
Credit **3 (3+0)**
Prerequisite **None**

The content of this course depends on current development in computer science. Current issues will be discussed by the lecturers. Part of this course will be in a form of seminar. Students will prepare and present working papers based on certain selected topics. This course is important as an elective of the Computer Science programme to introduce students to the latest technology in software engineering.

CSF3523 **Information System**
Credit **3 (3+0)**
Prerequisite **None**

This course explores the different types of Information Systems (IS) and their roles in today's business. It also looks into the IS processes, organizations and infrastructure. Several aspects of IS will be discussed including ethical and social issues, emerging technology and trends, business intelligence and security.

CSF3533 **Multimedia Technology**
Credit **3 (3+0)**
Prerequisite **None**

This course exposes students to the current technology in multimedia. It involves the study of multimedia hardware and software, the standards used in multimedia industries, the importance of multimedia in various fields, multimedia applications, and multimedia elements such as text, graphics, pictures, sound, video and animation. It also covers on the development of multimedia project and multimedia project management.

CSF3543 **Digital Image Processing**
Credit **3 (3+0)**
Prerequisite **None**

This course introduces students to the basic concepts and methodologies of digital image processing using marine data. Among the topics covered are the basic of digital image processing, image enhancement in spatial domain, morphological image processing, image segmentation as well as image representation and description. This course is important to expose students to the use of image processing techniques that can be applied in a given case study.

CSF3553 **Information Retrieval**
Credit **3 (3+0)**
Prerequisite **None**

This course provides an overview of the important issues in information retrieval. The course emphasizes the technology used in information retrieval theories and concepts that underlie the appropriate applications. It will cover algorithm, design, and implementation of modern information retrieval systems. Topics include retrieval system design and implementation, text processing techniques, retrieval models (e.g., Boolean, vector space, probabilistic, and learning- based methods), query languages, evaluation models, social search, and classification or clustering techniques. This course is important to expose students to the basics of accessing information and applying it in a given case study.

CSF3563 **Data Mining**
Credit **3 (3+0)**
Prerequisite **None**

This course is an introductory course on data mining. It introduces the basic concept of data mining such as data pre-processing, data warehousing as well as online analytical processing (OLAP). Students will be exposed to the data mining method and their implementations which focus to two major data mining functions i.e.: pattern discovery and cluster analysis.

CSF3573 **Computer Auditing**
Credit **3 (3+0)**
Prerequisite **None**

This course covers the technology and audit, knowledge of audit function, basic concepts of auditing and risks of Information Technology (IT), standards and guidelines for IT auditing, Knowledge of the concept of internal control, audit planning process, audit management, audit evidence process and follow-up of audit reporting.

CSF3583 **Formal Method**
Credit **3 (3+0)**
Prerequisite **None**

This course introduces formal methods for designing software system requirements, provides formal Z method languages, semantic operations for programming languages. This course is important in exposing students to the basics of formal method specification for software requirements and applying it in a given case study.

CSF3593 **Computer Forensics**
Credit **3 (3+0)**
Prerequisite **None**

This course introduces students to the fundamentals and importance of digital forensics and investigations. Students are taught the tools and techniques to recover and analyse digital data from the crime scene to be used as evidence in court. The types and structures of virus and Malware together with their detection techniques will also be discussed. Students will also be exposed to the technique to prepare and report on the results of the investigation for court cases.

CSF3603 **Digital Commerce**
Credit **3 (3+0)**
Prerequisite **None**

This course focuses on principles of e-commerce, providing an overview of commercial platform development and technology topics, commercial web development, virtual value chains and social innovation and marketing strategies. In addition, this course also covers intellectual property rights, authentication, encryption, acceptable use policies and legal liabilities. Students will build their own presence and market it using an online platform.

CSF3613 **Machine Learning**
Credit **3 (3+0)**
Prerequisite **None**

This course is an introductory course for undergraduate students related to machine learning. The class will briefly cover topics in supervised learning, unsupervised learning, and reinforcement learning. Besides, this course also will familiarize students with models and algorithms for machine learning and prepare students for research or industry application of machine learning techniques.

CSF3623 **Programming Paradigms**
Credit **3 (3+0)**
Prerequisite **None**

This course focuses on fundamental concepts of modern programming languages. The differences between paradigms: imperative, object-oriented, logic, functional and scripting. For each paradigm, related language will be covered.

CSF49712 **Industrial Training**
Credit **12 (0+12)**
Prerequisite **None**

This course exposes a student to the actual work environment. Students will carry out current duties appropriate to the Computer Science programme under the supervision of both industrial and university supervisors. This course incorporates elements of peeragogy (collaborative teaching and learning) between students and supervisors in the industry and unconventional learning and teaching elements (situation learning and inquiries) in completing the mini projects entrusted. It will assess the aspects of cognitive, communication, interpersonal, ethics and professionalism, and leadership, autonomy and responsibility skills through final reports, presentations and feedback from both industrial and UMT supervisors.

CSF4984 **Final Year Project I**
Credit **4 (0+4)**
Prerequisite **None**

In this course, the student will work on a software development project, research project, or equivalent under the supervision of a lecturer. The student will conduct preliminary research on the chosen topic, analyse requirements, and design the system. Students will prepare several software development documentations. Offering this course is critical for allowing students to apply their newly acquired knowledge and skills with minimal supervision.

CSF4994 **Final Year Project II**
Credit **4 (0+4)**
Prerequisite **CSF4984**

This course is an extension of CSF4984. The student will carry out a programming project or equivalent under the supervision of a lecturer. The student will focus on the implementation phase of project development. At the end of this course, the student will prepare a complete dissertation and present the dissertation for evaluation. The availability of this course is critical in allowing students to apply their knowledge and skills in software engineering to solve computing problems with minimal supervision.

CSM3103 **Front-End Programming**
Credit **3 (2+1)**
Prerequisite **None**

This course provides exposures to application development for mobile environment, specifically the front-end development. Topics covered include the design of dynamic and interactive user interface and interaction, server and database connectivity and event handling through JScript, jQuery, JSON, AJAX, PHP, RESTful web services and UI interface, Bootstrap. Hands on programming exercises and a group project will be given to strengthen students programming skills.

CSM3114 **Framework-Based Mobile Application Development**
Credit **4 (3+1)**
Prerequisite **None**

This course exposes students to JavaScript frameworks and their application in the development of mobile applications (frontend web application). Students will have hand-on experience in developing mobile applications based on JavaScript frameworks such as backbone.js and Angular.js. In addition, the hybrid application development experience through the use PhoneGap Cordova is also exposed to the students. Before the end of this course, students will undertake group project on framework based mobile application development by applying the methods they have learnt. This course is important for the development of mobile applications (frontend) based on Javascript framework.

CSM3123 **Native Mobile Programming**
Credit **3 (2+1)**
Prerequisite **None**

This course is an introduction to development of native applications for mobile environment. Topics covers include user interaction patterns, connectivity, interface design, software design pattern and application architectures within the context of mobile computing. Hands on programming exercises will be given to strengthen students programming language. This course is important for exposing students to mobile applications in a native development environment.

CSM3313 **IoT Computing**
Credit **3 (2+1)**
Prerequisite **None**

This course introduces concepts and main components of the Internet of Things (IoT). The student will be exposed to the concept of IoT thru the network technology and protocol as well as the wireless environment. Students also will be exposed to data analytics in an IoT environment. Exposure to the selected IoT application development will be carried out in the lab to increase the student learning experiences. This course is essential for introducing students to the fundamentals of the IoT and its relationship to everyday life.

CSM4908-I **Industrial Project Management**
Credit **8 (0+8)**
Prerequisite **None**

This course introduces students to the concepts and techniques used in managing a mobile application project development in industrial environment. Through this project, students will generate project plan and schedule, cost estimation, in addition to preparing related documentations. The aspect that will be accessed here is students' ability in managing project development. This course will be supervised by industrial supervisor and monitored by UMT.

CSM4918-1 **Industrial Project Development**
Credit **8 (0+8)**
Prerequisite **None**

Students will develop a mini application project under the supervision of an industrial supervisor and monitored by UMT. At the end of this course, the developed application will be evaluated by the appointed panels.

CSM4928-I **Integrated Industrial Project Management**
Credit **8 (0+8)**
Prerequisite **None**

This course enables students to apply the concepts and techniques of managing a mobile application project in industrial environment. In addition to preparing project plan and schedule, emphasis is given to the aspect of risks and quality management as well as project documentations. This course will be supervised by industrial supervisor and monitored by UMT.

CSM4938-I **Integrated Industrial Project Development**
Credit **8 (0+8)**
Prerequisite **None**

Students will develop a larger scale application in a team under the supervision of industry supervisors and monitored by UMT. Emphasis is also given to the ability to lead project development, manage resources, integrate modules and monitoring of progress and project costs. At the end of the course, the application will be evaluated by the appointed panel.

MMM3763 **Principle of Maritime Management**
Credit **3 (3+0)**
Prerequisite **None**

This course introduces students to the elements of basic management in maritime sectors. Topics include the theories, principles, analytical techniques, processes, and functions of management. Emphasis will also be given on the basic management with the example within maritime context.

MMM3843 **Global Shipping and Port Management**
Credit **3 (3+0)**
Prerequisite **None**

This course is designed to provide an understanding and exposure to the concepts of port and shipping management and administration, including port types, ship types, port operations, shipping operations, and port and shipping support services.

MMT3073 **Shipping and Port Technology**
Credit **3 (3+0)**
Prerequisite **None**

Environmental factors affecting the choice of technology. Specialization in cargo form, containment, types of handling, method of transport and efficient intermodal interface. Choice of ship and port technology. Contemporary issues in technology development.

MTK3053 **Introduction to Statistics**
Credit **3 (3+0)**
Prerequisite **None**

This course is selected to expose students to important concepts in statistics that can be used to analyse data. The basic concepts of data description, probability theory, random variable, probability distribution, parameter estimation, hypothesis testing, correlation and linear regression will be introduced in this course. The mastery of this knowledge is crucial to preventing misuse of statistics in data analysis and decision making.

Bachelor of Science (Applied Mathematics) with Honours

Introduction

The Bachelor of Science (Applied Mathematics) with Honours is a programme designed to produce graduates who are trained in the field of Mathematical Sciences who are able to apply their knowledge and expertise to meet the country's workforce needs. The programme curriculum has been completely blended to meet the eleven domains of learning outcomes of the programme recommended by KPT. This programme basically trains students to apply mathematical knowledge and related concepts in various areas of focus such as modelling, computing, optimization, geometry, use in physical science and so on. Students will also be exposed to knowledge and skills in various latest mathematical methods and also computer programming.

Along with the current technological developments and the requirements of the industrial revolution (IR) 4.0, some courses in this programme have been integrated with SAS modules that allow students to obtain SAS professional certificates that are recognized globally. In addition, this programme also trains students to think logically, organized and accurate and further helps them in finding effective solutions in related fields. At the end of the studies, which is in the seventh semester, students will undergo Industrial Training for 24 weeks in the industry whether public or private sector, local or international. While in the industry, students will be supervised by a supervisor from the industry and have the opportunity to practice the theory learned in the lecture room as well as through real work experience in preparation for the next phase. The study period is for 7 semesters or three and a half years.

Programme Education Objective (PEO)

At the end of their studies, students who follow this programme are able to achieve the following objectives:

- PEO1 : Knowledgeable and has practical skills in the field of Applied Mathematics that is in line with the needs of the industry.
- PEO2 : Communicate and have interpersonal skills effectively and show good leadership qualities in the organization.
- PEO3 : Able to analyse and solve real problems using numeracy skills based on scientific methods and critical thinking without neglecting pure values and integrity.
- PEO4 : Able to achieve, manage and deliver information by using the latest digital technology and demonstrate entrepreneurial skills as an added value for career advancement.

Career Prospects

Based on the principle of integrated education, when the field of Mathematical Science is offered together with various other disciplines, this programme is able to produce Applied Mathematics graduates who are knowledgeable, competent, authoritative and can provide excellent service in various job sectors that they enter into later. Among the careers that can be pursued are:

- Research Officer
- Science Officer
- Data Analyst
- Computerized Information Systems Manager
- Computerized Model Designer
- Computer Programmer
- Mathematics Teacher / Lecturer
- Bank Officer
- Insurance Officer
- Executive
- Financial Planner
- Applied Mathematician

PROGRAMME CURRICULUM
BACHELOR OF SCIENCE (APPLIED MATHEMATICS) WITH HONOURS

Total Credits to Graduate

The minimum number of credits to graduate is 120 credit hours. The distribution of credit hours by course category is as follows:

Category	Credit Hour	Percentage
University Core	20	17
Programme Core	70	58
University Elective	30	25
Total	120	100

University Core Courses

Students must attend and pass all **NINE** University Core courses with 20 credit hours. For co-curriculum courses, students can choose **ONE** from the various co-curriculum courses offered by the Centre for Foundation and Continuing Education.

No	Course Code	Course Name	Credit Hour	Prerequisite
1.	BBB3013	Academic Writing Skills	3(3+0)	None
2.	BBB3033	English for Occupational Purposes	3(3+0)	None
3.	MPU3132	Appreciation of Ethics and Civilizations	2(2+0)	None
4.	MPU3142	Philosophy and Current Issues	2(2+0)	None
5.	MPU3223	Basic Entrepreneurship	3(3+0)	None
6.	MPU3352	Integrity and Anti-Corruption	2(2+0)	None
7.	COM3112	Communication Arts	2(2+0)	None
8.	CCM3011	Community Care	1(0+1)	None
9.	CCXXXXX	Co-Curriculum	2(0+2)	None

Programme Core Courses

In order to meet the graduation requirements, students must attend and pass all **EIGHTEEN** Programme Core courses with 70 credits.

No	Course Code	Course Name	Credit Hour	Prerequisite
1.	MKG3002	Principle of Mathematical Modelling	2(2+0)	None
2.	MKG3003	Vector Calculus	3(3+0)	None
3.	MKG3004	Numerical Analysis	4(3+1)	None
4.	MKG3013	Modern Algebra	3(3+0)	None
5.	MKG3023	Applied Mathematical Methods	3(3+0)	None
6.	MKG3033	Scientific Computing	3(2+1)	None
7.	MTM3003	Ordinary Differential Equations	3(3+0)	None
8.	MTM3004	Linear Algebra	4(3+1)	None
9.	MTM3013	Real Analysis	3(3+0)	None
10.	MTM3014	Calculus	4(3+1)	None
11.	MTM3024	Statistics	4(3+1)	None
12.	MTM3034	Advanced Statistics	4(3+1)	None
13.	MTM3044	Operations Research with SAS	4(3+1)	None
14.	MTM3054	Programming Language	4(3+1)	None
15.	MTM4004	Optimization	4(3+1)	None
16.	MTM49712	Industrial Training	12(0+12)	None
17.	MTM4982	Final Year Project I	2(0+2)	None
18.	MTM4994	Final Year Project II	4(0+4)	None

University Elective Courses

Students must follow and pass elective courses totalling 30 credit hours. Elective courses can be chosen from any of the courses offered at UMT as appropriate based on their interest and maturity. However, students are encouraged to take at least 18 credit hours from the list of grouped elective courses below. Students can seek mentor guidance for the purpose of selecting this elective course.

No	Course Code	Course Name	Credit Hour	Prerequisite
Applied Mathematics Group				
1.	MKG4003	Partial Differential Equations	3(3+0)	None
2.	MKG4013	Computational Methods for Differential Equations	3(2+1)	None
3.	MKG4023	Mathematical Fluid Mechanics	3(3+0)	None
4.	MKG4033	Introduction to Fuzzy Set Theory	3(3+0)	None
Mathematical Analysis Group				
1.	MKG4043	Dynamical Systems	3(3+0)	None
2.	MKG4053	Complex Analysis	3(3+0)	None
3.	MKG4063	Functional Analysis	3(3+0)	None
4.	MKG4073	Topology	3(3+0)	None
Operations Research Group				
1.	MKG4004	Advanced Operations Research	4(3+1)	None
2.	MKG4013	Computational Methods for Differential Equations	3(2+1)	None
3.	MKG4083	Logic and Computing	3(3+0)	None
4.	MKG4093	Heuristic Techniques for Combinatorial Optimization	3(3+0)	None
Computer Based Geometric Design Group				
1.	MKG4013	Computational Methods for Differential Equations	3(2+1)	None
2.	MKG4083	Logic and Computing	3(3+0)	None
3.	MKG4103	Graph Theory	3(3+0)	None
4.	MKG4113	Computer Aided Geometric Design	3(2+1)	None

COURSE SCHEME
BACHELOR OF SCIENCE (APPLIED MATHEMATICS) WITH HONOURS

CODE	COURSE NAME	CREDIT HOUR	PRE REQUISITE	CODE	COURSE NAME	CREDIT HOUR	PRE REQUISITE
SEMESTER 1				SEMESTER 2			
MTM3004	Linear Algebra	4(3+1)	-	MTM3034	Advanced Statistics *	4(3+1)	-
MTM3014	Calculus	4(3+1)	-	MTM3044	Operations Research with SAS *	4(3+1)	-
MTM3024	Statistics*	4(3+1)	-	MKG3013	Modern Algebra	3(3+0)	-
MPU3132	Appreciation of Ethics and Civilizations	2(2+0)	-	BBB3013	Academic Writing Skills	3(3+0)	-
COM3112	Communication Arts	2(2+0)	-	CCXXXX	Co-Curriculum	2(0+2)	-
MPU3352	Integrity and Anti-Corruption	2(2+0)	-	MPU3142	Philosophy and Current Issues	2(2+0)	-
TOTAL		18		TOTAL		18	
SEMESTER 3				SEMESTER 4			
MTM3003	Ordinary Differential Equations	3(3+0)	-	MKG3004	Numerical Analysis	4(3+1)	-
MTM3054	Programming Language	4(3+1)	-	MTM3013	Real Analysis	3(3+0)	-
MKG3002	Principle of Mathematical Modelling	2(2+0)	-	MKG3023	Applied Mathematical Methods	3(3+0)	-
CCM3011	Community Care	1(0+1)	-	MKG3033	Scientific Computing	3(2+1)	-
	Elective 1	3	-		Elective 4	3	-
	Elective 2	3	-		Elective 5	3	-
	Elective 3	3	-				
TOTAL		19		TOTAL		19	
SEMESTER 5				SEMESTER 6			
MTM4004	Optimization*	4(3+1)	-	MTM4994	Final Year Project II	4(0+4)	-
MTM4982	Final Year Project I	2(0+2)	-	MPU3223	Basic Entrepreneurship	3(0+3)	-
MKG3003	Vector Calculus	3(3+0)	-		Elective 8	3	-
BBB3033	English for Occupational Purposes	3(3+0)	-		Elective 9	3	-
	Elective 6	3	-		Elective 10	3	-
	Elective 7	3	-				
TOTAL		18		TOTAL		16	
SEMESTER 7							
MTM49712	Industrial Training	12(0+12)	-				
TOTAL		12					
TOTAL CREDIT						120	

* A course equipped with a SAS certification module.

Note:

- 1) Students are required to follow the **Survival and Water Safety Programme** as a **requirement to graduate**.
- 2) The number of elective course credit hours that students must take in the study programme is subject to the **number of elective credit hours** set by the study programme to meet the qualification to graduate and is not subject to the **number** of elective courses taken.
- 3) The list of elective courses that can be taken by students in the study programme refers to the course offerings listed in the study programme handbook of that faculty and also other faculties.

Bachelor of Science (Financial Mathematics) with Honours

Introduction

The Bachelor of Science (Financial Mathematics) with Honours is a programme developed to provide knowledge about the use of mathematical methods such as probability theory, statistics, optimization, stochastic analysis and economic theory in financial problems that cover investment, insurance, Islamic finance, risk analysis etc. The curriculum of this programme has been completely blended to meet the eleven domains of learning outcomes of the programme recommended by the Ministry of Education throughout the course of 7 semesters or three and a half years.

In addition, in line with the development of the industrial revolution (IR) 4.0, several core courses of the programme have been implemented with SAS modules that qualify graduates for SAS certification at the end of the programme. This certification is an added value to graduates because it is recognized worldwide and is in demand from a wide range of industries.

To ensure students get real work experience, Industrial Training courses for 24 weeks implemented in the last semester (semester 7) in finance or other related industries. The knowledge that has been learned while on campus can be used during industrial training in addition to gaining new knowledge in the relevant sector.

Programme Education Objective (PEO)

At the end of their studies, students who follow this programme are able to achieve the following objectives:

- PEO1 : Knowledgeable and have practical skills in the field of Financial Mathematics that are in line with industry requirements.
- PEO2 : Communicate effectively and have interpersonal skills and demonstrate good leadership qualities in the organization.
- PEO3 : Able to analyse and solve real problems using numeracy skills based on scientific methods and critical thinking without neglecting pure values and integrity.
- PEO4 : Able to achieve, manage and communicate information by using the latest digital technology and demonstrate entrepreneurial skills as an added value for career advancement.

Career Prospects

Graduates of the Bachelor of Science (Financial Mathematics) with honours can engage in various service and career fields in either the public or private sector. The main sectors that graduates can enter are finance, insurance, banking or services. Among the careers that can be pursued are:

- Strategic Risk Officer
- Risk Modeler
- Investment Management Officer
- Actuarial Manager
- Mathematics Teacher/Lecturer
- Quantitative/Technical Analyst
- Data Analyst
- Researcher
- Science Officer
- Entrepreneur

PROGRAMME CURRICULUM
BACHELOR OF SCIENCE (FINANCIAL MATHEMATICS) WITH HONOURS

Total Credits to Graduate

The minimum number of credits to graduate is 120 credit hours. The distribution of credit hours by course category is as follows:

Category	Credit Hour	Percentage
University Core	20	17
Programme Core	70	58
University Elective	30	25
Total	120	100

University Core Courses

Students must attend and pass all **NINE** University Core courses with 18 credit hours. For co-curriculum courses, students can choose **ONE** from the various co-curriculum courses offered by the Centre for Foundation and Continuing Education.

No	Course Code	Course Name	Credit Hour	Prerequisite
1.	BBB3013	Academic Writing Skills	3(3+0)	None
2.	BBB3033	English for Occupational Purposes	3(3+0)	None
3.	MPU3132	Appreciation of Ethics and Civilizations	2(2+0)	None
4.	MPU3142	Philosophy and Current Issues	2(2+0)	None
5.	MPU3223	Basic Entrepreneurship	3(3+0)	None
6.	MPU3352	Integrity and Anti-Corruption	2(2+0)	None
7.	COM3112	Communication Arts	2(2+0)	None
8.	CCM3011	Community Care	1(0+1)	None
9.	CCXXXXX	Co-Curriculum	2(0+2)	None

Programme Core Courses

In order to meet the graduation requirements, students must attend and pass all **EIGHTEEN** Programme Core courses with 70 credits.

No	Course Code	Course Name	Credit Hour	Prerequisite
1.	ECO3043	Macroeconomics	3(3+0)	None
2.	MKW3003	Probability Theory in Finance	3(3+0)	None
3.	MKW3013	Stochastic Modeling and Applications	3(3+0)	None
4.	MKW3023	Investment Mathematics	3(3+0)	None
5.	MKW4003	Introduction to Stochastic Differential Equations	3(3+0)	None
6.	MKW4013	Financial Derivatives	3(3+0)	None
7.	MTM3003	Ordinary Differential Equations	3(3+0)	None
8.	MTM3004	Linear Algebra	4(3+1)	None
9.	MTM3013	Real Analysis	3(3+0)	None
10.	MTM3014	Calculus	4(3+1)	None
11.	MTM3024	Statistics	4(3+1)	None
12.	MTM3034	Advanced Statistics	4(3+1)	None
13.	MTM3044	Operations Research with SAS	4(3+1)	None
14.	MTM3054	Programming Language	4(3+1)	None
15.	MTM4004	Optimization	4(3+1)	None
16.	MTM49712	Industrial Training	12(0+12)	None
17.	MTM4982	Final Year Project I	2(0+2)	None
18.	MTM4994	Final Year Project II	4(0+4)	None

University Elective Courses

Students are free to enrol in any of the courses offered as appropriate based on interest and maturity. However, students are encouraged to take at least 21 credit hours from the list of elective courses below with guidance from a mentor:

No	Course Code	Course Name	Credit Hour	Prerequisite
1.	MKW4004	Numerical Methods in Finance	4(3+1)	None
2.	MKW4023	Financial Forecasting	3(3+0)	None
3.	MKW4033	Mathematical Theory in Insurance	3(3+0)	None
4.	MKW4043	Financial Optimization	3(3+0)	None
5.	MKW4053	Financial Risk Analysis	3(3+0)	None
6.	MKW4063	Financial Econometric	3(3+0)	None
7.	MKW4073	Islamic Financial Mathematics	3(3+0)	None
8.	MKG3004	Numerical Analysis	4(3+1)	None
9.	MKG4003	Partial Differential Equations	3(3+0)	None

COURSE SCHEME
BACHELOR OF SCIENCE (FINANCIAL MATHEMATICS) WITH HONOURS

CODE	COURSE NAME	CREDIT HOUR	PRE REQUISITE	CODE	COURSE NAME	CREDIT HOUR	PRE REQUISITE
SEMESTER 1				SEMESTER 2			
MTM3004	Linear Algebra	4(3+1)	-	MTM3034	Advanced Statistics *	4(3+1)	-
MTM3014	Calculus	4(3+1)	-	MTM3044	Operations Research with SAS *	4(3+1)	-
MTM3024	Statistics*	4(3+1)	-	MKW3003	Probability Theory in Finance	3(3+0)	-
COM3112	Communication Arts	2(2+0)	-	BBB3013	Academic Writing Skills	3(3+0)	-
MPU3352	Integrity and Anti-Corruption	2(2+0)	-	MPU3132	Appreciation of Ethics and Civilization	2(2+0)	-
CCXXXXX	Co-Curriculum	2(0+2)	-	MPU3142	Philosophy and Current Issues	2(2+0)	-
TOTAL		18		TOTAL		18	
SEMESTER 3				SEMESTER 4			
MTM3003	Ordinary Differential Equations	3(3+0)	-	MTM3013	Real Analysis	3(3+0)	-
MTM3054	Programming Language	4(3+1)	-	MKW3023	Investment Mathematics	3(3+0)	-
MKW3013	Stochastic Modelling and Applications	3(3+0)	-	ECO3043	Macroeconomics	3(3+0)	-
CCM3011	Community Care	1(0+1)	-		Elective 4	3	-
	Elective 1	3	-		Elective 5	3	-
	Elective 2	3	-		Elective 6	3	-
	Elective 3	3	-				
TOTAL		20		TOTAL		18	
SEMESTER 5				SEMESTER 6			
MTM4004	Optimization*	4(3+1)	-	MTM4994	Final Year Project II	4(0+4)	-
MTM4982	Final Year Project I	2(0+2)	-	MKW4013	Financial Derivatives	3(3+0)	-
MKW4003	Introduction to Stochastic Differential Equations	3(3+0)	-	MPU3223	Basic Entrepreneurship	3(3+0)	-
BBB3033	English for Occupational Purposes	3(3+0)	-		Elective 9	3	-
	Elective 7	3	-		Elective 10	3	-
	Elective 8	3	-				
TOTAL		18		TOTAL		16	
SEMESTER 7							
MTM49712	Industrial Training	12(0+12)	-				
TOTAL		12					
TOTAL CREDIT						120	

* A course equipped with a SAS certification module.

Note:

- 1) Students are required to follow the **Survival and Water Safety Programme** as a **requirement to graduate**.
- 2) The number of elective course credit hours that students must take in the study programme is subject to the **number of elective credit hours** set by the study programme to meet the qualification to graduate and is not subject to the **number** of elective courses taken.
- 3) The list of elective courses that can be taken by students in the study programme refers to the course offerings listed in the study programme handbook of that faculty and also other faculties.

Bachelor of Science (Data Analytics) with Honours

Introduction

The Bachelor of Science (Data Analytics) with Honours has been designed to provide a study programme that combines data science, statistics, machine learning and mathematics in line with Industrial Revolution 4.0. This programme applies 2u2i elements through the implementation of 2.5 years of study at university (university component) and 1 year of study in industry (industry component). After completing this study programme, students will obtain a SAS Certificate known as "SAS Academic specialization in Data Analytics".

The curriculum of this study programme has been fully integrated to meet the increasing needs of highly skilled data analysts who are able to analyse the growing amount of data in various disciplines and process it into useful information for decision making. The programme also aims to meet the industry's high demand for business and data analysts. Graduates will be trained with the latest methods, concepts and tools through knowledge, skills and abilities to understand data in various forms.

Students will have the opportunity to work with industry through 4 industry component courses in the form of Work-Based Learning (WBL) offered in the final year of study. This learning involves a project in a real industrial environment related to IR4.0. The implementation of the 2u2i mode will expose students to real learning and practice directly from relevant industry practitioners. Such training will add value to their qualifications and increase their employment opportunities.

Programme Education Objective (PEO)

Students in this programme are targeted to achieve the following objectives:

- PEO1 : Able to apply knowledge (PLO1) and technical skills (PLO2) as well as practical skills supported by intellectual skills (PLO3) in the field of Data Analytics in line with Industrial Revolution 4.0 (IR4.0)
- PEO2 : Able to communicate effectively in various levels of autonomy (PLO4) as well as capable in planning and managing relationships in teams and organizations with different political, cultural and social backgrounds (PLO5)
- PEO3 : Practicing knowledge ethically and professionally with integrity and accountability (PLO6)
- PEO4 : Able to solve problems in an IR4.0 environment effectively with the spirit of "esprit de corps" (PLO7) and able to make decisions critically and analytically at various levels of autonomy in the organization (PLO9)
- PEO5 : Able to sharpen the entrepreneurial mind related to IR4.0 (PLO8) by leveraging digital technology knowledge and skills (PLO10) supported by quantitative skills to analyse and manage the economic, political, social and climate change environment in IR4.0 (PLO11)

Career Prospects

Graduates of the Bachelor of Science (Data Analytics) programme with honours can be involved in various fields and services of big data or industrial revolution 4.0 either in the public or private sector such as finance, insurance, banking, investment, transport, manufacturing, mining, health, marketing, sports, research and development and more. Among the careers that can be pursued are:

- Data Scientist
- Data Analyst
- Data Engineer
- Data Manager
- Data Architect
- Business/Marketing Analyst
- Quantitative Analyst
- Financial Analyst
- System Analyst
- Information Security Analyst
- Research and Development
- Business Consultant
- Database Developer or Administrator

PROGRAMME CURRICULUM
BACHELOR OF SCIENCE (DATA ANALYTICS) WITH HONOURS

Total Credits to Graduate

The minimum number of credits to graduate is 125 credit hours. The distribution of credit hours by course category is as follows:

Category	Credit Hour	Percentage
University Core	20	16
Programme Core	68	54
Programme Specialization	22	18
University Elective	15	12
Total	125	100

University Core Courses

Students must attend and pass all **NINE** University Core courses with 18 credit hours. For co-curriculum courses, students can choose **ONE** from the various co-curriculum courses offered by the Centre for Foundation and Continuing Education.

No	Course Code	Course Name	Credit Hour	Prerequisite
1.	BBB3013	Academic Writing Skills	3(3+0)	None
2.	BBB3033	English for Occupational Purposes	3(3+0)	None
3.	MPU3132	Appreciation of Ethics and Civilizations	2(2+0)	None
4.	MPU3142	Philosophy and Current Issues	2(2+0)	None
5.	MPU3223	Basic Entrepreneurship	3(3+0)	None
6.	MPU3352	Integrity and Anti-Corruption	2(2+0)	None
7.	COM3112	Communication Arts	2(2+0)	None
8.	CCM3011	Community Care	1(0+1)	None
9.	CCXXXXX	Co-Curriculum	2(0+2)	None

Programme Core Courses

In order to meet the graduation requirements, students must attend and pass all **FIFTEEN** Programme Core courses with 68 credits.

No	Course Code	Course Name	Credit Hour	Prerequisite
1.	CSF3013	Data Structure and Algorithm	3(2+1)	None
2.	CSF3123	Database	3(2+1)	None
3.	MDA3003	Introduction to Data Science	3(2+1)	None
4.	MDA3024	Multivariate Calculus	4(3+1)	None
5.	MDA3044	Industrial Programming Language	4(3+1)	None
6.	MDA3053	Introduction to Machine Learning	3(2+1)	None
7.	MDA3103	Topological Data Analysis	3(2+1)	None
8.	MDA3123	Data Visualisation	3(3+0)	None
9.	MDA3133	Network Science	3(2+1)	None
10.	MDA4003	Scientific Research	3(3+0)	None
11.	MDA4908-I	Industrial Project I	8(0+8)	None
12.	MDA4918-I	Project Management I	8(0+8)	None
13.	MDA4928-I	Industrial Project II	8(0+8)	None
14.	MDA4938-I	Project Management II	8(0+8)	None
15.	MTM3004	Linear Algebra	4(3+1)	None

Programme Specialization Courses

In order to meet the graduation requirements, students must attend and pass all **SEVEN** Programme Specialization courses with 22 credits.

No	Course Code	Course Name	Credit Hour	Prerequisite
1.	MDA3014	Probability and Statistics for Data Analytics	4(3+1)	None
2.	MDA3033	Applied Statistical Linear Model	3(2+1)	None
3.	MDA3063	Experimental Design	3(3+0)	None
4.	MDA3073	Survey Sampling Methods	3(3+0)	None
5.	MDA3083	Predictive Analytics	3(3+0)	None
6.	MDA3093	Bayesian Statistics	3(3+0)	None
7.	MDA3113	Multivariate Statistics	3(3+0)	None

University Elective Courses

Students are free to enrol in any of the courses offered as appropriate based on interest and maturity. However, it is suggested that students take at least 15 credit hours from the list of elective courses below or subject to the approval of the Head of Programme:

No	Course Code	Course Name	Credit Hour	Prerequisite
1.	CSF3563	Data Mining	3(3+0)	None
2.	ECO3003	Principles of Economic Thinking	3(3+0)	None
3.	KAS3032	Principles of Environmental Analysis	2(2+0)	None
4.	MGM3323-E	Management Philosophy	3(3+0)	None
5.	MKG3002	Principles of Mathematical Modelling	2(2+0)	None
6.	MKG3033	Scientific Computing	3(2+1)	None
7.	MKG4083	Logic and Computing	3(3+0)	None
8.	MKG4093	Heuristic Techniques for Combinatorial Optimization	3(3+0)	None
9.	MKG4103	Graph Theory	3(3+0)	None
10.	MMS3103	Oceans, Atmosphere and Climate	3(3+0)	None
11.	MMS3603	Introduction to Marine Science	3(3+0)	None
12.	MMS3633	Marin Management and Police Approach	3(3+0)	None
13.	MMS3653	Marine Scientific Data Analysis	3(3+0)	None
14.	MMS3663	Basics of Marine Science	3(3+0)	None
15.	MMT3112	Marine Technology Laboratory	2(0+2)	None

**PROGRAMME SCHEME
BACHELOR OF SCIENCE (DATA ANALYTICS) WITH HONOURS**

CODE	COURSE NAME	CREDIT HOUR	PRE REQUISITE	CODE	COURSE NAME	CREDIT HOUR	PRE REQUISITE
SEMESTER 1				SEMESTER 2			
MDA3003	Introduction to Data Science	3(2+1)	-	MDA3033	Applied Linear Statistical Models	3(2+1)	-
MDA3014	Probability and Statistics for Data Analytics*	4(3+1)	-	MDA3044	Industrial Programming Language	4(3+1)	-
MDA3024	Multivariate Calculus	4(3+1)	-	MDA3053	Introduction to Machine Learning	3(2+1)	-
MTM3004	Linear Algebra	4(3+1)	-	BBB3013	Academic Writing Skills	3(3+0)	-
MPU3142	Philosophy and Current Issues	2(2+0)	-	COM3112	Communication Arts	2(2+0)	-
CCXXXXX	Co-Curriculum	2	-	CCM3011	Community Care	1(0+1)	-
			-	MPU3352	Integrity and Anti-Corruption	2(2+0)	-
TOTAL		19		TOTAL		18	
SEMESTER 3				SEMESTER 4			
MDA3063	Experimental Design	3(3+0)	-	MDA3083	Predictive Analytics*	3(3+0)	-
MDA3073	Survey Sampling Methods	3(3+0)	-	MDA3093	Bayesian Statistics*	3(3+0)	-
CSF3013	Data Structure and Algorithm	3(2+1)	-	MDA3103	Topological Data Analysis	3(2+1)	-
CSF3123	Database	3(2+1)	-	MPU3223	Basic Entrepreneurship	3(3+0)	-
	Elective 1	3	-	MPU3132	Appreciation of Ethics and Civilization	2(2+0)	-
	Elective 2	3	-		Elective 3	3	-
					Elective 4	3	-
TOTAL		18		TOTAL		20	
SEMESTER 5				SEMESTER 6 (INDUSTRIAL COMPONENT 1)			
MDA3113	Multivariate Statistics*	3(3+0)	-	MDA4908-I	Industrial Project I	8(0+8)	-
MDA3123	Data Visualisation*	3(3+0)	-	MDA4918-I	Project Management I	8(0+8)	-
MDA3133	Network Science	3(2+1)	-				
MDA4003	Scientific Research	3(3+0)	-				
BBB3033	English for Occupational Purposes	3(3+0)	-				
	Elective 5	3	-				
TOTAL		18		TOTAL		16	
SEMESTER 7 (INDUSTRIAL COMPONENT 2)							
MDA4928-I	Industrial Project II	8(0+8)	-				
MDA4938-I	Project Management II	8(0+8)	-				
TOTAL		16					
TOTAL CREDIT						125	

* A course equipped with a SAS certification module.

Note:

- 1) Students are required to follow the **Survival and Water Safety Programme** as a **requirement to graduate**.
- 2) The number of elective course credit hours that students must take in the study programme is subject to the **number of elective credit hours** set by the study programme to meet the qualification to graduate and is not subject to the **number** of elective courses taken.
- 3) The list of elective courses that can be taken by students in the study programme refers to the course offerings listed in the study programme handbook of that faculty and also other faculties.

COURSE SYNOPSIS
BACHELOR OF SCIENCE (APPLIED MATHEMATICS) WITH HONOURS
BACHELOR OF SCIENCE (FINANCIAL MATHEMATICS) WITH HONOURS
BACHELOR OF SCIENCE (DATA ANALYTICS) WITH HONOURS

ECO3003 **Principles of Economic Thinking**
Credit **3(3+0)**
Prerequisite **No**

This course aims to provide students with an understanding of the fundamental concepts and theories of the economy in order to connect and apply the knowledge learned in real life. This course covers selected topics in microeconomics and macroeconomics. Modern pedagogy approaches particularly heutagogy, pedagogy and cybergogy will be implemented in this course.

ECO3043 **Macroeconomics**
Credit **3(3+0)**
Prerequisite **No**

This course explains in depth the concepts of national income accounting, employment, inflation and unemployment, macroeconomic policies and macroeconomic models.

CSF3013 **Data Structure and Algorithm**
Credit **3(2+1)**
Prerequisite **No**

This course introduces programming methods to solve problems. Topics for this course include the introduction to data structure such as linked list, stack, queue, tree, graph, sorting techniques and searching methods. Emphasis will be given on modular programming technique. This course also introduces algorithm time complexity as a measuring technique of an efficient algorithm. In addition, the time complexity algorithm as an efficient algorithm measurement technique will also be introduced.

CSF3123 **Database**
Credit **3(2+1)**
Prerequisite **No**

This course introduces database concepts (goals of DBMS, relationships, physical and logical organization, schema and subschema); data models, normalisation (until BCNF), canonical schema and data independence; data description language; query facilities, query functions; design and translation strategies; and data integrity and reliability.

CSF3563 **Data Mining**
Credit **3(3+0)**
Prerequisite **No**

This course is an introductory course on data mining. It introduces the basic concept of data mining such as data pre-processing, data warehousing as well as online analytical processing (OLAP). Students will be exposed to the data mining method and their implementations which focus to two major data mining functions i.e.: pattern discovery and cluster analysis.

KAS3032 Principles of Environmental Analysis**Credit 2(2+0)****Prerequisite No**

This course covers the general topics on the analysis of pollutants in environmental matrices including the instrumentations, theory and techniques for their measurements. The knowledge gained from this course will be useful for mastering other advance courses including air quality and pollution, water and wastewater treatment technology.

MDA3003 Introduction to Data Science**Credit 3(2+1)****Prerequisite No**

This course introduces the student to the collection, preparation, data acquisition, cleaning, aggregation, exploratory data analysis, modelling and visualization of data, feature engineering, and model creation and validation covering both conceptual and practical issues. Examples from diverse fields will be presented, and hands-on use of statistical and data manipulation software will be included.

MDA3024 Multivariate Calculus**Credit 4(3+1)****Prerequisite No**

This course discusses the topics like the limit and continuity, multivariable functions, partial derivatives, total derivative and multiple integration. In addition, this course discusses the cylinder coordinate, spherical coordinate and the change of variables in multiple integration.

MDA3044 Industrial Programming Language**Credit 4(3+1)****Prerequisite No**

This course contains basic programming and programming language; Problem solving techniques; flow diagram and structured algorithm; Programme coding techniques and instructions to solve formal problems. Hands-on programming exercises will be given to expose students on integration of SQL, TensorFlow, and many other useful functions and libraries for data science and machine learning.

MDA3053 Introduction to Machine Learning**Credit 3(2+1)****Prerequisite No**

This course discusses the basics of machine learning which include introduction to machine learning, various concepts and methods in machine learning, classification of machine learning algorithms, various types of machine learning such as "Neural Networks", "Support Vector Machine" and ending with language learning.

MDA3103 Topological Data Analysis**Credit 3(2+1)****Prerequisite No**

This course introduces fundamental elements of the emerging science of Topological Data Analysis (TDA) with the underlying principles from computational geometry, algebraic topology, data analysis, and many other related scientific areas. The application of topological techniques to complex data has opened up new opportunities in exploratory data analysis and data mining. This course is intended to cover theory, algorithm and application of TDA for identifying topological signatures of complex datasets, not just massive in size, but rich in features.

MDA3123 Data Visualization

Credit 3(2+1)

Prerequisite No

This course introduces to the principles and basic data visualization design; visualization representation methods and techniques including charts, tables, graphics, effective presentations, multimedia content, animation, and dashboard design for visualizing multivariate, temporal, text-based, geospatial, hierarchical and network data. Hands-on visualization exercises based on common data domains will be given to experience designing data graphics and visualizations, and reporting findings using data visualization tool.

MDA3133 Network Science

Credit 3(2+1)

Prerequisite No

This course introduces fundamental elements of the emerging science of complex networks, with emphasis on social and information networks. Students will learn about mathematical and computational methods used to visualize analyse networks, methods used to understand and predict behaviour of networked systems, and theories used to reason about network dynamics. Students will also be exposed to current trend in the field, and derive insights on complex structures.

MDA4003 Scientific Research

Credit 3(3+0)

Prerequisite No

The course aims to provide in-depth knowledge of scientific research in the field of data analytics. This course provides students with the body of knowledge and practical skills of scientific work in data analytics from introduction to scientific research, understanding of the scientific literature and its ethics, methodology of scientific research including the problem identification, investigation design, data collection, data analysis, formulation, elaboration of the research model, instruments and consult students to the systematics scientific research, writing good report and effective presentation.

MDA4908-I Industrial Project I

Credit 8(0+8)

Prerequisite No

This course introduces the student to the basic requirement of industrial project particularly data science projects at industrial environment.

MDA4918-I Project Management I

Credit 8(0+8)

Prerequisite No

This course introduces students to the concepts and techniques used in managing a project particularly data science projects in industrial environment. Through this project, students will generate project plan and schedule, cost estimation, in addition to preparing the related documents. The aspect that will be accessed here is students' ability in managing project development. This course will be supervised by industrial supervisor and monitored by UMT.

MDA4928-I Industrial Project II**Credit 8(0+8)****Prerequisite No**

This course is a continuation from the Industrial Project I (MDA49781). Through this course, students will be implementing the concepts and techniques used in the Industrial Project I in terms of real industrial environment. The aspect that will be accessed here is students' ability in managing project development with minimum supervision by industrial and UMT supervisors.

MDA4938-I Project Management II**Credit 8(0+8)****Prerequisite No**

This course is a continuation from the Project Management I (MDA49782). Through this course, students will be implementing the concepts and techniques used in the Project Management I in terms of real industrial environment such as the project plan and schedule, cost estimation, in addition to preparing the related documents. The aspect that will be accessed here is students' ability in managing project development with minimum supervision by industrial and UMT supervisors.

MDA3014 Probability and Statistics for Data Analytics**Credit 4(3+1)****Prerequisite No**

This course introduces the student to the important concepts in probability and statistics such as probability, random variables, probability distribution random variables, sampling distribution theory, estimation and hypothesis testing. Examples data from marine and aquatic will be presented, and hands-on use of statistical and data manipulation software will be included.

MDA3033 Applied Linear Statistical Models**Credit 3(2+1)****Prerequisite No**

In this course, we will learn how to develop linear models via simple and multiple linear regression. Mastery of this knowledge is important because statistical methods are widely used today that involve real data and big data.

MDA3063 Experimental Design**Credit 3(3+0)****Prerequisite No**

This course begins with Basic principles of experimental design; Randomization; Completely randomized design; Randomized blocks, Latin Squares, Factorial design; Blocking in factorial design; 2k factorial design; Extension of 2k factorials; Blocking and confounding in 2k factorials; Fractional factorial designs; Blocking in fractional factorials; Nested and split-plot designs; Replicated and un-replicated designs; Random effects model.

MDA3073 Survey Sampling Methods

Credit 3(3+0)

Prerequisite No

The course introduces the student to a set of principles of survey and data analytics that are the basis of standard practices in these fields. This course begins with how to do survey research for data analytics, quality of data, modes of survey data collection, data generation from other sources, sampling technique such as simple random, probability sampling, stratified sampling, ratio and regression estimation, cluster and systematic sampling, two-stage sampling, estimating the population size, total survey error, writing reports and managing the survey process. Examples from diverse fields will be presented, and hands-on.

MDA3083 Predictive Analytics

Credit 3(3+0)

Prerequisite No

This course introduces student to the knowledge of widely-used forecasting technique, such as the forecasting problem, an introduction to time series methods, time series methods, data reduction and big data. Examples data from marine and aquatic will be presented, and hands-on use of forecasting methods and data manipulation will be included.

MDA3093 Bayesian Statistics

Credit 3(3+0)

Prerequisite No

The course begins with a brief overview of the probabilities and is followed by Statistics. Topics to be covered in this course include one-parameter models, multiparameter models, Markov Monte Carlo chains and model comparisons.

MDA3113 Multivariate Statistics

Credit 3(3+0)

Prerequisite No

This course covers introduction to multivariate data, multivariate data visualization, application of multivariate models such as principal component analysis, multidimensional scaling, factor analysis and group analysis.

MGM3323-E Philosophy of Management

Credit 3(3+0)

Prerequisite No

Analyse key management theories, principles, techniques and tools with a focus on management activities related to areas or functions for a business and non-business organization. Emphasis will also be given to the systematic approach.

MKG3002 Principle of Mathematical Modelling

Credit 2(2+0)

Prerequisite No

This course discusses the topics involves introductory to mathematical modelling, dimension analysis, model approximation and verification and their applications.

MKG3003 Vector Calculus

Credit 3(3+0)

Prerequisite No

This course discusses the topics involves the vector and geometry of space, calculus for vector valued functions and integration of vector valued function in two and three dimensional of space.

MKG3004 Numerical Analysis

Credit 4(3+1)

Prerequisite No

This course presents numerical methods for solving mathematical problems. Both theoretical and computer implementation of the methods are discussed in this course. It covers solution of nonlinear equations, interpolation and approximation, numerical integration and differentiation and solution of ordinary differential equations.

MKG3013 Modern Algebra

Credit 3(3+0)

Prerequisite No

This course discusses the concepts of sets, functions and the set of integers. It continues by discussing linear congruence and subsequently equivalence relations. The concepts on groups, rings and fields, which also include several basic theories relating to the topics which cover mappings, and the basic ideas on direct products of groups are also discussed. Discussion on theory of ideals and basic operation involving ideals end this course.

MKG3023 Applied Mathematical Methods

Credit 3(3+0)

Prerequisite No

This course discusses mathematical methods and techniques commonly used in solving science, technology and engineering problems. It begins with a series solution for differential equations involving the power series method and the Frobenius method. Later, Fourier analysis which is one of the methods often used in solving real world problems is also discussed in this course. At the end of the course, the partial differential equations involving the Heat, Wave and Laplace equations is introduced and solved using the mathematical methods and techniques learned in this course.

MKG3033 Scientific Computing

Credit 3(2+1)

Prerequisite No

This course discusses the basics elements of scientific computing, in particular the methods for solving or approximating the solution of calculus and linear algebra problems associated with real world problems. Using a sophisticated scientific computing and visualisation environments, students are introduced to the basic computational concepts of stability, accuracy and efficiency. New numerical methods and techniques are introduced to solve more challenging problems.

MKG4003 Partial Differential Equations

Credit 3(3+0)

Prerequisite No

This course discusses partial differential equations and its applications in physics. This course introduces partial differential equations of the first and second order and the solutions using the method of characteristics. This course also discusses main three partial differential equations in physics, namely the heat equation, the wave equation and the Laplace equation and their solutions using the method of separation of variables and integral transforms.

MKG4004 Advanced Operations Research

Credit 4(3+1)

Prerequisite No

This course expands the explanation on the application of methods in operations research for real problems. It emphasizes more on the topic of integer programming, linear and non-linear programming. Solution using SAS will also be discussed in the course.

MKG4013 Computational Methods for Differential Equations

Credit 3(2+1)

Prerequisite No

This course pursues numerical approach modelling natural phenomena that often cannot be solved analytically. This course is divided into two parts. The first part discusses about finite- difference and shooting method to solve linear and nonlinear ordinary differential equations with boundary values. The second part discusses about various numerical approaches to solve hyperbolic, parabolic and elliptic partial differential equations. Students are exposed to solve a wide variety of real problems in science, engineering, and other fields using numerical methods.

MKG4023 Mathematical Fluid Mechanics

Credit 3(3+0)

Prerequisite No

This course discusses the basic concepts of fluid mechanics consisting of the definition and scope of fluid mechanics, the basic equations involved, methods of analysis and classification of fluids. This course continues with fluid statics, basic equations in integral form and differential analysis of fluid motions. Applications in incompressible flow are considered by introducing to Euler and Bernoulli equations.

MKG4033 Introduction to Fuzzy Set Theory

Credit 3(3+0)

Prerequisite No

This course discusses the concept of uncertainty and its solution techniques using fuzzy set theory, fuzzy expansion and fuzzy logic. This course also provides a fuzzy modeling method of fuzzy approach to solve the problem of uncertainty. Fuzzy logic systems and application of fuzzy set theory are discussed through case studies.

MKG4043 Dynamical Systems**Credit 3(3+0)****Prerequisite No**

This course discusses nonlinear ordinary differential equations from an analytical point of view and involves significant use of a few concepts, including equilibrium points, orbits, phase portraits and limit cycles. Several methods such as linearization are discussed to determine existence and stability of equilibrium points and analyse nonlinear differential equations such as. An introduction to chaos theory is also presented. The techniques will be applied to nonlinear differential equations from physics, engineering, biology, ecology.

MKG4053 Complex Analysis**Credit 3(3+0)****Prerequisite No**

This course discusses the following topics: algebra of complex numbers, analytic functions, elementary functions and mapping by elementary functions, complex integration, Cauchy's theorem and integration formula, Liouville's theorem and maximum modulus theorem. Discussion on fundamental theorem of algebra, power series, Taylor's series, zeroes and poles, residues, the residue theorem, and evaluation of contour integrals end this course.

MKG4063 Functional Analysis**Credit 3(3+0)****Prerequisite No**

This course discusses the concepts of metric spaces, normed spaces as well as topological concepts such as ideas of openness and closeness, compact set, and continuity in metric, normed and inner product spaces. Banach and Hilbert spaces will be discussed in more detail. This course also discusses the properties of convergence including strong and weak convergences, and uniform boundedness. Discussion on several important properties such dual spaces, LP spaces, spectrum theory and compact linear operators end this course.

MKG4073 Topology**Credit 3(3+0)****Prerequisite No**

This course discusses the basic concepts such as functions, countability of sets, cardinality, partially ordered sets, definition of topological space, neighbourhoods, sequences, bases and subbases. This course also discusses the continuity of functions, homeomorphisms, topological properties, first and second countable spaces, Lindelöf's theorems, hereditary properties and some separation axioms. Discussion continues compact spaces, compactification, connected spaces, components and simply connected spaces. In addition, some selected topics from fields related to topology ended this course.

MKG4083 Logic and Computation**Credit 3(3+0)****Prerequisite No**

This course considers classical logics; primarily first-order logic but also propositional logic and second-order logic. Each logic has a notion of atomic formula. Every sentence and formula can be constructed from atomic formulas following precise rules. The foundation issues are not discussed in this course, but rather focus on the other areas such as computability theory and complexity theory.

MKG4093 Heuristic Techniques for Combinatorial Optimization

Credit 3(3+0)

Prerequisite No

Optimization using heuristic techniques is one of the frequently used methods for solving various real-world problems. This technique is often used for solving NP-hard problem, for example in transportation, scheduling, network, and bioinformatics. Since there are numerous possible applications using this method, it is important for students to understand it and to be able to apply it in real world applications.

MKG4103 Graph Theory

Credit 3(3+0)

Prerequisite No

This course discusses the basic concepts in Graph Theory including Eulerian and Hamilton graphs and their application, graphs and subgraphs, connectivity of graphs, tours and matchings. Graph colouring, planar graph and directed graphs end this course.

MKG4113 Computer Aided Geometric Design

Credit 3(2+1)

Prerequisite No

This course discusses the principles of geometric modelling focusing on Bezier and B-Splines curves and surfaces. Clear comprehension of the underlying mathematics of curve and surface design may prepare the students to explore various applications such scientific visualization, manufacturing design and computer graphics.

MKW3003 Probability Theory in Finance

Credit 3(3+0)

Prerequisite No

The course introduces probability theory, mainly the one that are used in finance. It elaborates important topics; namely set and function, measure theory, random variables, probability distribution and conditional expectation which underly the area of financial mathematics. This knowledge of relevant probability theory is essential in understanding the development of stochastic calculus used in finance.

MKW3013 Stochastic Modelling and Applications

Credit 3(3+0)

Prerequisite No

This course discusses the concept of Markov chain in discrete and continuous times. This course begins with basic definitions and properties of the Markov chain including transition probability and continues with limiting distribution as the long-term behaviour of Markov chain. The Poisson process is also highlighted. Some examples of real applications will also be discussed in this course.

MKW3023 Investment Mathematics

Credit 3(3+0)

Prerequisite No

This course provides an introductory analysis of investments from a quantitative viewpoint. It draws together many of the tools and techniques required by investment professionals, focuses mainly to the interest rate theory. Using these techniques, simple analyses of a number of securities including fixed interest bonds, equities, and real estates are discoursed. Discussions on the real return ends the course.

MKW4003 Introduction to Stochastic Differential Equations**Credit 3(3+0)****Prerequisite No**

The course discusses some basic concepts of calculus for the development of stochastic differential equations which is widely used in finance, other than application in engineering, physics and biology. Explanation on Brownian motion, the main continuous process used in stochastic calculus, is done before stochastic integral and related Ito process are described. Next, the application of Ito formula for Brownian motion and Ito process, also several other cases are illustrated. The course ended with the derivation of stochastic differential equation from ordinary differential equation and solution for few types of stochastic differential equations by using Ito formula.

MKW4004 Numerical Methods in Finance**Credit 4(3+1)****Prerequisite No**

This course explains the use of numerical methods in finance through programming aids. The focus is option pricing through the Monte Carlo method and finite variance. This method is important for solving the problem of calculating the price of an option that has no analytical form. Topics discussed include financial theory, numerical methods and option pricing. Students are assumed to understand numerical analysis and the basis of option pricing.

MKW4013 Financial Derivatives**Credit 3(3+0)****Prerequisite No**

This course discussed on the fundamentals of financial derivatives, covering the basic properties and the pricing fundamentals of futures, options and swaps. It also explores trading and hedging strategies involving financial derivatives. Finally, time permitting special topics such as exotic options are explored. The course provides the foundation of financial derivatives and lays the ground for a rigorous risk management course.

MKW4023 Financial Forecasting**Credit 3(3+0)****Prerequisite No**

This course discusses the introductory of forecasting, forecasting using regression analysis, forecasting using exponential smoothing, forecasting using Box-Jenkins method and modelling univariate GARCH.

MKW4033 Mathematical Theory in Insurance**Credit 3(3+0)****Prerequisite No**

The course gives the students exposure to various types of life insurance and annuities. By applying knowledge from the interest rate and probability theories, the values for net single premium and net premium for each type of life insurance and annuities are formulated. The formulas are then employed in solving the related practical insurance problems.

MKW4043 Financial Optimization**Credit 3(3+0)****Prerequisite No**

This course is a continuation of the optimization course. It discusses and provides a platform for students to apply linear and nonlinear optimization knowledge for solving problems in finance.

MKW4053 Financial Risk Analysis**Credit 3(3+0)****Prerequisite No**

This course is designed to foster a basic understanding of risk management through a Value at Risk (VaR) approach. The main focus of this course is on the measurement and application of the VaR method. This understanding is important for students and financial practitioners to understand the latest revolution in financial risk management. Topics covered including financial risk measurement, VaR calculation, risk and correlation forecasting and stress testing. Each student will involve in VaR calculation project using real financial data. Students are assumed familiar with the concepts in probability including probability distributions, expectations and quantiles.

MKW4063 Financial Econometrics**Credit 3(3+0)****Prerequisite No**

This course discusses several topics in financial econometrics such as the return predictability and the effect markets hypothesis, event study analysis, portfolio choice and testing the capital asset pricing model, multifactor pricing model, volatility and vector autoregressive models.

MKW4073 Islamic Financial Mathematics**Credit 3(3+0)****Prerequisite No**

This course emphasizes the need for and importance of Islamic economics in the world economic system. The needs and interests are clarified by discussions on the principles, fundamental and methods of Islamic economics. Discussion on mathematical models for Islamic financial instruments ended the course.

MMS3103 Oceans, Atmosphere and Climate**Credit 3(3+0)****Prerequisite No**

This course introduces the fundamentals of atmospheric processes with special emphasis on ocean-atmosphere interactions and their role in the global climate change. Topics include atmospheric composition and structure, solar radiation and heat budget, hydrologic cycle, ocean and atmospheric circulation, climate system, natural climate variability of ENSO and MJO, and the ocean`s role in response to climate change. Theory is complemented by a series of tutorial and student-led discussion based on global historical climate data and the recent IPCC report.

MMS3603 Introduction to Marine Science**Credit 3(3+0)****Prerequisite No**

This course provides a basic understanding of world ocean science, the interaction among marine chemical, biological, geological and physical system on Earth. This course describes the main environment of the oceans, from the coast to the oceans and at the different depths, linking the relationship between humans and the oceans, the importance of the oceans in supplying mineral, food and energy resources. Students also learn how global weather affects the oceans and oceans' function as buffer system.

MMS3633 Approaches to Marine Management and Policy

Credit 3(3+0)

Prerequisite No

This course exposes students to the policies, law and management of marine resources at the national and international levels. Students will understand the formulation of marine related policies, legislation and management as well as the concepts and models adopted, for example the United Nations Convention on the Law of the Sea (UNCLOS). Through understanding the concepts and models used internationally, students will be able to identify their national and regional significance.

MMS3653 Marine Scientific Data Analyses

Credit 3(3+0)

Prerequisite No

This course provides exposure to the basics of marine data interpretation, scientific data analysis and presentation of results. Topics of this course include the introduction of the concept of measurement, data collection, data analysis using appropriate statistical analysis, processing and presenting data. Different statistical software is also disclosed to students. In addition, students are also given the experience to explore the data collected or observed in the environment as well as the scope of various statistical techniques appropriate to specific analytical needs.

MMS3663 Fundamental of Marine Science

Credit 3(3+0)

Prerequisite No

This course provides a basic understanding of world ocean science, the interaction among marine chemical, biological, geological and physical system on Earth. This course describes the main environment of the oceans, from the coast to the oceans and at the different depths, linking the relationship between humans and the oceans, the importance of the oceans in supplying mineral, food and energy resources. Students also learn how global weather affects the oceans and oceans' function as buffer system. This course also provides an initial exposure to the basics of fieldwork as well as methods of using sampling instruments.

MMT3112 Marine Technology Laboratory

Credit 2(2+0)

Prerequisite No

This course incorporates some important technical aspects in the field of marine engineering and naval architecture, which includes the provision of drawings of ship lines, understanding of hydrostatic, stability of floating objects, conduct tests/experiments/observations related to different aspects of electrical equipment found on board. The concepts are discussed understood through performing the actual tests/experiments using model ships and also CBT in the laboratory.

MTM3003 Ordinary Differential Equations

Credit 3(3+0)

Prerequisite No

This course is an introduction to techniques of solutions for differentiation equations that require a basis in calculus as well as algebra. Discussions on applications in real problems are also implemented. This course is necessary as the basis for the relevant advanced courses namely Applied Mathematical Methods and Partial Differential Equations.

MTM3013 Real Analysis**Credit 3(3+0)****Prerequisite No**

This course discusses the concepts of real number space, bounded set, similar set, finite set and countable set. Point set topology on real line includes the ideas of openness and closeness, compact set and connected set. This course also discusses the properties of convergence sequences of real numbers including the pointwise convergence and uniform convergence of functions. Discussion on several important properties such as limit function, continuity, continuity on compact and connected sets and uniform continuity end this course.

MTM3024 Statistics**Credit 4(3+1)****Prerequisite No**

This course discusses basic concepts for statistics including probability, random variables, probability distributions of random variables, sampling distribution theory, estimation and hypothesis test.

MTM3034 Advanced Statistics**Credit 4(3+1)****Prerequisite No**

This course discusses linear models, nonparametric methods, multivariate distribution and some approaches in applied multivariate.

MTM3044 Operations Research with SAS**Credit 4(3+1)****Prerequisite No**

This course discusses the fundamental concepts of linear programming problems and the methods of solution. Topics also include simplex method, duality and its sensitivity analysis, transportation and network problems. The course also supports the industrial revolution through the application of SAS programming to solve optimisation problems.

MTM3054 Programming Language**Credit 4(3+1)****Prerequisite No**

This course discusses an introduction to good programming style through examples, the modification of existing computer programming such as C++ codes to solve similar problems and the implementation of mathematical algorithms in a well-documented computer programming programme. This course supports IR 4.0 by means of systematic thinking.

MTM4004 Optimization**Credit 4(3+1)****Prerequisite No**

This course discusses several mathematical techniques which are used in solving for unconstrained and constrained optimization problems. Unconstrained methods include Fibonacci search, Newton method, Secant method, gradient method and conjugate direction method. Meanwhile constrained methods include Lagrange condition and Karush-Kuhn-Tucker condition. Students also will solve optimization problems using software SAS.

MTM49712 **Industrial Training**
Credit **12 (0+12)**
Prerequisite **No**

Students who have met the requirements for practical training shall be located at suitable industries for a period of 24 weeks, after 6 semesters of studies. Each student is required to do a comprehensive report equivalent to 12 credits under the supervision of a lecturer decided upon by the coordinator for practical training and the supervisor in charge at the industry concerned.

MTM4982 **Final Year Project I**
Credit **2(0+2)**
Prerequisite **No**

This course exposes the students with the basics in academic research, especially in writing the proposal of a scientific research project.

MTM4994 **Final Year Project II**
Credit **4(0+4)**
Prerequisite **No**

This course is a direct continuation of the MTM4982 course which allows students to implement scholarly projects that have been systematically recommended. Among the areas of research thrust are pure mathematics, applied mathematics, statistics, optimization, fuzzy set theory, financial mathematics, computer-assisted graphic design, numerical analysis methods and operational research. An appropriate series of talks will be given to the students and further discussions on the topic of the talk will be conducted with their respective supervisors next. All students are required to write, submit and present the final report of their respective academic projects in chronological order as determined by the Programme.



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