

# POSTGRADUATE ACADEMIC HANDBOOK 2025/2026

Master Degree Programmes

Faculty of Artificial Intelligence  
and Cyber Security (FAIX)

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# POSTGRADUATE ACADEMIC HANDBOOK

Master Degree Programmes

Session 2025/2026

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FACULTY OF ARTIFICIAL INTELLIGENCE AND CYBER SECURITY  
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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Universiti Teknikal Malaysia Melaka.

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## Establishment

UTeM was established under Section 20 University and University College Act 1971 (Act 30) through “Perintah Universiti Teknikal Malaysia Melaka (Pemerbadanan 2007)” gazetted as P.U.(A) 43 on 1st February 2007. UTeM was initially known as Kolej Universiti Kebangsaan Malaysia (KUTKM), established on 1st December 2001.

## Vision

To be one of the world's leading innovative and creative technical universities.

## Mission

UTeM determined to lead and contribute to the wellbeing of the country and the world by:

1. Promoting knowledge through innovative teaching and learning, research and technical scholarship.
2. Developing professional leaders with impeccable moral values.
3. Generating sustainable development through smart partnership with the community and industry.

## Motto

**Excellence through competency.**

## Educational Goals

1. To conduct academic and professional programmes based on relevant needs of the industries.
2. To produce graduates with relevant knowledge, technical competency, soft skills, social responsibility and accountability.
3. To cultivate scientific method, critical thinking, creative and innovative problem solving and autonomy in decision making amongst graduates.
4. To foster research development and innovation activities with industries for the prosperity of the Nation.
5. To equip graduates with leadership and teamwork skills as well as develop communication and life-long learning skills.
6. To develop technopreneurship and managerial skills amongst graduates.
7. To instill an appreciation of the arts and cultural values and awareness of healthy lifestyles amongst graduates.

# UTeM Top Management



**PROFESSOR DATUK  
TS. DR. MASSILA BINTI KAMALRUDIN**  
(VICE CHANCELLOR)



**PROFESSOR  
DR. ZULKIFLIE BIN IBRAHIM**  
DEPUTY VICE CHANCELLOR  
(ACADEMIC AND INTERNATIONAL)



**PROFESSOR DR. ZAHRILADHA  
BIN ZAKARIA**  
DEPUTY VICE CHANCELLOR  
(RESEARCH & INNOVATION)



**ASSOCIATE PROFESSOR DATUK  
DR. SABRI BIN MOHAMAD SHARIF**  
DEPUTY VICE CHANCELLOR  
(STUDENT AFFAIRS AND ALUMNI)



**ASSOCIATE PROFESSOR  
TS. MOHD RAHIM BIN YUSOFF**  
DEPUTY VICE CHANCELLOR  
(STRATEGIC AND GLOBAL SUSTAINABILITY)



**MR. MASDZARIF  
BIN MAHAT**  
(CHIEF OPERATING OFFICER)



**MRS. SABARINA  
BINTI ABDULLAH**  
(BURSAR)



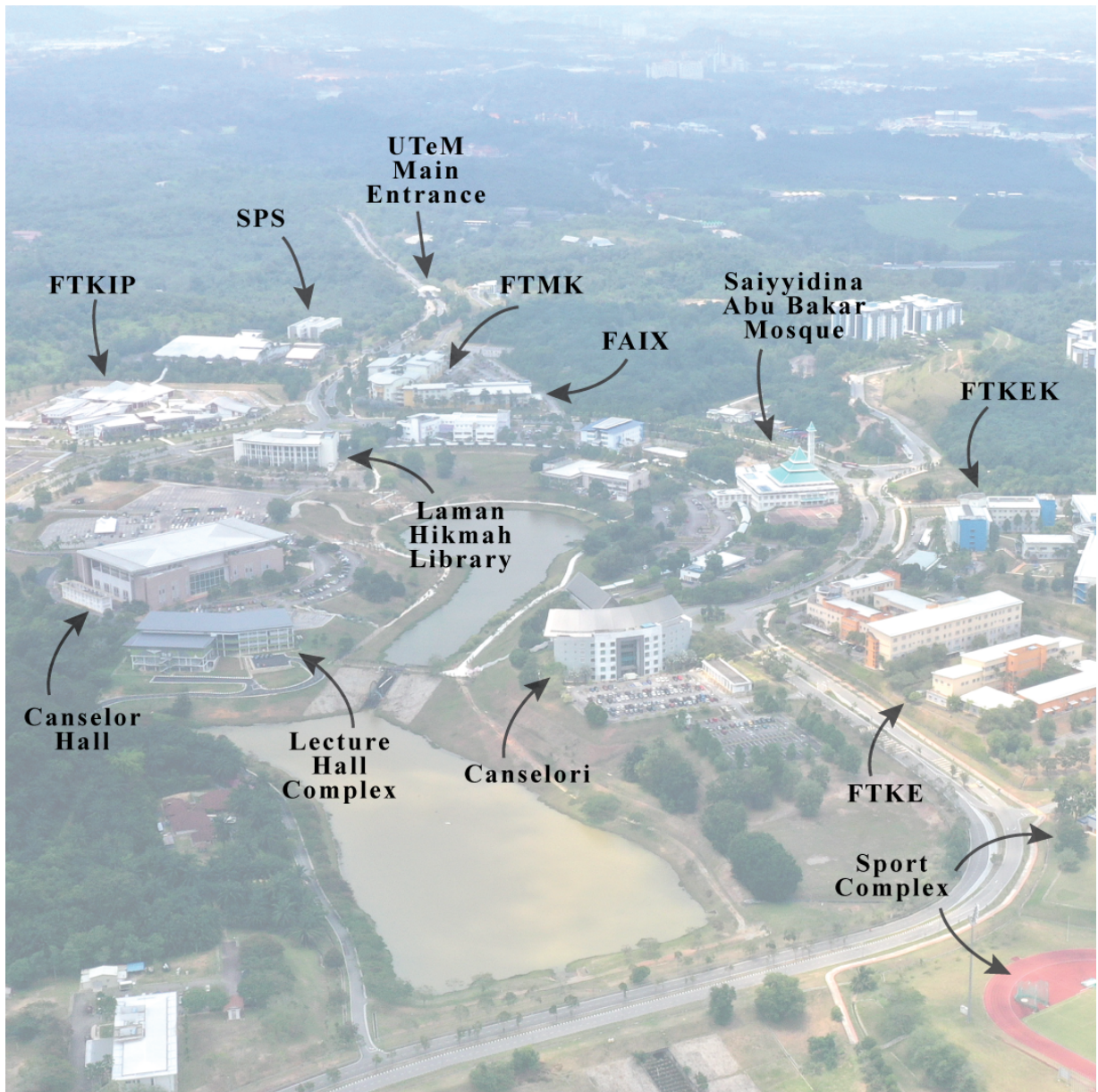
**MRS. SITI SALUWA  
BINTI JAMAL**  
(CHIEF LIBRARIAN)



**MR. MOHD NIZAM  
BIN PAVEL**  
(LEGAL ADVISOR)



**PROFESSOR  
DR. KHANAPI BIN ABD GHANI**  
(CHIEF DIGITAL OFFICER)



# Forward by the Dean

**Assoc. Prof. Ts. Dr Muhammad Hafidz Fazli Md Fauadi**

Dean

Faculty of Artificial Intelligence and Cyber Security



Assalamualaikum warahmatullahi wabarakatuh and warm greetings

All praise to Allah, the Most Gracious, the Most Merciful. It is my great pleasure to welcome all students to the inaugural academic session of the Faculty of Artificial Intelligence and Cyber Security (FAIX) at Universiti Teknikal Malaysia Melaka (UTeM).

FAIX began operations on 2nd December 2024 as part of UTeM's strategic move to position itself at the forefront of emerging technologies. Our faculty was officially launched by YAB Dato' Seri Utama Anwar Bin Ibrahim, Prime Minister of Malaysia, on 12th June 2025, marking a national milestone in the advancement of AI and cybersecurity education grounded in TVET excellence.

Today, we proudly commence our first academic year 2025/2026, supported by a committed team of academic, administrative, and technical personnel, with the number steadily growing. This dedicated team forms the backbone of a faculty that aims to produce future-ready graduates who are not only technically competent but also agile and ethical in navigating complex digital challenges.

As the faculty entrusted to spearhead UTeM's agenda on artificial intelligence and cyber security, FAIX is more than just a new academic unit. FAIX is a hub of innovation, collaboration, and transformative education. Our strong ties with the industry and full accreditations from the Malaysian Qualifications Agency (MQA) and the Malaysia Board of Technologists (MBOT) reflect our commitment to ensuring that learning at FAIX is not confined to theory but is firmly rooted in real-world application and relevance.

To all new students, you are now part of a pioneering cohort that will shape the future of intelligent and secure technology in Malaysia and beyond. Take pride in this opportunity, stay curious, and actively engage with your lecturers, peers, and the wider community.

Let us embark on this journey together to build a safer, smarter, and more inclusive digital world.

Thank you.



## Vision

To be a global leader in advancing Artificial Intelligence and Cyber Security, empowering an intelligent, secure, and future-ready digital world.

## Mission

1. Leading the development of competent talent in the fields of Artificial Intelligence and Cyber Security to shape human capital and a secure, intelligent digital future.
2. Pioneering innovation in Artificial Intelligence and Cyber Security through strategic collaboration.
3. Advancing Artificial Intelligence and Cyber Security solutions that are ethical, inclusive, industry-oriented and societal well-being.

## Objectives

1. To produce graduates who are competent, globally competitive, creative, and innovative in Artificial Intelligence and Cyber Security, capable of addressing future technological and industrial challenges.
2. To enhance research, innovation, and commercialisation in Artificial Intelligence and Cyber Security with a strategic and integrated approach to social well-being and technological sustainability.
3. To foster strong moral, leadership, and ethical values among students holistically.
4. To strengthen smart infrastructure, digital systems, financial governance, and a high-performance work culture that supports the sustainability of the faculty.
5. To uphold the faculty as a globally recognised institution through internationalisation, strategic collaborations, and excellence in academics and research.

## FAIX Top Management



**Assoc. Prof. Ts. Dr  
Muhammad Hafidz Fazli  
Md Fauadi**  
DEAN



**Assoc. Prof. Ts. Dr  
Siti Azirah Asmai**  
Deputy Dean  
(Academic)



**Assoc. Prof. Ts. Dr  
Zuraida Abal Abas**  
Deputy Dean  
(Research &  
Postgraduate Studies)



**Ts. Dr  
Muhammad Noorazlan Shah  
Zainudin**  
Deputy Dean  
(Student Development  
& Alumni)



**Pn Nur Azriah Amir**  
Deputy Registrar



**Ts. Dr  
Abdul Syukor  
Mohamad Jaya**  
Head of Department  
Intelligent Computing  
& Analytics  
(ICA)



**Ts. Dr  
S.M. Warusia Mohamed  
S.M.M Yassin**  
Head of Department  
Cyber Security  
(CX)



**Assoc. Prof. Ts. Dr  
Halizah Basiron**  
Head of Programme  
Masters  
by Taught Course  
& Mixed Mode



**Ts. Dr  
Mohd Zaki Mas'ud**  
Laboratory  
Coordinator



**Pn Hazrin Kasim**  
Senior  
Assistant Registrar

## List of Programme Offered

### MASTER'S DEGREE

#### By coursework:

1. Master of Computer Science (Security Science), MAXZ (MQA/FA 5653)  
Coordinator: Dr Zaheera Zainal Abidin
2. Master of Technology (Data Science and Analytics), MAXD (MQA/FA 9613)  
Coordinator: Ts. Dr Ngo Hea Choon
3. Master of Technology in Data Science and Analytics (with Open and Distance Learning - ODL), MAXL (MQA/PA 17473)  
Coordinator: Ts. Dr Norfadzlia Mohd Yusof

### BACHELOR'S DEGREE<sup>1</sup>

1. Bachelor of Computer Science (Artificial Intelligence) with Honours, BAXI.
2. Bachelor of Computer Science (Computer Security) with Honours, BAXZ.

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<sup>1</sup>Please browse through our **Undergraduate Academic Handbook** for details of Undergraduate Programmes

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## Facilities

### Lab Facilities

Faculty of Information and Communication Technology (FTMK) has been equipped with the state-of-art computers and software and integrated into UTeM Network. These facilities ease the process of teaching and learning in FTMK.

Averages of 36 computers with latest software are located at each lab and studio to ensure practical teaching and learning is applicable for the students. Server, router, switches, wireless, digital camera, video, biometric machines are also provided for teaching and learning purposes.

### Lab Staffs

The labs in FTMK are administered by the Lab Coordinator assisted by Assistant Engineers to ensure smooth teaching and learning processes. The infrastructure committee members are responsible for maintaining and managing respective clients in FTMK environment.

### Loan Facilities on Lab Equipment

Students are allowed to use the lab equipment to complete their assignments or projects on time. The equipment that are allowed to be used are wireless equipment, video camera, digital camera, biometric tool, GSM and others.

### Lab Operational Hours

During Semester:

|                    |                                           |
|--------------------|-------------------------------------------|
| Monday to Thursday | 8:00 am to 6:00 pm                        |
| Friday             | 8:00 am to 12:15 pm<br>2:45 pm to 6:00 pm |

During Semester Break:

|                    |                                           |
|--------------------|-------------------------------------------|
| Monday to Thursday | 8:00 am to 5:00 pm                        |
| Friday             | 8:00 am to 12:15 pm<br>2:45 pm to 5:00 pm |

Saturday-Sunday / Public Holidays    Close

| NAME OF FACILITY                          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Seminar Hall                              | The hall is equipped with audio-visual facility for 250 pax at a time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Lecture Rooms                             | Rooms No. 1 to 8 with each room for 60 pax<br>Rooms No. 13 to 14 with each room for 120 pax                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Recording Capture System (ReCap)          | Mini Theatre for interactive learning environment for 114 pax                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Collaborative Learning Laboratory (CLeAR) | A collaborative learning laboratory with 60 pax capacity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Mini Theatre                              | The theatre room for student animation presentation for 32 pax                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Virtual Reality Studio                    | Laboratory for motion capture and games development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Photography/Recording Studio              | Multimedia recording and editing studio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Teaching Laboratories                     | <ol style="list-style-type: none"> <li>1. Computer Game Laboratory</li> <li>2. Software Engineering Lab 1, 2 and 3</li> <li>3. Programming Laboratory 1, 2, 3 and 4</li> <li>4. Database Laboratory 1, 2 and 3</li> <li>5. Network Laboratory 1 and 2</li> <li>6. CCNA &amp; CCNP Laboratory</li> <li>7. Fiber Optic Laboratory</li> <li>8. Security Laboratory</li> <li>9. System / Hardware Laboratory</li> <li>10. Wireless Laboratory</li> <li>11. Virtual Reality Laboratory</li> <li>12. Multimedia Laboratory 1, 2, 3 and 4</li> <li>13. Artificial Intelligence Laboratory 1, 2, 3 and 4</li> <li>14. Student Workshop Laboratory</li> </ol> |

|                                |                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| University-Industry Centre     | UTeM Cybersecurity Competency Centre - collaboration with CyberSecurity Malaysia, ASK-Pentest, Ministry of Higher Education                                                                                                                                                                                                                  |
| University-Industry Laboratory | Coordinated Malware Eradication and Remediation Project (CMERP) Satellite Laboratory – collaboration with Cyber Security Malaysia                                                                                                                                                                                                            |
| Research Group                 | <ol style="list-style-type: none"><li>1. Information Security Forensics &amp; Computer Networking (INSFORNET)</li><li>2. Optimization, Modelling, Analytics and Simulation (OptiMAS)</li><li>3. Applied Intelligent Computing (APIC)</li><li>4. Social Analytics and Intelligence Lab (SAIL)</li><li>5. Smart Factory System (SFS)</li></ol> |
| Other Facilities               | <ol style="list-style-type: none"><li>1. Visiting Professor Rooms</li><li>2. Executive Laboratory</li><li>3. Administration Office</li><li>4. Student Common Room</li><li>5. Surau or Prayer Room</li><li>6. Lobby Area</li><li>7. Parking Area for staffs and students</li></ol>                                                            |

## Lab Usage Regulation

1. Students must display their matric card at all times in the lab.
2. Students are not allowed to bring in their bags into the lab.
3. Students are not allowed to eat/drink or bring in any foods or drinks into the lab.
4. Students are not allowed to wear sandals in the lab except sandals with back straps for female students and covered sandals for male students.
5. Students are not allowed to wear t-shirt without collar in the lab. UTeM's students' dress code is referred.
6. All lab equipment used must be returned in its original condition.
7. Chairs must be arranged neatly after use.
8. Do not leave used papers or litters in the lab. Please throw it into rubbish bin if it is not needed anymore.
9. All equipment must be switched off after used.
10. Students should not enter the lab without lecturers' or tutors' presence.
11. For after-hours lab usage, students must record their details in the lab record book and submit their matric card to Assistant Engineers in duty.
12. Students are prohibited from playing games, chatting or surfing the net for unrelated content in the lab.
13. Students are not allowed to bring out any lab equipment except with permission from the lecturers or Assistant Engineers in duty.
14. Students are not allowed to bring in laptop, CPU, monitor, mouse, CD, VCD or any computer equipment except with permission from the lecturers or Assistant Engineers in duty.
15. Users are not allowed to do any installation on computers in the lab.
16. All requests for software installation into students' laptop will not be entertained.
17. Students must report immediately to lecturer or Assistant Engineers on duty if any lab equipment got lost or broken during their students' usage.

18. Research labs are for post graduates' students ONLY. Post-graduate students can get the access by referring to their supervisor.

### **Additional Lab Rules Outside Teaching and Learning Allocated Times**

1. Total users for a lab must comply with the maximum capacity allowed for a particular lab.
2. Students are allowed to use labs outside teaching and learning allocated times with permission from a lecturer. The lecturer will be responsible for lab for the duration of the usage. Students must record their start and end times of usage in the record book provided in the lab.
3. Studios and Recording room usage are strictly by booking only. Students can use the studios or recording room through their lecturer or Assistant Engineer on duty.

DISCIPLINARY ACTIONS WILL BE TAKEN AGAINST ANY STUDENT WHO IS FOUND BREAKING ANY RULE LISTED ABOVE.

## Academic System

The university adopts a semester-based academic system. Each academic year consists of two regular semesters and in some instances, the faculty may also offers a special semester, called Short Semester or Semester 3, which is arranged during the semester break.

Each regular semester spans 18 weeks, structured as follows:

- 7 weeks for the first part of lecture.
- 1 week of mid semester break.
- 7 weeks for the second part of lecture.
- 1 week of revision.
- 2 weeks for final examination.

For the Short Semester or Semester 3, the duration is limited to 8 weeks, consisting of 7 weeks of lectures followed by 1 week of final examinations.

## Duration of Studies

| MAXZ and MAXD  | Durations of studies                              |                                                    |
|----------------|---------------------------------------------------|----------------------------------------------------|
|                | Minimum                                           | Maximum                                            |
| Full-time mode | 1 year (2 normal semesters and 1 short semester)  | 3 years (6 normal semesters and 2 short semesters) |
| Part-time mode | 2 years (4 normal semesters and 1 short semester) | 4 years (8 normal semesters and 4 short semesters) |

| MAXL           | Durations of studies |         |
|----------------|----------------------|---------|
|                | Minimum              | Maximum |
| Full-time mode | 1 year               | 6 years |
| Part-time mode | 2 years              | 6 years |

## Grading System

The following shows the grading system adopted by the university.

| Marks    | Letter Grades                                                                       | Grade Points | Remarks                       |
|----------|-------------------------------------------------------------------------------------|--------------|-------------------------------|
| 80 - 100 |    | 4.0          | Excellent                     |
| 75 - 79  |    | 3.7          | Very Good                     |
| 70 - 74  |    | 3.3          | Good                          |
| 65 - 69  |    | 3.0          | Pass                          |
| 60 - 64  |    | 2.7          | Conditional Pass (Redeemable) |
| 55 - 59  |    | 2.3          | Fail                          |
| 50 - 54  |    | 2.0          | Fail                          |
| 47 - 49  |    | 1.7          | Fail                          |
| 44 - 46  |  | 1.3          | Fail                          |
| 40 - 43  |  | 1.0          | Fail                          |
| 0 - 39   |  | 0.0          | Fail                          |

## Academic Achievement

### GRADE POINT AVERAGE (GPA):

GPA is average points obtained by students at the end of each semester.

$$\text{Total Grade Point (TGP)} = k_1m_1 + k_2m_2 + \dots + k_nm_n$$

$$\text{Total Calculated Point (TCP)} = k_1 + k_2 + \dots + k_n$$

$$\text{GPA} = \frac{TGP}{TCP}$$

where

$k_n$  = credit hour for course  $n$ ,

$m$  = grade point obtained for course  $n$ ,

$n$  = number of courses registered.

### CUMULATIVE GRADE POINT AVERAGE (CGPA):

CGPA refers to cumulative grade point average calculated for all semester studied.

$$\text{CGPA} = \frac{TGP_1 + TGP_2 + \dots + TGP_i}{TCP_1 + TCP_2 + \dots + TCP_i}$$

where

$i$  = number of semester studied.

## Academic Standing

A student's academic standing is determined at the end of every regular semester based on his/her CGPA as shown in the following table:

|                                                      |                               |
|------------------------------------------------------|-------------------------------|
| Good Standing / <i>Kedudukan Baik</i> (KB)           | $\text{CGPA} \geq 3.00$       |
| Conditional Status / <i>Kedudukan Bersyarat</i> (KS) | $2.7 \leq \text{CGPA} < 3.00$ |
| Fail / <i>Kedudukan Gagal</i> (KG)                   | $\text{CGPA} < 2.70$          |

1. A student must attain a **minimum CGPA of 3.00** in order to be eligible **for graduation**.
2. The **minimum CGPA** that would allow a student to remain in the programme is **2.70**.
3. If a student obtains a **Conditional Pass (KS)** status in **TWO (2) consecutive semesters**, he/she will be **dismissed** from the programme.



# **MAXZ**

**Master of Computer Science  
(Security Science)**

# Master of Computer Science (Security Science) (MQA/FA 5653)

## Programme Overview

The Master of Computer Science (Security Science) is a specialized graduate program to equip students to face the real-world challenges by offering students extensive knowledge and practical skills with security elements in information and communication technology related to management, data and infrastructure.

## Programme Educational Objectives (PEO)

Program Educational Objectives (PEO) are specific goals describing graduates' expected achievements in their career and professional life after graduation. Following are the PEO for the Master of Computer Science (Security Science):

1. Practice in-depth knowledge and skills of Computer Science with specialization in Security Science field.
2. Demonstrate effective leadership and communication to a wide variety of audiences or multi-disciplinary teams, tolerate and value different global perspectives and cultures towards lifelong learning.
3. Demonstrate knowledge of current issues in technology through learning and research activities using scientific methods.
4. Practice professional, ethical, and societal responsibilities, and show adaptability in different roles and surroundings in contributing to the community and business.

## Programme Learning Outcomes (PLO)

Programme Learning Outcomes (PLO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These relate to the skills, knowledge, and behaviours that students acquire through their program of studies.

1. Demonstrate originality and independence in undertaking analytical and critical evaluation, and synthesis of complex information, specialized concepts, theories, methods and practice in Computer Science.
2. Apply knowledge and quantitative skills critically and collectively to manage and resolve complex problems or issues in the field of internetworking technology.
3. Conduct standardized and specialized research approaches, or apply practical skills, tools or investigative techniques which are informed by knowledge at its forefront and the latest development in the field of internetworking technology.
4. Communicate effectively the knowledge, skills, ideas, critique and rationale in both written and verbal forms using appropriate methods to peers, experts, and non-experts.
5. Competently use a wide range of suitable digital technologies to design and plan evaluation activities for enhancing study, research and practice.
6. Demonstrate significant autonomy, independence and leadership skills at work and class with self-advancement through continuous academic or professional development.
7. Initiate or lead entrepreneurial projects and adhere to legal, ethical and professional codes of practice.

## Career Prospects

There is a wide range of career opportunities in the field of computer science and information technology available for graduates who are specialised in cyber security. Among the career opportunities are:

1. Chief Information Security Officer.
2. Cyber Risk Manager.
3. Cyber Risk Analyst.
4. Security Penetration Tester.
5. Security Operation Analyst.
6. Incident Manager.
7. Digital Forensic Specialist.
8. Security Architect / Engineer.

## Programme Structure - Full Time

### September Intake:

| Semester 1 (September)      |                                          |                    |        |
|-----------------------------|------------------------------------------|--------------------|--------|
| Course Code                 | Course                                   | Classification     | Credit |
| MPSW 5013                   | Research Methodology                     | Compulsory Courses | 3      |
| MITP 5113                   | Algorithm Analysis and Design            | Core Courses       | 3      |
| MITS 5313                   | Advanced Data Communications and Network | Core Courses       | 3      |
| MAXZ 5463                   | Security Management Practices            | Core Courses       | 3      |
| MPSW 5063                   | Elective I (Entrepreneurship)            | Elective Courses   | 3      |
| MAXZ ****                   | Elective II                              | Elective Courses   | 3      |
| Total credit                |                                          |                    | 18     |
| Semester 2 (February)       |                                          |                    |        |
| Course Code                 | Course                                   | Classification     | Credit |
| MAXZ 5433                   | System and Network Ethical Hacking       | Core Courses       | 3      |
| MAXZ 5443                   | Cryptography and Data Security           | Core Courses       | 3      |
| MAXZ 5483                   | Cyber Threat Intelligence                | Core Courses       | 3      |
| MAXZ ****                   | Elective III                             | Elective Courses   | 3      |
| MAXU 5214                   | Project 1                                | Core Courses       | 4      |
| Total credit                |                                          |                    | 16     |
| Semester 3 (Short Semester) |                                          |                    |        |
| Course Code                 | Course                                   | Classification     | Credit |
| MAXU 5226                   | Project 2                                | Core Courses       | 6      |
| Total credit                |                                          |                    | 6      |
| Total graduated credit      |                                          |                    | 40     |

**February Intake:**

| <b>Semester 1 (February)</b>       |                                          |                       |               |
|------------------------------------|------------------------------------------|-----------------------|---------------|
| <b>Course Code</b>                 | <b>Course</b>                            | <b>Classification</b> | <b>Credit</b> |
| MPSW 5013                          | Research Methodology                     | Compulsory Courses    | 3             |
| MAXZ 5433                          | System and Network Ethical Hacking       | Core Courses          | 3             |
| MAXZ 5443                          | Cryptography and Data Security           | Core Courses          | 3             |
| MAXZ 5483                          | Cyber Threat Intelligence                | Core Courses          | 3             |
| MPSW 5063                          | Elective I (Entrepreneurship)            | Elective Courses      | 3             |
| MAXZ ****                          | Elective II                              | Elective Courses      | 3             |
| <b>Total credit</b>                |                                          |                       | <b>18</b>     |
| <b>Semester 2 (Short Semester)</b> |                                          |                       |               |
| <b>Course Code</b>                 | <b>Course</b>                            | <b>Classification</b> | <b>Credit</b> |
| MAXZ ****                          | Elective III                             | Elective Courses      | 3             |
| MAXU 5214                          | Project 1                                | Core Courses          | 4             |
| <b>Total credit</b>                |                                          |                       | <b>7</b>      |
| <b>Semester 3 (September)</b>      |                                          |                       |               |
| <b>Course Code</b>                 | <b>Course</b>                            | <b>Classification</b> | <b>Credit</b> |
| MITP 5113                          | Algorithm Analysis and Design            | Core Courses          | 3             |
| MITS 5313                          | Advanced Data Communications and Network | Core Courses          | 3             |
| MAXZ 5463                          | Security Management Practices            | Core Courses          | 3             |
| MAXU 5226                          | Project 2                                | Core Courses          | 6             |
| <b>Total credit</b>                |                                          |                       | <b>15</b>     |
| <b>Total graduated credit</b>      |                                          |                       | <b>40</b>     |

**Elective courses - choose THREE (3) only:**

| Course Code | Course                           | Credit |
|-------------|----------------------------------|--------|
| MPSW 5063   | Entrepreneurship                 | 3      |
| MAXZ 5413   | Public Key Infrastructure        | 3      |
| MAXZ 5423   | Computer Forensics               | 3      |
| MAXZ 5453   | Intrusion Detection & Prevention | 3      |
| MAXZ 5473   | Watermarking                     | 3      |
| MAXZ 5493   | Security Audit and Assessment    | 3      |

## Programme Structure - Part Time

### September Intake:

| Semester 1 (September)      |                                          |                    |        |
|-----------------------------|------------------------------------------|--------------------|--------|
| Course Code                 | Course                                   | Classification     | Credit |
| MPSW 5013                   | Research Methodology                     | Compulsory Courses | 3      |
| MITS 5313                   | Advanced Data Communications and Network | Core Courses       | 3      |
| MAXZ 5463                   | Security Management Practices            | Core Courses       | 3      |
| Total credit                |                                          |                    | 9      |
| Semester 2 (February)       |                                          |                    |        |
| Course Code                 | Course                                   | Classification     | Credit |
| MAXZ 5433                   | System and Network Ethical Hacking       | Core Courses       | 3      |
| MAXZ 5443                   | Cryptography and Data Security           | Core Courses       | 3      |
| MAXZ 5483                   | Cyber Threat Intelligence                | Core Courses       | 3      |
| Total credit                |                                          |                    | 9      |
| Semester 3 (Short Semester) |                                          |                    |        |
| Course Code                 | Course                                   | Classification     | Credit |
| MAXZ ****                   | Elective I                               | Elective Courses   | 3      |
| Total credit                |                                          |                    | 3      |
| Semester 4 (September)      |                                          |                    |        |
| Course Code                 | Course                                   | Classification     | Credit |
| MITP 5113                   | Algorithm Analysis and Design            | Core Courses       | 3      |
| MPSW 5063                   | Elective II (Entrepreneurship)           | Elective Courses   | 3      |
| MAXU 5214                   | Project 1                                | Core Courses       | 4      |
| Total credit                |                                          |                    | 10     |
| Semester 5 (February)       |                                          |                    |        |
| Course Code                 | Course                                   | Classification     | Credit |
| MAXZ ****                   | Elective III                             | Elective Courses   | 3      |
| MAXU 5226                   | Project 2                                | Core Courses       | 6      |
| Total credit                |                                          |                    | 9      |
| Total graduated credit      |                                          |                    | 40     |

**Elective courses - choose **THREE (3)** only:**

| Course Code | Course                           | Credit |
|-------------|----------------------------------|--------|
| MPSW 5063   | Entrepreneurship                 | 3      |
| MAXZ 5413   | Public Key Infrastructure        | 3      |
| MAXZ 5423   | Computer Forensics               | 3      |
| MAXZ 5453   | Intrusion Detection & Prevention | 3      |
| MAXZ 5473   | Watermarking                     | 3      |
| MAXZ 5493   | Security Audit and Assessment    | 3      |

## Course Synopsis

### **MPSW 5013**

#### **Research Methodology**

##### **Course Learning Outcomes:**

1. Apply ethical research skills in constructing research questions, objectives and hypothesis (if any) relevant to the research problem.
2. Synthesize relevant literature to address the knowledge gaps.
3. Propose a research work for an improvement of existing knowledge.

##### **Course Synopsis:**

The primary goal of this course is to provide students with the necessary knowledge and skills in preparing for their Master dissertation. In this course, students will be exposed to the important concepts of conducting scientific research and managing ethical research. The course is designed to introduce students to the principles and good practices of conducting research. Activities at each step of the research process will be elaborated in order to develop the skills and competencies required to facilitate a successful research project at postgraduate level. At the end of the course, students are expected to submit a research proposal relevant to their field of study.

### **MITP 5113**

#### **Algorithm Analysis and Design**

##### **Course Learning Outcomes:**

1. Identify algorithm design technique and method of analysis.
2. Explain algorithms efficiency in terms of the amount of resources, which are time and storage space required to execute the algorithm.
3. Explain algorithm design technique based on problem type.

##### **Course Synopsis:**

This course introduces the students to the fundamentals principles of design and analysis of algorithms. It covers formal techniques to support the design and analysis of algorithms that emphasizes on both the underlying mathematical theory and practical considerations of efficiency. By learning a range of algorithm design techniques as Brute Force, Divide & Conquer, Decrease & Conquer, Transform and Conquer, Greedy Algorithms and Dynamic Programming, students should be able to develop efficient algorithms for simple computational tasks and reasoning about the correctness of them. Through the complexity measures, different range of behaviors of algorithms and the notion of tractable and intractable problems will be discussed.

**MIT5 5313****Advanced Data Communications and Network****Course Learning Outcomes:**

1. Evaluate the theory of data communications related to the network models in current technologies.
2. Manipulate the implementation in managing network infrastructure and services with the emerging trends and technologies.
3. Relate the present research in data communications and networking in order to apply in the real environment based on the concept.

**Course Synopsis:**

This course introduces the fundamental concepts and terminology of data communication and networking, encompassing both technical and managerial aspects and to help students better understand the challenges and opportunities faced by modern business. Topics will include fundamentals of telecommunications, data transmission mechanisms, telecommunication media and technologies, considerations for LAN and WAN implementations, the Internet and intranet applications, emerging telecommunications technologies, and trends in the telecommunications industry. Students will also be able to understand, explain and apply the fundamentals of data communication and network technology concepts and skills in network applications, troubleshooting, and configuring the computer networks using guided or unguided media.

**MAXZ 5433****System and Network Ethical Hacking****Course Learning Outcomes:**

1. Explain the fundamentals steps that a hacker performs, and common tools hackers use in conducting attacks.
2. Demonstrate exploitation on system and network vulnerability as proof of concept by using appropriate hacking tools.
3. Formulate the tools and methods of protecting systems and networks against hacker attacks.

**Course Synopsis:**

In this course, students will study and gain experience with the role of defending hosts and networks from attack as well as learning how the hacker uses tools to attack and penetrate networks. Students will be able to use several open software tools that will analyze host and networks for vulnerabilities and be exposed to the hacking methodology. It will immerse the student into an interactive environment where they will be shown how to scan, test, hack and secure their own systems. The lab intensive environment gives each student in-depth knowledge and practical experience with the current essential security systems. Students will begin by understanding how perimeter defenses work and then be lead into scanning and attacking their own networks in a simulation environment. Students then learn how intruders escalate privileges and what steps can be taken to secure a system from hacking threat.

**MAXZ 5443****Cryptography and Data Security****Course Learning Outcomes:**

1. Explain the concept and components of cryptography.
2. Relate the basic theory and practice of secure systems, and the types of security services needed for computer and network security.
3. Demonstrate some aspect of cryptography in depth.

**Course Synopsis:**

This course explore the methods, algorithms, techniques, and tools of cryptography and data security. After studying the theoretical aspects of cryptographic algorithms and protocols, we show how these techniques can be integrated to solve particular data and communication security problems. This course material is of use to computer and communication engineers who are interested in embedding security into an information system, and thus, providing confidentiality, integrity and authenticity of the documents and the communicating parties.

**MAXZ 5463****Security Management Practices****Course Learning Outcomes:**

1. Asses risks in information security and implement protection and control efforts.
2. Organize an information security program.
3. Design the requirement of regulatory, standards and best practices and apply them in the working environment.

**Course Synopsis:**

This course covers the principles of information security management and techniques to formulate, plan, manage, implement and maintain information security strategies, policies and procedures. The course focuses on two main disciplines of information security management; first is strategic which covers theoretical view of information security management issues that range from national to international levels, and second is on organizational security management. In the latter, students are taught on issues and challenges surrounding the implementation of best security practices, process and the application of well-known information security standards as practiced by the industry.

**MAXZ 5483****Cyber Threat Intelligence****Course Learning Outcomes:**

1. Explain the concept of intelligence detection againsts cyberthreat.
2. Relate relevant approach in cyberthreat detection challenges.
3. Identify suitable approach in detecting cyberthreat collaboratively.

**Course Synopsis:**

This course covers the concept and applications of intelligence techniques to various problem domains in security and abuse. The course will explore methods for detecting, evaluating the suitability of different machine learning techniques in different scenarios, and focus on guiding principles that will help achieve better security. This course also discusses threats to modern computer and network systems on how intelligence detection applies to the aforementioned threats.

**MPSW 5063****Entrepreneurship****Course Learning Outcomes:**

1. Explain entrepreneurial skills in identifying and exploiting entrepreneurial opportunities.
2. Formulate a business model canvas for business value proposition.
3. Propose a creative and viable high tech business models/plan and strategies.

**Course Synopsis:**

The objectives of this course are to provide students with a robust foundation in theories relevant to entrepreneurial behaviour in the context of technology ventures and to stimulate them to think and behave like an entrepreneur. First, the course covers fundamental issues such as the influence of risk and uncertainty, the role of technology in entrepreneurship, opportunity recognition, business model creation, life cycle and critical stages of the entrepreneurial business and the development of an operational and financial foundation of a technology venture. Second, the course provides students with actionable knowledge by familiarising them with the necessary entrepreneurial expertise to establish and scaling up a technology venture.

**MAXZ 5413****Public Key Infrastructure****Course Learning Outcomes:**

1. Explain the issues related to the successful deployment of digital certificates to meet business and security requirements.
2. Elaborate an insight and strategy into an effective use of PKI in the context of working policies that govern the use, administration, and management of certificates, and design the digital certificate according to the standard format.
3. Demonstrate how PKI establishes digital trust and maintains that level of assurance built through a complex web of social, legal, national, international, and business interactions, and the future trend of PKI.

**Course Synopsis:**

This subject highlighted the principles of Public Key Infrastructure, Digital Signature Law and the related Cyber Laws. The course will not only cover public key algorithms in electronic communications but also the certificate authority and related arrangements as well as. This course aims to give a broader view to the Electronic Commerce transaction to the students.

**MAXZ 5423****Computer Forensics****Course Learning Outcomes:**

1. Explain the emerging field of computer forensics in obtaining and analyzing the evidence from computers.
2. Prepare the investigation procedures for investigating the computer crime.
3. Demonstrate the use of forensic tools to complete the investigating process.

**Course Synopsis:**

This subject introduces the fundamentals of computer forensic technology. Emphasis will be placed on identifying the threats to, and vulnerabilities of, computer systems and how to minimize them. The subject also focuses on identifying the victims, executing the attack, and determining various methods that used to gain access to computer systems. The theory and technique on identifying the legal and ethical issues that are involved in computer forensics and methods on investigating the crime are also explored. The hands-on covers the process of investigating the computer crime using computer forensics tools.

**MAXZ 5453****Intrusion Detection and Prevention****Course Learning Outcomes:**

1. Explain the various types of intrusions and attacks on a network.
2. Organize the mechanism or tools which can be used to detect and prevent the intrusions by integration of technique and technology of security management.
3. Demonstrate intrusion detection system for preventing the illegal intrusion.

**Course Synopsis:**

This subject highlights the concepts of computer security in term of intrusion detection and prevention. The scope of detection mainly involves the network-based and host-based approaches. Several techniques as well as technology emphasized to form a secure network environment. In addition, the current trends with the application of machine learning and deep learning also will be focused. The hands-on covers the configuration of intrusion detection system using detection tools.

**MAXZ 5473**  
**Watermarking****Course Learning Outcomes:**

1. Manipulate the concept, theory, method and practice in Digital Watermarking for analysis and evaluation.
2. Use the knowledge needed to resolve problems in digital watermarking based on techniques.
3. Demonstrate practical skills of development using current and latest tools for intellectual property management and protection of multimedia.

**Course Synopsis:**

The subject explores the mechanism for protecting audio, video, image and data. It covers about knowledge and application on protecting the multimedia content and distributing multimedia products over the Internet. The theory and technique on identifying the legal and technical issues that are involved in digital watermarking is studied. Methods on the mechanism of current and latest application tools for protecting the intellectual property management and protection of multimedia are also explored.

**MAXZ 5493**  
**Security Audit and Assessment****Course Learning Outcomes:**

1. Analyze the concepts of computer audit and risk management.
2. Perform an audit process in the computerized environment.
3. Propose the appropriate response in conformity with security issues in computer security audit.

**Course Synopsis:**

This course focuses on the concept of computer security and risk management. In addition, emphasizes has given to the importance of computer audit and risk management. The enclosed topics are mainly related to security audit analysis, security monitoring, environmental security and follow up auditing in security concern. The student will be exposed to the field of risk and incident response, recovery and disaster recovery.

**MAXU 5214****Project 1****Course Learning Outcomes:**

1. Identify the problems, objectives and scope based on current trends of technologies.
2. Prepare a comprehensive literature review and appropriate procedures to complete the project.
3. Justify the suitable key answers to clarify the contribution in application domain.

**Course Synopsis:**

This course is the first part of project that contains the results based on the theories and techniques of current technologies learnt previously. Besides writing the proposal, student is required to write four chapters of dissertation, i.e.;

- Chapter 1: Introduction,
- Chapter 2: Literature Review, and
- Chapter 3: Research Methodology.

In addition, student must accomplish the project design and justify the proposed solution during presentation.

**MAXU 5226****Project 2****Course Learning Outcomes:**

1. Demonstrate the solutions with significance contribution to the application domain.
2. Verify the proposed solutions to understand the strengths, weaknesses and limitations of the study.
3. Modify the proposed solution by articulating the series of processes to achieve the end results of the domain business requirements.

**Course Synopsis:**

This course is the second part of project that show the ability of student in applying the theories and techniques of knowledge and technologies learnt previously. Student must write the second fold of dissertation which consists of three chapters of dissertation, i.e.;

- Chapter 4: Analysis & Design,
- Chapter 5: Implementation,
- Chapter 6: Evaluation, and
- Chapter 7: Conclusion & Future Works.

These chapters must align with the proposed solutions developed as the end product of this project. Student is required to justify the contribution of the proposed solutions throughout the presentation and demonstration sessions.

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# **MAXD**

**Master of Technology  
(Data Science and Analytics)**

# Master of Technology (Data Science and Analytics)

(MQA/FA 9613)

## Programme Overview

The Master of Technology (Data Science and Analytics), for short MAXD, is aimed at recent graduates and industry practitioners from various academic disciplines with strong analytical and computing skills or experiences. The programme is designed to equip students with fundamental and applied knowledge, technical skills, and current technologies in Data Science and Analytic area. These include the fundamental principles of data science, the capability to analyse a diversity of big data, the skills of using data science tools and the capability to apply the data analytics techniques to various domains, as well as the capability to present the analytics results to intended audience. The programme's delivery modes are through lectures, lab sessions, and industrial projects, that emphasize on state-of-the-practice techniques, tools and technology, and recognised methodology through university-industry collaborations.

## Programme Educational Objectives (PEO)

Program Educational Objectives (PEO) are specific goals describing graduates' expected achievements in their career and professional life after graduation. Following are the PEO for the Master of Technology (Data Science and Analytics):

1. Practice in-depth and specialist knowledge, technology and skills of Science and Analytics, and related disciplines in solving emerging challenges.
2. Demonstrate business acumen in solving complex problems and sustain intellectual curiosity through life-long learning.
3. Demonstrate effective leadership and communication to a wide variety of audiences or multi-disciplinary teams, tolerate and value different global perspectives and cultures.
4. Practice professional, ethical and societal responsibilities, and show adaptability in different roles and surroundings in contributing to the community.

## Programme Learning Outcomes (PLO)

Programme Learning Outcomes (PLO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These relate to the skills, knowledge, and behaviours that students acquire through their program of studies.

1. Ability to integrate Data Science and Analytics knowledge for effective and excellent practice as a Data Scientist and Data Analyst.
2. Ability to apply knowledge, technology and skills of Data Science and Analytics to discover potential yet hidden information, knowledge and insights for data-driven and well-informed decision making.
3. Ability to apply critical and creative thinking and conduct systematic investigations into complex Big Data, analytics and decisions problems to generate innovative solutions and extend knowledge in Data Science and Analytics.
4. Ability to effectively communicate, orally and in writing, Data Science and Analytics solutions to peers, superiors, clients and experts.
5. Ability to apply independent and life-long learning skills to keep up with latest relevant knowledge and cutting edge technologies in Data Science and Analytics, and build up further professional and information management skills.
6. Ability to work and function effectively in community and multidisciplinary teams either as a leader or a group member, demonstrate respect for cultural diversity and contribute to their organization and society.
7. Ability to prepare, publish and present technical material to a diverse audience applying ethics, values, attitude, professionalism and sustainable practices.
8. Ability to demonstrate entrepreneurial and management skills.

## Career Prospects

There is a wide range of career opportunities in the field of computer science and information technology available for graduates who are specialised in data science and analytics. Among the career opportunities are:

1. Principle Data Scientist.
2. Senior Data Scientist.
3. Principle Data Analyst.
4. Senior Data Analyst.
5. Principle Data Engineer.
6. Senior Data Engineer.
7. Data Architect.

## Programme Structure - Full Time

### September Intake:

| Semester 1 (September)      |                                      |                    |        |
|-----------------------------|--------------------------------------|--------------------|--------|
| Course Code                 | Course                               | Classification     | Credit |
| MPSW 5013                   | Research Methodology                 | Compulsory Courses | 3      |
| MAXD 5113                   | Fundamental of Data Science          | Core Courses       | 3      |
| MAXD 5123                   | Big Data Management                  | Core Courses       | 3      |
| MAXD 5133                   | Applied Statistical Methods          | Core Courses       | 3      |
| MAXD 5143                   | Applied Machine Learning             | Core Courses       | 3      |
| MPSW 5063                   | Elective I (Entrepreneurship)        | Elective Courses   | 3      |
| Total credit                |                                      |                    | 18     |
| Semester 2 (February)       |                                      |                    |        |
| Course Code                 | Course                               | Classification     | Credit |
| MAXD 5153                   | Big Data Analytics and Visualization | Core Courses       | 3      |
| MAXD 5163                   | Modelling and Decision Making        | Core Courses       | 3      |
| MAXD ****                   | Elective II                          | Elective Courses   | 3      |
| MAXD ****                   | Elective III                         | Elective Courses   | 3      |
| MAXU 5214                   | Project 1                            | Core Courses       | 4      |
| Total credit                |                                      |                    | 16     |
| Semester 3 (Short Semester) |                                      |                    |        |
| Course Code                 | Course                               | Classification     | Credit |
| MAXU 5226                   | Project 2                            | Core Courses       | 6      |
| Total credit                |                                      |                    | 6      |
| Total graduated credit      |                                      |                    | 40     |

**February Intake:**

| <b>Semester 1 (February)</b>       |                                      |                       |               |
|------------------------------------|--------------------------------------|-----------------------|---------------|
| <b>Course Code</b>                 | <b>Course</b>                        | <b>Classification</b> | <b>Credit</b> |
| MPSW 5013                          | Research Methodology                 | Compulsory Courses    | 3             |
| MAXD 5113                          | Fundamental of Data Science          | Core Courses          | 3             |
| MAXD 5123                          | Big Data Management                  | Core Courses          | 3             |
| MAXD 5133                          | Applied Statistical Methods          | Core Courses          | 3             |
| MAXD 5143                          | Applied Machine Learning             | Core Courses          | 3             |
| MAXD 5153                          | Big Data Analytics and Visualization | Core Courses          | 3             |
| <b>Total credit</b>                |                                      |                       | <b>18</b>     |
| <b>Semester 2 (Short Semester)</b> |                                      |                       |               |
| <b>Course Code</b>                 | <b>Course</b>                        | <b>Classification</b> | <b>Credit</b> |
| MAXD ****                          | Elective I                           | Elective Courses      | 3             |
| MAXU 5214                          | Project 1                            | Core Courses          | 4             |
| <b>Total credit</b>                |                                      |                       | <b>7</b>      |
| <b>Semester 3 (September)</b>      |                                      |                       |               |
| <b>Course Code</b>                 | <b>Course</b>                        | <b>Classification</b> | <b>Credit</b> |
| MAXD 5163                          | Modelling and Decision Making        | Core Courses          | 3             |
| MPSW 5063                          | Elective II (Entrepreneurship)       | Elective Courses      | 3             |
| MAXD ****                          | Elective III                         | Elective Courses      | 3             |
| MAXU 5226                          | Project 2                            | Core Courses          | 6             |
| <b>Total credit</b>                |                                      |                       | <b>15</b>     |
| <b>Total graduated credit</b>      |                                      |                       | <b>40</b>     |

**Elective courses - choose **THREE (3)** only:**

| Course Code | Course                                 | Credit |
|-------------|----------------------------------------|--------|
| MPSW 5063   | Entrepreneurship                       | 3      |
| MAXD 5213   | Special Topics in Applied Data Science | 3      |
| MAXD 5223   | Manufacturing Analytics                | 3      |
| MAXD 5233   | Social Media Analytics                 | 3      |
| MAXD 5243   | Geospatial Analytics                   | 3      |
| MAXD 5253   | Healthcare Analytics                   | 3      |
| MAXD 5263   | Tourism Analytics                      | 3      |
| MAXD 5273   | Customer and Financial Analytics       | 3      |

## Programme Structure - Part Time

### September Intake:

| Semester 1 (September)      |                                      |                    |        |
|-----------------------------|--------------------------------------|--------------------|--------|
| Course Code                 | Course                               | Classification     | Credit |
| MPSW 5013                   | Research Methodology                 | Compulsory Courses | 3      |
| MAXD 5113                   | Fundamental of Data Science          | Core Courses       | 3      |
| MAXD 5133                   | Applied Statistical Methods          | Core Courses       | 3      |
| Total credit                |                                      |                    | 9      |
| Semester 2 (February)       |                                      |                    |        |
| Course Code                 | Course                               | Classification     | Credit |
| MAXD 5123                   | Big Data Management                  | Core Courses       | 3      |
| MAXD 5143                   | Applied Machine Learning             | Core Courses       | 3      |
| MAXD 5153                   | Big Data Analytics and Visualization | Core Courses       | 3      |
| Total credit                |                                      |                    | 9      |
| Semester 3 (Short Semester) |                                      |                    |        |
| Course Code                 | Course                               | Classification     | Credit |
| MAXU 5214                   | Project 1                            | Core Courses       | 4      |
| Total credit                |                                      |                    | 4      |
| Semester 4 (September)      |                                      |                    |        |
| Course Code                 | Course                               | Classification     | Credit |
| MAXD 5163                   | Modelling and Decision Making        | Core Courses       | 3      |
| MAXD ****                   | Elective I                           | Elective Courses   | 3      |
| MAXD ****                   | Elective II                          | Elective Courses   | 3      |
| Total credit                |                                      |                    | 9      |
| Semester 5 (February)       |                                      |                    |        |
| Course Code                 | Course                               | Classification     | Credit |
| MPSW 5063                   | Elective III (Entrepreneurship)      | Elective Courses   | 3      |
| MAXU 5226                   | Project 2                            | Core Courses       | 6      |
| Total credit                |                                      |                    | 9      |
| Total graduated credit      |                                      |                    | 40     |

**Elective courses - choose TWO (2) only:**

| Course Code | Course                                 | Credit |
|-------------|----------------------------------------|--------|
| MPSW 5063   | Entrepreneurship                       | 3      |
| MAXD 5213   | Special Topics in Applied Data Science | 3      |
| MAXD 5223   | Manufacturing Analytics                | 3      |
| MAXD 5233   | Social Media Analytics                 | 3      |
| MAXD 5243   | Geospatial Analytics                   | 3      |
| MAXD 5253   | Healthcare Analytics                   | 3      |
| MAXD 5263   | Tourism Analytics                      | 3      |
| MAXD 5273   | Customer and Financial Analytics       | 3      |

## Course Synopsis

### **MPSW 5013**

#### **Research Methodology**

##### **Course Learning Outcomes:**

1. Apply ethical research skills in constructing research questions, objectives and hypothesis (if any) relevant to the research problem.
2. Synthesize relevant literature to address the knowledge gaps.
3. Propose a research work for an improvement of existing knowledge.

##### **Course Synopsis:**

The primary goal of this course is to provide students with the necessary knowledge and skills in preparing for their Master dissertation. In this course, students will be exposed to the important concepts of conducting scientific research and managing ethical research. The course is designed to introduce students to the principles and good practices of conducting research. Activities at each step of the research process will be elaborated in order to develop the skills and competencies required to facilitate a successful research project at postgraduate level. At the end of the course, students are expected to submit a research proposal relevant to their field of study.

### **MAXD 5113**

#### **Fundamental of Data Science**

##### **Course Learning Outcomes:**

1. Explain the concept of Data Science and the skill sets needed to be a data scientist.
2. Identify the Data Analytic Lifecycle and how its components interact.
3. Construct computer program to carry out basic statistical modeling and analysis.

##### **Course Synopsis:**

The course provides an introduction to data science, which is the study of the generalizable extraction of knowledge from data. Being a data scientist requires an integrated skill set spanning mathematics, statistics, machine learning, databases and other branches of computer science along with a good understanding of the craft of problem formulation to engineer effective solutions. This course provides an overview of today's data environment, the rationale and opportunity for a new approach to analytics, the roles required, including the Data Scientist, and representative examples of big data analytics in industry. This course introduces students to the fundamental principles of data science that underlie the algorithms, processes, methods, and data-analytic thinking. It also introduces students to algorithms and tools based on these principles, and frameworks to support problem-focused data-analytic thinking. The course ends by examining students understanding on integration and synthesis of concepts and their application to solving problems.

**MAXD 5123****Big Data Management****Course Learning Outcomes:**

1. Explain the challenges, ecosystem, trends, and technologies for big data management.
2. Manipulate the learnt technologies to solve challenges in managing big data.
3. Integrate the different technologies in planning and designing comprehensive solution for big data management.

**Course Synopsis:**

Big data is the new norm for many organizations. Meaningful insights obtained from this huge amount of collected data help organizations remain competitive. Hence it is important that organizations manage their big data properly. In this course, the many challenges in managing big data such as data quality, data security, data privacy, data storage, data processing and data analytics are exposed. Ecosystem and future trends are elaborated to get better insight in managing big data. This course introduces NoSQL data storage like MongoDB, Cassandra, and Neo4J which stores non-relational data model easily. To deal with the huge amount data that need to be stored and processed, Hadoop which is the de-facto technology for big data management is explored by this course. HDFS which is Hadoop data storage component and MapReduce which is Hadoop data processing component are delved into. This course also discusses Hadoop ecosystem which provides added functionalities for managing big data such as Flume and Sqoop for data ingestion. For analyzing big data, this course introduces Spark and its ecosystem to provide different types of analytics. At the end of the course, students will have exposure and understanding in managing big data, what tools are appropriate and relevant to manipulate and to integrate in planning and designing comprehensive solution for big data management.

**MAXD 5133****Applied Statistical Methods****Course Learning Outcomes:**

1. Find solutions for statistical problems using appropriate statistical techniques.
2. Analyse solutions for real life statistical problems.
3. Formulate solutions for statistical problems using statistical software.
4. Integrate solution plan to application problems based on available data.

**Course Synopsis:**

Applied statistical methods covers the fundamental understanding of statistical methods necessary to deal with a wide variety of practical problems. The course offers a curriculum that provides a balanced approach towards learning of statistical theory and its applications. The core courses give a thorough grounding in advanced statistical methods. Topics covered in this course stresses clarity of understanding, interpretation, and method of application. Various qualitative and quantitative methods in research will be discussed in this course. This includes also on how to compute, evaluate and analyze qualitative and quantitative data. This course also covers the discovery and exploration of complex multivariate relationships among variables. Multivariate analysis is a set of statistical techniques used for analysis of data that contain more than one variable. The underlying theory required to understand the multivariate methods, as well as their applications in data analysis will be discussed. Methods in time series analysis also will be discussed where it comprises methods for analyzing time series data to extract meaningful statistics of the data as well as forecasting future values.

**MAXD 5143****Applied Machine Learning****Course Learning Outcomes:**

1. Explain the concepts and principles of machine learning.
2. Evaluate different machine learning techniques in terms of their applicability to different Machine Learning problems.
3. Manipulate appropriate tools to apply suitable machine learning techniques to the data set given to solve the problem.
4. Formulate a systematic approach to conduct scientific experimental investigations and assessment.

**Course Synopsis:**

Machine learning is a rapidly growing field at the intersection of computer science and statistics, which concerns about finding patterns in real data. The learning evolved from the study of pattern recognition and computational learning theory in artificial intelligence to explore the construction of algorithms for making prediction on data. This course aims to provide practical skills in applying machine learning algorithms on real applications. It emphasizes on the implementation and evaluation of machine learning systems. The focus will be placed on applying machine learning model for problem solving more than the fundamental understanding of learning algorithm. Students will be exposed to the tasks on design, implementation, training and evaluation of a machine learning systems. Topics of discussion include: introduction to machine learning; real-world data; feature engineering; classification techniques; predicting continuous target variables; model evaluation, parameter tuning; clustering analysis; association analysis; ensemble learning; reinforcement learning; deep learning; and scaling machine learning workflows.

**MAXD 5153****Big Data Analytics and Visualization****Course Learning Outcomes:**

1. Identify the concepts, fundamentals and methodologies of big data analytics.
2. Interpret massive volumes of unstructured data into a meaningful form, using data analytics software.
3. Construct big data analytics and visualization strategy in a proper and meaningful way using appropriate techniques.

**Course Synopsis:**

This course consists of two parts: Big Data Analytics and Data Visualization. In the first part, the course brings together several key information technologies used in manipulating, storing, and analyzing big data especially unstructured data. The unstructured data are text, images, videos, audio/speech. R or Python or other tools will be used as the tool for analyzing the unstructured data. In the second part of this course, data visualization is covered to enables multi-level analysis of data. The fundamental concepts in data visualization will be covered, including the various types of data visualization according to input types, different approaches in determining good data visualization techniques and methods, good practices for amplifying cognition, revealing better insights and unveiling underlying structure. Students will also learn how to develop interactive visualizations and applications, use various data exploratory functions and how to present the data.

**MAXD 5163****Modelling and Decision Making****Course Learning Outcomes:**

1. Interpret knowledge of modelling and prescriptive analytics with data science for data-driven and evidence-based decision making.
2. Choose appropriate and relevant modelling and prescriptive analytics technique using Big data input to solve complex decision problems.
3. Propose prescriptive models and solutions using appropriate software tools and analysis of Big data.

**Course Synopsis:**

In Data Science, prescriptive analytics is the final frontier of analytics, which entails the application of mathematical modelling, simulation, optimization and computational intelligence to suggest decision options, taking advantage of the results from the earlier analytic stages of descriptive and predictive analytics. Prescriptive analytics optimizes decision making and able to suggest or prescribe what actions to take in order to maximize output, given constraints and key objectives, and shows the implication of each decision option. In this course, students are exposed to operations research modelling, and meta-heuristics and soft computing based optimizations, and showed how to exploit them to solve real-world decision problems. The course covers the arts of decision making, decision making and modelling process, decision analysis and method of decision science which involves the application of selected operations research and optimization (hard and soft) techniques, to strategic and managerial decision problems.

The focus is to impart analytical systems level thinking and problem solving skills in complex decision making contexts. At the end of the course students will have exposure and deep understanding on how organizational decisions are made in the present of Big data, what appropriate and relevant modelling and analytics solutions should be provided to support well-informed, in-time and effective decision making.

**MPSW 5063****Entrepreneurship****Course Learning Outcomes:**

1. Explain entrepreneurial skills in identifying and exploiting entrepreneurial opportunities.
2. Formulate a business model canvas for business value proposition.
3. Propose a creative and viable high tech business models/plan and strategies.

**Course Synopsis:**

The objectives of this course are to provide students with a robust foundation in theories relevant to entrepreneurial behaviour in the context of technology ventures and to stimulate them to think and behave like an entrepreneur. First, the course covers fundamental issues such as the influence of risk and uncertainty, the role of technology in entrepreneurship, opportunity recognition, business model creation, life cycle and critical stages of the entrepreneurial business and the development of an operational and financial foundation of a technology venture. Second, the course provides students with actionable knowledge by familiarising them with the necessary entrepreneurial expertise to establish and scaling up a technology venture.

**MAXD 5213****Special Topic in Applied Science****Course Learning Outcomes:**

1. Analyze emerging technologies in data science.
2. Integrate new data science concepts and skills to selected application domains.
3. Demonstrate data science results to various stakeholders.

**Course Synopsis:**

The course starts by introducing the current computing culture in selected applications domain. Data Science in the selected applications domain are discussed as well as its scenario in Malaysia and globally. Then the course provides a comprehensive examination of data science as it is applied to real organizations and processes within the application domain. Students will be introduced to real-world examples and have the opportunity to learn from industry case studies on organizations that have successfully applied data science to their advantage. This course will also provide the students with an understanding of the use of emerging technologies in data science. Communicating data science results to various stakeholders is also emphasized in this course.

**MAXD 5223****Manufacturing Analytics****Course Learning Outcomes:**

1. Illustrate analytics use cases in manufacturing systems.
2. Formulate analytics models for manufacturing systems.
3. Accomodate appropriate tools to implement analytics model for manufacturing use cases.

**Course Synopsis:**

Manufacturing analytics aims to analyse the production data to generate added value. The analytics models are purpose-built to improve decision-making and boost production performance. Manufacturers take advantage of the actionable insights to reduce process flaws, increase performance, save time and cost. This course aims to provide a general overview of implementing analytics in manufacturing domain. It emphasises on practical issues and application of advanced analytics on manufacturing challenges. The main focus will be placed on designing the manufacturing use cases using analytics tools toward actionable intelligence. Topics of discussion include: introduction to manufacturing analytics; the return of investments in manufacturing analytics; product design analysis; the manufacturing process; automation and computer-aided manufacturing; IoT-enabled manufacturing system; manufacturing performance management, performances analysis method, and production scheduling system; and the human side of analytics in manufacturing industry.

**MAXD 5233****Social Media Analytics****Course Learning Outcomes:**

1. Analyze the fundamentals and concepts of social media data mining.
2. Prepare appropriate solution steps for social media data analysis based on text mining methods.
3. Build computer program based on appropriate methods for practical uses in social media analytics.

**Course Synopsis:**

This course will introduce social media content analytics. Text data mining, especially data from social media has been gaining attention as the available volume of online social media information grows at a rate that is by far higher than our human capacity to handle and process such a huge volume of data from the web. Topics that will be covered in this course includes overview of social media data mining, mining social media data, mining blog pages and other social web analysis.

**MAXD 5243****Geospatial Analytics****Course Learning Outcomes:**

1. Analyse geospatial analytics approaches on various geospatial data.
2. Integrate required knowledge and skills to solve real-world geospatial analytics problems.
3. Construct multi-step workflows in variety of geospatial analytics applications.

**Course Synopsis:**

Geospatial analytics offers revolutionary approaches in discovering how and why location matters in problem solving and decision-making. This course elaborates the acquisition, processing, analysis and interpretation of objects, areas and phenomena by utilising geospatial analysis for various domains, such as environmental sustainability, urban planning, agriculture and natural resources. It aims to provide knowledge and skill in geospatial analysis particularly by making use of remotely sensed data captured from sensors mounted on airborne and spaceborne platforms. In order to understand an object, area or phenomenon, students will be integrating knowledge and skills in image processing that involves the use of fundamental and advanced algorithms, analysing, visualizing and interpreting of geospatial data for problem solving and decision making.

**MAXD 5253****Healthcare Analytics****Course Learning Outcomes:**

1. Construct solution in healthcare analytics through simple modelling and simulation.
2. Evaluate the concept of healthcare analytics to support the data sciences analysis and design.
3. Formulate the healthcare analytics in solving data science related problems.

**Course Synopsis:**

This course covers the transformation of big data by creating enormous opportunities for companies, researchers and other related area in healthcare to improve patient outcomes. Healthcare analytics powers data-driven transformations that combine strategy, big data and advanced analytics, and implementation processes to change the way healthcare companies especially think, decide, and act. The four areas within healthcare are considered as a case study; claims and cost data (retail purchases e.g. data captured in running stores), pharmaceutical and research and development (R&D) data, clinical data (collected from electronic medical records (EHRs)), and patient behavior and sentiment data (patient behaviors and preferences). By the end of this course, students are able to design, analyze and implement the healthcare analytics concepts in data sciences.

**MAXD 5263****Tourism Analytics****Course Learning Outcomes:**

1. Analyze each one of the concepts in tourism analytics.
2. Propose appropriate solution for tourism application problems using analytics software.
3. Solve tourism application problems using appropriate analytics method.

**Course Synopsis:**

The course covers the development of analytics in tourism. There are three types of analytics including descriptive, diagnostic and predictive analytics in this course. Moreover, the sentiment analysis for the tourism data will also be implemented. At the end of the course, the student is required to produce a dashboard.

**MAXD 5273****Customer and Financial Analytics****Course Learning Outcomes:**

1. Analyze analytics use cases in customer behaviour and financial systems.
2. Propose appropriate solution steps for customer behaviour and financial systems.
3. Build computer program based on appropriate methods for practical uses in customer and financial analytics.

**Course Synopsis:**

Customer analytics is a process by which data from customer behaviour is used to help make key business decisions via market segmentation and predictive analytics. This information is used by businesses for direct marketing, site selection, and customer relationship management. Marketing provides services in order to satisfy customers. With that, the productive system is considered from its beginning at the production level, to the end of the cycle at the consumer. Customer analytics plays a very important role in the prediction of customer behaviour today. Financial analytics explores how financial statement data and non-financial metrics can be linked to financial performance. In this course, students will learn how data is used to assess what drives financial performance and to forecast future financial scenarios.

**MAXU 5214****Project 1****Course Learning Outcomes:**

1. Identify the problems, objectives and scope based on current trends of technologies.
2. Perform a comprehensive literature review and appropriate procedures to complete the project.
3. Justify the suitable key answers to clarify the contribution in application domain.

**Course Synopsis:**

This course is the first part of project that contains the results based on the theories and techniques of current technologies learnt previously. Besides writing the proposal, student is required to write four chapters of dissertation, i.e.;

- Chapter 1: Introduction,
- Chapter 2: Literature Review, and
- Chapter 3: Research Methodology.

In addition, student must accomplish the project design and justify the proposed solution during presentation.

**MAXU 5226****Project 2****Course Learning Outcomes:**

1. Demonstrate the solutions with significance contribution to the application domain.
2. Verify the proposed solutions to understand the strengths, weaknesses and limitations of the study.
3. Defend the proposed solution by articulating the series of processes to achieve the end results of the domain business requirements.

**Course Synopsis:**

This course is the second part of project that show the ability of student in applying the theories and techniques of knowledge and technologies learnt previously. Student must write the second fold of dissertation which consists of three chapters of dissertation, i.e.;

- Chapter 4: Analysis & Design,
- Chapter 5: Implementation,
- Chapter 6: Evaluation, and
- Chapter 7: Conclusion & Future Works.

These chapters must align with the proposed solutions developed as the end product of this project. Student is required to justify the contribution of the proposed solutions throughout the presentation and demonstration sessions.



# **MAXL**

**Master of Technology in  
Data Science and Analytics**  
(with Open and Distance Learning - ODL)

# **Master of Technology in Data Science and Analytics**

**(with Open and Distance Learning - ODL)**  
(MQA/PA 17473)

## **Programme Overview**

The Master of Technology in Data Science and Analytics with ODL mode, for short MAXL, is aimed at recent graduates and industry practitioners from various academic disciplines with strong analytic and computing skills or experience. The programme is designed to equip the students with fundamental and applied knowledge, technical skills, and current technologies in the data science and analytics area. These include the fundamental principles of data science, the capability to analyse a diversity of big data, the skills of using data science tools and applying the data analytics techniques to various domain, as well as the capability to present the analytics results to the intended audience. The materials emphasise state-of-the-practice techniques, tools, and technology, and recognised methodology through university-industry collaborations. Graduates from this programme will have career opportunities as data scientists, data analysts and many more.

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

Program Educational Objectives (PEO) are specific goals describing graduates' expected achievements in their career and professional life after graduation. Following are the PEO for the Master of Technology in Data Science and Analytics:

1. Have in-depth knowledge and apply enhanced technical, digital, and numeracy skills of data science and analytics, and related disciplines to provide innovative solutions in computing.
2. Demonstrate effective leadership, interpersonal, and communication skills to interact effectively with a wide variety of audiences or multi-disciplinary teams, tolerate and value different global perspectives and cultures.
3. Engage and advocate lifelong learning activities and have an entrepreneurial mindset.
4. Practise professional, ethical and societal responsibilities with integrity, and show adaptability in different roles and surroundings in contributing to the community.

## Programme Learning Outcomes (PLO)

Programme Learning Outcomes (PLO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These relate to the skills, knowledge, and behaviours that students acquire through their program of studies.

1. Utilize data science and analytics knowledge for effective and excellent practice as a data scientist and data analyst.
2. Conduct systematic investigations and apply critical and creative thinking to generate innovative solutions in data science and analytics.
3. Apply knowledge, technology and skills of data science and analytics to discover potential yet hidden information, knowledge and insights for data-driven and well-informed decision making.
4. Effectively interact with diverse peers, superiors, clients and experts.
5. Display effective communication, both orally and in writing, for data science and analytics solutions, to a diverse audience, including peers, superiors, clients, and experts.
6. Practise digital skills to acquire, interpret and extend knowledge in data science and analytics.
7. Determine suitable numerical tools to manage and resolve data science and analytics problems.
8. Operate effectively in community and multidisciplinary teams either as a leader or a group member, demonstrate respect for cultural diversity and contribute to their organization and society.
9. Apply independent and lifelong learning skills to keep up with latest relevant knowledge and cutting edge technologies in Data Science and Analytics.
10. Demonstrate entrepreneurial and managerial skills.
11. Manage research and services by applying ethics, values, attitude, professionalism and sustainable practices in data science and analytics.

## Career Prospects

There is a wide range of career opportunities in the field of computer science and information technology available for graduates who are specialised in data science and analytics. Among the career opportunities are:

1. Principle Data Scientist.
2. Senior Data Scientist.
3. Principle Data Analyst.
4. Senior Data Analyst.
5. Principle Data Engineer.
6. Senior Data Engineer.
7. Data Architect.

## Programme Structure - Full Time

### September Intake:

| Semester 1 (September)      |                                      |                    |        |
|-----------------------------|--------------------------------------|--------------------|--------|
| Course Code                 | Course                               | Classification     | Credit |
| MPSW 5013                   | Research Methodology                 | Compulsory Courses | 3      |
| MAXL 5113                   | Fundamental of Data Science          | Core Courses       | 3      |
| MAXL 5123                   | Big Data Management                  | Core Courses       | 3      |
| MAXL 5133                   | Applied Statistical Methods          | Core Courses       | 3      |
| MAXL 5143                   | Applied Machine Learning             | Core Courses       | 3      |
| MPSW 5063                   | Elective I (Entrepreneurship)        | Elective Courses   | 3      |
| Total credit                |                                      |                    | 18     |
| Semester 2 (February)       |                                      |                    |        |
| Course Code                 | Course                               | Classification     | Credit |
| MAXL 5153                   | Big Data Analytics and Visualization | Core Courses       | 3      |
| MAXL 5163                   | Modelling and Decision Making        | Core Courses       | 3      |
| MAXL ****                   | Elective II                          | Elective Courses   | 3      |
| MAXL ****                   | Elective III                         | Elective Courses   | 3      |
| MAXU 5214                   | Project 1                            | Core Courses       | 4      |
| Total credit                |                                      |                    | 16     |
| Semester 3 (Short Semester) |                                      |                    |        |
| Course Code                 | Course                               | Classification     | Credit |
| MAXU 5226                   | Project 2                            | Core Courses       | 6      |
| Total credit                |                                      |                    | 6      |
| Total graduated credit      |                                      |                    | 40     |

**February Intake:**

| <b>Semester 1 (February)</b>       |                                      |                       |               |
|------------------------------------|--------------------------------------|-----------------------|---------------|
| <b>Course Code</b>                 | <b>Course</b>                        | <b>Classification</b> | <b>Credit</b> |
| MPSW 5013                          | Research Methodology                 | Compulsory Courses    | 3             |
| MAXL 5113                          | Fundamental of Data Science          | Core Courses          | 3             |
| MAXL 5123                          | Big Data Management                  | Core Courses          | 3             |
| MAXL 5133                          | Applied Statistical Methods          | Core Courses          | 3             |
| MAXL 5143                          | Applied Machine Learning             | Core Courses          | 3             |
| MAXL 5153                          | Big Data Analytics and Visualization | Core Courses          | 3             |
| <b>Total credit</b>                |                                      |                       | <b>18</b>     |
| <b>Semester 2 (Short Semester)</b> |                                      |                       |               |
| <b>Course Code</b>                 | <b>Course</b>                        | <b>Classification</b> | <b>Credit</b> |
| MAXL ****                          | Elective I                           | Elective Courses      | 3             |
| MAXU 5214                          | Project 1                            | Core Courses          | 4             |
| <b>Total credit</b>                |                                      |                       | <b>7</b>      |
| <b>Semester 3 (September)</b>      |                                      |                       |               |
| <b>Course Code</b>                 | <b>Course</b>                        | <b>Classification</b> | <b>Credit</b> |
| MAXL 5163                          | Modelling and Decision Making        | Core Courses          | 3             |
| MPSW 5063                          | Elective II (Entrepreneurship)       | Elective Courses      | 3             |
| MAXL ****                          | Elective III                         | Elective Courses      | 3             |
| MAXU 5226                          | Project 2                            | Core Courses          | 6             |
| <b>Total credit</b>                |                                      |                       | <b>15</b>     |
| <b>Total graduated credit</b>      |                                      |                       | <b>40</b>     |

**Elective courses - choose **THREE (3)** only:**

| Course Code | Course                           | Credit |
|-------------|----------------------------------|--------|
| MPSW 5063   | Entrepreneurship                 | 3      |
| MAXL 5223   | Manufacturing Analytics          | 3      |
| MAXL 5233   | Social Media Analytics           | 3      |
| MAXL 5253   | Healthcare Analytics             | 3      |
| MAXL 5273   | Customer and Financial Analytics | 3      |

## Programme Structure - Part Time

### September Intake:

| Semester 1 (September)      |                                      |                    |        |
|-----------------------------|--------------------------------------|--------------------|--------|
| Course Code                 | Course                               | Classification     | Credit |
| MPSW 5013                   | Research Methodology                 | Compulsory Courses | 3      |
| MAXL 5113                   | Fundamental of Data Science          | Core Courses       | 3      |
| MAXL 5133                   | Applied Statistical Methods          | Core Courses       | 3      |
| Total credit                |                                      |                    | 9      |
| Semester 2 (February)       |                                      |                    |        |
| Course Code                 | Course                               | Classification     | Credit |
| MTDS 5123                   | Big Data Management                  | Core Courses       | 3      |
| MAXL 5143                   | Applied Machine Learning             | Core Courses       | 3      |
| MAXL 5153                   | Big Data Analytics and Visualization | Core Courses       | 3      |
| Total credit                |                                      |                    | 9      |
| Semester 3 (Short Semester) |                                      |                    |        |
| Course Code                 | Course                               | Classification     | Credit |
| MAXU 5214                   | Project 1                            | Core Courses       | 4      |
| Total credit                |                                      |                    | 4      |
| Semester 4 (September)      |                                      |                    |        |
| Course Code                 | Course                               | Classification     | Credit |
| MAXL 5163                   | Modelling and Decision Making        | Core Courses       | 3      |
| MAXL ****                   | Elective I                           | Elective Courses   | 3      |
| MAXL ****                   | Elective II                          | Elective Courses   | 3      |
| Total credit                |                                      |                    | 9      |
| Semester 5 (February)       |                                      |                    |        |
| Course Code                 | Course                               | Classification     | Credit |
| MPSW 5063                   | Elective III (Entrepreneurship)      | Elective Courses   | 3      |
| MAXU 5226                   | Project 2                            | Core Courses       | 6      |
| Total credit                |                                      |                    | 9      |
| Total graduated credit      |                                      |                    | 40     |

**February Intake:**

| <b>Semester 1 (February)</b>       |                                      |                       |               |
|------------------------------------|--------------------------------------|-----------------------|---------------|
| <b>Course Code</b>                 | <b>Course</b>                        | <b>Classification</b> | <b>Credit</b> |
| MPSW 5013                          | Research Methodology                 | Compulsory Courses    | 3             |
| MAXL 5113                          | Fundamental of Data Science          | Core Courses          | 3             |
| MAXL 5133                          | Applied Statistical Methods          | Core Courses          | 3             |
| <b>Total credit</b>                |                                      |                       | <b>9</b>      |
| <b>Semester 2 (September)</b>      |                                      |                       |               |
| <b>Course Code</b>                 | <b>Course</b>                        | <b>Classification</b> | <b>Credit</b> |
| MTDS 5123                          | Big Data Management                  | Core Courses          | 3             |
| MAXL 5143                          | Applied Machine Learning             | Core Courses          | 3             |
| MAXL 5153                          | Big Data Analytics and Visualization | Core Courses          | 3             |
| <b>Total credit</b>                |                                      |                       | <b>9</b>      |
| <b>Semester 3 (February)</b>       |                                      |                       |               |
| <b>Course Code</b>                 | <b>Course</b>                        | <b>Classification</b> | <b>Credit</b> |
| MAXL 5163                          | Modelling and Decision Making        | Core Courses          | 3             |
| MAXL ****                          | Elective I                           | Elective Courses      | 3             |
| MAXL ****                          | Elective II                          | Elective Courses      | 3             |
| <b>Total credit</b>                |                                      |                       | <b>9</b>      |
| <b>Semester 4 (Short Semester)</b> |                                      |                       |               |
| <b>Course Code</b>                 | <b>Course</b>                        | <b>Classification</b> | <b>Credit</b> |
| MAXU 5214                          | Project 1                            | Core Courses          | 4             |
| <b>Total credit</b>                |                                      |                       | <b>4</b>      |
| <b>Semester 5 (September)</b>      |                                      |                       |               |
| <b>Course Code</b>                 | <b>Course</b>                        | <b>Classification</b> | <b>Credit</b> |
| MPSW 5063                          | Elective III (Entrepreneurship)      | Elective Courses      | 3             |
| MAXU 5226                          | Project 2                            | Core Courses          | 6             |
| <b>Total credit</b>                |                                      |                       | <b>9</b>      |
| <b>Total graduated credit</b>      |                                      |                       | <b>40</b>     |

**Elective courses - choose **THREE (3)** only:**

| Course Code | Course                           | Credit |
|-------------|----------------------------------|--------|
| MPSW 5063   | Entrepreneurship                 | 3      |
| MAXL 5223   | Manufacturing Analytics          | 3      |
| MAXL 5233   | Social Media Analytics           | 3      |
| MAXL 5253   | Healthcare Analytics             | 3      |
| MAXL 5273   | Customer and Financial Analytics | 3      |

## Course Learning Outcomes and Synopsis

### **MPSW 5013**

#### **Research Methodology**

##### **Course Learning Outcomes:**

1. Apply ethical research skills in constructing research questions, objectives and hypothesis (if any) relevant to the research problem.
2. Synthesize relevant literature to address the knowledge gaps.
3. Propose a research work for an improvement of existing knowledge.

##### **Course Synopsis:**

The primary goal of this course is to provide students with the necessary knowledge and skills in preparing for their Master dissertation. In this course, students will be exposed to the important concepts of conducting scientific research and managing ethical research. The course is designed to introduce students to the principles and good practices of conducting research. Activities at each step of the research process will be elaborated in order to develop the skills and competencies required to facilitate a successful research project at postgraduate level. At the end of the course, students are expected to submit a research proposal relevant to their field of study.

### **MAXL 5113**

#### **Fundamental of Data Science**

##### **Course Learning Outcomes:**

1. Explain the concept of Data Science and the skill sets needed to be a data scientist.
2. Identify the Data Analytic Lifecycle and how its components interact.
3. Construct computer program to carry out basic statistical modeling and analysis.

##### **Course Synopsis:**

The course provides an introduction to data science, which is the study of the generalizable extraction of knowledge from data. Being a data scientist requires an integrated skill set spanning mathematics, statistics, machine learning, databases and other branches of computer science along with a good understanding of the craft of problem formulation to engineer effective solutions. This course provides an overview of today's data environment, the rationale and opportunity for a new approach to analytics, the roles required, including the Data Scientist, and representative examples of big data analytics in industry. This course introduces students to the fundamental principles of data science that underlie the algorithms, processes, methods, and data-analytic thinking. It also introduces students to algorithms and tools based on these principles, and frameworks to support problem-focused data-analytic thinking. The course ends by examining students understanding on integration and synthesis of concepts and their application to solving problems.

**MAXL 5123****Big Data Management****Course Learning Outcomes:**

1. Discover the challenges, ecosystem, trends, and technologies for big data management.
2. Manipulate the learnt technologies to solve challenges in managing big data.
3. Integrate the different technologies in planning and designing comprehensive solution for big data management.

**Course Synopsis:**

Big data is the new norm for many organizations. Meaningful insights obtained from this huge amount of collected data help organizations remain competitive. Hence it is important that organizations manage their big data properly. In this course, the many challenges in managing big data such as data quality, data security, data privacy, data storage, data processing and data analytics are exposed. Ecosystem and future trends are elaborated to get better insight in managing big data. This course introduces NoSQL data storage like MongoDB, Cassandra, and Neo4J which stores non-relational data model easily. To deal with the huge amount data that need to be stored and processed, Hadoop which is the de-facto technology for big data management is explored by this course. HDFS which is Hadoop data storage component and MapReduce which is Hadoop data processing component are delved into. This course also discusses Hadoop ecosystem which provides added functionalities for managing big data such as Flume and Sqoop for data ingestion. For analyzing big data, this course introduces Spark and its ecosystem to provide different types of analytics. At the end of the course, students will have exposure and understanding in managing big data, what tools are appropriate and relevant to manipulate and to integrate in planning and designing comprehensive solution for big data management.

**MAXL 5133****Applied Statistical Methods****Course Learning Outcomes:**

1. Apply appropriate statistical techniques for statistical problems.
2. Analyse solutions for real life statistical problems.
3. Formulate solutions for statistical problems using statistical software.
4. Integrate solution plan to application problems based on available data.

**Course Synopsis:**

Applied statistical methods covers the fundamental understanding of statistical methods necessary to deal with a wide variety of practical problems. The course offers a curriculum that provides a balanced approach towards learning of statistical theory and its applications. The core courses give a thorough grounding in advanced statistical methods. Topics covered in this course stresses clarity of understanding, interpretation, and method of application. Various qualitative and quantitative methods in research will be discussed in this course. This includes also on how to compute, evaluate and analyze qualitative and quantitative data. This course also covers the discovery and exploration of complex multivariate relationships among variables. Multivariate analysis is a set of statistical techniques used for analysis of data that contain more than one variable. The underlying theory required to understand the multivariate methods, as well as their applications in data analysis will be discussed. Methods in time series analysis also will be discussed where it comprises methods for analyzing time series data to extract meaningful statistics of the data as well as forecasting future values.

**MAXL 5143****Applied Machine Learning****Course Learning Outcomes:**

1. Apply the concepts and principles of machine learning for problem solving.
2. Evaluate different machine learning techniques in terms of their applicability to different Machine Learning problems.
3. Manipulate appropriate tools to apply suitable machine learning techniques to the data set given to solve the problem.
4. Formulate a systematic approach to conduct scientific experimental investigations and assessment.

**Course Synopsis:**

Machine learning is a rapidly growing field at the intersection of computer science and statistics, which concerns about finding patterns in real data. The learning evolved from the study of pattern recognition and computational learning theory in artificial intelligence to explore the construction of algorithms for making prediction on data. This course aims to provide practical skills in applying machine learning algorithms on real applications. It emphasizes on the implementation and evaluation of machine learning systems. The focus will be placed on applying machine learning model for problem solving more than the fundamental understanding of learning algorithm. Students will be exposed to the tasks on design, implementation, training and evaluation of a machine learning systems. Topics of discussion include: introduction to machine learning; real-world data; feature engineering; classification techniques; predicting continuous target variables; model evaluation, parameter tuning; clustering analysis; association analysis; ensemble learning; reinforcement learning; deep learning; and scaling machine learning workflows.

**MAXL 5153****Big Data Analytics and Visualization****Course Learning Outcomes:**

1. Identify the concepts, fundamentals and methodologies of big data analytics.
2. Interpret massive volumes of unstructured data into a meaningful form, using data analytics software.
3. Construct big data analytics and visualization strategy in a proper and meaningful way using appropriate techniques.

**Course Synopsis:**

This course consists of two parts: Big Data Analytics and Data Visualization. In the first part, the course brings together several key information technologies used in manipulating, storing, and analyzing big data especially unstructured data. The unstructured data are text, images, videos, audio/speech. R or Python or other tools will be used as the tool for analyzing the unstructured data. In the second part of this course, data visualization is covered to enables multi-level analysis of data. The fundamental concepts in data visualization will be covered, including the various types of data visualization according to input types, different approaches in determining good data visualization techniques and methods, good practices for amplifying cognition, revealing better insights and unveiling underlying structure. Students will also learn how to develop interactive visualizations and applications, use various data exploratory functions and how to present the data.

**MAXL 5163****Modelling and Decision Making****Course Learning Outcomes:**

1. Interpret knowledge of modelling and prescriptive analytics with data science for data-driven and evidence-based decision making.
2. Generate appropriate and relevant modelling and prescriptive analytics technique using Big data input to solve complex decision problems.
3. Propose prescriptive models and solutions using appropriate software tools and analysis of Big data.

**Course Synopsis:**

In Data Science, prescriptive analytics is the final frontier of analytics, which entails the application of mathematical modelling, simulation, optimization and computational intelligence to suggest decision options, taking advantage of the results from the earlier analytic stages of descriptive and predictive analytics. Prescriptive analytics optimizes decision making and able to suggest or prescribe what actions to take in order to maximize output, given constraints and key objectives, and shows the implication of each decision option. In this course, students are exposed to operations research modelling, and meta-heuristics and soft computing based optimizations, and showed how to exploit them to solve real-world decision problems. The course covers the arts of decision making, decision making and modelling process, decision analysis and method of decision science which involves the application of selected operations research and optimization (hard and soft) techniques, to strategic and managerial decision problems. The focus is to impart analytical systems level thinking and problem solving skills in complex decision making contexts. At the end of the course students will have exposure and deep understanding on how organizational decisions are made in the present of Big data, what appropriate and relevant modelling and analytics solutions should be provided to support well-informed, in-time and effective decision making.

**MPSW 5063****Entrepreneurship****Course Learning Outcomes:**

1. Explain entrepreneurial skills in identifying and exploiting entrepreneurial opportunities.
2. Formulate a business model canvas for business value proposition.
3. Propose a creative and viable high tech business models/plan and strategies.

**Course Synopsis:**

The objectives of this course are to provide students with a robust foundation in theories relevant to entrepreneurial behaviour in the context of technology ventures and to stimulate them to think and behave like an entrepreneur. First, the course covers fundamental issues such as the influence of risk and uncertainty, the role of technology in entrepreneurship, opportunity recognition, business model creation, life cycle and critical stages of the entrepreneurial business and the development of an operational and financial foundation of a technology venture. Second, the course provides students with actionable knowledge by familiarising them with the necessary entrepreneurial expertise to establish and scaling up a technology venture.

**MAXL 5223****Manufacturing Analytics****Course Learning Outcomes:**

1. Illustrate analytics use cases in manufacturing systems.
2. Formulate analytics models for manufacturing systems.
3. Manipulate appropriate tools to implement analytics model for manufacturing use cases.

**Course Synopsis:**

Manufacturing analytics aims to analyse the production data to generate added value. The analytics models are purpose-built to improve decision-making and boost production performance. Manufacturers take advantage of the actionable insights to reduce process flaws, increase performance, save time and cost. This course aims to provide a general overview of implementing analytics in manufacturing domain. It emphasises on practical issues and application of advanced analytics on manufacturing challenges. The main focus will be placed on designing the manufacturing use cases using analytics tools toward actionable intelligence. Topics of discussion include: introduction to manufacturing analytics; the return of investments in manufacturing analytics; product design analysis; the manufacturing process; automation and computer-aided manufacturing; IoT-enabled manufacturing system; manufacturing performance management, performances analysis method, and production scheduling system; and the human side of analytics in manufacturing industry.

**MAXL 5233****Social Media Analytics****Course Learning Outcomes:**

1. Analyze the fundamentals and concepts of social media data mining.
2. Propose appropriate solution steps for social media data analysis based on text mining methods.
3. Build computer program based on appropriate methods for practical uses in social media analytics.

**Course Synopsis:**

This course will introduce social media content analytics. Text data mining, especially data from social media has been gaining attention as the available volume of online social media information grows at a rate that is by far higher than our human capacity to handle and process such a huge volume of data from the web. Topics that will be covered in this course includes overview of social media data mining, mining social media data, mining blog pages and other social web analysis.

**MAXL 5253****Healthcare Analytics****Course Learning Outcomes:**

1. Construct solution in healthcare analytics through simple modelling and simulation.
2. Explain healthcare analytical case studies using data sciences approach.
3. Formulate the healthcare analytics in solving data science related problems.

**Course Synopsis:**

This course covers the transformation of big data by creating enormous opportunities for companies, researchers and other related area in healthcare to improve patient outcomes. Healthcare analytics powers data-driven transformations that combine strategy, big data and advanced analytics, and implementation processes to change the way healthcare companies especially think, decide, and act. The four areas within healthcare are considered as a case study; claims and cost data (retail purchases e.g., data captured in running stores), pharmaceutical and research and development (R&D) data, clinical data (collected from electronic medical records (EHRs)), and patient behavior and sentiment data (patient behaviors and preferences). By the end of this course, students are able to design, analyze and implement the healthcare analytics concepts in data sciences.

**MAXL 5273****Customer and Financial Analytics****Course Learning Outcomes:**

1. Analyze analytics use cases in customer behaviour and financial systems.
2. Identify appropriate solution steps for customer behaviour and financial systems.
3. Build computer program based on appropriate methods for practical uses in customer and financial analytics.

**Course Synopsis:**

Customer analytics is a process by which data from customer behaviour is used to help make key business decisions via market segmentation and predictive analytics. This information is used by businesses for direct marketing, site selection, and customer relationship management. Marketing provides services in order to satisfy customers. With that, the productive system is considered from its beginning at the production level, to the end of the cycle at the consumer. Customer analytics plays a very important role in the prediction of customer behaviour today.

Financial analytics explores how financial statement data and non-financial metrics can be linked to financial performance. In this course, students will learn how data is used to assess what drives financial performance and to forecast future financial scenarios.

**MAXU 5214****Project 1****Course Learning Outcomes:**

1. Identify the problems, objectives and scope based on current trends of technologies.
2. Prepare a comprehensive literature review and appropriate procedures to complete the project.
3. Justify the suitable key answers to clarify the contribution in application domain.

**Course Synopsis:**

This course is the first part of project that contains the results based on the theories and techniques of current technologies learnt previously. Besides writing the proposal, student is required to write four chapters of dissertation, i.e.;

- Chapter 1: Introduction,
- Chapter 2: Literature Review, and
- Chapter 3: Research Methodology.

In addition, student must accomplish the project design and justify the proposed solution during presentation.

**MAXU 5226****Project 2****Course Learning Outcomes:**

1. Demonstrate the solutions with significance contribution to the application domain.
2. Verify the proposed solutions to understand the strengths, weaknesses and limitations of the study.
3. Modify the proposed solution by articulating the series of processes to achieve the end results of the domain business requirements.

**Course Synopsis:**

This course is the second part of project that show the ability of student in applying the theories and techniques of knowledge and technologies learnt previously. Student must write the second fold of dissertation which consists of three chapters of dissertation, i.e.;

- Chapter 4: Analysis & Design,
- Chapter 5: Implementation,
- Chapter 6: Evaluation, and
- Chapter 7: Conclusion & Future Works.

These chapters must align with the proposed solutions developed as the end product of this project. Student is required to justify the contribution of the proposed solutions throughout the presentation and demonstration sessions.

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