



UTM
UNIVERSITI TEKNOLOGI MALAYSIA



POSTGRADUATE HANDBOOK

2026/2027 SESSION

FACULTY OF MECHANICAL ENGINEERING
UNIVERSITI TEKNOLOGI MALAYSIA



<https://mech.utm.my/>

The content of this book is true and accurate at the time of publication. The Faculty of Mechanical Engineering UTM reserves the right to change any information contained herewith.

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Foreword

BY THE DEAN

Assalamualaikum and Greetings.

I am grateful to the Almighty Allah S.W.T for enabling me to compose a few words in this **Postgraduate Handbook 2026/2027**.

Welcome to Faculty of Mechanical Engineering, Universiti Teknologi Malaysia (UTM). I would like to congratulate all new students for being admitted to the various degree programs offered by the faculty. I hope you will seize this opportunity to perform at your utmost, acquiring the knowledge, necessary skill set, and transformative experiences to become a future-oriented graduates and successful engineer.

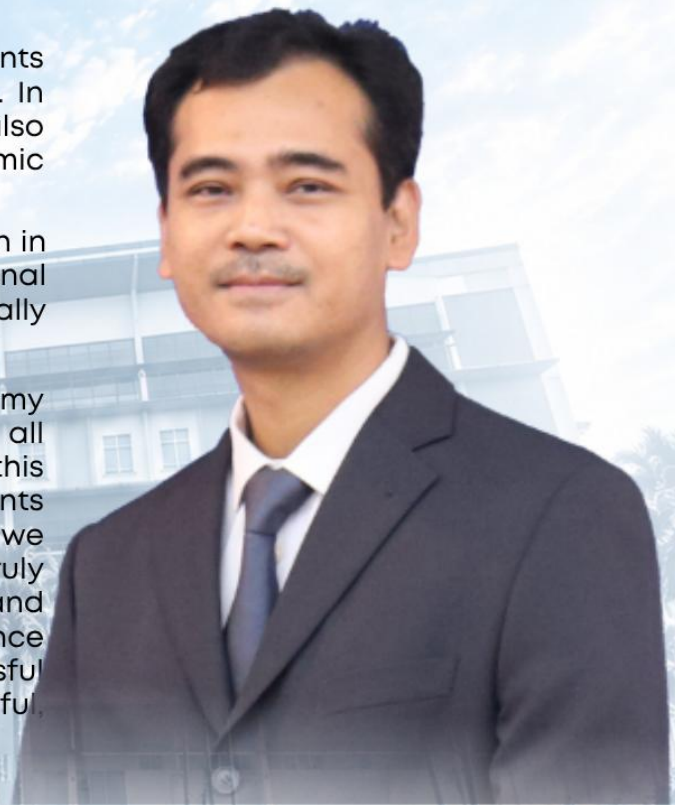
The Postgraduate Handbook contains brief information on the curriculum structures and syllabus of the programs offered by the faculty which is applicable to the student intakes for 2026/2027 session. It also serves as your main source of reference related to your academic affairs and provides the required information for the students particularly on the implementation of programs and detailed courses offered.

This handbook can be referenced by students throughout their studies for their graduation plan. In addition, a special topic on Academic Advising is also included so that both students and academic advisors can play their roles effectively.

We hope all new students will utilize the information in this handbook to enhance their educational experience and work towards becoming globally recognized, high-quality graduates.

On behalf of the faculty, I would like to extend my utmost appreciation and sincere gratitude to all parties involved in the publication of this Undergraduate Handbook. I wish all the new students to perform at your very best in the studies and we hope that this handbook will be useful to all. I truly hope that students will give their full effort and commitment, demonstrating great perseverance during their studies, and embark on a successful journey with adab-instilled, knowledgeable, skilful, holistic, and balanced attributes.

Thank You.



***Prof. Ir. Ts. Dr.
Muhamad Azizi Mat Yajid***

**Acting Dean,
Faculty of Mechanical Engineering**

Vision

A leading mechanical engineering faculty with global talents for providing unique engineering solutions.

Mission

To provide global education and solutions for nation through sustainable mechanical engineering practices with humanity values.

Motto

Gearing Up the Future with **ME**

Core Values

Bold Prompt Persistent

Management Team



Prof. Ir. Ts. Dr. Muhamad Azizi Mat Yajid
Acting Dean

- BEng (Hons)(Materials Eng.), USM
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- PhD (Materials Eng.), UK



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FACULTY OF MECHANICAL ENGINEERING
Management Team



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FACULTY OF MECHANICAL ENGINEERING
Management Team



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Management Team



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Postgraduate Studies



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ABOUT THE FACULTY OF MECHANICAL ENGINEERING

Faculty Background

Faculty of Mechanical Engineering (FME) formerly known as *Fakulti Kejuruteraan Jentera* (FKJ), was set up in 1975 at UTM Kuala Lumpur campus. FKJ initially had two departments, namely, the Department of Mechanical Engineering and Department of Petroleum Engineering. The faculty was managed by a Dean with the assistance of a Deputy Dean and two Heads of Department.

The faculty initially offered degree and diploma programmes in Mechanical Engineering and Petroleum Engineering. The student population during the 1976/1977 session was 544 with the number of students undergoing the Diploma in Mechanical Engineering (DKJ) programme and Diploma in Petroleum Engineering (DKP) programme totalling of 312 and 66, respectively, while for the Degree in Mechanical Engineering (SKJ) programme and Degree in Petroleum Engineering (SKP) programme, it was 126 and 40, respectively. As a result of the UTM-TUDM initiative, a new programme, Diploma in Aeronautical Engineering was offered during the 1980/1981 session. A total of 30 students enrolled in the programme. During the 1981/1982 session, another new programme was offered by the Faculty, namely, Diploma and Bachelor Degree in Ocean Engineering. A total of 29 students enrolled the diploma programme and 25 students for the degree programme.

In 1981, the faculty introduced a new position, the Deputy Dean II and set up a new department known as the Department of Production and Industrial Engineering. 15th of March 1983 marked a significant occasion in the history of FKJ when the Department of Petroleum Engineering was officially separated from FKJ to form a new faculty known as the Faculty of Chemical and Natural Resources Engineering. FKJ moved to a new main campus in Skudai, Johor in June 1989. As an effort to make the faculty more internationally marketable, the University has agreed to rename the *Fakulti Kejuruteraan Jentera* (FKJ) to the *Fakulti Kejuruteraan Mekanikal* (FKM) or Faculty of Mechanical Engineering (FME) on the 20th of December 1995. Since then, the faculty has considerably thrived and grown into a reputable and healthy organisation through a number of changes and transformation related to the expansion of academic programmes, new departments, improved facilities and infrastructures, and increased in number of staff and students.



Faculty Leadership and Governance

The Faculty of Mechanical Engineering is executive led by the Dean, supported by two Deputy Deans:

- Deputy Dean (Academic and Student Affairs)
- Deputy Dean (Research, Innovation, and Development)

Administrative operations are directed by a Deputy Registrar, assisted by a Senior Assistant Registrar and Assistant Registrar. Operational units are led by an Information Technology (IT) Manager and a Research Manager overseeing Teaching Laboratories. Academic governance is divided into four (4) specialized departments, each administered by Head of Department:

- Department of Applied Mechanics & Design
- Department of Thermofluids
- Department of Materials, Manufacturing & Industrial Engineering
- Department of Aeronautics, Automotive & Ocean Engineering

Academic Programmes

The faculty currently offers the following programmes:

Undergraduate Programmes:

1. Bachelor of Mechanical Engineering with Honours
2. Bachelor of Mechanical Engineering (Manufacturing) with Honours
3. Bachelor of Aeronautical Engineering with Honours
4. Bachelor of Engineering (Naval Architecture) with Honours

Postgraduate Programmes:

Master Programmes by Taught Course:

1. Master of Science in Mechanical Engineering
2. Master of Science in Industrial Engineering

Master of Philosophy (Field of Research):

Mechanical Engineering

Doctor of Philosophy:

Mechanical Engineering

Facilities

The Faculty is equipped with comprehensive teaching and research infrastructure, including modern lecture halls, smart classrooms, tutorial spaces, seminar facilities, and a dedicated Resource Centre. To support practical instruction and advanced research, technical operations are overseen by a Lab. Manager, who supervises the following Teaching Laboratories:

- Industrial and Systems Engineering Laboratory
- Metrology Laboratory
- Metal Forming Laboratory
- Metal Fabrication Laboratory
- Mechanics of Materials & Structures Laboratory
- Control & Instrumentation Laboratory
- Mechanics of Machines Laboratory
- Noise & Vibration Laboratory
- Thermodynamics Laboratory
- Fluid Mechanics Laboratory
- Foundry Laboratory
- Combustion Laboratory
- Mechatronic & Automation

Workshop facilities are available as follows:

- Machine Shop
- Rapid Prototyping

The faculty is also equipped with the following Laboratories of Excellence:

- Marine Technology Laboratory
- Aeronautical Laboratory
- Automotive Laboratory
- Materials Engineering Laboratory
- Manufacturing Laboratory
- Composite Laboratory

Complementing its academic infrastructure, the Faculty houses a strong research ecosystem comprising Higher Institution Centres of Excellence (HICoE), Centres of Excellence (CoE), and specialized Research Centres (RC):

- Institute of Noise and Vibration (IKG) - HICoE
- Institute for Sustainable Transport - HICoE
- Centre for Advanced Composite Materials (CACM) - CoE
- Marine Technology Centre (MTC) - CoE
- Aeronautics Research Centre (UTM AeroLab) - CoE
- Medical Devices and Technology Centre (MEDiTEC) - RC

Computing and IT Infrastructure

The Faculty offers extensive computing facilities to support coursework, specialized software simulation, and student research:

- **Computer Laboratories:** Five dedicated computer laboratories equipped with over 250 workstations.
- **Software Suite:** Fully licensed engineering and analytical software, including SolidWorks and MATLAB/Simulink, alongside various open-source tools for computer-aided learning.
- **Connectivity and Services:** High speed internet access via wired and wireless (Wi-Fi) networks across the Faculty campus, giving students full access to University e-learning portals and institutional email services.

Additional computing resources are available campus-wide at the UTM Department of Digital Services (UTMDigital), the Sultanah Zanariah Library (PSZ), and student residential colleges.

POSTGRADUATE STUDY

Doctor of Philosophy

Doctor of Philosophy (PhD) is a research-only qualification designed for students who intend to pursue an academic or research career. The degree is awarded on the basis of the submission of a thesis which should give evidence of the candidate's ability to carry out research, evidence that the candidate has shown originality and independence, and that the candidate has made a significant contribution to knowledge in a particular field.

Research Masters Degrees

The Master by research is supervised by a graduate faculty (or a panel of graduate faculty members). The directed research work introduces candidates to the processes by which new knowledge is developed and applied accordingly.

Entry Requirements

Doctor of Philosophy

- A Master's Degree from Universiti Teknologi Malaysia or any other Institutions of higher learning recognised by the Senate; Universiti Teknologi Malaysia, and approved by the Graduate Studies Committee of the respective faculty and the Senate.
- Other qualifications equivalent to a Master's degree and experience in the relevant field recognised by the Senate; or
- Candidates who are currently registered in a Master's Degree programme at Universiti Teknologi Malaysia, and approved by the Graduate Studies Committee of the respective faculty and the Senate.

Master's Degree

- A Bachelor's Degree with good honours from Universiti Teknologi Malaysia or any other institution of higher learning recognised by the Senate; or
- A qualification equivalent to a Bachelor's Degree and experience in the relevant field recognised by the Senate.

UTM Entry Requirement to Master by Research and Mixed mode Programme						
Obtained Bachelor degree with the following grade						Working Experience
Degree Class	CPA Scale of 4	CPA Scale of 5	CPA Scale of 20	Percentage	1000 Marks	
First Class						
Second Class Upper	2.75 or higher	3.38 or higher	13.75 and higher	68.75 % or higher	687.5 or higher	No Working Experience Needed
Excellent Pass						
Second Class Lower	2.50 < CPA < 2.75	3.13 < CPA < 3.43	12.5 < CPA < 13.75	62.5% < CPA < 68.75%	625 < CPA < 687.5	Subject to rigorous internal assessment
Very Good Pass						
Third Class	2.00 < CPA < 2.50	2.50 < CPA < 3.13	10 < CPA < 12.5	50% < CPA < 62.5%	500 < CPA < 625	5 years working experience in the related field
Good Pass						

UTM Entry Requirement to Master by Coursework Programme						
Obtained Bachelor degree with the following grade						Working Experience
Degree Class	CPA Scale of 4	CPA Scale of 5	CPA Scale of 20	Percentage	1000 Marks	
First Class						
Second Class Upper	2.50 or higher	3.13 or higher	12.5 and higher	62.5% or higher	625 or higher	No Working Experience Needed
Excellent Pass						
Second Class Lower	2.00 ≤ CPA < 2.50	2.50 ≤ CPA < 3.13	10 ≤ CPA < 12.5	50% ≤ CPA < 62.5%	500 ≤ CPA < 625	5 year working experience in the related field
Very Good Pass						

English Language Requirement for International Students

If English is not your native language and you are attending a school where English is not the language of instruction, you must take the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS) Academic.

Applicants who do not meet the English proficiency requirements of their chosen programme at Universiti Teknologi Malaysia (UTM) can improve their English at Intensive English Programme (IEP) at Language Academy, UTM or CIEP at ELS Language Centres in Malaysia. UTM accepts IELTS Level 5.5 and above upon completion of IEP conducted by Language Academy, UTM or ELS English Certificate (level 107) as an ENGLISH LANGUAGE ENTRY REQUIREMENTS FOR INTERNATIONAL STUDENTS. Students who choose to attend IEP (Language Academy, UTM) must attain IELTS 5.5 or attend ELS and must pass the required English course(s) before starting their programmes in UTM.

Course Registration

It is mandatory for all students who have registered for a programme – a full time or external candidate – to register every course that will be taken for the semester. Students who did not enrol in the programme will not be allowed to register for any course.

Students can only register for courses that are offered for a particular semester based on the regulations set by the student's faculty. Students cannot register for any course that is not offered in the semester.

Students can withdraw (TD) any course registered for the semester. Application to withdraw must be made by using the Course Withdrawal Form (UTM.E/3-2).

If a student fails to do the registration or does not do the registration of courses within the specified duration as mentioned above, unless valid reasons are given, he or she will be dismissed from the University.

Academic Transcript

Applications will be charged a fee of RM25.00 for each Master and PhD. Transcripts are released in English for students who were enrolled from 2000 onwards.

Award Requirements

Doctor of Philosophy

1. Application is open to all students who have submitted their hard bound thesis/graduating students.
2. Students are NOT charged with any disciplinary action by the University.
3. Students with outstanding fees WILL NOT be considered.
4. Students who apply for early certificates and academic transcript WILL NOT be considered.
5. Duration of study:
 - Full time students MUST have completed their study within 30 months until 48 Months.
6. Students MUST obtain a grade of A or B1 for their viva voce.
(B2 result will be considered if the correction after viva is submitted within (3) months)
7. Publication
 - Students MUST be the first student author for all publications. Otherwise, the publication WILL NOT be counted.
 - Publications without the name of Main/ Co-Supervisor WILL NOT be considered.
 - Only publication with UTM affiliation will be considered.
 - Publications MUST be related to the discipline of study.
 - Every publication MUST be verified by the supervisor on the first page of the article.
 - Indexed journal (Q1, Q2, Q3, Q4, WOS, SCOPUS/ ERA), non-indexed journal, book chapter MUST be published during the duration of study.
 - Proof of evidence for indexed publication MUST be attached and fulfil the following condition. Examples are as follows:
 - Proof of SCOPUS/ ERA/ Web of Science.
 - Proof of Impact Factor (if any).
 - Verification of supervisor on the first page of the article.
8. Conference
 - Students MUST have participated in international or national conferences during their study as the presenter.
 - Students who have received the best paper or oral presenter during the conference.
 - Students MUST upload the certificate of attendance for the conference as the presenter.
9. Recognition

- Students MUST have received an award at an International, National or University level.
- 10. Intellectual Property / Commercialization
 - Students who have received Intellectual Property and commercialization.
- 11. Student Activities
 - Certificate of activities is compulsory to be uploaded.
- 12. All information for the application is based on the current programme of studies only.
- 13. Only applications which are recommended by the supervisor and endorsed by faculty will be considered.
- 14. After online submission, the applicant is required to follow up with the supervisor to verify his/her application.
- 15. Result of the application is strictly final and no appeal will be entertained.
- 16. The application can only be submitted once and no resubmission is allowed.

Master by Research

1. Application is open to all students who have submitted their hard bound thesis/graduating students.
2. Students are NOT charged with any disciplinary action by the University.
3. Students with outstanding fees WILL NOT be considered.
4. Students who apply for early certificates and academic transcript WILL NOT be considered.
5. Duration of study:
 - Full time students MUST complete study within 15 months until 27 months.
6. Students MUST obtain a grade of A or B1 for their viva voce.
(B2 result will be considered if the correction after viva is submitted within one (1) month)
7. Publication / Book Chapter
 - Students MUST be the first student author for all publications. Otherwise, the publication will not be counted.
 - Only publication with UTM affiliation will be considered.
 - Publications MUST be related to the discipline of study.
 - Every publication MUST be verified by the supervisor on the first page of the article.
 - Indexed journal (Q1, Q2, Q3, Q4, WOS, SCOPUS / ERA), journal non-indexed, book chapter MUST be published during the duration of study.
 - Proof of evidence for indexed publication MUST be attached and fulfil the following condition. Examples are as follows:
 - Proof of SCOPUS indexing (SCOPUS website)
 - Proof of Quartile (if any)
 - Verification of supervisor on the first page of the article.
8. Conference
 - Students MUST have participated in international or national conferences during their study as the presenter.
 - Students who have received the best paper or oral presenter during the conference.
 - Students MUST upload the certificate of attendance for the conference as the presenter.
9. Recognition
 - Students MUST have received an award at an International, National or University level.
10. Intellectual Property / commercialization
 - Students who have received Intellectual Property and commercialization.
11. Student Activities
 - Students who have participated in a student activity,
 - Certificate of activities is compulsory to be uploaded.
 - Student activities MUST be related to academic matters.

12. All information for the application is based on the current programme of studies only.
13. Only applications which are recommended by the supervisor and endorsed by faculty will be considered.
14. After online submission, the applicant is required to follow up with the supervisor to verify his/her application.
15. Result of the application is strictly final and no appeal will be entertained.

Master by Coursework

1. Open for all graduating students.
2. Students are NOT charged with any disciplinary action by the University.
3. Students with outstanding fees WILL NOT be considered.
4. Students who apply for early certificates and academic transcript WILL NOT be considered.
5. Duration of study:
 - Full time students MUST complete study within 4 semesters or below.
6. Students MUST obtained A+, A or A- grade for master dissertation / master project and CPA 3.70 or above.
7. Publication / Book Chapter
 - Students MUST be the first student author for all publications. Otherwise, the publication will not be counted.
 - Publications without the name of Main/Co-Supervisor will not be considered.
 - Only publication with UTM affiliation will be considered
 - Publications MUST be related to the discipline of study
 - Every publication MUST be verified by the supervisor on the first page of the article.
 - Indexed journal (Q1, Q2, Q3, Q4, WOS, SCOPUS / ERA), journal non-indexed, book chapter MUST be published during the duration of study
 - Proof of evidence for indexed publication MUST be attached and fulfil the following condition. Examples are as follows:
 - Proof of SCOPUS indexing (SCOPUS website)
 - Verification of supervisor on the first page of the article.
 - Publications MUST be related to the discipline of study
8. Conference
 - Students MUST have participated in international or national conferences during their study as the presenter.
 - Students who have received the best paper or oral presenter during the conference.
 - Students MUST upload the certificate of attendance for the conference as the presenter.
9. Recognition
 - Students MUST have received an award at an International, National or University level.
10. Intellectual Property / Commercialization
 - Students who have received Intellectual Property and commercialization.
11. Student Activities
 - Students who have participated in a student activity,
 - Certificate of activities is compulsory to be uploaded.
 - Student activities MUST be related with academic matters.
12. All information for the application is based on the current programme of studies only.
13. Only applications which are recommended by the supervisor and endorsed by faculty will be considered.
14. After online submission, the applicant is required to follow up with the supervisor to verify his/her application.
15. All results of application are strictly final and no appeal will be entertained.

Pre-Master at Faculty Mechanical Engineering

A pre-master is designed to bridge the gap between your current bachelor degree to your intended Master degree of your choice. Undergraduate students of Engineering, Science and Technology who cannot be admitted directly to our Master programmes, could now gain entry through the Pre-Master.

Students who have passed the Pre-Master courses can continue and complete their Master courses.

List of Pre-Master Courses

Pre-Master Course (Undergraduate Core Course)	Master by Taught Course
SEMM 1113 - Mechanics of Solids I SEMM 2313 - Mechanics of Fluids I SSCE 1793 - Differential Equations	Master of Science (Mechanical Engineering)
SEMM 3813 - Industrial Engineering SSCE 2193 - Engineering Statistics SEMI 4823 - Operations Research	Master of Science (Industrial Engineering)

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UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Faculty of
Mechanical Engineering



**Doctor of
Philosophy**
Field of Research:
Mechanical Engineering

DOCTOR OF PHILOSOPHY FIELD OF RESEARCH: MECHANICAL ENGINEERING

Programme Specification

The Doctor of Philosophy Field of Research: Mechanical Engineering (PEMM) is offered on a full-time basis. The duration of study is in between a minimum of three (3) years to a maximum of eight (8) years. The PhD candidate must be supervised by a Graduate Faculty. In terms of supervision panel, co-supervisor(s) may come from other higher learning institutions or the industry. The academic progress of a candidate is assessed through a research progress report submitted at the end of each semester as well as on the research proposal presented during proposal defence (mini viva). The degree is awarded based on an examination of the thesis (including viva-voce) submitted by the candidate upon completion of the study.

General Information

1. Awarding Institution	Universiti Teknologi Malaysia		
2. Teaching Institution	Universiti Teknologi Malaysia		
3. Programme Name	Doctor of Philosophy		
4. Final Award	Doctor of Philosophy		
	Field of research: Mechanical Engineering		
5. Programme Code	PEMM3		
6. Professional or Statutory Body of Accreditation	Malaysian Qualifications Agency (MQA)		
7. Language(s) of Instruction	English		
8. Mode of Study	Research		
9. Mode of Operation (Franchise, Self-govern, etc.)	Self-governing		
10. Study Scheme (Full Time/Part Time)	Full Time		
11. Study Duration	Minimum : 3 years Maximum : 8 years		
Type of Semester	No. of Semesters		No of Weeks/Semester
	Minimum	Maximum	
	6	16	14
Normal			
Short	-		-

Course Classification

No.	Classification	Credit Hours
1.	University Elective (1 course)	3
2.	Research Methodology	HW
3.	Research (Minimum 6 semesters)	0
4.	Thesis	0
Total		3

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Demonstrate professional competence and research leadership through mastery of mechanical engineering knowledge, creation of new knowledge, and innovative research practices with global competitiveness.
PEO2	Demonstrate high ethical standards in leading and contributing to organizational success and sustainable technological and societal development.
PEO3	Engage in lifelong learning, research, and innovation to adapt to technological changes and advance engineering knowledge.

Programme Learning Outcomes (PO)

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

Code	Intended Learning Outcomes
PO1	<i>Synthesize, critique, apply, and extend in-depth relevant knowledge independently using innovative techniques, tools, and skills in the field of Mechanical Engineering as a basis for research to produce new ideas and solution.</i>
PO2	<i>Create new concept/theories/solutions/practice through independent research and originality that satisfies international standards within the field of Mechanical Engineering using the latest techniques, tools, and skills.</i>
PO3	<i>Integrate highly advanced and specialized research methodologies and tools based on the forefront knowledge and latest development in the field of Mechanical Engineering to solve complex research problems with reasonable degree of originality.</i>
PO4	<i>Demonstrate decent collaboration with peers, scholarly communities and society at large in the relevant field of expertise and research.</i>
PO5	<i>Communicate knowledge, skills, ideas, and research findings strategically and effectively using appropriate methods and media to peers, scholarly communities, stakeholders, and society.</i>
PO6	<i>Use, improve, or develop appropriate tools or methodologies by responsibly applying a broad range of digital technologies, including artificial intelligence (AI), media, and software to support and enhance research activities.</i>
PO7	<i>Demonstrate leadership, professionalism and management skills, and take full responsibility for own work, and significantly for others in the research organization.</i>
PO8	<i>Demonstrate research leadership, professionalism, and management skills, and take full responsibility for one's own work and, where appropriate, for the work of others within a research organization.</i>
PO9	<i>Develop potential commercialisation research output.</i>
PO10	<i>Demonstrate adherence to legal, professional and contribute to the development of ethical sound codes of practice.</i>
PO11	<i>Demonstrate adherence to legal and professional requirements and contribute to the development of ethical, responsible, and sustainable research practices.</i>

Graduation Checklist

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

No	Course Code	Course Name	Credit Earned	Credit Counted	Tick (/) If Passed
Faculty of Mechanical Engineering Courses					
1	UXXX xxx3	University Elective (1 course)			
2	UEMP 0010	Research Methodology			
3	PEMM xx00	Research (Minimum 2 semesters)			
4		Thesis			
5	Requirement	ONE (1) article (accepted or published) in a journal indexed on the WOS or, TWO (2) articles (accepted or published) in journal indexed in SCOPUS/ERA/Journals listed in myJurnal (Malaysian Journal Management System) from MyCite (Malaysian Citation Center).			



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Faculty of
Mechanical Engineering



Master of Philosophy

**Field of Research:
Mechanical Engineering**

MASTER OF PHILOSOPHY FIELD OF RESEARCH: MECHANICAL ENGINEERING

Programme Specification

The Master of Philosophy Field of Research: Mechanical Engineering (MKMM) is offered on a full-time basis. The duration of study is in between a minimum of one (1) year to a maximum of four (4) years. This master programme must be supervised by an academic staff (main supervisor) from the Graduate Faculty. The academic progress of a candidate is assessed through a research progress report submitted at the end of each semester as well as on the research proposal presented during proposal defence (mini-viva). The degree is awarded based on an examination of the thesis (including viva-voce) submitted by the candidate upon completion of the study

General Information

1. Awarding Institution	Universiti Teknologi Malaysia		
2. Teaching Institution	Universiti Teknologi Malaysia		
3. Programme Name	Master of Philosophy		
4. Final Award	Master of Philosophy Field of Research: Mechanical Engineering		
5. Programme Code	MEMM3		
6. Professional or Statutory Body of Accreditation	Malaysian Qualifications Agency (MQA)		
7. Language(s) of Instruction	English		
8. Mode of Study	Research		
9. Mode of Operation (Franchise, Self-govern, etc.)	Self-governing		
10. Study Scheme (Full Time/Part Time)	Full Time		
11. Study Duration	Minimum : 1 years Maximum : 4 years		
Type of Semester	No. of Semesters		No of Weeks/Semester
	Minimum	Maximum	
Normal	2	8	14
Short	-	-	-

Course Classification

No.	Classification	Credit Hours
1.	University Elective (1 course)	3
2.	Research Methodology	HW
3.	Research (Minimum 2 semesters)	0
4.	Thesis	0
Total		3

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Demonstrate professional competence by applying mechanical engineering knowledge and innovative research practices.
PEO2	Demonstrate high ethical standards in contributing to organizational success and sustainable societal development.
PEO3	Engage in lifelong learning, research, and innovation to adapt to technological changes and advance engineering knowledge.

Programme Learning Outcomes (PO)

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

Code	Intended Learning Outcomes
PO1	Integrate and generate in-depth relevant knowledge independently using innovative techniques, tools and skills for decision-making to manage and resolve a complex problem in the field of Mechanical Engineering as a basis for Research.
PO2	Construct a critical and innovative solution for complex problems or issues in the field of Mechanical Engineering through research using the latest techniques and skills.
PO3	Devise standard research methodology that are based on the forefront knowledge and latest development in the field of Mechanical Engineering to solve research problems with reasonable degree of originality.
PO4	Demonstrate effective collaboration with peers, scholarly communities and society at large in the relevant field of expertise and research.
PO5	Communicate the knowledge, skills, ideas clearly using appropriate methods to peers, experts, and non-experts through various medium.
PO6	Use a broad range of suitable digital technologies, media, and software to design, manage, analyse and report research studies.
PO7	Demonstrate skills in designing, planning evaluation activities, and analysing numerical and graphical data using quantitative or qualitative tools in solving problems.
PO8	Demonstrate leadership, autonomy and responsibility in conducting and managing own research and resources.
PO9	Demonstrate the ability to manage and enhance own self-advancement for academic development, professional development and research skills using lifelong learning strategies.
PO10	Develop potential commercialisation research output.
PO11	Demonstrate adherence to legal, ethical and professional codes of practice in the field of Mechanical Engineering and research activities.

Graduation Checklist

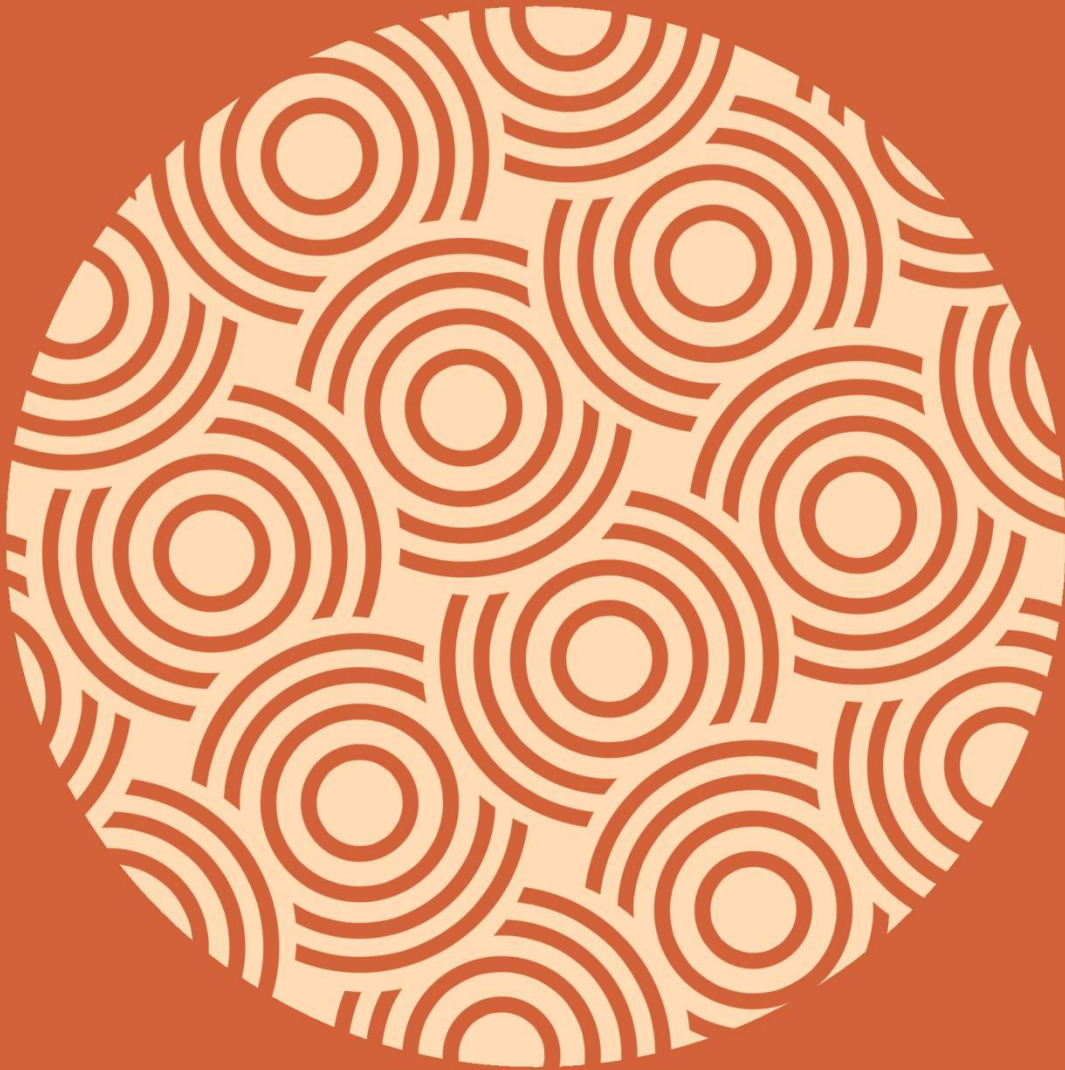
To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

No	Course Code	Course Name	Credit Earned	Credit Counted	Tick (/) If Passed
Faculty of Mechanical Engineering Courses					
1	UXXX xxx3	University Elective (1 course)			
2	UEMP 0010	Research Methodology			
3	MEMM xx00	Research (Minimum 2 semesters)			
4		Thesis			
5	Requirement	ONE (1) publication in the form of a journal article OR conference paper OR book chapter that has been accepted for publication OR has been published.			



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Faculty of
Mechanical Engineering



Master of Science Mechanical Engineering

MASTER OF SCIENCE (MECHANICAL ENGINEERING)

Programme Specification

The Master of Science by Taught Course extends the knowledge gained from undergraduate and develops new professional skills in a particular area of mechanical engineering discipline. The programme comprises a combination of compulsory courses, electives, and a master's project. There are five (5) tracks which give more options to the students to choose a specific area or specialization in the mechanical engineering field. The aim of this program is to provide an opportunity to pursue an in-depth study in the broadly based mechanical engineering disciplines, thus enhancing the technological developments.

This programme is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The normal full-time program can be completed in a minimum of one year, i.e., two long semesters and one short semester. The full-time student is allowed to take a maximum of 20 credits in a normal semester and 10 credits in a short semester. The part time student is allowed to take a maximum of 12 credits in a normal semester and 6 credits in a short semester. Assessment is based on coursework and final examinations given throughout the semester.

General Information

1.	Awarding Institution	Universiti Teknologi Malaysia		
2.	Teaching Institution	Universiti Teknologi Malaysia		
3.	Programme Name	Master of Science in Mechanical Engineering		
4.	Final Award	Master of Science in Mechanical Engineering		
5.	Programme Code	MKMJ		
6.	Professional or Statutory Body of Accreditation	Malaysian Qualifications Agency (MQA)		
7.	Language(s) of Instruction	English		
8.	Mode of Study	Conventional		
9.	Mode of Operation (Franchise, Self-govern, etc.)	Self-governing		
10.	Study Scheme (Full Time/Part Time)	Full Time / Part Time		
11.	Study Duration	Minimum : 1 years		
		Maximum : 4 years		
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	8	14	14
Short	4	4	8	8

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University General Courses (a) University Elective	3	7.5 %
ii.	Programme Core (Including Master Project I and Master Project II)	22	55.0%
iii.	Programme Track Electives	15	37.5%
Total		40	100%
Classification of courses for engineering programme			

Engineering Courses		
(a) Lecture/Project/Laboratory	30	
(b) Workshop/Field/Design Studio	0	100%
(c) Final Year Project	10	
Total Credit Hours		40
		100%
Total Credit Hours to Graduate		40 credit hours

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Demonstrate professional competence by applying advanced mechanical engineering knowledge and innovative practices.
PEO2	Demonstrate leadership and high ethical standards in contributing to organizational success and sustainable societal development.
PEO3	Engage in lifelong learning, research, and innovation to adapt to technological changes and advance the engineering knowledge.

Programme Learning Outcomes (PO)

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

Code	Intended Learning Outcomes
PO1	Apply advanced knowledge to solve critical issues in the field of mechanical engineering. (Knowledge and Understanding)
PO2	Manage and solve complex problems efficiently using systematic and standard approaches. (Cognitive Skills)
PO3	Adapt technical and scientific skills to solve real world problems. (Practical Skills)
PO4	Perform effective collaboration with stakeholders professionally. (Interpersonal Skills)
PO5	Use a broad range of information, media and technology to support study or research findings. (Communication Skills)
PO6	Use digital technologies and software competently to support study or research works. (Digital Skills)
PO7	Analyse numerical or graphical data using quantitative or qualitative methods for solving problems. (Numeracy Skills)
PO8	Demonstrate leadership, autonomy and responsibility in a team by managing resources and tasks fairly. (Leadership, Autonomy and Responsibility)
PO9	Perform independent studies for self-advancement through continuous academic or professional development. (Personal Skills)
PO10	Propose entrepreneurial projects based on relevant knowledge and expertise. (Entrepreneurial Skills)
PO11	Conduct respectable, ethical and professional practices in organization and society. (Ethics and Professionalism Skills)

Elective Courses

Apart from the core course, students must also take 15 credits of elective course. Student can pick FIVE (5) elective courses from ONE (1) programme track.

Programme Track	Code	Elective Courses
Advanced Mechanical Engineering	<i>-Select 5 courses from this track</i>	
	MKMJ 1343	Friction, Wear and Lubrication**
	MKMJ 1333	Computational Fluid Dynamics
	MKMJ 2413	Advanced Engineering Thermodynamics
	MKMJ 1413	Energy Management**
	MKMJ 1433	Sustainable Energy Technology
	MKMJ 1553	Creative Design Engineering
	MKMJ 1513	Integrated Computer Aided Design and Engineering
	MKMJ 1223	Adaptive control and Intelligent System
	MKMJ 1233	Intelligent Robotic System
	MKMJ 2223	Advanced Industrial Automation**
	MKMJ 1263	Condition Monitoring
	MKMJ 1133	Elasticity and Plasticity
Smart and Sustainable Manufacturing	<i>-Select 5 courses from this track</i>	
	MKMA 1723	Green Manufacturing Technology**
	MKMA 2713	Welding Technologies and Applications
	MKMA 2723	Smart Manufacturing
	MKMA 2773	Machining and Machine Tool Technology
	MKMA 2763	Advanced Manufacturing Processes
Welding Engineering & Technology	<i>-Select 5 courses from this track</i>	
	MKMW 1013	Advanced Welding Processes**
	MKMW 1023	Welding Process and Equipment**
	MKMW 1033	Management of Weld Quality
	MKMW 1043	Materials for Welding Engineering
	MKMW 1053	Design of Welded Structures
Materials Integrity and Asset Reliability	<i>-Select 5 courses from this track</i>	
	MKMC 1633	Assets Integrity and Management**
	MKMC 2613	Advanced Materials Characterization
	MKMC 2623	Surface Engineering and Coating Technology
	MKMC 2653	Corrosion Principles and Corrosion Control
	MKMC 1653	Metallurgy and Microstructure of Advanced Metallic Materials
	MKMC 2643	Corrosion and Materials Degradation
Sustainable Marine and Offshore Technology	<i>-Select 5 courses from this track</i>	
	MKME 1213	Dynamics of Marine Structures
	MKME 2113	Strength and Vibration of Marine Structures
	MKME 2003	Marine Environment and Renewable Energy
	MKME 2723	Marine Robotics
	MKME 1713	Sustainable Production and Decommissioning of Marine Structures

Remarks:

**PRISMS course

Graduation Checklist

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

No	Course Code	Course Name	Credit Earned	Credit Counted	Tick (/) If Passed
University General Course					
1	UXXX xxx3	University Course Electives	3	3	
TOTAL CREDIT FOR UNIVERSITY GENERAL COURSE (A)			3	3	
Programme Core Courses					
1	MKMJ 1903	Research Methodology	3	3	
2	MKMJ 1023	Smart Integrated Engineering Design**	3	3	
3	MKMJ 1033	Project Management	3	3	
4	MKMJ 1613	Mechanical Behavior of Materials	3	3	
TOTAL CREDIT FOR PROGRAMME CORE COURSES (B)			12	12	
Master Project Courses					
1	MKMJ 1914	Master Project I	4	4	
2	MKMJ 2926	Master Project II	6	6	
TOTAL CREDIT FOR MASTER PROJECT COURSES (C)			10	10	
Programme Track Elective Courses					
1	MKM# ###3	Elective 1	3	3	
2	MKM# ###3	Elective 2	3	3	
3	MKM# ###3	Elective 3	3	3	
4	MKM# ###3	Elective 4	3	3	
5	MKM# ###3	Elective 5	3	3	
TOTAL CREDIT FOR PROGRAMME TRACK ELECTIVE COURSES (D)			15	15	
TOTAL CREDIT TO GRADUATE (A + B + C + D)			37	37	

Remarks:

**PRISMS course

Course Synopsis – Programme Core Courses

MKMJ 1023 - Smart Integrated Engineering Design

This course introduces the students to the various stages of product design and development methods that can be put into immediate practice in developing products or projects. The development procedures blend the various perspectives of marketing, design, and manufacturing into a single approach to product development. Aspects of sustainable design and manufacturing will also be covered. The course also provides practice in carrying out small projects to expose the various stages of product development. It also includes the various prototyping and manufacturing systems strategies in developing product prototypes.

MKMJ 1903 - Research Methodology

This course aims to provide students with fundamental knowledge of research and the methodologies commonly used in engineering. It encompasses literature review, problem formulation, designing research methods, analysis methods and report writing

MKMJ1033 - Project Management

This intermediate course introduces the principles and practices of project management, emphasizing its importance in engineering and industrial contexts. It provides students with the knowledge and tools necessary to plan, execute, monitor, and control projects effectively to drive economic productivity (SDG8). Key topics include project scope, cost, time, and quality management, as well as risk assessment, stakeholder engagement, leadership, and the use of project management tools and techniques. The course also covers current challenges such as sustainability and digital project management trends. Delivered through lectures, case-based discussions, and active learning exercises, it emphasizes problem-solving, collaboration, and practical applications. By the end of the course, students will be able to analyze project requirements, design effective project plans, and evaluate project performance to ensure successful delivery that supports decent work and resilient industrial growth.

MKMJ1613 - Mechanical Behavior of Materials

This intermediate course explores dislocation theory and its role in plastic deformation, along with key strengthening mechanisms in materials. The course covers the mechanical behavior of metals, polymers, ceramics, and composites under conditions such as fatigue, creep, and fracture, while also learning the principles and applications of fracture mechanics. Teaching combines lectures with problem-solving and case-based discussions to encourage active learning and collaboration. By the end of the course, students will be able to analyze the relationship between material structures and their mechanical performance, and design strategies to prevent and control material failure.

Course Synopsis – Master Project Courses

MKMJ1914 - Master Project I

Master Project 1 is an advanced-level course designed for graduate students preparing to undertake independent research. It serves as the first phase of a two-semester research project (Master Project 1 and 2), emphasizing the development of a comprehensive research proposal. The course encompasses key components such as problem statement, objectives, scope, literature review, methodology, proposed solutions, preliminary data collection, research model development, and project planning. Teaching and learning activities include supervised research, individual consultations, and presentation sessions, allowing students to receive tailored guidance and demonstrate their academic progress. At the end of the course, students are able to plan and present a structured research proposal, critically articulate their research ideas, and demonstrate readiness for independent scholarly investigation.

MKMJ2926 - Master Project II

Master Project 2 is an advanced-level course that builds upon the foundation established in Master Project 1. Designed for graduate students, this course focuses on executing independent research through practical work conducted in a laboratory, workshop, computer lab, or industry setting. Students are expected to collect,

analyze, and interpret data to address the research problem previously defined. The course culminates in the production of a comprehensive research report and the defense of findings. Additionally, students must develop a technical article based on the project outcomes, suitable for academic or professional dissemination. Teaching and learning activities are conducted through researchbased learning, individual consultations, and presentation sessions to support critical inquiry and scholarly communication. At the end of the course, students are able to complete an independent research project, critically interpret and communicate results, and present their findings effectively through written reports and oral presentations.

Course Synopsis – Programme Track Electives

TRACK 1: Advanced Mechanical Engineering

This track equips students with advanced expertise in thermofluids, design, automation, and materials mechanics. Covering CFD, thermodynamics, energy systems, intelligent robotics, and industrial automation, it prepares engineers to innovate across mechanical design and smart control systems. Graduates gain versatile skills for roles in R&D, product design, and automation industries.

MKMJ 1343 – Friction, Wear, and Lubrication

This course covers basic knowledge on tribological contact in mechanical systems in relative motion. The course presents the importance, role and properties of contact surfaces, materials and surroundings. Furthermore, the influence of the components of a tribological system and contact conditions on the properties of friction and wear is explained. The course covers the types and the role of lubricants, as well as their influence on the quality of lubrication, friction, and on various friction and wear mechanics. In relation to these topics, the analytical techniques available for the analysis of surface properties, lubricants, tribological behaviour and wider systems are presented.

MKMJ 1333 - Computational Fluid Dynamics

This course connects the gap between the introductory level and the applied in engineering practice as well as in research and development of using computational fluid dynamics (CFD) for solving fluid flow problems. In the first part, the spatial and time discretization methods for solving fluid mechanics problems governed by the incompressible Navier-Stokes equations are introduced. This course also provides hands-on experience using both commercial and community developed CFD software. This is followed by introducing advanced numerical schemes in CFD and various Multiphysics methods for modelling complex fluid flow.

MKMJ 2413 - Advanced Engineering Thermodynamics

This course in advanced engineering thermodynamics provides a strong foundation in the fundamentals of thermal sciences for further advanced research. The students shall be exposed to the restrictions on possible properties and systems. An advanced treatment of the First and Second law of Thermodynamics will be given. Exergy analysis will be given in depth regarding fundamental concepts, techniques, and application in various systems.

MKMJ 1413 - Energy management

Energy management is meant for guiding energy-sector activities to conserve energy and enhance energy supply and security. Energy management includes four main functions: analysis of historical data, energy audit and accounting, engineering analysis of systems, and energy economics. This course covers contemporary energy management topics such as energy sector challenges, energy system thinking, energy management control systems, energy economics, and emerging energy technologies. This course also provides training in gathering updated energy related information to apply in real-life applications. The course is multidisciplinary in nature

and students will be required to look at the energy sector problems from different points of views. Thus, the course is well suited to students from any of the mechanical, electrical, chemical, and environmental engineering majors. After successful completion of this course, the students would comprehend the energy management knowledge to play their role in conserving and efficient use of energy in buildings and industry.

MKMJ 1433 - Sustainable Energy Technology

In the context of depleting fossil fuel reserves and environmental consequences, the concept of sustainable energy has drawn a central focus among energy stakeholders. This course embraces both sustainable energy systems and technology. The energy system is an entity that includes all components and technology related to energy exploration, production, conversion, delivery and end uses. This course explains the concepts of sustainable energy systems and technology based on ethics, environments and economy (E3) and their role on sustainability in practical system applications. The course first recognizes the effects from the fossil dominated energy system and technology and then provides the latest review of the most important renewable energy resources and advanced technologies. The course also demonstrates evaluating the fossil and alternative energy systems and technologies in terms of the sustainability criteria. Comprehension of the issues associated with sustainable energy systems and technology are achieved through lectures, discussions, combined with reports and student presentations on the literature reviewed.

MKMJ 1553 - Creative Design Engineering

This course introduces the new approach in the field of engineering design that has traditionally been primarily concerned with 'how to make things' – but as technology has advanced – the challenge has changed to 'what to make'. Topics highlighted are basic concerns associated with innovation. First, design is considered a kind of universal human act. Second, it is an interdisciplinary approach that brings together perspectives from fields such as cognitive science, cognitive psychology, and science of knowledge. Third, the scope of the discussion includes the process of creating an initial idea for a new product (pre-design phase) as well as the use of the product in society (the post-design phase).

MKMJ 1513 – Integrated Computer Aided Design and Engineering

This course is divided into two parts. The first part covers the foundation theories in CAD. Then, the second part discusses the applications of the foundation theories. These applications include from the applications in the engineering design and extends to the framework in the creation of an intelligent system. The course also exposes the possible research and emerging technologies related to CAD.

MKMJ 1223 - Adaptive Control and Intelligent System

The course shall cover the essential and basic theory of adaptive control engineering and intelligent systems. It shall cover the following: System identification using least squares, generalised least squares, recursive least squares, adaptation concepts, theory of adaptive algorithms, and their use in control and estimation, servo follower and regulator, self-tuning and adaptive model reference controllers. The intelligent system part shall cover the history, basic theory and architecture of Neural Network (MLP), Adaptive Neural Networks (Elman Networks), Deep Learning and Meta-heuristic Algorithms such as Genetic Algorithm, Particle Swarm Algorithm and Firefly Algorithm. MATLAB and Simulink software packages shall be demonstrated and used as a tool in solving system identification, adaptive control and artificial intelligent problems throughout the course.

MKMJ 1233 - Intelligent Robotic System

This course is designed to enable the students at graduate level to develop the necessary insight into the areas of robotics and control. It will examine the fundamental elements of a robot system related to anatomy and configuration, robot main components, programming features and methods and robot's performance specifications. The students are expected to acquire analytical skills through the analyses of robot manipulators related to their kinematics, statics and dynamics which typically constitute the important prerequisites to designing the mechanical structure, planned trajectory path and control aspects. The robot control topic that is included in the later section provides a platform for the students to explore the various control algorithms that address the stability, accuracy, and robustness of the systems. Particular emphasis is laid on the mathematical modelling and simulation of the control schemes. A number of case studies pertaining to selected robotic systems are expected to further strengthen the students' understanding and insight into the actual systems.

MKMJ 2223 - Advanced Industrial Automation

The course is an elective for students seeking a specialty in mechanical engineering. It shall introduce students to the methods, tools, and technologies used to automate a product or a plant. Primary automation technologies include sensors, actuators, signal conditioners, microprocessor/microcontroller, programmable logic controllers (PLCs), ON/OFF and automatic control, and PC-based control are covered within this course. Students will also experience development of automated products/plants through hardware programming and interfacing implementation.

MKMJ 1263 - Conditional Monitoring

The course relates to practical aspects of maintenance and assets management practices in industry. The course focuses on the condition-based maintenance strategy where condition monitoring is the key aspect of this success. Several condition monitoring techniques such as vibration, ultrasonic, thermography, oil analysis/tribology-based analysis, acoustic emission, temperature monitoring and performance monitoring are discussed in detail. Important aspects of data acquisition, signal processing and data interpretation are covered in detail. The course involves practical exercises to demonstrate and to apply knowledge in condition monitoring.

MKMJ 1133 - Elasticity and Plasticity

This course introduces students to general in-depth theories in the area of elasticity and plasticity. Stress analysis is extended to 3D stress transformation using the stress transformation equation and 3D Mohr's circle in conjunction with typical failure criteria. The stress states of plane stress and plain strain problems are theoretically evaluated in rectangular coordinate systems and by using the stress function concept. For the plasticity concept, fundamental theory of plasticity is introduced for practical applications. Furthermore, the elastoplastic in bending and torsion with strain hardening effect in beams including residual stress is also included in the plasticity analysis. Plasticity analysis on beams and frames is taught to be applied for more complicated structures. Commercial finite element code LS-DYNA is employed as the simulation tools for plasticity application. Upon mastering the software, a case study is given as a group project for evaluating energy absorption capacity of thin-walled structure under large deformation.

TRACK 2: Smart and Sustainable Manufacturing

Focused on next-generation production, this track covers green and smart manufacturing, welding technologies, machining, and advanced manufacturing processes. Students gain skills to design efficient, environmentally responsible manufacturing systems. Those who complete this track are well-positioned for careers in smart factories, process engineering, and sustainability-driven manufacturing sectors.

MKMA 1723 - Green Manufacturing Technology

This course introduces students to green manufacturing technology and sustainability considerations in product design and manufacture. It presents the principles, methodology and case studies to develop an understanding of sustainable development that can reduce environmental impact and promote green technology for sustainable practice. Besides that, the Life Cycle Assessment consists of four main phases, goal and scope definition, inventory, impact assessment, and interpretation. Analysis uses a valid life cycle assessment method to collect and process data of the product's life cycle or the manufacturing processes consumption or declaring the total emissions from the manufacturing.

MKMA 2713 - Welding technologies and Applications

This course discusses the physical principles, operating characteristics and practical applications of a variety of welding processes to enable selection of a suitable process for a particular application. The importance of understanding the principles behind the most recent developments in welding processes. There is a strong emphasis on laser welding, as well as recent developments in arc, friction and resistance welding. The module will cover the operating principles, characteristics and practical applications of each process.

MKMA 2723 - Smart Manufacturing

This course introduces the overview of Smart Manufacturing architectural framework, its application, related technologies and its future directions related to various case studies around the globe. The aim is to introduce students to the new era of Industrial Revolution (IR4.0) related to the power of digital manufacturing and product model data for manufacturing integration. Students will also gain deep insights into how various support systems are used in harnessing product design, knowledge management, data analysis and other technologies being seamlessly transferred through the entire lifecycle of a manufactured product.

MKMA 2773 - Machining and Machine Tools Technology

This course introduces the students to the fundamental knowledge in metal cutting theory and principle. Some of the essential topics that will be covered include machinability, cutting forces, cutting tool, tool wear mechanism and tool life. The basic metal cutting concept and operations for product manufacture such as turning, milling and grinding processes will be taught. The students are also exposed to the various aspects of machine tools technology and its elements such as the constructional and design features, guideways and slideways, drives, vibration and chatter, machine tool metrology. Individual assignments and exercises are given to the students to enhance their knowledge in machining theory and machine tool technology.

MKMA 2763 - Advanced Manufacturing Processes

This course introduces automation and advanced techniques used in modern manufacturing. Types of automation systems, applications, advantages and disadvantages are discussed. It also includes discussion on the principle of CAD/CAM/CNC and other applications in various manufacturing automation systems such as GT, FMS and CIM. This course will also allow students to carry out small case studies in the real environments for exposing them to certain issues related to manufacturing automation.

TRACK 3: Welding Engineering and Technology

This specialized track develops expertise in welding processes, equipment, and quality management. Covering advanced welding techniques, materials selection, and structural design, students learn to ensure weld integrity and performance. Engineers emerging from this specialization benefit from strong career prospects in oil & gas, construction, and heavy fabrication industries.

MKMW 1013 – Advanced Welding Processes

This course discusses the fundamental aspect of various advanced welding processes for joining metal and non-metal components as well as sustainable welding concepts. It starts from the overall introduction on advanced welding technology, followed by resistance welding, brazing and soldering, polymer welding, ceramics and composites joining, ultrasonic welding, laser and electron beam welding, friction and forge welding, friction stir and explosion welding, and wire bonding and micro joining. Assessment is based on assignment, tests and group project with the evaluation process designed to emphasize on practical application. The knowledge gained from this course also allows students in making right decision in selecting joining parts-based on welding process requirements. At the end of this course, the students should be able to select suitable welding processes to join a part or component.

MKMW 1023 – Welding Process and Equipment

This course provides an in-depth exploration of fundamental and advanced welding technologies for joining metal and non-metal components, including sustainable welding practices. Topics covered include electrotechnics, arc welding, MIG/MAG, FCAW, SAW, oxy-fuel gas welding, cutting preparation, and the joining of plastics, ceramics, and composites. Emphasis is placed on understanding complex welding systems and processes, their advantages and limitations, and the sustainability considerations involved in each. Students will also engage in group-based project activities to enhance collaboration and leadership skills. By the end of the

course, students are expected to evaluate various welding principles and technologies, compare different welding systems, analyze sustainability issues in welding practices, and select the most appropriate welding process for a given application through informed and practical decision-making. Assessment is based on assignment, tests and group project with the evaluation process designed to emphasize on practical application.

MKMW 1033 – Management of Weld Quality

This course introduces students to the fundamental aspects of welding fabrication with a focus on quality assurance, quality control, and manufacturing practices. Topics covered include welding procedure requirements, approval and performance testing, calibration, non-destructive testing methods, repair techniques, economic considerations, and real-world case studies. Students will gain a thorough understanding of QA and QC principles in welding fabrication and learn to apply various non-destructive evaluation methods. By the end of the course, students are expected to justify parameter adjustments based on welding defects, differentiate techniques for industry certification, interpret terminology and design concepts in welding and fabrication, and demonstrate proactive commitment as effective team members or leaders in group projects.

MKMW 1043 – Materials for Welding Engineering

This course introduces students to the fundamentals of materials and behaviour with emphasis on join a range of materials and methods of avoiding problems in joining metals. It will introduce students include materials science, technology and an understanding of the characteristics and weldability of different materials, ranging from steels to non-ferrous materials. The course will also provide a knowledge of failure in welding including cracking phenomena, corrosion, creep, and others together with methods to avoid them. At the end of the course, students should be able to apply the knowledge of materials behaviour and their response to welding and joining to appreciate design requirements and their implications and understand why products fail.

MKMW 1053 – Design of Welded Structures

This course introduces students to the fundamentals of materials and behaviour with emphasis on join a range of materials and methods of avoiding problems in joining metals. It will introduce students include materials science, technology and an understanding of the characteristics and weldability of different materials, ranging from steels to non-ferrous materials. The course will also provide a knowledge of failure in welding including cracking phenomena, corrosion, creep, and others together with methods to avoid them. At the end of the course, students should be able to apply the knowledge of materials behaviour and their response to welding and joining to appreciate design requirements and their implications and understand why products fail.

TRACK 4: Materials Integrity and Asset Reliability

This track addresses materials degradation, corrosion, and asset management essential to industrial reliability. Covering advanced materials characterization, surface engineering, and corrosion control, students develop skills to extend asset life and manage risk. Graduates of this track gain expertise valued in oil & gas, power generation, and infrastructure maintenance sectors.

MKMC 1633 - Assets Integrity & Management

This course is introducing the students to the Asset Integrity Management (AIM) system especially for an aging offshore oil field infrastructure. The platforms, pipelines and onshore facilities were aged and needed some extensive refurbishment and a new inspection and integrity regime put in place. The course also provides a comprehensive coverage of the various non-destructive techniques (NDT) used to assess the integrity of engineering components. The concepts and techniques used in assessing assets through risk-based assessment (RBI) be covered.

MKMC 2613 - Advanced Materials Characterization

This course provides the students with a deep and broad insight into the principles of advanced techniques used in characterizing and determining the structure and properties of materials. The technique includes x-ray analysis methods such as XRD, XRF, Raman spectroscopy and Fourier-Transform infrared (FTIR). The students will also be introduced microscopy techniques which covers from light to electron microscopy (SEM, TEM, HRTEM, STEM) and analytical techniques such as energy dispersive X-ray (EDX/WDX), electron energy loss spectroscopy (EELS). To learn the principles and application of advanced surface characterisation techniques including atomic force microscopy (AFM), X-ray photoelectron spectroscopy (XPS). The principles and interpretation of various thermal analysis techniques will also be covered in this course.

MKMC 2623 - Surface Engineering and Coating Technology

Corrosion, wear, or the combined effects of these destructive failure modes cost the industrial economic hundreds of billions of dollars each year. One of the most effective means of mitigating damage due to corrosion and wear is to treat or 'engineer' the surface so that it can perform functions that are distinct from those functions required from the bulk of the material. Understanding corrosion and wear problems and the factors involved must be considered before selecting the specific surface modification process. Different processes demonstrate different thickness ranges, hardness, wear resistance, corrosion resistance, cost, processing time, operating temperature, surface finish/roughness and other surface characteristics. The course provides an overall view of the advanced surface modification processes with emphasis on the strengths and limitations of each method and practical design guidelines for surface modification. At the end of the course students should gain an understanding of how improvements in the surface properties are achieved through a range of processes and also be able to apply the knowledge to select an appropriate surface modification process for the specific application.

MKMC 2653 - Corrosion Principles and Corrosion Control

This course will give an overview on the importance of corrosion, electrochemical reactions, thermodynamics and kinetics of electrochemical phenomena. Different forms of corrosion related to materials, environment and stresses will also be discussed followed by the five main corrosion control methods. Apart from aqueous corrosion, the high temperature oxidation will be addressed and discussed. Degradation of various materials classes such as polymers, composites and electronic materials will also be covered in the course. The course will also provide students to the various techniques of corrosion testing and monitoring

MKMC 1653 – Metallurgy and Microstructure of Advanced Metallic Materials

This course examines the metallurgy and microstructure of advanced metallic materials, focusing on mechanisms that govern structural and mechanical behavior. It is designed for students seeking deeper understanding of structure–property relationships in engineering alloys. Core topics include solidification, recrystallization, and phase transformations, with emphasis on crystallographic changes, dislocation motion, and their effects on properties. Students will study equilibrium and non-equilibrium transformations through binary/ternary phase diagrams, time–temperature–transformation (TTT) diagrams, and continuous-cooling-transformation (CCT) diagrams, covering both diffusional and diffusionless processes. The course also explores microstructural characterization of steels, superalloys, lightweight alloys, and smart materials, highlighting techniques for modification and their impact on performance. Delivered through lectures, case studies, and research discussions, it emphasizes problem-solving and critical analysis. By the end, students will be able to analyze microstructural evolution, evaluate structure–property relationships, design tailored microstructures, and assess the integrity of engineering structures.

MKMC 2643 - Corrosion and Materials Degradation

This course introduces students to the dislocation theory and the role of these dislocations on the metal's ability to deform plastically as well as strengthening mechanisms. It will focus on the mechanical behaviour of all classes of materials (metals, polymers, ceramics and composites) under different stressing conditions such as fatigue, creep, and fracture. The course will also provide students with the principles of fracture mechanics and its application. At the end of the course the student should be able to relate between the behaviour of materials and their structures and design procedures to control failure of materials.

TRACK 5:
**Sustainable Marine
and Offshore
Technology**

This track prepares engineers for marine and offshore engineering challenges, covering structural dynamics, marine robotics, and renewable energy. Students gain expertise in designing resilient marine structures and sustainable practices. Those completing this specialization are equipped for careers in offshore engineering, marine renewable energy, and maritime infrastructure development.

MKME 1213 - Dynamic of Marine Structures

This subject equips the students with knowledge of the environment and relates it with performance of the vessel in seakeeping and manoeuvring. The first part of the subject introduces the ocean environment (Theory of regular/irregular waves and wave energy spectrum). The second part covers the seakeeping aspect – By applying the knowledge of dynamics, vessel's motions due to ocean waves can be predicted. The third part covers the aspect of vessel's manoeuvring and directional stability. The final part discusses the aspect of using devices such as bilge keels and rudders to control a vessel's motions. Besides that, this subject also introduces to students the skill for computer modelling and simulation engineering (CMSE). The CMSE software such as Rand Model Designer and MATLAB Simulink will be used to solve the engineering problem and complete the given project/assignment.

MKME 2113 - Strength and Vibration of Marine Structures

This course covers the fundamentals and calculations of structural plastic analysis, strength design of column and beam-column, strength design of unstiffened and stiffened plate, and analysis of structural vibrations for ship and offshore platform. The course begins with the basics and marine structural safety concerns, and design process through all phases of calculations: loads, response, and limits state stress. The focus of this course is on the structural design synthesis including design philosophy and procedures, and the importance of vibration in ship and offshore structural design. The course is presented through classroom lectures, student participation in practical exercises. The course addresses the universally accepted mathematical calculations of unstiffened and stiffened plate response, and analysis on vibrations model.

MKME 2003 - Marine Environment and Renewable Energy

This course is designed to give students an understanding of the science of marine environment, particularly waves and tides, and how this affects efforts to exploit energy from these resources. Students will first be introduced to fundamentals of oceanography and marine meteorology. It explains the fluid physical characteristics and movement on the earth surface. As such, the student will have a clear understanding of the weather that results from the interaction between the atmosphere and the sea surface. Students will then learn on marine environmental issues related to ship and offshore structure. This course also introduces the main forms of marine renewable energy particularly wind, wave and tidal, focusing on the technology and resource assessment associated with each.

MKME 2723 – Marine Robotics

Unmanned Underwater Vehicle (UUV) is essential in marine and offshore operations. Generally, there are two types of unmanned underwater vehicle namely the Remote Operated Vehicle (ROV) and Autonomous Underwater Vehicle (AUV). This course will develop the student's knowledge and understanding on the basic principles and operations required for both types of unmanned underwater vehicles. Essential topics which include the hull form and pressure hull design, hydrostatics and hydrodynamic requirements, onboard systems and power and propulsion specific to underwater vehicles will be introduced in this course. Students will apply the knowledge they have by designing, constructing and evaluating the performance of their model scale underwater vehicle which is capable of executing predetermined tasks.

MKME 1713 – Sustainable Production and Decommissioning of Marine Structures

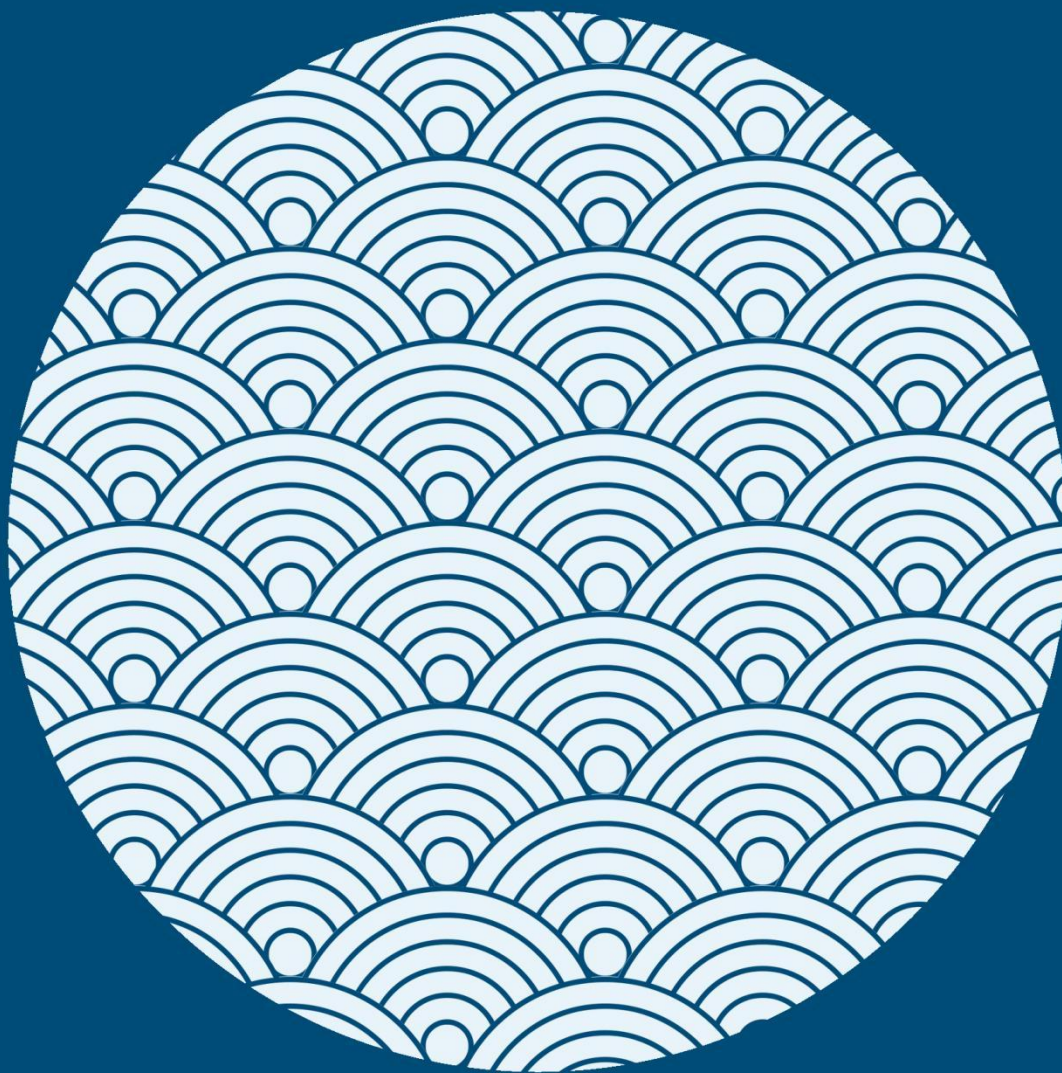
This course is offered with the aim of preparing the students to be able to assume the middle management roles of identifying, planning, scheduling, monitoring the ship construction and ship repair project, managing the tasks, time, material, manpower and money of a given project effectively. The students can learn how to perform

the duty of a ship surveyor effectively and identify the critical items to be considered during the inspection process. The course also covers the NDT works to be carried out during new construction, repair and maintenance, survey and inspection works. The course can be delivered in a module-by-module base, 2 days x 7 hours per day per module.



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Faculty of
Mechanical Engineering



Master of Science Industrial Engineering

MASTER OF SCIENCE (INDUSTRIAL ENGINEERING)

Programme Specification

Master of Science (Industrial Engineering) program makes up the core of the Industrial Engineering studies at the Faculty of Mechanical Engineering, UTM. It is designed to provide the students with the knowledge and capabilities to use appropriate techniques, skills, and tools to identify, formulate, analyse, and solve complex problems in both engineering and management. This master programme is by taught course comprises a combination of compulsory courses, electives, and a Master's Project. This program offers four (4) tracks which give more options to the students to choose the most suitable track. The four (4) tracks offered are Engineering Management, System Engineering, Manufacturing Engineering and Quality Engineering. The aims of this program are to equip graduates with quantitative, analytical, and applications skills. This will prepare graduates as entrepreneurs, problem solvers, effective decision-makers, and change agents in a competitive business environment or as prospective scientists in academia.

This programme is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The normal full-time program can be completed in a minimum of one year, i.e., two long semesters and one short semester. The full-time student is allowed to take a maximum of 20 credits in a normal semester and 10 credits in a short semester. The part time student is allowed to take a maximum of 12 credits in a normal semester and 6 credits in a short semester. Assessment is based on coursework and final examinations given throughout the semester.

General Information

1. Awarding Institution	Universiti Teknologi Malaysia			
2. Teaching Institution	Universiti Teknologi Malaysia			
3. Programme Name	Master of Science (Industrial Engineering)			
4. Final Award	Master of Science (Industrial Engineering)			
5. Programme Code	MEMI			
6. Professional or Statutory Body of Accreditation	Malaysia Qualification Agency (MQA)			
7. Language(s) of Instruction	English			
8. Mode of Study	Conventional			
9. Mode of Operation (Franchise, Self-govern, etc.)	Self-governing			
10. Study Scheme (Full Time/Part Time)	Full Time / Part Time			
11. Study Duration	Minimum : 1 years			
	Maximum : 4 years			
Type of Semester	No. of Semesters (Maximum)		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	8	14	14

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University General Courses		
	(b) University Elective	3	15 %
	(c) Free Elective	3	
ii.	Programme Core (Including Master Project I and Master Project II)	22	55 %
iii.	Programme Track Electives	12	30 %
Total		40	100 %
Classification of courses for engineering programme			

Engineering Courses		
(d) Lecture/Project/Laboratory	30	
(e) Workshop/Field/Design Studio	0	100%
(f) Final Year Project	10	
Total Credit Hours		40
		100%
Total Credit Hours to Graduate		40 credit hours

Programme Educational Objectives (PEO)

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

Programme Learning Outcomes (PO)

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

Code	Intended Learning Outcomes
PO1	Attain new frontiers of knowledge in the field of Mechanical Engineering (Knowledge and understanding)
PO2	Solve complex problems critically and integratively using systematic approaches (Cognitive skills).
PO3	Apply practical skills to solve problems in the field of Mechanical Engineering (Practical skills).
PO4	Demonstrate effective collaboration with stakeholders professionally (Interpersonal skills).
PO5	Communicate effectively the knowledge, skills and ideas using appropriate method to peers, experts and communities (Communication skills).
PO6	Use digital technologies and appropriate software competently to enhance study and practice (Digital skills).
PO7	Evaluate numerical and graphical data critically using quantitative or qualitative tools in solving problems (Numeracy skills).
PO8	Demonstrate leadership, autonomy and responsibility in managing resources (Leadership, autonomy and responsibility).
PO9	Engage self-advancement through continuous learning or professional development (Personal skills).
PO10	Demonstrate entrepreneurial skills with relevant knowledge and expertise (Entrepreneurial skills).
PO11	Demonstrate respectable ethical conducts and professionalism skills in an organization and society (Ethics and professionalism skills).

Elective Courses

Apart from the core course, students must also take 12 credits of elective course. Student can pick FOUR (4) elective courses from ONE (1) programme track.

Programme Track	Code	Elective Courses
Engineering Management	MEMI 2813	Project Management
	MEMI 2823	Engineering Economy and Finance
	MEMI 2833	Safety Management
	MEMI 2843	Quality Management
	MEMI 2853	Engineering and Technology Management
	MEMI 2863	Lean Manufacturing
System Engineering	MEMI 1813	Statistical Quality Engineering
	MEMI 1823	Supply Chain and Logistics
	MEMI 1833	Work Systems and Ergonomics
	MEMI 2823	Engineering Economy and Finance
	MEMI 2873	Modelling and Simulation
	MEMI 2883	Facilities Planning and Design
Manufacturing Engineering	MEMI 1813	Statistical Quality Engineering
	MEMM 1023	Product Innovation & Development
	MEMP 1723	Green Manufacturing Technology
	MEMP 1743	CAD/CAM/AM
	MEMP 2723	Smart Manufacturing
	MEMP 2733	IT for Manufacturing
Quality Engineering	MEMI 1813	Statistical Quality Engineering
	MEMI 2803	Engineering and Environmental Safety
	MEMI 2843	Quality Management
	MEMI 2863	Lean Manufacturing
	MEMI 2893	Risk Management
	MEMP 2723	Smart Manufacturing

Graduation Checklist

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

No	Course Code	Course Name	Credit Earned	Credit Counted	Tick (/) If Passed
University General Course					
1	UXXX xxx3	University Course Electives	3	3	
TOTAL CREDIT FOR UNIVERSITY GENERAL COURSE (A)			3	3	
Programme Core Courses					
1	MEMI 1903	Research Methodology	3	3	
2	MEMI 1843	Operations Planning and Control	3	3	
3	MEMI 1853	Operations Research and Application	3	3	
4	MEMI 1863	Industrial Data Analytics	3	3	
TOTAL CREDIT FOR PROGRAMME CORE COURSES (B)			12	12	
Master Project Courses					
1	MEMI 1914	Master Project I	4	4	
2	MEMI 2926	Master Project II	6	6	
TOTAL CREDIT FOR MASTER PROJECT COURSES (C)			10	10	
Programme Track Elective Courses					
1	MEM# ###3	Elective 1	3	3	
2	MEM# ###3	Elective 2	3	3	
3	MEM# ###3	Elective 3	3	3	
4	MEM# ###3	Elective 4	3	3	
TOTAL CREDIT FOR PROGRAMME TRACK ELECTIVE COURSES (D)			12	12	
Free Elective Courses					
1	MXXX xxx3	Free Elective Course (cross-discipline / Area / Track / Faculty)	3	3	
TOTAL CREDIT FOR FREE ELECTIVE COURSE (E)			3	3	
TOTAL CREDIT TO GRADUATE (A + B + C + D + E)			40	40	

Course Synopsis – Programme Core Courses

MEMI 1903 – Research Methodology

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

MEMI 1843 - Operations Planning and Control

This course gives advanced knowledge on production planning and control concepts, issues, and techniques. It covers topics such as demand forecasting, aggregate planning, master production schedule, job scheduling, line balancing, capacity planning, inventory management and material requirement planning (MRP) and Enterprises Resources Planning. The focus is on analysis and integration of various techniques for solving production planning problems.

MEMI 1853 - Operations Research and Application

This course provides students with the concepts and tools to model manufacturing or service systems efficiently using mainly Operations Research techniques. It focuses on formulating models based on deterministic and stochastic Operations Research techniques, applying these techniques for decision making, developing solutions from the models, and conducting simulation studies. Topics covered include linear programming, integer

programming, transportation models, network models, goal programming, decision analysis, queuing theory, Monte Carlo simulation, etc.

MEMI 1863 - Industrial Data Analytics

This course provides students with the concepts and techniques of data analytics in industrial engineering. The topics covered are based on data science lifecycle, data acquisition, feature engineering, modelling and visualization. Data analytics types to be included are descriptive, diagnostics, predictive and prescriptive. Descriptive analytics reveals what has happened and predictive analytics is for understanding trends and predicting the future. The course focuses on statistical and machine learning techniques for data modelling, and data visualization to gain insights for decision making.

Course Synopsis – Master Project Courses

MEMI 1914 - Master Project I

Master Project 1 requires a student to prepare a research proposal which will be conducted over two semesters (Projects 1 and 2). Master Project 1 covers introduction (problem statement, objective and scope), literature review, methodology, proposed method of solution, provide preliminary data and research model and planning for Projects 1 and 2. The student is required to write a draft report and to present and defend his/her research proposal.

MEMI 2926 - Master Project II

Master Project 2 is a continuation of Master Project 1. The student conducts the research work either in a laboratory, workshop, computer laboratory, or industry. The student is then required to do data collection, analyses data and interpret the results to solve the research problem that has been identified in Master Project 1. The student is required to write a complete report and defend the findings. On top of the report writing, students are also required to produce a technical article based on the project findings.

Course Synopsis – Programme Track Electives

TRACK 1: Engineering Management

Engineering Management track offers a specific skills gap in the industry for engineers with project management competencies who can lead on engineering projects in any sector focusing on both technical excellence and management ability in equal measure. This track offers the insights and skills which are needed to reach a managerial level within the engineering field and also how to successfully manage the day-to-day projects as well as long-term, complex initiatives such as ensuring quality management, sustainability, and supply chain and operations. From that student will develop industrial engineering skills, knowledge and expertise, alongside knowledge of business and management techniques, strategies and concerns. It is a dynamic and demanding programme, combining in-depth technical knowledge with a multitude of personal attributes and business expertise.

MEMI 2813 - Project Management

This subject introduces students to the myriad and exacting skills and knowledge expected to manage high risk projects and produce high quality deliverables within the time and cost constraints of their organizations. The phases of the project lifecycle, management deliverables, project charters, scope, work breakdown structures, activity lists, duration estimates, CPM/PERT network diagrams and risk analysis. This subject also covers scheduling resources and costs, reducing project duration as well progress performance measurement and evaluation. This section employs Cooperative Learning (CL).

MEMI 2823 - Engineering Economy and Finance

This course prepares students to appreciate the financial impact of their decisions. The course takes a broad managerial perspective emphasizing the strategic impact of financial and accounting activities in relation to other activities of the firm. Evaluation of company's performance from financial statements, designing cost structures and determining costs of products or services for managerial use, Activity-based costing and Target costing, time value of money, inflation, taxes, measures of worth of individual projects and alternatives, and methods for capital budgeting methods for long term projects.

MEMI 2833 - Safety Management

This course provides students with the knowledge on safety management and its implementation in industrial sector, act and regulations and familiar with the standards related to safety management, the principles in hazard identification, risk assessment & control, planning & implementing an effective safety program, behaviour-based safety and safety culture

MEMI 2843 - Quality Management

This course covers the principles, philosophy and concepts of quality management and related issues. Application of the principles and concepts of Total Quality Management in their organization, developing a strategy for the development of TQM in an organization, applying the problem-solving process and relevant tools for organizational improvement, and using the continuous improvement process for establishing a quality organization. Other quality management initiatives such as Six Sigma, Lean and Lean Six Sigma, and current issues are also discussed.

MEMI 2853 - Engineering and Technology Management

This course introduces students to the basic functions of engineering management which include planning, organizing, motivating, leading and controlling. Topics on strategic management, organizational structure, motivation, leadership, R&D management, technology management, innovation management, intellectual property management, and professional ethics are covered.

MEMI 2863 - Lean Manufacturing

This course provides concepts relating to lean manufacturing including kaizen system, value stream mapping, just in time (JIT), Kanban, single minute exchange of die (SMED) technique and line balancing. Selection of lean techniques for problem solving and waste minimization program.

TRACK 2: System Engineering

System Engineering track is a multidisciplinary track that includes a combination of engineering, systems thinking and management courses. Focused on the design, improvement, and installation of integrated systems of people, materials, information, equipment, and energy, this track provides variety of skills in the areas of contemporary manufacturing processes/systems, product development, ergonomic analysis, logistics and supply chain management, and sustainable design and development, systems engineering/product development, and systems simulation. The track is the right blend of engineering, technology, and management training which prepares graduates to become technical leaders who apply a systems approach to successfully navigate and manage complex systems. Graduates from this track will be able to address systems integration, life cycle issues and systems thinking at the system and enterprise levels, in a market where globalization, quality, complexity, and productivity are the business drivers.

MEMI 1813 - Statistical Quality Engineering

This course is designed to provide the students with sound understanding of statistical methods in quality improvement. It encompasses various statistical process control problem-solving tools. For control charts, emphasis was given on additional control charts not covered previously at the undergraduate level. Advanced tools and techniques such as Gauge Repeatability and Reproducibility (GR & R), Quality Function Deployment (QFD), Failure Mode Effect Analysis (FMEA) and experimental design methodology were also covered.

MEMI 1823 - Supply Chain and Logistics

This course is identifying the strategic importance of good supply chain and logistics design and management on the competitive position for each supply chain member. The main goal of this course is to understand the fundamental of supply chain and logistics including logistics vs supply chain, supply chain drivers, metrics and performance, distribution and network designs, 3PL, 4PL, transportation, procurement and sourcing and the logistics and supply chain in the future in order to satisfy end customers. This course also concerns techniques for designing transportation networks, distribution issues, logistics management, integration issues and performance measurement.

MEMI 1833 - Work Systems and Ergonomics

This course aims to provide students with fundamental knowledge of ergonomics (also known as human factors engineering) relevant for industry. This includes fundamental concepts and analysis of industrial problems in ergonomics such as practice of ergonomics principles and methodology, solving industrial problems related to ergonomics, information input and design, human physical work capacity, job design and task analysis including Ergonomics Risk Assessment (ERA).

MEMI 2823 - Engineering Economy and Finance

This course prepares students to appreciate the financial impact of their decisions. The course takes a broad managerial perspective emphasizing the strategic impact of financial and accounting activities in relation to other activities of the firm. Evaluation of company's performance from financial statements, designing cost structures and determining costs of products or services for managerial use, Activity-based costing and Target costing, time value of money, inflation, taxes, measures of worth of individual projects and alternatives, and methods for capital budgeting methods for long term projects.

MEMI 2873 - Modelling and Simulation

This course provides students with the concepts and tools to model manufacturing or service systems efficiently using practical Simulation software. Topics under Discrete-Event Simulation that span from basic modelling concepts, types of discrete-event approaches, analysis of input data, goodness-of-fit tests, model verification and validation, to full model experimentation and analysis of outputs are covered.

MEMI 2883 - Facilities Planning and Design

This subject provides students with the concepts and issues related to selection of facilities locations, facilities layout planning and design at the macro and micro levels. It also introduces students to the planning and design of warehousing, material handling systems and related equipment. It uses both quantitative and qualitative approaches in the analyses, together with the application of several layout procedures, algorithms, and computerized layout planning concepts within a typical manufacturing plant.

TRACK 3: Manufacturing Engineering

Manufacturing Engineering track deals with integrated science and technologies to develop and improve innovative products and manufacturing processes. This interdisciplinary program integrates fundamental science and knowledge from mechanical, industrial, production, and materials engineering to research, design, and develop manufacturing systems, processes, machines, tools, and equipment. This track offers a deep knowledge in current and new manufacturing technologies, such as continuous manufacturing processes, regulatory issues affecting manufacturing, quality risk management, Lean Six Sigma, decision making tools, as well as a thorough knowledge in key aspects regarding the operation and management of a high-tech industry. This track aims to embrace the requirements of manufacturing industry areas such as production planning, design, materials handling, processes, and quality control.

MEMI 1813 - Statistical Quality Engineering

This course is designed to provide the students with a sound understanding of statistical methods in quality improvement. It encompasses various statistical process control problem-solving tools. For control charts, emphasis was given on additional control charts not covered previously at the undergraduate level. Advanced tools and techniques such as Gauge Repeatability and Reproducibility (GR & R), Quality Function Deployment (QFD), Failure Mode Effect Analysis (FMEA) and experimental design methodology were also covered.

MEMM 1023 - Product Innovation & Development

This course introduces the students to the various stages of product design and development methods that can be put into immediate practice in developing products or projects. The development procedures blend the various perspectives of marketing, design, and manufacturing into a single approach to product development. Aspects of sustainable design and manufacturing will also be covered. The course also provides practice in carrying out small projects to expose the various stages of product development. It also includes the various prototyping and manufacturing systems strategies in developing product prototypes.

MEMP 1723 - Green Manufacturing Technology

This course introduces students to green manufacturing technology and sustainability considerations in product design and manufacture. It presents the principles, methodology and case studies to develop an understanding of sustainable development that can reduce environmental impact and promote green technology for sustainable practice. Besides that, the Life Cycle Assessment consists of four main phases, goal and scope definition, inventory, impact assessment, and interpretation. Analysis uses a valid life cycle assessment method to collect and process data of the product's life cycle or the manufacturing processes consumption or declaring the total emissions from the manufacturing.



MEMP 1743 - CAD/CAM/AM

This course discusses: the role of CAD in the design process, the Design/Manufacturing interface CAD/CAM, the basic techniques involved in CAD/CAM, its importance in the selection, implementation and management of CAD/CAM system, the link to machine control, fundamentals of Numerical Control (NC) and Additive Manufacturing (AM). The course also involves hands-on experience in CAD/CAM/AM

MEMP 2723 - Smart Manufacturing

This course introduces the overview of Smart Manufacturing architectural framework, its application, related technologies and its future directions related to various case studies around the globe. The aim is to introduce students to the new era of Industrial Revolution (IR4.0) related to the power of digital manufacturing and product model data for manufacturing integration. Students will also gain deep insights into how various support systems are used in harnessing product design, knowledge management, data analysis and other technologies being seamlessly transferred through the entire lifecycle of a manufactured product.

MEMP 2733 - IT for Manufacturing

Knowledge Management and Knowledge Management Infrastructure are the main contents. The lecture is supplemented with the real data mapping and development of information systems. This course is an Instructional lecture and Cooperative learning (CL) enriched with student assignments and group projects. Students are required to perform problem solving using real case study and projects in their individual assignments/projects to measure their skill in communication and analysis of data. Students are guided through the real-life case study that requires them to construct real data for database design. They are also to prove their ability by constructing a database information system using selected tools. The contents include Business System of project and Product Based, Information Security, Cyber physical system, networking, vertical & horizontal integration, Data exchange, Cloud manufacturing and computer integrated manufacturing (CIM).

TRACK 4: Quality Engineering

Quality Engineering track offer concepts and tools in quality improvement. It encloses all tasks from ideation to execution. These would include the analysis of a product's design, its development, and finally the manufacturing processes. The focus is on improving the quality of the final product and an efficient production process. Quality Engineering has a broad range of tools and methodologies. It encompasses various statistical process control problem-solving tools such as quality systems, product and process control and design, quality methods and tools, applied statistics, statistical process control (SPC), and design of experiments (DOE). This track aims to produce graduates which are able to ensure services or products are designed, developed, and manufactured to meet customer's expectations and also produces professionals with leadership skills.

MEMI 1813 - Statistical Quality Engineering

This course is designed to provide the students with sound understanding to statistical methods in quality improvement. It encompasses various statistical process control problem-solving tools. For control charts, emphasis was given on additional control charts not covered previously at the undergraduate level. Advanced tools and techniques such as Gauge Repeatability and Reproducibility (GR & R), Quality Function Deployment (QFD), Failure Mode Effect Analysis (FMEA) and experimental design methodology were also covered.

MEMI 2803 - Engineering and Environmental Safety

This course provides the fundamental concepts of engineering and environmental safety that covers both management and technical aspects. In engineering safety, the focus is on the safety of equipment commonly used in engineering installation and maintenance, safety of chemicals used in engineering processes, and implementation of safety engineering programs in engineering installations and plants. Environmental safety provides the principles and concepts of environmental safety elements, hazardous waste control, environmental assessment under OSHA 1994, impact and cause of global warming, green design and manufacturing, sustainable energy and design for environment. The management element provides the elements of safety

(engineering and environmental) management and relevant issues in industry. Certification to ISO 14000, ISO 14001 EMS and compliance to local regulations (EQA 1974) as well as environmental audit are included. The principles in hazard identification, risk assessment & control, planning & implementing an effective safety program and assessment of the effectiveness of safety programs.

MEMI 2843 - Quality Management

This course covers the principles, philosophy and concepts of quality management and related issues. Application of the principles and concepts of Total Quality Management in their organization, developing a strategy for the development of TQM in an organization, applying the problem-solving process and relevant tools for organizational improvement, and using the continuous improvement process for establishing a quality organization. Other quality management initiatives such as Six Sigma, Lean and Lean Six Sigma, and current issues are also discussed.

MEMI 2863 - Lean Manufacturing

This course provides concepts relating to lean manufacturing including kaizen system, value stream mapping, just in time (JIT), Kanban, single minute exchange of die (SMED) technique and line balancing. Selection of lean techniques for problem solving and waste minimization program.

MEMI 2893 - Risk Management

Enterprise risk management enables management to effectively deal with uncertainty and associated risk and opportunity, enhancing the capacity to build value. Value is maximized when management sets strategy and objectives to strike an optimal balance between growth, return goals and related risks, as well as efficiently and effectively deploys resources in pursuit of the entity's objectives. This course aims to prepare students with Enterprise risk management knowledge which encompasses i) aligning risk appetite and strategy, ii) enhancing risk response decisions, iii) reducing operational surprises and losses, iv) identifying and managing multiple and cross enterprise risks, v) seizing opportunities and vi) improving deployment of capital. Enterprise risk management helps ensure effective reporting and compliance with laws and regulations and helps avoid damage to the entity's reputation and associated consequences. In sum, enterprise risk management helps an entity get to where it wants to go and avoid pitfalls and surprises along the way.

MEMP 2723 - Smart Manufacturing

This course introduces the overview of Smart Manufacturing architectural framework, its application, related technologies, and its future directions related to various case studies around the globe. The aim is to introduce students to the new era of Industrial Revolution (IR4.0) related to the power of digital manufacturing and product model data for manufacturing integration. Students will also gain deep insights into how various support systems are used in harnessing product design, knowledge management, data analysis and other technologies being seamlessly transfer through the entire lifecycle of a manufactured product.

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