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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Assalamu’alaikum and Greetings

I am grateful to the Almighty Allah S.W.T for enabling me to pen a few words in this Undergraduate Handbook 2015/2016.

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 the opportunity given will be used wisely and you will do your utmost to acquire the knowledge, experience and exposure necessary to be a successful Engineer.

The Undergraduate Handbook contains brief information on the curriculum and syllabus of programs offered by the faculty which is applicable to the students of the 2015/2016 session intake. It also serves as your main source of reference related to your academic affairs and provides the required information for the students especially on the faculty’s administration implementation of programmes and courses offered. This handbook can be used by the students to plan their studies as well as a reference for the programme structure offered by the faculty. Additionally a special topic on Academic Advising is included so that both students and academic advisors can play their roles effectively.

We hope all new students will utilize the information provided in this handbook so that you can benefit from all the services provided thus enhancing your educational experience and create many valuable memories. All users of this handbook are invited to submit comments and recommendations for changes to the Academic Office of the faculty. Additionally, deletions and changes to this handbook may occur throughout the year. So please be on the lookout for notices informing of the changes.

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 the new students all the best in their studies at the faculty and we hope this handbook will be useful to all. The faculty and staff are very interested in your success even though much of your success is dependent on you.

Thank you.

Best wishes, Wassalam.

PROFESSOR DR. NOORDIN MOHD. YUSOF
Dean
Faculty of Mechanical Engineering
Universiti Teknologi Malaysia
PHILOSOPHY OF THE UNIVERSITY
FALSFAH UNIVERSITI

The divine law of Allah is the foundation for science and technology. Universiti Teknologi Malaysia strives with total and unified effort to develop excellence in science and technology for universal peace and prosperity, in accordance with His Will.

Hukum Allah adalah dasar kepada sains dan teknologi. Universiti Teknologi Malaysia berusaha secara menyeluruh dan bersepadu memperkembangkan kecemerlangan sains dan teknologi untuk kesejahteraan dan kemakmuran sejagat sesuai dengan kehendakNya.
VISION OF THE UNIVERSITY
VISI UNIVERSITI

To be recognised as a world class centre of academic and technological excellence

Diktiraf sebagai pusat kecemerlangan akademik dan teknologi bertaraf dunia

MISSION OF THE UNIVERSITY
MISI UNIVERSITI

To be a leader in the development of human capital and innovative technologies that will contribute to the nation’s wealth creation

Menjadi peneraju dalam pembangunan modal insan dan teknologi inovatif demi pengkayaan khazanah negara
VISION OF THE FACULTY
VISI FAKULTI

To become a world-class Mechanical Engineering Faculty
Menjadi Fakulti Kejuruteraan Mekanikal bertaraf dunia

MISSION OF THE FACULTY
MISI FAKULTI

To develop the human resource required by the nation through training, development, dissemination of knowledge, research and consultancy.
Membangunkan sumber manusia yang diperlukan oleh negara melalui latihan, pembangunan, penyebaran pengetahuan, penyelidikan dan perundingan

OBJECTIVES OF THE FACULTY
OBJEKTIF FAKULTI

• To develop quality human resource at undergraduate and post-graduate levels
Membangunkan sumber manusia berkualiti di peringkat Sarjana Muda dan Pasca Ijazah

• To assist the industry through basic and applied research
Membantu industri melalui penyelidikan asas dan gunaan

• To forge cooperative network with the industry in areas of mutual benefit
Membentuk jalinan kerjasama dengan industri dalam bidang kepentingan bersama

• To disseminate knowledge through the publication of research papers, journals, books and reports
Menyebar pengetahuan melalui penerbitan kertas kerja, penyelidikan, jurnal, buku dan laporan

• To develop its staff
Membangunkan staf
CLIENT’S CHARTER

Realising that the main role of the faculty is developing human resources in the field of Mechanical Engineering to fulfil the needs of the country, university and society, we hereby pledge:-

• to produce capable and ethical Mechanical Engineers;
• to design and implement a world class curriculum recognised by the Professional bodies;
• to provide efficient, ethical and professional staffs who are capable of executing quality academic and administrative tasks in a planned, orderly and controlled manner;
• to provide suitable and conducive infrastructure for teaching and learning;
• to be concerned of students self-development
ACADEMIC CALENDAR

for 2015 / 2016 Session
ACADEMIC SESSION

The University Academic Session is divided into two regular semesters namely, Semester I and Semester II. Each semester consists of at least 19 weeks of lectures, mid semester break, revision and final examination. Apart from the regular semesters, the University also runs a short semester, which is held during the vacation period at the end of an academic year. This semester is not taken into account in the maximum study duration stipulated for a particular programme.

The academic session is shown in Table 1.

<table>
<thead>
<tr>
<th>Table 1 : Academic Session (*Subject to amendments)</th>
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<tbody>
<tr>
<td><strong>SEMESTER I</strong></td>
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<tr>
<td>Lectures</td>
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<tr>
<td>Mid Semester Break</td>
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<tr>
<td>Revision Week</td>
</tr>
<tr>
<td>Final Examination</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
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<tr>
<td>End of Semester I Vacation</td>
</tr>
<tr>
<td><strong>SEMESTER II</strong></td>
</tr>
<tr>
<td>Lectures</td>
</tr>
<tr>
<td>Mid Semester Break</td>
</tr>
<tr>
<td>Revision week</td>
</tr>
<tr>
<td>Final Examination</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
</tr>
<tr>
<td>End of Semester II Vacation</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
</tr>
<tr>
<td><strong>SHORT SEMESTER</strong></td>
</tr>
<tr>
<td>(During End of Semester II Vacation)</td>
</tr>
<tr>
<td>Lectures &amp; Examination</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
</tr>
</tbody>
</table>
# ACADEMIC SESSION

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Sept 2015</td>
<td>Registration for New Students</td>
</tr>
<tr>
<td>1 - 3 Sept 2015</td>
<td>Student Transformation Week</td>
</tr>
<tr>
<td>2 &amp; 3 Sept 2015</td>
<td>Registration of Courses for Semester I, 2015/2016 Academic Session</td>
</tr>
</tbody>
</table>

## 6 Sept 2015 - 13 Feb 2016 - SEMESTER I (23 weeks)

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Sept – 7 Nov 2015</td>
<td>Semester I Lectures (Part One) (9 weeks)</td>
</tr>
<tr>
<td>7 Oct 2015</td>
<td>*Senate Meeting</td>
</tr>
<tr>
<td>24 – 26 Oct 2015</td>
<td>*UTM 55th Convocation Ceremony</td>
</tr>
<tr>
<td>8 – 14 Nov 2015</td>
<td>Mid-Semester I Break (1 week)</td>
</tr>
<tr>
<td>15 Nov - 19 Dec 2015</td>
<td>Continuation of Semester I Lectures (Part Two) (5 weeks)</td>
</tr>
<tr>
<td>4 Nov 2015</td>
<td>*Senate Meeting</td>
</tr>
<tr>
<td>6 - 18 Dec 2015</td>
<td>Pre-Registration of Courses for Semester II, 2014/2015 Session</td>
</tr>
<tr>
<td>2 Dec 2015</td>
<td>*Senate Meeting</td>
</tr>
<tr>
<td>20 - 26 Dec 2015</td>
<td>Revision Week (1 week)</td>
</tr>
<tr>
<td>28 Dec 2015 - 16 Jan 2016</td>
<td>Final Examination for Semester I (3 weeks)</td>
</tr>
<tr>
<td>6 Jan 2016</td>
<td>*Senate Meeting</td>
</tr>
<tr>
<td>17 Jan - 13 Feb 2016</td>
<td>Final Break for Semester I (5 weeks)</td>
</tr>
<tr>
<td>10 Feb 2016</td>
<td>*Senate Meeting</td>
</tr>
<tr>
<td>1 – 3 Feb 2016</td>
<td>Registration of Courses for Semester II, 2015/2016 Session</td>
</tr>
<tr>
<td>14 - 26 Feb 2016</td>
<td>Special Examination for Semester I</td>
</tr>
</tbody>
</table>

## 14 February 2016 - 3 September 2016 - SEMESTER II (23 weeks)

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 Feb - 2 April 2016</td>
<td>Semester II Lectures (Part One) (6 weeks)</td>
</tr>
<tr>
<td>9 March 2016</td>
<td>*Senate Meeting</td>
</tr>
<tr>
<td>5 March 2016</td>
<td>*Meeting of Senate Standing Committee on Special Examinations and Conferment for Semester I, 2014/2015 Session</td>
</tr>
<tr>
<td>9 - 9 April 2016</td>
<td>Mid-Semester II Break (1 week)</td>
</tr>
<tr>
<td>6 April 2016</td>
<td>*Senate Meeting</td>
</tr>
<tr>
<td>10 April – 28 May 2016</td>
<td>Semester II Lectures (Part Two) (7 weeks)</td>
</tr>
<tr>
<td>23 - 24 April 2016</td>
<td>*UTM 56th Convocation Ceremony</td>
</tr>
<tr>
<td>4 May 2016</td>
<td>*Senate Meeting</td>
</tr>
<tr>
<td>15 - 27 May 2016</td>
<td>Pre-Registration of Course for Semester I 2015/2016 Session (2 weeks)</td>
</tr>
<tr>
<td>29 May - 4 June 2016</td>
<td>Revision Week (1 week)</td>
</tr>
<tr>
<td>Date</td>
<td>Event</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>5 - 25 June 2016</td>
<td>Final Examination for Semester II (3 weeks)</td>
</tr>
<tr>
<td>26 June – 3 Sept 2016</td>
<td>Final Semester Long Vacation (10 weeks)</td>
</tr>
<tr>
<td>8 June 2016</td>
<td>*Senate Meeting</td>
</tr>
<tr>
<td>6 July 2016</td>
<td>*Senate Meeting</td>
</tr>
<tr>
<td>31 July - 12 Aug 2016</td>
<td>Special Examination for Semester II</td>
</tr>
<tr>
<td>10 Aug 2016</td>
<td>*Senate Meeting</td>
</tr>
<tr>
<td>31 Aug &amp; 2 Sept 2016</td>
<td>Registration of Course for Semester I 2016/2017 Session</td>
</tr>
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**SHORT SEMESTER**

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<th>Event</th>
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</thead>
<tbody>
<tr>
<td>29 &amp; 30 June 2016</td>
<td>Registrations of Course for Short Semester 2014/2015 Session</td>
</tr>
<tr>
<td>3 July – 27 Aug 2016</td>
<td>Lectures for Short Semester</td>
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</tbody>
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**PUBLIC HOLIDAY**

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<tbody>
<tr>
<td>16 Sept 2015</td>
<td>Malaysia Day</td>
</tr>
<tr>
<td>24 Sept 2015</td>
<td>Eid Al-Adha</td>
</tr>
<tr>
<td>10 Nov 2016</td>
<td>*Deepavali</td>
</tr>
<tr>
<td>22 Nov 2014</td>
<td>Birthday of His Majesty Sultan Johor (Public Holiday for Johor only)</td>
</tr>
<tr>
<td>18 Nov 2015</td>
<td>Hol Day Almarhum Sultan of Johor (Public Holiday for Johor only)</td>
</tr>
<tr>
<td>24 Dec 2015</td>
<td>Birthday of Prophet Muhammad S.A.W (Public Holiday for Johor only)</td>
</tr>
<tr>
<td>25 Dec 2015</td>
<td>Christmas</td>
</tr>
<tr>
<td>8 &amp; 9 Feb 2016</td>
<td>Chinese New Year</td>
</tr>
<tr>
<td>Feb 2016</td>
<td>*Thaipusam Day</td>
</tr>
<tr>
<td>1 May 2016</td>
<td>Labour Day</td>
</tr>
<tr>
<td>May 2016</td>
<td>*Wesak Day</td>
</tr>
<tr>
<td>4 June 2016</td>
<td>Birthday of DYMM Seri Paduka Baginda Yang Di-Pertuan Agong</td>
</tr>
<tr>
<td>6 June 2016</td>
<td>Awal Ramadhan (Public Holiday for Johor only)</td>
</tr>
<tr>
<td>6 &amp; 7 July 2016</td>
<td>Eid Al-Fitri</td>
</tr>
<tr>
<td>31 Aug 2015</td>
<td>National Day</td>
</tr>
</tbody>
</table>

*Subject to changes*
ENTRY REQUIREMENTS
ENTRY REQUIREMENTS FOR THE FOLLOWING PROGRAMMES:

1. Bachelor of Engineering (Mechanical)
2. Bachelor of Engineering (Mechanical – Materials)
3. Bachelor of Engineering (Mechanical – Industrial)
4. Bachelor of Engineering (Mechanical – Manufacturing)
5. Bachelor of Engineering (Mechanical – Aeronautics)
6. Bachelor of Engineering (Mechanical – Automotive)
7. Bachelor of Engineering (Naval Architecture and Offshore Engineering)

A. MINIMUM ENTRY REQUIREMENTS FOR STPM HOLDERS

1. University General Requirements
   1.1 Passed Sijil Pelajaran Malaysia (SPM) or equivalent with a credit in Bahasa Melayu/Bahasa Malaysia or a credit in Bahasa Melayu/Bahasa Malaysia, July Paper.
   1.2 Passed Sijil Tinggi Persekolahan Malaysia (STPM) with at least
   i) C Grade (2.00) in General Studies/General Paper and
   ii) C Grade (2.00) in two (2) other courses
   1.3 Obtained at least a Band 1 in Malaysian University English Test (MUET)

2. Programme Specific Requirements
   2.1 Passed with at least a C Grade in Mathematics and Physics at SPM level or equivalent
   2.2 Passed with at least a CGPA 3.00 at STPM level
   2.3 Passed with at least a CGPA 3.00 at STPM level in Additional Mathematics, Physics and Chemistry
   2.4 Do not have any health problems that may affect their studies
B. MINIMUM ENTRY REQUIREMENTS FOR THOSE WHO HAVE COMPLETED THE MINISTRY OF EDUCATION MALAYSIA MATRICULATION/UM SCIENCE FOUNDATION/UiTM FOUNDATION PROGRAMME

1. University General Requirements
   1.1 Passed Sijil Pelajaran Malaysia (SPM) or equivalent with a credit in Bahasa Melayu/Bahasa Malaysia or a credit in Bahasa Melayu/Bahasa Malaysia, July paper.
   1.2 Passed Ministry of Education Matriculation/UM Science Foundation/UiTM Foundation with at least a CGPA 2.00.
   1.3 Obtained at least a Band 1 in Malaysian University English Test (MUET)

2. Programme Specific Requirements
   2.1 Passed with a C Grade in Mathematics and Physics at SPM level or equivalent
   2.2 Obtained at least a CGPA 3.00 at Matriculation/Foundation level
   2.3 Passed with at least a B- Grade (2.67) in Mathematics/Engineering Mathematics, Physics/Engineering Physics and Chemistry/Engineering Chemistry at Matriculation level.
   2.4 Do not have any health problems that may affect their studies

C. MINIMUM ENTRY REQUIREMENT FOR DIPLOMA HOLDERS/EQUIVALENT

1. University General Requirements
   1.1 Passed SPM or equivalent with a credit in Bahasa Melayu/Bahasa Malaysia or a credit in Bahasa Melayu/Bahasa Malaysia, July paper.
   1.2 Obtained a Diploma or equivalent qualification recognised by the Malaysian Government and approved by the Senate:

   or

   1.3 Passed STPM examination in 2009 or before and obtained at least:
   i) C Grade (2.00) in General paper and
   ii) C Grade (2.00) in two (2) other courses

   or

   1.4 Passed Matriculation examination in 2009 or before and obtained at least CGPA 2.00
   1.5 Obtained at least a Band 1 in Malaysian University English test (MUET)
2. Programme Specific Requirements

2.1 Obtained a Diploma in Mechanical Engineering from UTM or equivalent with at least a CGPA 2.75.

or

2.2 For those who obtained a CGPA of less than 2.75 but have at least two (2) years working experience in related field are eligible to apply.

or

2.3 Meet the minimum entry requirements as required for STPM holders.

or

2.4 Meet the minimum entry requirements as required for those who have completed the Ministry of Education Malaysia Matriculation/UM Science Foundation/UiTM Foundation Programme.

and

2.5 Obtained at least a credit in Mathematics and Physics at SPM level.

or

2.6 Obtained at least a C Grade (2.0) in any one of the Mathematics courses at Diploma level.

and

2.7 Do not have any healthy problems that may affect their studies.

Note:
Candidates are required to submit to UTM, a detailed transcript of the examination results during the course of their Diploma study (from the first semester to the final semester). They are also required to submit a copy of their Diploma certificate or a letter verifying completion of their study.

The actual year of entry and duration of study are subjected to credit exemptions approved by UTM.
ORGANISATIONAL STRUCTURE
FACULTY BACKGROUND

The Faculty of Mechanical Engineering (FME) formerly known as Fakulti Kejuruteraan Jentera (FKJ), was set up in 1975 at the 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 in the 1980/1981 session. A total of 30 students enrolled in the programme. During the 1981/1982 session, another new programmes were offered by the Faculty, namely, Diploma and Bachelor Degree in Ocean Engineering. A total of 29 students enrolled in the diploma programme and 25 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. On the day, 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. In 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 number of staff and students.

FACULTY STRUCTURE AND DEPARTMENTS

FME is currently headed by a Dean and is assisted by two Deputy Deans, the Deputy Dean (Academics) and Deputy Dean (Development). A Deputy Registrar with the assistance of an Assistant Registrar handles the administrative matters of the faculty. The administration of the Information Technology (IT) unit is headed by an IT Manager and the Teaching Laboratories are headed by a Laboratory Manager. Currently, the Faculty has FOUR (4) academic departments, each headed by a Head of Department.
They are as follows:

- Department of Applied Mechanics & Design
- Department of Thermo-Fluids
- 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 Engineering (Mechanical)
2) Bachelor of Engineering (Mechanical – Materials)
3) Bachelor of Engineering (Mechanical – Industrial)
4) Bachelor of Engineering (Mechanical – Manufacturing)
5) Bachelor of Engineering (Mechanical – Aeronautics)
6) Bachelor of Engineering (Mechanical – Automotive)
7) Bachelor of Engineering (Naval Architecture and Offshore Engineering)

**Postgraduate Programmes**
Master programmes by taught course:
1) Master of Science (Mechanical Engineering)
2) Master of Science (Industrial Engineering)
3) Master of Science (Materials Engineering)
4) Master of Science (Advanced Manufacturing Technology)
5) Master of Science (Ship and Offshore Engineering)
6) Master of Science (Aeronautical Engineering)

Master of Philosophy/Doctor of Philosophy (Field of Research)
1) Mechanical Engineering
2) Industrial Engineering
3) Materials Engineering
4) Advanced Manufacturing Technology
5) Ship and Offshore Engineering
6) Aeronautical Engineering
7) Automotive Engineering

**FACILITIES**

The faculty is well-equipped with lecture halls smart classrooms, lecture and tutorial rooms, seminar halls and resource centre (mini library). To support teaching activities, laboratories and workshops are available and headed by a Laboratory Manager, who supervises the following Teaching Laboratories:
x Industrial Engineering Laboratory
x Metrology Laboratory
x Metal Forming Laboratory
x Fabrication Laboratory
x Mechanics of Materials & Structures Laboratory
x Systems & Control Laboratory
x Mechanics of Machines Laboratory
x Vibration & Noise Laboratory
x Thermodynamics Laboratory

x Fluid Mechanics Laboratory
x Foundry Laboratory

Workshop facilities are available as follows:

x Machine Shop
x Woodworking Workshop

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

x Marine Technology Laboratory
x Aeronautical Laboratory
x Automotive Laboratory
x Materials Science Laboratory
x Production Laboratory

Apart from the above the faculty also has a number of Centre of Excellence:

x Institute of Vibration and Noise

Computing and IT Facilities

Five computer laboratories with more than 250 computers are available for students use. To facilitate computer aided teaching and learning, fully licenced software packages such as Solidworks, MATLAB/Simulink, S-Plus, Witness, LS-Dyna, Alias Wavefront, Rhino 3D, Patran, Nastran, AutoCAD, Fluent and Catia as well as Open Source softwares are readily available for use. Students are also able to access e-mail and e-learning facilities provided by the Faculty and Universitiy. Internet facilities is widely available through both cabled and wireless configurations installed across the faculty. Additional computing facilities are also available in the Centre for Information and Communication Technology (CICT), main library and student hostels.

The Faculty academic web portal can be accessed directly from http://pmaya.fkm.utm.my
ADMINISTRATIVE STAFF
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MSc (CAD for Manufacture), Aston, UK
PhD (Mech. Eng.), Cranfield, UK
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E-mail: kamarul@fkm.utm.my

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Mphil (Computer Aided Eng.), Heriot-Watt
PhD (Computer Aided Mfng), Dundee
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       masine@fkm.utm.my

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MSc (Adv. Mnfgr. Sys. & Tech.), Liverpool
PhD (Mech. Eng.), De Monfort University UK
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       mohamed@fkm.utm.my
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Assoc. Prof. Dr. Nor Azwadi bin Che Sidik
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MSc (Mech. W.),
UMIST
PhD (Mech. Eng.), Japan
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Email : azwadi@fkm.utm.my

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(Undergraduate)
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Master (Mech. Eng.), Rice University
PhD (Mech. Eng.) UTM
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Ext : 57072/34561
Email : shafiek@fkm.utm.my

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External Programmes
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MSc (Auto Eng. Design & Mfg.), Coventry
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PhD (Automatic Control & Sys. Eng.), Sheffield
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Post Graduate (Research)
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MEng (Eng. Mngt), UTM
PhD (Mech. Eng.), Birmingham
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Manager
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MSc (Mech. Eng.), Arizona
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Laboratory Manager  
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BSc (Mech. Eng.), Arizona  
MSc (Mech. Eng.), Cranfield  
PhD (Mech. Eng.), Cranfield  
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Ext  :  34604  
Email  :  rishak@fkm.utm.my  

Senior Deputy Registrar  
Mr. Amir Hamzah bin Jamil  
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Ext  :  57073  
E-mail  :  tpfkm@mail.fkm.utm.my  
amir-hj@utm.my  

Senior Assistant Registrar  
Mrs. Khairany binti Mohd. Kassim  
Diploma in Law,  
UiTM  
Advanced Diploma in Law, UiTM Room  :  
E07 – 04.03.01  
Ext  :  57063  
E-mail  :  ppfkm@fkm.utm.my  
khairany@fkm.utm.my
PROGRAMME
SPECIFICATIONS, AREAS
OF STUDY, CAREER
PROSPECTS & CURRICULUM
1. Programme Name | Bachelor of Engineering (Mechanical)  
2. Final Award | Bachelor of Engineering (Mechanical)  
3. Awarding Institution | Universiti Teknologi Malaysia  
4. Teaching Institution | Universiti Teknologi Malaysia  
5. Professional or Statutory Body of Accreditation | Engineering Accreditation Council (EAC)  
6. Language(s) of Instruction | Bahasa Melayu and English  
7. Mode of Study (Conventional, distance learning, etc.) | Conventional  
8. Mode of Operation (Franchise, self-govern, etc.) | Self-govern  
9. Study Scheme (Full Time/Part Time) | Full Time  
10. Study Duration | Minimum: 4 years  
                      | Maximum: 6 years  
11. Entry Requirements | Matriculation/STPM/Diploma or equivalent  
12. Programme Objectives (PEO)  
   To produce graduates who are able to:  
   i) Demonstrate their academic and technological excellence professionally and globally, particularly in  
      areas related to mechanical engineering practices and contribute innovatively to the nation’s wealth  
      creation.  
   ii) Advance their careers by assuming increasing levels of responsibility, leadership and acquiring  
      professional and advanced academic qualifications.  
   iii) Recognize and practice professional, ethical, environmental and societal responsibilities and value  
      different global and cultural aspects of their work and society.  
   iv) Adapt and communicate effectively and be successful working with multi disciplinary teams.  
13. Programme Learning Outcomes (PO)  

(a) Technical Knowledge and Competencies  

<table>
<thead>
<tr>
<th>Intended Learning Outcomes</th>
<th>Teaching and Learning Methods</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to acquire and apply fundamental knowledge of mathematics, science and engineering principles to solve complex mechanical engineering problems; Keywords: Engineering Knowledge!</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
</tr>
<tr>
<td>Ability to identify, formulate and analyse complex mechanical engineering problems; Keywords: Problem Analysis!</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
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<tr>
<td>Ability to design solutions for complex mechanical engineering problems that fulfil health, safety, societal, cultural and environmental needs; Keywords: Design/Development of solutions</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
</tr>
<tr>
<td>Ability to investigate complex mechanical engineering problems using research-based knowledge and methods to produce conclusive results;</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
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### (b) Generic Skills

<table>
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<th>Teaching and Learning Methods</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to use modern engineering and information technology (IT) tools in complex mechanical engineering activities, with an understanding of the limitations; Keywords: Modern Tools Usage</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
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<tr>
<td>Ability to apply professional engineering practice related to societal, health, safety, legal and cultural issues with full responsibility and integrity; Keywords: The Engineer and Society</td>
<td>Lectures, tutorials, seminars, group projects and industrial training.</td>
<td>Industrial training, and group project reports.</td>
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<tr>
<td>Ability to identify the impact of mechanical engineering solutions on sustainability and demonstrate the needs for sustainable development in societal and environmental contexts. Keywords: Environment &amp; Sustainability</td>
<td>Tutorials, laboratory works, group assignments and projects, final year project presentations and problem-based learning.</td>
<td>Group reports, learning logs/diaries and oral presentations.</td>
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<tr>
<td>Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. Keywords: Ethics</td>
<td>Lectures, tutorials, seminars, group projects and industrial training.</td>
<td>Industrial training, and group project reports.</td>
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<td>Ability to communicate effectively on complex mechanical engineering activities both orally and in writing; Keywords: Communication</td>
<td>Seminars, assignments and final year projects.</td>
<td>Reports and theses</td>
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<td>Ability to work productively as an individual, and as a member or leader in a team that may involve multi-disciplinary settings; Keywords: Team Working:</td>
<td>Lectures and project assignments.</td>
<td>Demonstrations, reports, tests, examinations and presentations.</td>
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<tr>
<td>Ability to undertake life long learning and manage information including conducting literature study; Keywords: Life Long Learning</td>
<td>Lectures and project assignments.</td>
<td>Demonstrations, reports, tests, examinations and presentations.</td>
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<tr>
<td>Ability to demonstrate and apply knowledge on finance and management principles and acquire entrepreneurship skill ; Keywords: ProjectManagement, Finance &amp; Entrepreneurship</td>
<td>Lectures and project assignments.</td>
<td>Demonstrations, reports, tests, examinations and presentations.</td>
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### 14. Classification of Courses

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<th>No.</th>
<th>Classification</th>
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<th>Percentage</th>
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<td>ii</td>
<td>Programme Electives</td>
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<td>Compulsory University Subject</td>
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<td>T</td>
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**Total credit hours for Part A**

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<tr>
<th>Engineering Courses</th>
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<td><strong>Total credit hours for Part B</strong></td>
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<tr>
<td><strong>Total credit hours for Part A and B</strong></td>
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### 15. Total Credit Hours to Graduate

137
AREAS OF STUDY

Mechanical Engineering programme makes up the core of the engineering studies at the Faculty of Mechanical Engineering. Students pursuing specialisation in a particular field shall take additional elective courses. The fundamental areas of study in mechanical engineering are described as follows:

a) Applied Mechanics

Applied Mechanics is the application of mechanics principles to real world problems. It is a field of engineering that combines the fundamental physical sciences with mathematical, computational and experimental techniques. The term mechanics refers to the formulation of rules predicting the behaviour of physical system under the influence of any type of interaction with its environments, particularly due to the action of the forces that cause the behaviour or response of the physical system at rest (statics) or in motion (dynamics).

Applied Mechanics covers the following disciplines:

- Mechanics of Materials and Structures
- Mechanics of Machines
- Dynamic Systems and Control

The above sub-fields provide the essential knowledge that is required by the mechanical-based engineers to include Aeronautical, Automotive, Naval Architecture and Offshore Engineering, Materials, Manufacturing and Industrial Engineering counterparts.

Examples of the elective courses in Applied Mechanics are:

- Mechanics of Composite Materials
- Failure of Engineering Component and Structures
- Mechanical Vibration
- Machine Condition Monitoring
- Noise
- Robotics

b) Thermodynamics

Thermodynamics is taught at two levels – basic and applied. In the basic level, focus is given to the understanding of the concept of system, heat, work as well as material properties in relation to heat and work and their influence on a particular thermodynamic system. The second level involves application of theories based on thermodynamic laws in studying and analysing primary devices. Focus is on the methods of generating heat and power, minimisation of fuel usage, efficiency and other parameters. Thermodynamics is an important field, very much needed in several industrial sectors such as power generation, petrochemistry, automotive, and building maintenance. It is a course which is directly involved in power generation/energy savings, different engine designs and the supporting systems with high capability and cost effectiveness.
Examples of elective courses in Thermodynamics are:
- Combustion Processes
- Air Conditioning
- Internal Combustion Engine
- Heat Transfer
- Power Plant Technology

c) Fluid Mechanics

It is a field of study that deals with fluid properties, surface hydrostatic force (examples: dam gate, reservoir, pressure and flow measurement, piping system design, potential flow and boundary layer) to determine flow type and resulting force, pumps and turbines. The principles applied include Newton’s law, thermodynamic laws and basic knowledge in Mathematics. The scope of study is based on its application in the engineering field.

Examples of elective courses:
- Turbo-Machinery
- Hydraulic and Pneumatic Systems
- Computational Fluid Dynamics (CFD)

d) Design

x Introduction to Design
Students are exposed to the concepts and methods to develop an efficient design process and applying it to solve engineering design problems creatively and effectively.

x Component Design
Students are exposed to analysis in machine design element failure theories. This includes failures due to static and fatigue loads. It involves fatigue strength and endurance level, modified stress, Goodman diagram and fatigue design under tensile and combined stresses. The content will encompass the design and selection of bolts, welding, spring, ball and roller bearings, gears and belts. At the end of the course, a student should have the capabilities to identify, make analysis and design the machine elements in the perspective of static and fatigue failure aspect.

x System Design
Students are able to design methodologies and principles specific to the practice of mechanical design. Emphasis is on developing efficient and effective design techniques as well as project-oriented skills from both technical and non-technical consideration. Students are able to identify and apply appropriate methodology in performing design tasks, recognise the fundamental principles of mechanical design and practices and formulate
and apply general problem solving strategy in the analysis of situation problem and potential problem. Students are able to identify and apply industry standards in design communication.

e) Materials Science and Materials Technology

This course is important to the engineer because it provides the basic knowledge on engineering materials such as metals, polymers, ceramics and composites so that proper materials can be selected for a particular design or product. This course relates the structure to the properties of materials so that the behaviour of materials can be better understood.
CAREER PROSPECTS

Graduates of the program are expected to work in Mechanical Engineering field, one of the oldest and areas of engineering activity. The career of a Mechanical Engineer involves the efficient application of physical and human resources in improving the standard of living. A Mechanical Engineer combines the basic knowledge of physical sciences and engineering education with experience and expertise to invent, design and manufacture, run and maintain mechanical equipments, machineries and tools in all branches of industry including automotive, aerospace, marine/shipbuilding, manufacturing, processing and those involving heavy machineries. Graduates in this area are capable of fulfilling the task of an engineer cum technologist in the government, semi- government and private firms. Graduates will be able to find job opportunities in various sectors and industries as previously mentioned.

A Mechanical Engineer may further his career as a product designer, building contractor manufacturer of machines or engineering products, researcher in Research and Development (R&D) departments/institutes or an academician in institutions of higher learning. Indeed, the career of a Mechanical Engineer is deemed very versatile and thus it is not at all surprising that Mechanical Engineering graduates are able to take up various relevant positions without much hassle.


### CURRICULUM

#### FIRST YEAR

**Semester I**

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<th>Code</th>
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**Total** 16

**Semester II**

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**Total** 17

* Core courses - minimum passing grade is C (50%)

Subject to changes

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio
## Semester III

<table>
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<th>Code</th>
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Total 17

* Core courses - minimum passing grade is C (50%)

#UHAS 1162 Arts, Customs and Beliefs of Malaysians (for international students only)

## Semester IV

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<th>Code</th>
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Total 17

* Core courses - minimum passing grade is C (50%)
### Semester V

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** Minimum grade D- (30%) in the pre-requisite courses

#ULAM 1112 Malay Language for Communication (for international students only)

### Semester VI

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** Minimum grade D- (30%) in the pre-requisite courses

### Short Semester

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<td>SKMM 2123**, SKMM 2223**, SKMM 2323**, SKMM 2423**</td>
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** Minimum grade D- (30%) in the pre-requisite courses

## Obtained minimum of 80 credits
### Semester VII

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<td>SKMM 4823</td>
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** Total 16

### Semester VIII

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** Total 16
ELECTIVE COURSES

Students may take up any four (4) of the following elective courses (for SKMX 4xx3) in any area of study subject to them being offered in the respective semesters.

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<td>SKMM 4113</td>
<td>Plasticity &amp; Application</td>
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<tr>
<td>SKMM 4123</td>
<td>Structural Analysis</td>
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<td>SKMM 4133</td>
<td>Failure of Engineering Components &amp; Structures</td>
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<td>SKMM 4143</td>
<td>Mechanics of Composite Materials</td>
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<td>SKMM 4153</td>
<td>Applied Stress Analysis</td>
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<td>SKMM 4163</td>
<td>Surface Mount Technology</td>
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<tr>
<td>SKMM 4213</td>
<td>Mechanical Vibration</td>
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<td>SKMM 4233</td>
<td>Mechanisms &amp; Linkage</td>
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<td>SKMM 4243</td>
<td>Advanced Control</td>
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<td>SKMM 4253</td>
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<td>SKMM 4273</td>
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<td>SKMM 4293</td>
<td>Noise</td>
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<td>SKMM 4313</td>
<td>Turbo-Machinery</td>
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<td>SKMM 4323</td>
<td>Fluid Power</td>
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<td>SKMM 4333</td>
<td>Computational Fluid Dynamics</td>
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<tr>
<td>SKMM 4343</td>
<td>Hydraulic Machine &amp; Pipe System</td>
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<td>SKMM 4353</td>
<td>Lubrications</td>
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<td>Internal Combustion Engine</td>
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<td>SKMM 4423</td>
<td>Power Plant Engineering</td>
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<td>SKMM 4433</td>
<td>Refrigeration &amp; Air Conditioning</td>
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<td>Thermal Fluid System Design</td>
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<td>Combustion</td>
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<td>Computer Aided Design</td>
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<td>Physical Metallurgy</td>
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<td>SKMB 4613</td>
<td>Corrosion &amp; Corrosion Control</td>
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<td>Materials Selection</td>
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<td>SKMB 4633</td>
<td>Mechanical Properties of Materials</td>
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<td>SKMB 4643</td>
<td>Materials Characterization</td>
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<td>SKMB 4653</td>
<td>Advanced Materials</td>
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<td>SKMB 4663</td>
<td>Materials Processing</td>
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<td>SKMP 4703</td>
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<td>SKMP 4733</td>
<td>Product Design &amp; Development</td>
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<td>Production Planning &amp; Control</td>
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<td>SKMI 4883</td>
<td>Operation Research</td>
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<td>SKMI 4893</td>
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dyna:Mech@UTM

dyna:Mech is an initiative by the Faculty of Mechanical Engineering UTM, which aims to strengthen the currently available Mechanical Engineering Programme, at the same time improving the employability and competitiveness of the graduates. dyna:Mech is the first of its kind in Malaysia; no other university in the country offers a dynamic Mechanical Engineering programme such as this.

While other University-Industry collaborations involve research funding and technology transfer, the Mechanical Engineering programme in UTM takes it one step further, allowing involvement of the industry in the curriculum. Our new initiative offers approximately 20 flexible credits which are based on the needs of the industry; some of which are taught by lecturers of the faculty, and others by experienced personnel from the industry. The courses offered under the dyna:Mech programme to Mechanical Engineering students will be categorised into clusters according to the skillset required by specific industries. Students will also experience industrial training with industries related to the respective cluster that they had chosen. Consequently, Mechanical Engineering students can experience the working world while they are still studying, and they will be trained specific skills according to the current needs of the industry. This dyna:Mech initiative provides industrial benefit through significantly reducing the period taken to train and prepare the young engineers.

This collaboration between the University and industry will help students in getting an early chance to identify employment opportunities, simultaneously providing industries with the opportunity to select excellent students before they even graduate. The Faculty of Mechanical Engineering at UTM will stop at nothing to ensure its program is always the best in Malaysia to produce outstanding engineers in the country.
BACHELOR OF ENGINEERING (MECHANICAL-MATERIALS)

PROGRAMME SPECIFICATIONS

1. Programme Name: Bachelor of Engineering (Mechanical - Materials)
2. Final Award: Bachelor of Engineering (Mechanical - Materials)
3. Awarding Institution: Universiti Teknologi Malaysia
4. Teaching Institution: Universiti Teknologi Malaysia
5. Professional or Statutory Body of Accreditation: Engineering Accreditation Council (EAC)
6. Language(s) of Instruction: Bahasa Melayu and English
7. Mode of Study: Conventional
8. Mode of operation: Self-govern
9. Study Scheme: Full Time
10. Study Duration: Minimum: 4 years, Maximum: 6 years
11. Entry Requirements: Matriculation/STPM/Diploma or equivalent
12. Programme Objectives (PEO)
   To produce graduates who are able to:
   v) Demonstrate their academic and technological excellence professionally and globally, particularly in areas related to mechanical engineering practices and contribute innovatively to the nation’s wealth creation.
   vi) Advance their careers by assuming increasing levels of responsibility, leadership and acquiring professional and advanced academic qualifications.
   vii) Recognize and practice professional, ethical, environmental and societal responsibilities and value different global and cultural aspects of their work and society.
   viii) Adapt and communicate effectively and be successful working with multi disciplinary teams.
13. Programme Learning Outcomes (PO)
   (a) Technical Knowledge and Competencies

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<tr>
<th>Intended Learning Outcomes</th>
<th>Teaching and Learning Methods</th>
<th>Assessment</th>
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<td>PO 1</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
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<td>PO 2</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
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<td>PO 3</td>
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<td>PO 4</td>
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<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
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<td>Intended Learning Outcomes</td>
<td>Teaching and Learning Methods</td>
<td>Assessment</td>
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<td>------------------------------------------------------------------------------------------</td>
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<tr>
<td>Ability to use modern engineering and information technology (IT) tools in complex mechanical and materials engineering activities, with an understanding of the limitations;</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
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<td>Keywords: <strong>Modern Tools Usage</strong></td>
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<tr>
<td>Ability to apply professional engineering practice related to societal, health, safety, legal and cultural issues with full responsibility and integrity;</td>
<td>Lectures, tutorials, seminars, group projects and industrial training.</td>
<td>Industrial training, and group project reports.</td>
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<td>Keywords: <strong>The Engineer and Society</strong></td>
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<tr>
<td>Ability to identify the impact of mechanical and materials engineering solutions on sustainability and demonstrate the needs for sustainable development in societal and environmental contexts.</td>
<td>Tutorials, laboratory works, group assignments and projects, final year project presentations and problem-based learning.</td>
<td>Group reports, learning logs/diaries and oral presentations.</td>
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<td>Keywords: <strong>Environment &amp; Sustainability</strong></td>
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<td>Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.</td>
<td>Lectures, tutorials, seminars, group projects and industrial training.</td>
<td>Industrial training, and group project reports.</td>
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<tr>
<td>Keywords: <strong>Ethics</strong></td>
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<tr>
<td>Ability to communicate effectively on complex mechanical and materials engineering activities both orally and in writing;</td>
<td>Seminars, assignments and final year projects.</td>
<td>Reports and theses</td>
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<td>Keywords: <strong>Communication</strong></td>
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<td>Ability to work productively as an individual, and as a member or leader in a team that may involve multi-disciplinary settings;</td>
<td>Lectures and project assignments.</td>
<td>Demonstrations, reports, tests, examinations and presentations.</td>
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<td>Keywords: <strong>Team Working:</strong></td>
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### 14. Classification of Courses

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<td>ii</td>
<td>Programme Electives</td>
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<td>iii</td>
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#### Classification of courses for engineering programme

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<td>A</td>
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<td>B</td>
<td>Non-Engineering</td>
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<td><strong>Total credit hours for Part B</strong></td>
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<td><strong>Total credit hours for Part A and B</strong></td>
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15. Total Credit Hours to Graduate 137
AREAS OF STUDY

For the first two years students will be exposed to the basic mechanical engineering courses. Subsequently, they will be introduced to materials engineering related courses covering the following areas:

a) **Physical Metallurgy**
   This course provides the physical basis linking the structure of materials with their properties. It describes the microstructure, transformation and properties of metallic materials using solid state physics and chemical thermodynamics. Understanding the link between materials structure and mechanical properties will be discussed through the use of the theory of crystallography.

b) **Mechanical Properties of Materials**
   This course provides understanding of the mechanical behavior of engineering materials (metals, ceramics, polymers and composites) and the types of materials failures encountered during service. Equipped with this understanding, materials engineers would be able to select suitable engineering materials for a particular product design.

c) **Materials Characterisation**
   In this course the main techniques used for analyzing and characterizing engineering materials for their structure will be discussed. Materials characterization provides understanding of the link between physical/chemical properties, structural features and processing of materials and is of great importance to successful product development and quality control.

d) **Advanced Materials**
   This course covers advances in structures, properties, processes and applications of engineering materials through advanced technology. Students will be exposed to the latest technological innovations of advanced materials, processes, processing techniques as well as areas of applications and use.

e) **Materials Processing**
   In addition to selecting a suitable engineering material for a given product design, the processing method by which the selected material will be fabricated is also of crucial importance to ensure that the final product conforms to the design specifications. This course introduces the various processing and fabrication techniques of engineering materials (metal, ceramic, polymer and composite).

f) **Corrosion and Corrosion Control**
   Corrosion is concerned with the degradation and failure over time of all engineering materials due to their exposure to various environments such as seawater, atmosphere and chemicals. Apart from the high cost of repair, the corroded structures may also endanger people’s safety and result in loss of life. This course will expose prospective materials engineers on the importance of understanding the principles and mechanisms of corrosion and methods to control corrosion.

g) **Materials Selection**
   Materials engineers are often required to undertake technical tasks such as predicting the expected service life of engineering components. They are also required to work with other engineers to design products or manufacturing processes. Materials selection covers all aspects related to the concepts and methods of selecting suitable material for a given mechanical design. The influence of elements such as cost, sustainability and environment on materials selection will also be discussed.
CAREER PROSPECTS

Graduates of this programme are essentially Mechanical Engineers but with specialization in Materials Engineering who can easily find job opportunities in various sectors. Alternatively, they can also be known as Materials Engineers depending on their job placements in industries they are in.

The career of a Materials Engineer calls for an individual with a good understanding of the basic knowledge in science and engineering of materials and able to relate the characteristics, structure, properties, processing and performance of materials in accordance with their use and demand and in conformance with the development in technology. Because any new product starts with materials, materials engineers work on the leading edge in many industries. In fact, a materials engineer is directly involved in the aspect of materials selection, quality control, component failure analysis and Research and Development (R & D) in new materials.

Every product to be produced from design to processing system will require materials which usually consist of metals, polymers, ceramics or composites. Hence, the role of a materials engineer will be crucial especially when it involves selection of suitable materials and processing. Career opportunities for graduates in this field are very wide including metal and non-metal manufacturing industry, quality control, research (R & D), consultancy and education.

Thus, the career in the field of Mechanical and Materials Engineering is wide open covering all sectors-public, statutory and private sector. This covers the automotive, manufacturing, processing, research and development, service and consultancy, petroleum and petrochemical industry, electronic and semi-conductor as well as the aerospace industry. In moving towards an industrialised nation, the role of a Materials Engineer will be very important especially in producing advanced material
# CURRICULUM

## FIRST YEAR

### Semester I

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
<th>L</th>
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<th>Credit</th>
<th>Pre-requisite</th>
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<td>SKMM 1912</td>
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**Total** 17

* Core courses - minimum passing grade is C (50%)

### Semester II

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<th>P/S</th>
<th>Credit</th>
<th>Pre-requisite</th>
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<tbody>
<tr>
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<td>Dynamics *</td>
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<td>SKMM 1203</td>
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<td>SKMM 1113</td>
<td>Mechanics of Solid I *</td>
<td>3</td>
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<td>SKMM 1203</td>
</tr>
<tr>
<td>SKMM 1512</td>
<td>Introduction to Design</td>
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<td>SKMM 1503</td>
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<td>SKMM 1013</td>
<td>Programming for Engineers</td>
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<td>Differential Equations</td>
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**Total** 16

* Core courses - minimum passing grade is C (50%)

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio
SECON D YEAR

Semester III

<table>
<thead>
<tr>
<th>Code</th>
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<td>SKMM 2313</td>
<td>Mechanics of Fluids I*</td>
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<td>Mechanics of Solids II*</td>
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<td>SKMM 2613</td>
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Total 17

* Core courses - minimum passing grade is C (50%)

#UHAS 1162 Arts, Customs and Beliefs of Malaysians (for international students only)

Semester IV

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<tr>
<th>Code</th>
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<td>SKMM 2323</td>
<td>Mechanics of Fluids II *</td>
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<td>SKMM 2223</td>
<td>Mechanics of Machines &amp; Vibration *</td>
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<td>SKMM 2433</td>
<td>Applied Thermodynamics and Heat Transfer *</td>
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<td>SKMM 2413</td>
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<tr>
<td>SKMM 2713</td>
<td>Manufacturing Processes</td>
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Total 17

* Core courses - minimum passing grade is C (50%)
## THIRD YEAR

### Semester V

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<tr>
<td>SKMM 3523</td>
<td>Component Design</td>
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<td>SKMM 2123**, SKMM 1512</td>
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<td>SKMM 3233</td>
<td>Control Engineering</td>
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<tr>
<td>SKMB 3612</td>
<td>Physical Metallurgy</td>
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<td>UICI 2022</td>
<td>Science, Technology and Mankind</td>
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<td>Uxxx xxx2</td>
<td>Humanities Dev or Globalisation Elective</td>
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** Total 16

** Minimum grade D- in the pre-requisite courses

#ULAM 1112 Malay Language for Communication (for international students only)

### Semester VI

<table>
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<tr>
<th>Code</th>
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<th>Pre-requisite</th>
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<td>Instrumentation</td>
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<td>SKEU 2012**</td>
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<td>SKMM 3023</td>
<td>Applied Numerical Methods</td>
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<td>SKMM 1013, SSCE 1793</td>
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<td>SKMB 3623</td>
<td>Mechanical Properties of Materials</td>
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<td>Materials Characterization</td>
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<td>SKMM 3941</td>
<td>Laboratory III</td>
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** Total 17

** Minimum grade D- in the pre-requisite courses

### Short Semester

<table>
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<tr>
<td>SKMM 3915</td>
<td>12 weeks Industrial Training</td>
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<td>##, SKMM 2123**, SKMM 2223**, SKMM 2323**, SKMM 2433**</td>
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** Total 5

** Minimum grade D- in the pre-requisite courses

## Obtained minimum of 80 credits
FOURTH YEAR

Semester VII

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<th>Pre-requisite</th>
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<tr>
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<td>Elective I</td>
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<td>SKMB 46x3</td>
<td>Elective II</td>
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<td>SKMM 4823</td>
<td>Engineering Management, Safety and Economics</td>
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<td>0</td>
<td>6</td>
<td>2</td>
<td>SKMM 2123**, SKMM 2433**, SKMM 2223**, SKMM 2323**</td>
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** Minimum grade D- (30%) in the pre-requisite courses

Semester VIII

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<td>SKMM 4533</td>
<td>System Design</td>
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<td>SKMB 46x3</td>
<td>Elective III</td>
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<td>Engineering Professional Practice</td>
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<td>Innovation and Creativity Elective</td>
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** Minimum grade D- in the pre-requisite courses

ELECTIVE COURSES

Students may take any THREE (3) of the following elective courses subject to then being offered in the respective semester

- SKMB 4013  Modern Materials
- SKMB 4023  Non Destructive Testing
- SKMB 4623  Materials Selection
- SKMB 4663  Materials Processing
- SKMB 4673  Surface Engineering
- SKMB 4683  Nano Materials
- SKMB 4693  Modelling in Materials Engineering
BACHELOR OF ENGINEERING (MECHANICAL-INDUSTRIAL)  
PROGRAMME SPECIFICATIONS

1. Programme Name: Bachelor of Engineering (Mechanical – Industrial)

2. Final Award: Bachelor of Engineering (Mechanical – Industrial)

3. Awarding Institution: Universiti Teknologi Malaysia

4. Teaching Institution: Universiti Teknologi Malaysia

5. Professional or Statutory Body of Accreditation: Engineering Accreditation Council (EAC)

6. Language(s) of Instruction: Bahasa Melayu and English

7. Mode of Study (Conventional, distance learning, etc.): Conventional

8. Mode of operation (Franchise, self-govern, etc.): Self-govern

9. Study Scheme (Full Time/Part Time): Full Time

10. Study Duration: Minimum: 4 years, Maximum: 6 years

<table>
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<tr>
<th>Type of Semester</th>
<th>No. of Semesters</th>
<th>No. of Weeks/Semester</th>
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<td>14</td>
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<tr>
<td>Short</td>
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</tbody>
</table>

11. Entry Requirements: Matriculation/STPM/Diploma or equivalent

12. Programme Objectives (PEO)
To produce graduates who are able to:
   i) Demonstrate their academic and technological excellence professionally and globally, particularly in areas related to mechanical engineering practices and contribute innovatively to the nation’s wealth creation.
   ii) Advance their careers by assuming increasing levels of responsibility, leadership and acquiring professional and advanced academic qualifications.
   iii) Recognize and practice professional, ethical, environmental and societal responsibilities and value different global and cultural aspects of their work and society.
   iv) Adapt and communicate effectively and be successful working with multi disciplinary teams.

13. Programme Learning Outcomes (PO)
   (a) Technical Knowledge and Competencies

<table>
<thead>
<tr>
<th>Intended Learning Outcomes</th>
<th>Teaching and Learning Methods</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO 1</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
</tr>
<tr>
<td>Ability to acquire and apply fundamental knowledge of mathematics, science and engineering principles to solve complex mechanical and industrial engineering problems; Keywords: Engineering Knowledge</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
</tr>
<tr>
<td>PO 2</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
</tr>
<tr>
<td>Ability to identify, formulate and analyse complex mechanical and industrial engineering problems; Keywords: Problem Analysis</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
</tr>
<tr>
<td>PO 3</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
</tr>
<tr>
<td>Ability to design solutions for complex mechanical and industrial engineering problems that fulfil health, safety, societal, cultural and environmental needs; Keywords: Design/Development of solutions</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
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<tr>
<td>PO 4</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year project</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
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</table>
### (b) Generic Skills

<table>
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<th>Teaching and Learning Methods</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PO 5</strong> Ability to use modern engineering and information technology (IT) tools in complex mechanical and industrial engineering activities, with an understanding of the limitations; Keywords: Modern Tools Usage</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
</tr>
<tr>
<td><strong>PO 6</strong> Ability to apply professional engineering practice related to societal, health, safety, legal and cultural issues with full responsibility and integrity.; Keywords: The Engineer and Society</td>
<td>Lectures, tutorials, seminars, group projects and industrial training.</td>
<td>Industrial training, and group project reports.</td>
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<tr>
<td><strong>PO 7</strong> Ability to identify the impact of mechanical engineering and industrial solutions on sustainability and demonstrate the needs for sustainable development in societal and environmental contexts. Keywords: Environment &amp; Sustainability</td>
<td>Tutorials, laboratory works, group assignments and projects, final year project presentations and problem-based learning.</td>
<td>Group reports, learning logs/diaries and oral presentations.</td>
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<tr>
<td><strong>PO 8</strong> Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. Keywords: Ethics</td>
<td>Lectures, tutorials, seminars, group projects and industrial training.</td>
<td>Industrial training, and group project reports.</td>
</tr>
<tr>
<td><strong>PO 9</strong> Ability to communicate effectively on complex mechanical and industrial engineering activities both orally and in writing; Keywords: Communication</td>
<td>Seminars, assignments and final year projects.</td>
<td>Reports and theses</td>
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<tr>
<td><strong>PO 10</strong> Ability to work productively as an individual, and as a member or leader in a team that may involve multi-disciplinary settings; Keywords: Team Working</td>
<td>Lectures and project assignments.</td>
<td>Demonstrations, reports, tests, examinations and presentations.</td>
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14. Classification of Courses

<table>
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<th>No.</th>
<th>Classification</th>
<th>Credit Hours</th>
<th>Percentage</th>
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<td>66</td>
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<td>ii</td>
<td>Programme Electives</td>
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<td>19</td>
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<tr>
<td>iii</td>
<td>Compulsory University Subject</td>
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Classification of courses for engineering programme

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<td>B</td>
<td>Non-Engineering</td>
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<td>Total credit hours for Part B</td>
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<td>Total credit hours for Part A and B</td>
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15. Total Credit Hours to Graduate

137
## CURRICULUM

### FIRST YEAR

#### Semester I

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<th>Code</th>
<th>Course</th>
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<th>Credit</th>
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**Total 16**

* Core courses - minimum passing grade is C (50%)

#### Semester II

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<td>Experimental Methods</td>
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**Total 17**

* Core courses - minimum passing grade is C (50%)

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio
# SECOND YEAR

## Semester III

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
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<th>Pre-requisite</th>
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<tr>
<td>SKMM 2313</td>
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<td>Mechanics of Solids II*</td>
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<td>Mechanics of Machines &amp; Vibration*</td>
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<td>Thermodynamics *</td>
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Total: 17

* Core courses - minimum passing grade is C (50%)

---

## Semester IV

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Total: 17

* Core courses - minimum passing grade is C (50%)

---

#UHAS 1162 Arts, Customs and Beliefs of Malaysians (for international students only)
THIRD YEAR

Semester V

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<tr>
<th>Code</th>
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Total 17

** Minimum grade D- in the pre-requisite courses

#ULAM 1112 Malay Language for Communication (for international students only)

Semester VI

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Total 16

** Minimum grade D- in the pre-requisite courses

Short Semester

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<tr>
<td>SKMM 3915</td>
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<td>#, SKMM 2123**, SKMM 2223**, SKMM 2323**, SKMM 2433**</td>
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Total 5

** Minimum grade D- in the pre-requisite courses

## Obtained minimum of 80 credits
**FOURTH YEAR**

**Semester VII**

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<tr>
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<td>SKMM 2123**, SKMM 2433**, SKMM 2223**, SKMM 2323**</td>
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<tr>
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**Total 16**

**Semester VIII**

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<td>Innov &amp; Creativity Elective</td>
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**Total 16**

**ELECTIVE COURSES**

Students may take THREE (3) of the following courses subject to then being offered in the respective semester.

- SKMI 4063  Ergonomics and Occupational Safety
- SKMI 4073  Industrial Systems Simulation
- SKMI 4083  Reliability and Maintenance
- SKMI 4093  Supply Chain Management and Sustainability
- SKMI 4813  Quality Engineering
- SKMI 4833  Facility Design
# BACHELOR OF ENGINEERING (MECHANICAL-MANUFACTURING)

## PROGRAMME SPECIFICATIONS

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<td>1.</td>
<td>Programme Name</td>
<td>Bachelor of Engineering (Mechanical – Manufacturing)</td>
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<td>2.</td>
<td>Final Award</td>
<td>Bachelor of Engineering (Mechanical – Manufacturing)</td>
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<td>3.</td>
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<td>Universiti Teknologi Malaysia</td>
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<td>4.</td>
<td>Teaching Institution</td>
<td>Universiti Teknologi Malaysia</td>
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<td>5.</td>
<td>Professional or Statutory Body of Accreditation</td>
<td>Engineering Accreditation Council (EAC)</td>
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<td>6.</td>
<td>Language(s) of Instruction</td>
<td>Bahasa Melayu and English</td>
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<td>7.</td>
<td>Mode of Study (Conventional, distance learning, etc.)</td>
<td>Conventional</td>
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<td>8.</td>
<td>Mode of operation (Franchise, self-govern, etc.)</td>
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<td>9.</td>
<td>Study Scheme (Full Time/Part Time)</td>
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<td>Study Duration</td>
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<td>No. of Semesters</td>
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<td>No. of Weeks/Semester</td>
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<td>11.</td>
<td>Entry Requirements</td>
<td>Matriculation/STPM/Diploma or equivalent</td>
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<td>12.</td>
<td>Programme Objectives (PEO)</td>
<td>To produce graduates who are able to:</td>
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<tr>
<td></td>
<td></td>
<td>i) Demonstrate their academic and technological excellence professionally and globally, particularly in areas related to mechanical engineering practices and contribute innovatively to the nation’s wealth creation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii) Advance their careers by assuming increasing levels of responsibility, leadership and acquiring professional and advanced academic qualifications.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>iii) Recognize and practice professional, ethical, environmental and societal responsibilities and value different global and cultural aspects of their work and society.</td>
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<td></td>
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<td>iv) Adapt and communicate effectively and be successful working with multi disciplinary teams.</td>
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<tr>
<td>13.</td>
<td>Programme Learning Outcomes (PO)</td>
<td>(a) Technical Knowledge and Competencies</td>
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<td></td>
<td>Teaching and Learning Methods</td>
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<td></td>
<td></td>
<td>Assessment</td>
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<tr>
<td></td>
<td>Ability to acquire and apply fundamental knowledge of mathematics, science and engineering principles to solve complex mechanical and manufacturing engineering problems;</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
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<tr>
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<td>Keywords: Engineering Knowledge</td>
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<tr>
<td></td>
<td>Ability to identify, formulate and analyse complex mechanical and manufacturing engineering problems;</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
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<td>Keywords: Problem Analysis</td>
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<td></td>
<td>Ability to design solutions for complex mechanical and manufacturing engineering problems that fulfil health, safety, societal, cultural and environmental needs;</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
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### (b) Generic Skills

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<th>Teaching and Learning Methods</th>
<th>Assessment</th>
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<tr>
<td>Ability to investigate complex mechanical and manufacturing engineering problems using research-based knowledge and methods to produce conclusive results; Keywords: <strong>Modern Tools Usage</strong></td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
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<tr>
<td><strong>PO 5</strong></td>
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<tr>
<td>Ability to use modern engineering and information technology (IT) tools in complex mechanical and manufacturing engineering activities, with an understanding of the limitations; Keywords: <strong>The Engineer and Society</strong></td>
<td>Lectures, tutorials, seminars, group projects and industrial training.</td>
<td>Industrial training, and group project reports.</td>
</tr>
<tr>
<td><strong>PO 6</strong></td>
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<tr>
<td>Ability to apply professional engineering practice related to societal, health, safety, legal and cultural issues with full responsibility and integrity; Keywords: <strong>Environment &amp; Sustainability</strong></td>
<td>Tutorials, laboratory works, group assignments and projects, final year project presentations and problem-based learning.</td>
<td>Group reports, learning logs/diaries and oral presentations.</td>
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<tr>
<td><strong>PO 7</strong></td>
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<tr>
<td>Ability to identify the impact of mechanical and manufacturing engineering solutions on sustainability and demonstrate the needs for sustainable development in societal and environmental contexts. Keywords: <strong>Ethics</strong></td>
<td>Lectures, tutorials, seminars, group projects and industrial training.</td>
<td>Industrial training, and group project reports.</td>
</tr>
<tr>
<td><strong>PO 8</strong></td>
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<tr>
<td>Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. Keywords: <strong>Communication</strong></td>
<td>Seminars, assignments and final year projects.</td>
<td>Reports and theses</td>
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</table>
PO 10
Ability to work productively as an individual, and as a member or leader in a team that may involve multi-disciplinary settings;
Keywords: **Team Working**

Lectures and project assignments. Demonstrations, reports, tests, examinations and presentations.

PO 11
Ability to undertake life long learning and manage information including conducting literature study;
Keywords: **Life Long Learning**

Lectures and project assignments. Demonstrations, reports, tests, examinations and presentations.

PO 12
Ability to demonstrate and apply knowledge on finance and management principles and acquire entrepreneurship skill ;
Keywords: **Project Management, Finance & Entrepreneurship**

Lectures and project assignments. Demonstrations, reports, tests, examinations and presentations.

### 14. Classification of Courses

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<th>Credit Hours</th>
<th>Percentage</th>
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<td>ii</td>
<td>Programme Electives</td>
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<td>iii</td>
<td>Compulsory University Subject</td>
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<td><strong>Total</strong></td>
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**Classification of courses for engineering programme**

|     | Engineering Courses                    | 117          | 85         |
| A   | **Total credit hours for Part A**      | **117**      | **85**     |
| B   | Non-Engineering                        | 20           | 15         |
|     | **Total credit hours for Part B**      | **20**       | **15**     |
|     | **Total credit hours for Part A and B**| **137**      | **100**    |

**15. Total Credit Hours to Graduate** 137
## CURRICULUM

### FIRST YEAR

#### Semester I

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
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* Core courses - minimum passing grade is C (50%)

**Total** 16

#### Semester II

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<td>Mechanics of Solids I *</td>
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* Core courses - minimum passing grade is C (50%)

**Total** 17

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio
### SECOND YEAR

#### Semester III

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<tr>
<th>Code</th>
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<td>SKMM 2313</td>
<td>Mechanics of Fluids I *</td>
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<td>SKMM 1203</td>
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<td>SKMM 2123</td>
<td>Mechanics of Solids II *</td>
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<td>SKMM 2921</td>
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* Core courses - minimum passing grade is C (50%)

**Total 17**

#### Semester IV

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* Core courses - minimum passing grade is C (50%)

**Total 17**

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*UHAS 1162 Arts, Customs and Beliefs of Malaysians (for international students only)*
## THIRD YEAR

### Semester V

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<tr>
<th>Code</th>
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<td>SKMM 1213**, SSCE 1693**</td>
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<td>Humanities Develop/Globalisation</td>
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** Minimum grade D- in the pre-requisite courses

### Semester VI

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<td>SKMM 3023</td>
<td>Applied Numerical Methods</td>
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** Minimum grade D- in the pre-requisite courses

### Short semester

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** Minimum grade D- in the pre-requisite courses

## Minimum grade D- in the pre-requisite courses

** Obtained minimum of 80 credits
**FOURTH YEAR**

**Semester VII**

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<td>SKMM 2123**, SKMM 2433**,</td>
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<td>SKMM 2223**, SKMM 2323**</td>
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**Semester VIII**

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<td>Innov &amp; Creativity Elective</td>
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**ELECTIVE COURSES**

Students may take THREE( 3) of the following courses subject to then being offered in the respective semester.

- SKMP 4013 Additive Manufacturing
- SKMP 4703 Sustainable Manufacturing
- SKMP 4713 Industrial Automation
- SKMP 4733 Product Design & Development
- SKMP 4743 Plastic Technology
- SKMP 4753 Modern Machining
- SKMP 4763 Quality Engineering & Metrology
- SKMP 4773 Engineering Economy & Accounting
- SKMP 4783 Quality Engineering
- SKMP 4793 CAD/CAM
- SKMP 4833 Project Management & Maintenance
BACHELOR OF ENGINEERING (MECHANICAL – AERONAUTICS)  
PROGRAMME SPECIFICATIONS

<table>
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<tr>
<th>No.</th>
<th>Programme Name</th>
<th>Bachelor of Engineering (Mechanical – Aeronautics)</th>
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<td>Bachelor of Engineering (Mechanical – Aeronautics)</td>
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<td>4.</td>
<td>Teaching Institution</td>
<td>Universiti Teknologi Malaysia</td>
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<td>5.</td>
<td>Professional or Statutory Body of Accreditation</td>
<td>Engineering Accreditation Council (EAC)</td>
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<td>Language(s) of Instruction</td>
<td>Bahasa Melayu and English</td>
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<td>7.</td>
<td>Mode of Study (Conventional, distance learning, etc.)</td>
<td>Conventional</td>
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<tr>
<td>8.</td>
<td>Mode of operation (Franchise, self-govern, etc.)</td>
<td>Self-govern</td>
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<tr>
<td>9.</td>
<td>Study Scheme (Full Time/Part Time)</td>
<td>Full Time</td>
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</table>
| 10. | Study Duration | Minimum 4 years  
Maximum 6 years |
| Type of Semester | No. of Semesters | No. of Weeks/Semester |
| Normal | 8 | 14 |
| Short  | 2 | 8 |
| 11. | Entry Requirements | Matriculation/STPM/Diploma or equivalent |
| 12. | Programme Objectives (PEO) | To produce graduates who are able to: |
|     |     | i) Demonstrate their academic and technological excellence professionally and globally, particularly in areas related to mechanical and aeronautical engineering practices and contribute innovatively to the nation’s wealth creation. |
|     |     | ii) Advance their careers by assuming increasing levels of responsibility, leadership and acquiring professional and advanced academic qualifications. |
|     |     | iii) Recognize and practice professional, ethical, environmental and societal responsibilities and value different global and cultural aspects of their work and society. |
|     |     | iv) Adapt and communicate effectively and be successful working with multi-disciplinary teams. |
| 13. | Programme Learning Outcomes (PO) | (a) Technical Knowledge and Competencies |
|     |     | Intended Learning Outcomes | Teaching and Learning Methods | Assessment |
|      | PO 1 | Ability to acquire and apply fundamental knowledge of mathematics, science and engineering principles to solve complex mechanical and aeronautical engineering problems; Keywords: **Engineering Knowledge** | Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning. | Examinations, laboratory reports, presentations, problem-based exercises, individual and group project reports. |
|      | PO 2 | Ability to identify, formulate and analyse complex mechanical and aeronautical engineering problems; Keywords: **Problem Analysis** | Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning. | Examinations, laboratory reports, presentations, problem-based exercises, individual and group project reports. |
|      | PO 3 | Ability to design solutions for complex mechanical and aeronautical engineering problems that fulfil health, safety, societal, cultural and environmental needs; Keywords: **Design/Development of solutions** | Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning. | Examinations, laboratory reports, presentations, problem-based exercises, individual and group project reports. |
### PO 4
Ability to investigate complex mechanical and aeronautical engineering problems using research-based knowledge and methods to produce conclusive results;
Keywords: Investigation

| Lectures, tutorials, seminars, laboratory works, studio works, directed reading, final year projects and problem-based |
| Examinations, laboratory reports, presentations, problem-based exercises, individual and group project reports. |

### (b) Generic Skills

<table>
<thead>
<tr>
<th>Intended Learning Outcomes</th>
<th>Teaching and Learning Methods</th>
<th>Assessment</th>
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<tr>
<td>Ability to use modern engineering and information technology (IT) tools in complex mechanical and aeronautical engineering activities, with an understanding of the limitations; Keywords: Modern Tools Usage</td>
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<tr>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
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<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
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</tbody>
</table>

| Ability to apply professional engineering practice related to societal, health, safety, legal and cultural issues with full responsibility and integrity; Keywords: The Engineer and Society |
| Lectures, tutorials, seminars, group projects and industrial training. |
| Industrial training, and group project reports. |

| Ability to identify the impact of mechanical and aeronautical engineering solutions on sustainability and demonstrate the needs for sustainable development in societal and environmental contexts. Keywords: Environment & Sustainability |
| Tutorials, laboratory works, group assignments and projects, final year project presentations and problem-based learning. |
| Group reports, learning logs/diaries and oral presentations. |

| Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. Keywords: Ethics |
| Lectures, tutorials, seminars, group projects and industrial training. |
| Industrial training, and group project reports. |

| Ability to communicate effectively on complex mechanical and aeronautical engineering activities both orally and in writing; Keywords: Communication |
| Seminars, assignments and final year projects. |
| Reports and theses |

| Ability to work productively as an individual, and as a member or leader in a team that may involve multi-disciplinary settings; Keywords: Team Working |
| Lectures and project assignments. |
| Demonstrations, reports, tests, examinations and presentations. |
14. Classification of Courses

<table>
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<th>Credit Hours</th>
<th>Percentage</th>
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<td>ii.</td>
<td>Programme Electives</td>
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<td>iii.</td>
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Classification of courses for engineering programme

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15. Total Credit Hours to Graduate

137
AREAS OF STUDY

Aeronautical engineering encompasses all aspects of studies related to flying. In this aspects, flying includes aerospace flight. The areas of specialisation in Aeronautical Engineering can be divided into the following:-

a) Aerodynamics
   Aerodynamics is the relationship between air (wind) and the material (solid) that moves in it. Various principles of Fluid Mechanics are considered in a flying problem. For example, aerodynamic study will determine a suitable shape for an aircraft, missile etc.

b) Structure
   This area will determine the integrity (strength) of a flying body such as an aircraft or a missile. Using dimensions and tolerances, strength of material, shear flow and theory of thin plate, the structure of an aircraft can be determined.

c) Propulsion
   Propulsion is a study of an aircraft power plant. This study includes design and selection of appropriate power plant for a particular aircraft. This field has developed vastly since the increase in the cost of petroleum. Engineers have been competing to invent lighter and more economic power plants.

d) Aircraft instrumentation and Avionics
   Avionics is the acronym for ‘Aviation Electronics’ and together with aircraft instrumentation they involve a wide range of studies. Flying has been facilitated by the use of various electronic devices. Electronic devices which facilitate flying such as radars ILS (Instrument Landing System) ADF (Automatic Direction Finder) etc were specifically invented by the Avionic/Aircraft Instrument Engineer. The Avionic/Aircraft Instrument Engineer will have to ensure that the instrument fitted on an aircraft will function satisfactorily together with a high degree of reliability.

e) Management
   The aircraft industry has expanded tremendously during this decade. The industry requires experts to manage and administer its operation smoothly. Regulations concerning the construction and operations of aircraft have been so devised in order to avoid accidents and mistakes which may sacrifice lives.

f) Transportation
   Apart from transporting passengers an aircraft is also used as cargo carriers, ambulance etc. Study in this area trains transportation experts to modify flight schedule and load so that the aircraft can be used economically.

g) Flight Regulations
   To avoid accidents the flying fraternity has formulated special laws for flying. Briefly the laws are divided into two, namely military flight regulations and public flight regulations.

h) Materials for Aircraft
   This field focuses its study on selecting and determining metals, plastic, composites, etc. which are suitable for building an aircraft, rocket etc.

i) Flight Mechanics
   Flight mechanics is an important aspect in the design and operation of an aircraft flight mission. Research area include aircraft performance (take-off, climbing, cruising, decent and landing) and aircraft static stability and control in steady flight condition.

j) Flight Dynamics and Control
   The area is about the dynamics behavior of rigid body aircraft and the application of control system theory to design simple stability augmentation systems to more complex automatic flight control systems. This includes the application of modern multivariable control system design using state-space methods. The area include, equation of motion of rigid body including translation aircraft longitudinal and lateral dynamic stability, flying and handling qualities, stability augmentation and automatic flight control system, aerodynamics stability derivatives and multivariable state-space methods.
CAREER PROSPECTS

Graduates of this programmes are essentially Mechanical Engineers but with specialisation to Aeronautical Engineering who can easily find job opportunities in various sectors. Alternatively, they can also be known as Aeronautical Engineers depending on their job placements in industries they are in.

The Aeronautical Engineering programme was first offered by UTM during the 1980/81 session, being jointly run by UTM and TUDM. Its objective was to fulfil the need for skilled and semi-skilled human resources in the aeronautical field especially in the public sector. TUDM required human resources to operate, maintain, repair, oversee and manage different types of aircraft and UTM had the capability to produce graduates in this field. This need has continued to increase with the development in the airline industry in Malaysia which demands for more trained manpower especially engineers and technical assistants.

The Aeronautical Engineering programme at UTM is offered as a specialisation of Mechanical Engineering and covers five main areas namely Aerodynamics, Aircraft Structure, Flight Dynamics and Control, Propulsion and Aircraft Design. Thus, graduates of this programme satisfy the requirement to graduate as an engineer in Mechanical Engineering as well as in the field of specialisation in aeronautics. Apart from TUDM, the Civil Aviation Department requires trained manpower to supervise flying activities in Malaysia. Other organisations that require graduates in the field of aeronautics include Malaysia Airline System, Air Asia, AIROD, Eagle Aircraft, SME Aviation, Malaysia Helicopter Services (MHS), TLDM and PDRM Air Unit. Several other firms also have working opportunities in the airline industry.

In the field of academic and research opportunity is available for Aeronautical Engineers to serve in any institution that runs courses and research in the field of Aeronautics. Several other universities and institutions in Malaysia have started to offer programme in the field of Aeronautics too. Due to the rapid expansion in the airline industry, many airline companies, flying clubs and firms are prepared to get involved actively in the airline industry of the country by offering more job opportunities to UTM graduates.
### CURRICULUM

**FIRST YEAR**

#### Semester I

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* Core courses - minimum passing grade is C (50%)

#### Semester II

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* Core courses - minimum passing grade is C (50%)

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio
### SECOND YEAR

#### Semester III

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* Core courses - minimum passing grade is C (50%)

#UHAS 1162 Arts, Customs and Beliefs of Malaysians (for international students only)

#### Semester IV

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* Core courses - minimum passing grade is C (50%)
### THIRD YEAR

#### Semester V

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** Minimum grade D- (30%) in the prerequisite courses

#ULAM 1112 Malay Language for Communication (for international students only)

#### Semester VI

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** Minimum grade D- (30%) in the prerequisite courses

** Minimum grade D- (30%) in the prerequisite courses

## Obtained minimum of 80 credits
## Semester VII

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** Minimum grade D- (30%) in the pre-requisite courses

## Semester VIII

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1. Programme Name  Bachelor of Engineering (Mechanical – Automotive)

2. Final Award  Bachelor of Engineering (Mechanical – Automotive)

3. Awarding Institution  Universiti Teknologi Malaysia

4. Teaching Institution  Universiti Teknologi Malaysia

5. Professional or Statutory Body of Accreditation  Engineering Accreditation Council (EAC)

6. Language(s) of Instruction  Bahasa Melayu and English

7. Mode of Study (Conventional distance learning, etc.)  Conventional

8. Mode of operation (Franchise self-govern, etc.)  Self-govern

9. Study Scheme (Full Time/Part Time)  Full Time

10. Study Duration  Minimum 4 years  Maximum 6 years

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<th>No. of Weeks/Semester</th>
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11. Entry Requirements  Matriculation/STPM/Diploma or equivalent

12. Programme Objectives (PEO)
   To produce graduates who are able to:
   i) Demonstrate their academic and technological excellence professionally and globally, particularly in areas related to mechanical-automotive engineering practices and contribute innovatively to the nation’s wealth creation.
   ii) Advance their careers by assuming increasing levels of responsibility, leadership and acquiring professional and advanced academic qualifications.
   iii) Recognize and practice professional, ethical, environmental and societal responsibilities and value different global and cultural aspects of their work and society.
   iv) Adapt and communicate effectively and be successful working with multi-disciplinary teams.

13. Programme Learning Outcomes (PO)
   (a) Technical Knowledge and Competencies

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<tr>
<th>Intended Learning Outcomes</th>
<th>Teaching and Learning Methods</th>
<th>Assessment</th>
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<tr>
<td>PO 1  Ability to acquire and apply fundamental knowledge of mathematics, science and engineering principles to solve complex mechanical and automotive engineering problems; Keywords: Engineering Knowledge</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, presentations, problem-based exercises, individual and group project reports.</td>
</tr>
<tr>
<td>PO 2  Ability to identify, formulate and analyse complex mechanical and automotive engineering problems; Keywords: Problem Analysis</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, presentations, problem-based exercises, individual and group project reports.</td>
</tr>
<tr>
<td>PO 3  Ability to design solutions for complex mechanical and automotive engineering problems that fulfil health, safety, societal, cultural and environmental needs; Keywords: Design/Development of solutions</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, presentations, problem-based exercises, individual and group project reports.</td>
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</table>
### Programme Learning Outcomes (PO)

1. Ability to design solutions for mechanical and automotive engineering problems using research-based knowledge and methods to produce conclusive results; **Keywords: Investigation**
2. Ability to identify, formulate and analyse complex mechanical and automotive engineering activities, with an understanding of the limitations; **Keywords: Modern Tools Usage**
3. Ability to acquire and apply fundamental knowledge of mathematics, science and engineering principles to solve complex engineering problems; **Keywords: Investigation**
4. Ability to undertake life long learning and manage information including directed reading, final year projects and problem-based learning. **Keywords: Investigation**
5. Ability to communicate effectively on engineering solutions on complex mechanical and automotive engineering activities both orally and in writing; **Keywords: Communication**
6. Ability to identify the impact of mechanical and automotive engineering solutions on sustainability and demonstrate the needs for sustainable development in societal and environmental contexts. **Keywords: Environment & Sustainability**
7. Ability to demonstrate and apply technical knowledge and methods to produce conclusive results; **Keywords: Investigation**
8. Ability to use modern engineering and information technology (IT) tools in complex mechanical and automotive engineering activities, with an understanding of the limitations; **Keywords: Modern Tools Usage**
9. Ability to apply professional engineering practice related to societal, health, safety, legal and cultural issues with full responsibility and integrity; **Keywords: The Engineer and Society**
10. Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. **Keywords: Ethics**
11. Ability to recognize and practice professional, ethical, environmental and societal responsibilities and value different global and cultural aspects of their work and society. **Keywords: Environment & Sustainability**
12. Ability to adapt and communicate effectively and be successful working with multi-disciplinary teams. **Keywords: Communication**

### (b) Generic Skills

#### Intended Learning Outcomes

<table>
<thead>
<tr>
<th>PO</th>
<th>Teaching and Learning Methods</th>
<th>Assessment</th>
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<tr>
<td>PO 4</td>
<td>Lectures, tutorials, seminar, laboratory works, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, presentations, problem-based exercises, individual and group project reports.</td>
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<td>PO 5</td>
<td>Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.</td>
<td>Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.</td>
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<td>PO 6</td>
<td>Lectures, tutorials, seminars, group projects and industrial training.</td>
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<td>PO 7</td>
<td>Tutorials, laboratory works, group assignments and projects, final year project presentations and problem-based learning.</td>
<td>Group reports, learning logs/diaries and oral presentations.</td>
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<td>PO 8</td>
<td>Lectures, tutorials, seminars, group projects and industrial training.</td>
<td>Industrial training, and group project reports.</td>
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<td>PO 9</td>
<td>Seminars, assignments and final year projects.</td>
<td>Reports and theses</td>
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<tr>
<td>PO 10</td>
<td>Lectures and project assignments.</td>
<td>Demonstrations, reports, tests, examinations and presentations.</td>
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14. Classification of Courses

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<td>ii</td>
<td>Programme Electives</td>
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Classification of courses for engineering programme

|     | Engineering Courses                    | 117          |
| A   | Total credit hours for Part A          | 117          |
| B   | Non-Engineering                        | 20           |
|     | Total credit hours for Part B          | 20           |
|     | **Total credit hours for Part A and B**| **137**      | **100**    |

15. Total Credit Hours to Graduate

|     |                                           | 137          |
AREAS OF STUDY

Students pursuing minor specialization in automotive will take about 10 automotive related courses in 3rd and 4th year of the programme. The area of minor specialization will cover the following:

a) **Automotive Technology**
   This area of study covers the fundamental technical know-how of the main system and subsystems that constitute a car; such as the internal combustion engine (ICE), transmission chassis and its electrical and electronics instrumentation system.

b) **Vehicle Structures**
   Vehicle structure covers the constructions, classifications and design of the vehicle chassis taking into consideration its load path that will affect its structural rigidity with regards to bending, torsion and lateral loading.

c) **Vehicle Dynamics**
   Vehicle dynamics covers the fundamental concepts of vehicle dynamics that takes into consideration the ride and comfort, handling, kinematics and kinetics behaviours of its essentials systems and subsystems.

d) **Vehicle Powertrain**
   Vehicle powertrain covers the engineering aspects of the vehicle power plant (dominantly the internal combustion engines) and transmissions (sometimes called as drivetrain). A part from that, it covers the integration of drivetrain with the power plant to predict the essentials vehicle performances such as its top speed, acceleration, gradeability and fuel consumptions.

e) **Automotive Electrical & Instrumentation System**
   This area of study introduces and explains the fundamental behaviours and characteristics of the essentials electrical and electronics related systems in a vehicle. Some general electrical system diagnosis methods also will be exposed.

f) **Automotive Production Technology**
   Automotive production covers the fundamental aspects of automotive production processes with emphasis on casting, forming and its’ challenging issues such as Quality Lean Manufacturing and Automation.

g) **Automotive Engineering Design**
   This area exposes students to automotive related engineering design activities; where real design group project is to be undertaken in group that requires creativity, commitment, leadership and good public relation. Some quality design tools such as QFD, DFM and DFA will be highlighted.

h) **Engine Turbocharging**
   Engine turbocharging is a field to improve the engine performance and increase its efficiency. This study includes analysis and evaluation of the parameters for turbocharger and supercharger engines. The study will determine the correct specifications of turbocharger-engine matching to achieve better engine performance.

i) **Internal Combustion Engine**
   This area of study covers the fundamental and applications of internal combustion engines, focusing mainly on transportation. Projects in this field can vary from intake system configuration to combustion study and exhaust energy recovery. The projects broadly aim for higher efficiency, lower fuel consumption and lower exhaust emissions, through experimental and simulation investigations.
CAREER PROSPECTS

Graduates of this programme are essentially Mechanical Engineers with minor specialisation in Automotive Engineering who can easily find job opportunities in various mechanical and automotive sectors. Alternatively, they can also be known as Automotive Engineers depending on their job placements in industries they are in.

Mechanical-Automotive Engineers graduated from UTM will be able to perform job requirements in the field of research, design, development and production of various types of vehicles. In most cases they will be working in the design and production of automotive components systems and sub-systems. In performing their duty they will make use of the knowledge learnt during their studies at UTM such as those mentioned earlier. A Mechanical-Automotive Engineer will always perform design or production work in accordance to quality assurance practice to fulfill the requirements of standards performance and safety.

Apart from passenger vehicles, Mechanical-Automotive graduates would also be able to find careers in the commercial vehicle industry or/off-road vehicles and even locomotives with companies such as MASTER BUILDERS, MALAYSIAN TRUCKS & BUS. Furthermore, the advancement of motor-racing in Malaysia such as Formula 1 and MotoGP have created the need for technical expertise to support the industry; this is another exciting industry in which Mechanical-Automotive graduates can develop their career. Malaysia has been producing cars for the past 20 over years with the growth of companies such as PROTON, PERODUA, MODENAS and HICOM. The rapid growth in the automotive industry which includes component manufacturing companies as well provides many job opportunities for Mechanical-Automotive graduates and consequently, to advance their career.

UTM Mechanical-Automotive graduates are also fully capable to take up position and advance their career with international car manufacturers either locally or overseas based. In short, UTM Mechanical-Automotive graduates have wide career opportunities as they are well trained to become competent engineers and managers especially, in the field of Mechanical-Automotive Engineering.
## CURRICULUM

### FIRST YEAR

#### Semester I

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* Core courses - minimum passing grade is C (50%)

#### Semester II

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* Core courses - minimum passing grade is C (50%)

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio
### SECOND YEAR

#### Semester III

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<th>Code</th>
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**Total** 17

* Core courses - minimum passing grade is C (50%)

# UHAS 1162 Arts, Customs and Beliefs of Malaysians (for international students only)

#### Semester IV

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**Total** 17

* Core courses - minimum passing grade is C (50%)
### Semester V

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** Minimum grade D- (30%) in the pre-requisite courses

---

** ** Minimum grade D- (30%) in the pre-requisite courses

---

** ** Minimum grade D- (30%) in the pre-requisite courses

---

## Semester VI

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** Minimum grade D- (30%) in the pre-requisite courses

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** ** Minimum grade D- (30%) in the pre-requisite courses

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## Short Semester

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** Minimum grade D- (30%) in the pre-requisite courses

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** ** Obtained minimum of 80 credits
FOURTH YEAR

Semester VII

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** Minimum grade D- (30%) in the pre-requisite courses

Semester VIII

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** Elective Courses **

Choose one (1) from each elective (Elective 1 and Elective 2):

**Elective 1**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
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<tbody>
<tr>
<td>SKMV 4213</td>
<td>Vehicle Dynamics</td>
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<tr>
<td>SKMV 4413</td>
<td>Engine Turbocharging</td>
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**Elective 2**

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<tr>
<td>SKMV 4423</td>
<td>Vehicle Powertrain</td>
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BACHELOR OF ENGINEERING (NAVAL ARCHITECTURE AND OFFSHORE ENGINEERING) PROGRAMME SPECIFICATIONS

1. Programme Name
   Bachelor of Engineering (Naval Architecture and Offshore Engineering)

2. Final Award
   Bachelor of Engineering (Naval Architecture and Offshore Engineering)

3. Awarding Institution
   Universiti Teknologi Malaysia

4. Teaching Institution
   Universiti Teknologi Malaysia

5. Professional or Statutory Body of Accreditation
   Engineering Accreditation Council (EAC)

6. Language(s) of Instruction
   Bahasa Melayu and English

7. Mode of Study (Conventional, distance learning, etc.)
   Conventional

8. Mode of operation (Franchise, self-govern, etc.)
   Self-govern

9. Study Scheme (Full Time/Part Time)
   Full Time

10. Study Duration
    Minimum 4 years
        Maximum 6 years

    Type of Semester | No. of Semesters | No. of Weeks/Semester
    Normal           | 8               | 14
    Short            | 2               | 8

11. Entry Requirements
    Matriculation/STPM/Diploma or equivalent

12. Programme Objectives (PEO)
    To produce graduates who are able to:
    i) Demonstrate their academic and technological excellence professionally and globally, particularly in areas related to naval architecture and offshore engineering practices and contribute innovatively to the nation’s wealth creation.
    ii) Advance their careers by assuming increasing levels of responsibility, leadership and acquiring professional and advanced academic qualifications.
    iii) Recognize and practice professional, ethical, environmental and societal responsibilities and value different global and cultural aspects of their work and society.
    iv) Adapt and communicate effectively and be successful working with multi-disciplinary teams.

13. Programme Learning Outcomes (PO)
    (a) Technical Knowledge and Competencies

    | Intended Learning Outcomes | Teaching and Learning Methods | Assessment |
    |-----------------------------|-------------------------------|------------|
    | Ability to acquire and apply fundamental knowledge of mathematics, science and engineering principles to solve complex naval architecture and offshore engineering problems; Keywords: Engineering Knowledge | Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning. | Examinations, laboratory reports, presentations, problem-based exercises, individual and group project reports. |
    | Ability to identify, formulate and analyse complex naval architecture and offshore engineering problems; Keywords: Problem Analysis | Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning. | Examinations, laboratory reports, presentations, problem-based exercises, individual and group project reports. |
    | Ability to design solutions for complex naval architecture and offshore engineering problems that fulfil health, safety, societal, cultural and environmental needs; Keywords: Design/Development of solutions | Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning. | Examinations, laboratory reports, presentations, problem-based exercises, individual and group project reports. |
### Intended Learning Outcomes

<p>| PO 1 | Lectures, tutorials, laboratory works, seminars, group projects and industrial training. | Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports. |
| PO 2 | Tutorials, laboratory works, seminars, group projects and industrial training. | Industrial training, and group project reports. |
| PO 3 | Tutorials, laboratory works, group assignments and projects, final year project presentations and problem-based learning. | Group reports, learning logs/diaries and oral presentations. |
| PO 4 | Lectures, tutorials, seminars, group projects and industrial training. | Industrial training, and group project reports. |
| PO 5 | Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning. | Examinations, laboratory reports, presentations, problem-based exercises, individual and group project reports. |
| PO 6 | Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning. | Examinations, laboratory reports, presentations, problem-based exercises, individual and group project reports. |
| PO 7 | Tutorials, laboratory works, group assignments and projects, final year project presentations and problem-based learning. | Group reports, learning logs/diaries and oral presentations. |
| PO 8 | Lectures, tutorials, seminars, group projects and industrial training. | Industrial training, and group project reports. |
| PO 9 | Seminars, assignments and final year projects. | Reports and theses |
| PO 10 | Lectures and project assignments. | Demonstrations, reports, tests, examinations and presentations. |</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Classification</th>
<th>Credit Hours</th>
<th>Percentage</th>
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<tr>
<td>i</td>
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<td>51</td>
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<tr>
<td>ii</td>
<td>Programme Electives</td>
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</tr>
<tr>
<td>iii</td>
<td>Compulsory University Subject</td>
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<td></td>
<td><strong>Total</strong></td>
<td><strong>137</strong></td>
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**Classification of courses for engineering programme**

<table>
<thead>
<tr>
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<th>Credit Hours</th>
<th>Percentage</th>
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<tr>
<td>A  Engineering Courses</td>
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<td><strong>Total credit hours for Part A</strong></td>
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<td>B  Non-Engineering</td>
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<tr>
<td><strong>Total credit hours for Part B</strong></td>
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<td><strong>Total credit hours for Part A and B</strong></td>
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14. Classification of Courses

<table>
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<th>Classification</th>
<th>Credit Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>i</td>
<td>Programme Core</td>
<td>71</td>
<td>51</td>
</tr>
<tr>
<td>ii</td>
<td>Programme Electives</td>
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<td>34</td>
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<tr>
<td>iii</td>
<td>Compulsory University Subject</td>
<td>20</td>
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<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>137</strong></td>
<td><strong>100</strong></td>
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</tbody>
</table>

15. Total Credit Hours to Graduate

137
AREAS OF STUDY

Naval Architecture and Offshore Engineering are two important sectors in the maritime industry. The area of studies includes the design and system design, operations, performance and dynamic behaviour of marine vehicles such as ships and submarines, and also other marine structures fixed or floating. The curriculum has about fifty two percents (52%) containing basic engineering courses such as Statics, Dynamics, Thermodynamics, Fluid Mechanics, and Mechanics of Materials. Naval architecture and offshore engineering related courses are introduced as early as in the first semester and more courses are offered towards the end of the study period. The specialised courses for Naval Architecture and Offshore Engineering include:-

a) Naval Architecture
   Naval Architecture is a study that introduces students to basic naval architectural knowledge. It enables students to familiarise themselves with naval architectural terms, ship components and undertakes simple hydrostatics and stability calculations. Tools and techniques which are required in future naval architecture work are introduced here. Students will be able to carry out calculations to determine ship stability in all conditions. The content covers Calculation of areas, moments and centroids, transverse stability, longitudinal stability, large angle stability, damage stability, launching.

b) Marine Hydrodynamics
   Basic knowledge of marine hydrodynamics theory and CFD software are introduced. Enhancement of knowledge in Mechanics of Fluids I started with some discussion on motion of Viscous/Real fluid and an Ideal fluid. Further discussion are also given in surface waves and hydrodynamic of slender bodies.

c) Ship and Offshore Structures
   Ship and Offshore Structures concerned with the knowledge on loading and stresses of ship and offshore structures. It begins with the components and functions on ship and offshore structures. The floating hull loading, shear forces and bending moments are then in detail discussed. The important structural strength analysis for ship and offshore structures will be highlighted on bending and buckling afterward.

d) Ship and Offshore Production Technology
   Ship and Offshore Production Technology study is essential as it prepare the student with the basic knowledge and exposure on construction process of ship & offshore structures. This course covers the hardware and software aspects of ship and offshore production technology. It begins with the introduction to shipbuilding industry, its importance and development in world economics and in Malaysia, ship and offshore/production construction process flow chart and activities. Production/construction yards location, layout and facilities. Material treatment including surface preparation, cutting process, welding, painting process etc. that involve in the construction process. It followed by subassembly, block assembly and erection process of offshore structures. Upon completion, launching, transporting and upsetting process will also
be discussed. On the soft engineering side, the quality control and production system will also be taught. Apart from normal lecture hours, the student is expected to carry out class assignment, field survey or site visits to ship and offshore production yards and technical writing. Therefore, the course is expected to develop and enhance the student ability to discuss and explain the related knowledge, to work in team effectively, long life learning and communication skills.

e) Ship and Offshore Design
The course firstly explains the concepts of engineering design and later relates them to the process and procedures in ship and offshore design. Emphasis is made on preliminary design calculations to satisfy owner’s requirements and related legislations. The hands-on part will deal with design tasks, including hull form design (manually and computer-aided), hydrostatics calculation and General Arrangement.

Design. The students will be given a real design job and working as consultant group to closely replicates the real ship and offshore design practice. Having design the ship hull forms and its related general arrangement to serve its functions done previously, this course continues by continuing the necessary design tasks including Stability Calculation and Assessment, Scantling Calculation and Strength Assessment, and Shell Expansion & material take off. This course emphasis is Hands on Design Project works (in group) with continuous monitoring from the lecturer. Apart from providing the necessary technical knowledge and skills the course also aimed at developing the necessary generic skills such as team working, oral and written presentation skills, project management skills etc. The contents and conduct of the design project is as much as possible tailored to the real design practice in industry.

f) Marine and Offshore Engineering Systems
The course covers the main engineering systems of the ship and offshore structure machinery. This includes the propulsion and auxiliary systems. Selected analyses of the thermodynamic processes of the system, description of the plant main components, operating principles and plant performances will be studied. This includes the marine diesel engine and steam turbine power plant, electric and hydraulic power systems. Other important support system such as air conditioning, fire, condition and performance monitoring system will also be covered.

g) Marine Transport Economic
The course focuses on delivering knowledge to students on two aspects of maritime transport and economics. Firstly is on the basic definitions and process for the efficient operation of global port and shipping operations. Secondly is on the basic definition for the economics of port and shipping operations up to the concepts for appraising investment and financial performance. Additional knowledge is also given to students on the current issues influencing the world maritime scenario. The topics selected are globalization, technology and knowledge while addressing environmental issues.

h) Marine Management, Environment and Safety
This course aims to prepare students with knowledge on basic principles of management, project
management, marine environment and safety. The management part will examine key issues in management and organization, management yesterday and today, strategic management, organizational structure and design, human resource management, motivating employees and leadership. Project management shall cover network analysis, resources constrained project, crash time and project performance and risk assessment. Main topics covered under environment and safety will be IMO, MARPOL, SOLAS and the like. OSHA 1994, Factories and Machinery Act 1967 shall also be given mention. Safety topics cover hazard identification, risk assessment and control, basic principles of accident prevention and occupational health. At the end of the course, students should be able to describe fundamental aspects of management, integrate knowledge in engineering and management in making business decisions, apply the principles of hazard identification, risk assessment/control, plan, design and implement an effective safety program.

i) Ship Resistance and Propulsion
This course introduces students to ship hydrodynamics, dimensional analysis, fundamental of ship resistance and its components, fundamental of ship model testing and extrapolation methods and marine propulsors. The course also includes propeller theories, methods of propeller design and the study of cavitation phenomena together with the analysis of propeller-engine matching.
CARRER PROSPECTS

Graduates of this programme are essentially Naval Architects but with applied knowledge on offshore engineering. They could be registered with the Board of Engineers Malaysia (BEM) under the category of Naval Architect and join the Institute of Engineers Malaysia (IEM).

The Maritime Industry encompasses all forms of maritime activity and can be divided into several segments namely, Shipbuilding & Ship Repair, Offshore Structure and Vessels Fabrication, Ocean & Coastal Shipping Port Services, Marine Professional Services, Maritime Defence and Law Enforcement, Government Authorities & Marine/Maritime Associations, Marine and Inland Fishing, Marine Tourism, Marine Mining, Marine Environment and Marine Products & Services.

Over the past few years, the marine and offshore industry has experienced rapid growth. The industry is expected to continue growing in the future. With particular, exploration activities have increased and thus the need for infrastructure such as FPSO (Floating Production Storage and off loading), semi-submarine platforms and so forth.

There are excellent employment opportunities in all of these segments of the maritime industry.

Naval Architects have a wide range of employment opportunities. They are involved in a wide variety of work that it is difficult to categorise it comprehensively. However, the main areas includes Design, Construction and Repair, Consultancy, Marketing and Sales, Operations, Regulation, Surveying and Overseeing, Research and Development and lastly but not least in the Education and Training field.

Naval Architects and Offshore Engineers play a vital role in the delivery of the many complex and challenging projects being developed. This is possible since they have the ability to model and solve a problem, describe and deliver an economical solution and then supervise and manage the work through to completion. The end product needs to be feasible, economical, safe, delivered on time, while also being respectful of the environment. All of these require a special combination of aptitude, vision and commitment.

Each type of work has its own distinctive character and offers opportunities for initiative and imagination in a wide variety of technical and managerial posts as well as opportunities for foreign travel. The workplace may be a large company, a small group, a consultancy or a government department.
CURRICULUM

FIRST YEAR

Semester I

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
<th>L</th>
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<th>P/S</th>
<th>Credit</th>
<th>Pre-requisite</th>
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Total 17

* Core courses - minimum passing grade is C (50%)

Semester II

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Total 16

* Core courses - minimum passing grade is C (50%)

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio
## SECOND YEAR

### Semester III

<table>
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<tr>
<th>Code</th>
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Total 17

* Core courses - minimum passing grade is C (50%)

#UHAS 1162 Arts, Customs and Beliefs of Malaysians (for international students only)

### Semester IV

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<th>Code</th>
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Total 16

* Core courses - minimum passing grade is C (50%)
### THIRD YEAR

#### Semester V

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**Minimum grade D- in the pre-requisite courses**

#### Semester VI

<table>
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<th>Course</th>
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<td>0</td>
<td>3</td>
<td>SKMO 2123**</td>
</tr>
<tr>
<td>SKMO 3523</td>
<td>Ship &amp; Offshore Design I</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>SKMO 3353**, SKMO 3333**</td>
</tr>
<tr>
<td>SKMO 3812</td>
<td>Marine Transport &amp; Economics</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>ULAB 3162</td>
<td>English for Professional Purposes</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>ULAB 2122</td>
</tr>
</tbody>
</table>

**Minimum grade D- in the pre-requisite courses**

#### Short Semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
<th>L</th>
<th>T</th>
<th>P/S</th>
<th>Credit</th>
<th>Pre-requisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKMO 315</td>
<td>12 weeks Industrial Training</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>obtained min of 80 credits, SKMO 2123**, SKMM 2223**</td>
</tr>
</tbody>
</table>

**Minimum grade D- in the pre-requisite courses**

**Obtained minimum of 80 credits**
**FOURTH YEAR**

**Semester VII**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
<th>L</th>
<th>T</th>
<th>P/S</th>
<th>Credit</th>
<th>Pre-requisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKMO 4233</td>
<td>Dynamics of Marine Vehicles</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>SKMM 2223, SKMO 2343</td>
</tr>
<tr>
<td>SKMO 4422</td>
<td>Marine &amp; Offshore Engineering System</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>SKMM 2413</td>
</tr>
<tr>
<td>SKMO 4533</td>
<td>Ship &amp; Offshore Design II</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>SKMO 3523</td>
</tr>
<tr>
<td>SKMO 4912</td>
<td>Undergraduate Project I</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>2</td>
<td>SKMO 2123**, SKMM 2223**</td>
</tr>
<tr>
<td>SKMO 4941</td>
<td>Marine Laboratory I</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>SKMO 3333**, SKMO 3353</td>
</tr>
<tr>
<td>SKMO 4xx2</td>
<td>Marine &amp; Offshore Elective I</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>UKQx xxx2</td>
<td>Co-Curriculum</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15</td>
<td><strong>Minimum grade D- (30%) in the pre-requisite courses</strong></td>
</tr>
</tbody>
</table>

**Semester VIII**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
<th>L</th>
<th>T</th>
<th>P/S</th>
<th>Credit</th>
<th>Pre-requisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKMM 4902</td>
<td>Engineering Professional Practice</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>Must be at least 3rd year</td>
</tr>
<tr>
<td>SKMO 4823</td>
<td>Marine Management, Safety and Environment</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>SKMO 4924</td>
<td>Undergraduate Project II</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>SKMO 4912</td>
</tr>
<tr>
<td>SKMO 4951</td>
<td>Marine Laboratory II</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>SKMO 4233**</td>
</tr>
<tr>
<td>SKMO 4xx2</td>
<td>Marine &amp; Offshore Elective II</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Uxxx xxx2</td>
<td>Entrepreneurship Elective</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Uxxx xxx2</td>
<td>Innovation &amp; Creativity Elective</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
<td><strong>Minimum grade D- in the pre-requisite courses</strong></td>
</tr>
</tbody>
</table>

**ELECTIVE COURSES**

Choose one (1) from each elective (Elective I and Elective 2):

**Elective I**

SKMO 4012  Marine Meteorology and Oceanography
SKMO 4132  Marine Control Engineering
SKMO 4142  Reliability of Ship and Offshore Structures

**Elective II**

SKMO 4152  Platform Pipeline and Sub-Sea Technology
SKMO 4262  Risers & Mooring Dynamics
SKMO 4452  Marine Engineering System Project
UNIVERSITY
GENERAL COURSES
Undergraduates in the Bachelors Degree Program are required to register for the University’s General Courses during their duration of study as a pre-requisite for graduation. The total number of credits for these courses are 20. The courses are categorized into cluster as follows:

(i) Nationhood and Civilization (6 credits)
(ii) Innovation, Creativity and Entrepreneurship (4 credits)
(iii) Development of Individual, Society and Globalization (8 credits)
(iv) Co-curriculum (2 credits)

**Nationhood and Civilization**

Students are required to register a total of six (6) compulsory credits of Nationhood and Civilization cluster as listed in the following table:

<table>
<thead>
<tr>
<th>Code of Course</th>
<th>Name of Course</th>
<th>Offered by</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>UICI 1012</td>
<td>Islamic Civilization and Asian Civilization</td>
<td>Faculty of Islamic Civilization</td>
<td>2</td>
</tr>
<tr>
<td>UICI 2022</td>
<td>Science, Technology and Mankind</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>UHAS 1172</td>
<td>Malaysian Dynamic (for local student only)</td>
<td>Faculty of Management</td>
<td>2</td>
</tr>
<tr>
<td>UHAS 1162</td>
<td>Arts, Customs and Belief of Malaysian (for internat</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>student only)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits for Nationhood and Civilization Cluster** 6

**Innovation, Creativity and Entrepreneurship**

Students are required to register a total of four (4) compulsory credits of Innovation, Creativity and Entrepreneurship cluster as listed in the following table:

<table>
<thead>
<tr>
<th>Code of Course</th>
<th>Name of Course</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>UXXX ###2*</td>
<td>Innovation &amp; Creativity elective</td>
<td>2</td>
</tr>
<tr>
<td>UXXX ###2*</td>
<td>Entrepreneurship elective</td>
<td>2</td>
</tr>
</tbody>
</table>

**Total Credits for Innovation, Creativity and Entrepreneurship Cluster** 4

*Elective courses (choose only one)

**List of elective courses for Innovation & Creativity elective**

<table>
<thead>
<tr>
<th>No</th>
<th>Code of Course</th>
<th>Name of Course</th>
<th>Offered by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UPPP 3002</td>
<td>Research Methodology</td>
<td>Faculty of Education</td>
</tr>
<tr>
<td>2</td>
<td>UHAS 2122</td>
<td>Creative and Critical Thinking</td>
<td>Faculty of Management</td>
</tr>
<tr>
<td>3</td>
<td>UKQU 2202</td>
<td>Innovation and Creativity</td>
<td>Centre for the General Courses</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>and Co-curriculum</td>
</tr>
<tr>
<td>4</td>
<td>UXXX 2XX2</td>
<td>Creative &amp; Innovative Design Competition</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>UXXX 3XX2</td>
<td>Innovative Design Practice for Wealth</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Creation</td>
<td></td>
</tr>
</tbody>
</table>
List of elective courses for Entrepreneurship elective:

<table>
<thead>
<tr>
<th>No</th>
<th>Code of Course</th>
<th>Name of Course</th>
<th>Offered by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UHAS 3012</td>
<td>Entrepreneurship &amp; Enterprise Development</td>
<td>Faculty of Management</td>
</tr>
<tr>
<td>2</td>
<td>UCSD 2762</td>
<td>Information Technology Entrepreneurship</td>
<td>Faculty of Computing</td>
</tr>
<tr>
<td>3</td>
<td>UHAS 2012</td>
<td>Social Entrepreneurship</td>
<td>Faculty of Management</td>
</tr>
<tr>
<td>4</td>
<td>UPPL 2012</td>
<td>Entrepreneurship Education</td>
<td>Faculty of Education</td>
</tr>
<tr>
<td>5</td>
<td>UICI 2132</td>
<td>Islamic Entrepreneurship</td>
<td>Faculty of Islamic Civilization</td>
</tr>
<tr>
<td>6</td>
<td>UKQU 2112</td>
<td>Entrepreneurship Practice II</td>
<td>Centre for the General Courses and Co-curriculum</td>
</tr>
</tbody>
</table>

Development of Individual, Society and Globalization

Students are required to register a total of eight (8) compulsory credits of Development of Individual, Society and Globalization cluster as listed in the following table:

<table>
<thead>
<tr>
<th>Code of Course</th>
<th>Name of Course</th>
<th>Offered by</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ULAB 1122</td>
<td>Academic English Skill</td>
<td>Language Academy</td>
<td>2</td>
</tr>
<tr>
<td>ULAB 2122</td>
<td>Advanced English for Academic</td>
<td>Language Academy</td>
<td>2</td>
</tr>
<tr>
<td>ULAB 3162</td>
<td>English for Professional Purposes</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>UXXX ##2*</td>
<td>Humanities Development or Globalisation elective (for local student)</td>
<td>Multi Faculties/Institutes</td>
<td>2</td>
</tr>
<tr>
<td>ULAM 1112*</td>
<td>Malay Language for Communication (for international student)</td>
<td>Language Academy</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits for Development of Individual, Society and Globalization Cluster** 8

* Elective courses (choose only one)
<table>
<thead>
<tr>
<th>No</th>
<th>Code of Course</th>
<th>Name of Course</th>
<th>Offered by</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UICI 2042</td>
<td>Islamic Institutions</td>
<td>Faculty of Islamic Civilization</td>
</tr>
<tr>
<td></td>
<td>UICI 2052</td>
<td>Quran &amp; Human Civilization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UICI 2062</td>
<td>Science &amp; The Philosophy of Solat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UICI 2082</td>
<td>Family Management in Islamic Perspective</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UICI 2092</td>
<td>Property Management &amp; Maintenance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UICI 2102</td>
<td>Biopsychosocial Spiritual</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UICI 2112</td>
<td>Introduction to Science Muamalat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UICI 2122</td>
<td>Philosophy of Islamic Arts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UPPR 2002</td>
<td>Healthy Living</td>
<td>Faculty of Education</td>
</tr>
<tr>
<td></td>
<td>UPPR 2012</td>
<td>Total Fitness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UHAS 2032</td>
<td>Technocrat &amp; Development</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UHAS 2042</td>
<td>Introduction to Industrial Sociology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UHAS 2052</td>
<td>Effective Communication</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UHAS 2062</td>
<td>Introduction to Industrial Psychology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UHAS 2092</td>
<td>Professional Ethics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UHAS 2102</td>
<td>Industrial Counselling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UHAS 2142</td>
<td>Leadership in Organization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UHAS 2132</td>
<td>Management Communication</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UKPU 2112</td>
<td>Energy Security</td>
<td>Faculty of Petroleum and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Renewable Energy Engineering</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No</th>
<th>Code of Course</th>
<th>Name of Course</th>
<th>Offered by</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UICI 2032</td>
<td>Islam &amp; Current Issues</td>
<td>Faculty of Islamic Civilization</td>
</tr>
<tr>
<td></td>
<td>UICI 2072</td>
<td>Introduction to Comparative Religion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UKAA 2022</td>
<td>Sustainable Development &amp; Community</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UHAS 2112</td>
<td>International Relation</td>
<td>Faculty of Management</td>
</tr>
<tr>
<td></td>
<td>UHAS 2152</td>
<td>Cross Cultural in Organization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UHAS 2162</td>
<td>Cross Cultural Management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ULAC 2112</td>
<td>Basic Mandarin Language</td>
<td>Language Academy</td>
</tr>
<tr>
<td></td>
<td>ULAF 2112</td>
<td>Basic French Language</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ULAJ 2112</td>
<td>Basic Japanese Language</td>
<td></td>
</tr>
</tbody>
</table>
Co-Curriculum

The co-curricular courses were first introduced as part of the University General Courses in July semester, 1992/1993 Academic session.

The courses offered are managed by the Centre for the General Courses and Co-curriculum. To attract the interest of students, variety of courses are offered and they are categorized into eight (8) main cores:

(a) Cultural
(b) Initiative and Innovation
(c) Leadership
(d) Sport
(e) Volunteerism
(f) Community Service
(g) Entrepreneurship
(h) Public Speaking

Special Course Registration Requirement

(a) Students are advised to discuss with Academic Advisor in the students’ faculty or Academic Officer in the Centre for the General Courses and Co-curriculum before any registration.
(b) The maximum number of credit allowed per semester is one (1).
(c) Students are not allowed to change courses and section once they have registered unless with permission from Director of the Centre for the General Courses and Co-curriculum.
(d) Students, who have registered and pass the course, will not be allowed to register the same course.

Credit Exemption

The University Senate in its meeting on 7th September, 2005 has decided that only diploma holder from UTM are eligible for credit exemption. The co-curricular course offered by other higher education institute, private agency or government is not eligible for credit exemption. However, for those students who have been trained and commissioned in the Reserve Officer Training Unit (PALAPES), Police Undergraduate Voluntary Corp (SUKSIS) and Civil Defence Department (JPA3), are eligible for credit exemption.

Co-curricular Courses

UKQX xxx2 Co-curriculum
ACADEMIC REGULATIONS & GUIDELINES
PROGRAMME REGISTRATION

All students are required to register their programmes on the dates specified by the University. Students who fail to register without any valid and acceptable reason to the University, will be automatically withdrawn from his/her programme.

Programme registration for senior students will be done automatically by the University Administration based on examination results in the previous semester. However, students whose studies have been interrupted due to a deferment of suspended from study etc are required to re-register their programme. Students who fail to register for the course after the registration period will have their study be terminated with the exception that the university accepts their reasons.

COURSE CODES AND ABBREVIATIONS

For each programmes, the course code offered by the faculty is made up of four letters followed by four numbers.

S = Award/Programme/Level of Study
KM = Faculty/Centre/School/Academy
M = Specialisation
4 = Year of programme
2 = Field of course/panel
8 = Course sequence
3 = Course credit

SKMM = Bachelor of Engineering (Mechanical)
SKMB = Bachelor of Engineering (Mechanical – Materials)
SKMI = Bachelor of Engineering (Mechanical – Industrial)
SKMP = Bachelor of Engineering (Mechanical – Manufacturing)
SKMA = Bachelor of Engineering (Mechanical – Aeronautics)
SKMV = Bachelor of Engineering (Mechanical – Automotive)
SKMO = Bachelor of Engineering (Naval Architecture & Offshore Engineering)

A. Award/Programme/Level of Study

C = Certificate
D = Diploma
S = Degree
L = Post Graduate Diploma/Advanced Diploma
M = Master
P = Doctor of Philosophy
U = University General Course

B. Faculty/Centre

BB = Built Environment
CS = Computer Science
DP = UTMSpace (Diploma Study Programme)
GH = Geoinformation & Real Estate
HA = Management & Human Resource Development
IC = Islamic Civilization
KA = Civil Engineering
KE = Electrical Engineering
KK = Chemical Engineering  
KM = Mechanical Engineering  
KP = Petroleum and Renewable Energy Engineering  
KQ = Centre for General Courses & Co-Curriculum  
PP = Education  
RS = Razak School  
SC = Science

C. Specialisation

M = Mechanical  
B = Material  
I = Industrial  
P = Manufacturing  
O = Naval Architecture & Offshore Engineering  
A = Aeronautical  
V = Automotive

D. Field of Course/Panel

1 = Panel of Mechanics of Materials and Structure  
2 = Panel of Control and automation/Panel of Machines and Vibration  
3 = Panel of Fluid Mechanics  
4 = Panel of Thermodynamics  
5 = Panel of Design  
6 = Panel of Materials Engineering  
7 = Panel of Manufacturing Engineering  
8 = Panel of Industrial Engineering  
9 = Laboratory/Workshop/Industrial Training/Engineering Professional Practice/Undergraduate Project  
0 = Panel of Engineering Computational

CHANGING PROGRAMME OF STUDY

Students may apply to change their study programme within the faculty or between faculties. This can be done after undergoing at least one semester of study at the University. However, changing of study programme is not encouraged.

COURSE REGISTRATION

It is compulsory in every semester for students to register the courses to be taken with the correct codes and sections. Course registration must be done within the pre-registration or registration period. Students can only register for the course offered with the faculty’s permission. Students are to note that there are courses designated as pre-requisites to some other courses (refer the chapter on curriculum). This means that the pre-requisite courses must be registered and passed before the other subject can be registered. For example, a student must pass course SKMM 1203 (Statics) before the student can register for SKMM 1213 (Dynamics). If a student registers both courses concurrently in the same semester the student will be recorded a zero mark (Grade E) for SKMM 1213 (Dynamics) in the examination results and its credits will be taken into account in the computation of the CPA and GPA.
Compulsory course registration will be conducted over a period of two (2) working days during the last week before the semester begins according to the date determined by the university. Registration after this period is restricted to the last working day of the first week of the semester and will include a fine of RM50.00 (subject to change). Course registration after this period of time will not be allowed unless permission is obtained from the faculty. Students who fail to register for the course after the registration period will have their study be terminated with the exception that the university accepts their reasons.

Full-time students must register for the minimum number of TWELVE (12) credits inclusive of Audit Course (HS) and Compulsory Audit course (HW) in a semester with the exception of student who are under academic probation (KS) and/or is in the final TWO (2) semesters of their study. Students who would like to take more than EIGHTEEN (18) credits will have to seek approval from the Dean of the Faculty and would not be allowed to take more than TWENTY ONE (21) credits in a semester. Students under academic probation (KS) are allowed to take between NINE (9) and THIRTEEN (13) credits only in the following semester. Pre-registration for students under probation will be nullified and they were will need to re-register within the time given.

Students are encouraged to pre-register their courses by using the online or other facilities within the registration period given by the university. Students are responsible for ensuring that there are no mistakes in their course registration record. Students may make amendments to the previous registration during the first week of the semester. Late registration or amendments to course registration will not be accepted except for valid reasons accepted by the University. Any changes in the registration made in the second week will incur a fine of RM50.00 (subject to change) per course up to a maximum of RM300.00 (subject to change). The amendments include insertion, deletion, change of code and status of courses. Any application for amendments to course registration after Friday of second week will not be entertained.

A student with the approval of his lecturer and Academic Advisor can withdraw from a registered course in the semester no later than the last working day of week EIGHT (8) of the academic semester. Any late application will not be entertained. Approvals for withdrawing from a course are subjected to the required total number of minimum credits unless permission from the Dean is obtained. Withdrawals (TD) will be recorded in the course registration and transcript.

**STATUS OF COURSE**

Apart from the regular course there are courses that have particular status as the following:

(a) **HW - (Compulsory Audit Course):** A student is required to attend lectures practical training or seminar and will be awarded either a HL (Passed Attendance) or a HG (Failed Attendance) grade. If the student passes credits will be taken into account in computing Credits Obtained but will not be considered in computing the GPA (Grade Point Average) and CPA (Cumulative Grade Point Average). If the student fails credits will not be counted into Credits Obtained and the subject must be repeated until a pass is obtained.

(b) **UM - (Replacement Course):** For a course with an UM status grade HL will be awarded if the course is of an HW status. For core courses students are required to pass with at least a C grade. However, the credits for a failed UM course will not be counted in the CPA computation since they have been taken into consideration during the previous
semester. This is to avoid duplication. A student who fails an elective course is allowed to take another elective course as a substitute but the credits and grade of the original course will be taken into account in Credits Counted and the CPA.

(c) **UG - (Replacement Grade):** A student may improve any course with a B- grade or lower using the UG status. For a particular course this permission is given once only. The better grade between the previous and current grade will be awarded and used in the computation of GPA and CPA.

(d) **HS - (Attendance Only):** A student can take course which are not stipulated for his/her programme and this course must be registered with an HS status. An HS grade will be awarded and the credits will not be used in the computation of Credits Obtained, Credits Counted, GPA and CPA.

Students may take a course with an HS status for the following reasons:

i. To fulfill the requirement as a full time students as stipulated by scholarship sponsors

ii. To seek further knowledge in the related course
SPECIFIC REQUIREMENTS FOR COURSES IN THE FACULTY

Pre-requisite Course
Passing grade for all courses is 40% (D+) except for core courses, the passing grade is 50% (C). Therefore a student must pass the pre-requisite course before taking the next course.

Core Courses for Engineering Programmes
The core courses for all 7 engineering programmes in the faculty are given in the following table. The minimum passing mark for these courses is 50% (C).

<table>
<thead>
<tr>
<th>Core Courses for SKMM programme</th>
<th>Core Courses for SKMB, SKMI, SKMP, SKMT and SKMV Programmes</th>
<th>Core Courses for SKMO Programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKMM 1203 (Statics)</td>
<td>SKMM 1213 (Dynamics)</td>
<td>SKMM 2223 (Mechanics of Machines and Vibration)</td>
</tr>
<tr>
<td>SKMM 1113 (Mechanics of Solids I)</td>
<td>SKMM 2123 (Mechanics of Solids II)</td>
<td>SKMM 2313 (Mechanics of Fluids I)</td>
</tr>
<tr>
<td>SKMM 2323 (Mechanics of Fluids II)</td>
<td>SKMM 2413 (Thermodynamics)</td>
<td>SKMM 2413 (Thermodynamics)</td>
</tr>
<tr>
<td>SKMM 2433 (Applied Thermodynamics &amp; Heat Transfer)</td>
<td>SKMM 2433 (Applied Thermodynamics &amp; Heat Transfer)</td>
<td>SKMM 2413 (Thermodynamics)</td>
</tr>
<tr>
<td>SKMM 2433 (Applied Thermodynamics &amp; Heat Transfer)</td>
<td>SKMM 2433 (Applied Thermodynamics &amp; Heat Transfer)</td>
<td>SKMM 2413 (Thermodynamics)</td>
</tr>
</tbody>
</table>
CREDIT SYSTEM

Every course is accorded a credit value except those specified by the University.

CREDIT VALUE

The credit value is based on the number of contact hours per week per semester.

Lectures and Practical Period

1 credit = 1 lecture hour per week or (14 hours per semester)
1 credit = 28 – 42 meeting hours per semester for practical/studio

Example:
Determination of credits for lectures and equivalent for practical period:
- 3 lecture hours per week or
- 2 lecture hours per week + 2 – 3 hours of practical/studio work per week or
- 1 lecture hour per week + 4 – 6 hours of practical/studio work per week or
- 6 – 9 hours of practical/studio work per week

Undergraduate Project

The undergraduate/final year project is split into 2 semesters. In the first semester the project is taken, it is given 2 credits and in the following semester it is given 4 credits. Both of these parts are evaluated individually.

Industrial Training

Industrial Training is evaluated with a pass or fail grade.

CREDIT EXEMPTION

i) Credit exemption refers to courses taken by a student before being accepted to the first degree programme at UTM as approved by the Senate. Courses given credit exemption will not be taken into account in the computation of GPA and CPA.

ii) Conditions for credit exemption are as the following:

a) Courses to be applied for credit exemption must have the same content or at least not less than 80% with the course offered by the University;

b) The grade or grade point obtained in the said course should not be less than C; and

c) The total credit hours to be exempted must not exceed 30% of the total credits for graduation.

CREDIT TRANSFER

i) Credit transfer is for courses taken by a student at other institution of higher learning after his/her admission to the first degree a study at UTM is approved by the faculty.

ii) In the case of credit transfer, all credits obtained from the institutions of higher learning at which the student has undertaken the study, together with their grades and
grade points, will be taken into account in the GPA and CPA computation subject to
the condition that a student is not allowed to transfer more than 30% of the total
number of credits for graduation but not more than one semester of study for any
institute of higher learning.

iii) Application for transfer of credits must be made at least one semester before a student
undergoes study at another Institute of Higher Learning for the purpose of credit
transfer.

CREDITS OBTAINED

Credits Obtained is the total number of credits for courses for which a student has
passed including courses with HW (Compulsory Audit Courses) which have a credit
value. Credits for courses registered with the HS (Audit Courses) will not be taken
into account in computing Credits Obtained. Credits Obtained is computed for each
semester and for all semesters. For students with credit transfer, the credits will be
added to the passed course credits in order to determine the overall Credits Obtained.
The total Credits Obtained is very closely related to the Credits for Course
Graduation.

CREDIT COUNTED

Credits Counted is the total number of credits taken by a student in a semester and in all
semesters. The number of credits is used in the computation of GPA and CPA. Credits
for course registered with HS and HW status will not be used in computing Credits
Counted. Credits for courses registered with a UM (Replacement Course) status will
not be involved in the CPA.

CREDITS FOR PROGRAMME YEAR

The stage of study or the year of the programme for a student is determined by the total
number of Credits Obtained. A student is deemed to have progressed a particular year
of programme if the Credits Obtained is not less than the following value:

<table>
<thead>
<tr>
<th>To Progress To Year</th>
<th>Minimum Total Credit Obtained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second</td>
<td>27</td>
</tr>
<tr>
<td>Third</td>
<td>60</td>
</tr>
<tr>
<td>Fourth</td>
<td>93</td>
</tr>
</tbody>
</table>

CREDITS FOR GRADUATION

A student must pass all courses specified for his/her programme of study. The total
minimum credits and the maximum duration to complete and pass a programme are
shown in the following table.

Total Credit Hours for Graduation and Maximum Duration of Study

<table>
<thead>
<tr>
<th>Degree</th>
<th>Minimum Credits</th>
<th>Maximum Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor of Engineering (Mechanical)</td>
<td>137</td>
<td>12</td>
</tr>
<tr>
<td>Bachelor of Engineering (Mechanical – Materials)</td>
<td>137</td>
<td>12</td>
</tr>
<tr>
<td>Bachelor of Engineering (Mechanical – Industrial)</td>
<td>137</td>
<td>12</td>
</tr>
<tr>
<td>Bachelor of Engineering (Mechanical – Manufacturing)</td>
<td>137</td>
<td>12</td>
</tr>
<tr>
<td>Bachelor of Engineering (Mechanical – Aeronautics)</td>
<td>137</td>
<td>12</td>
</tr>
<tr>
<td>Bachelor of Engineering (Mechanical – Automotive)</td>
<td>137</td>
<td>12</td>
</tr>
<tr>
<td>Bachelor of Engineering (Naval Architecture &amp; Offshore Engineering)</td>
<td>137</td>
<td>12</td>
</tr>
</tbody>
</table>
LECTURE ATTENDANCE

Students must attend all course meetings (lectures/practical/studio etc.). If they do not attend these meetings, they will have to inform their lecturers immediately and give their reasons for being absent. Students must attend not less than 80% of their meetings for a course in ONE (1) semester. This applies to Compulsory Audit Courses (HW) or Audit Courses (HS).

Students who do not fulfill the 80% of their meetings without valid reasons accepted by the university will not be allowed to attend lectures and sit for any form of assessment. The mark ZERO (0) will be given for such courses: or Failed Attendance (HG) for compulsory audit courses (HW): however, audit courses (HS) will not be recorded in the transcript.

GRADING SYSTEM

A student’s performance in a course is indicated by the grade obtained. The relationship between marks grades and grade points are given in the following table. Generally the passing grade for any course is D+. However, the passing grade for a particular course is subjected to the Faculty’s requirement with the approval of the University Senate.

<table>
<thead>
<tr>
<th>Mark</th>
<th>Grade</th>
<th>Grade Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 – 100</td>
<td>A+</td>
<td>4.00</td>
</tr>
<tr>
<td>80 – 89</td>
<td>A</td>
<td>4.00</td>
</tr>
<tr>
<td>75 – 79</td>
<td>A-</td>
<td>3.67</td>
</tr>
<tr>
<td>70 – 74</td>
<td>B+</td>
<td>3.33</td>
</tr>
<tr>
<td>65 – 69</td>
<td>B</td>
<td>3.00</td>
</tr>
<tr>
<td>60 – 64</td>
<td>B-</td>
<td>2.67</td>
</tr>
<tr>
<td>55 – 59</td>
<td>C+</td>
<td>2.33</td>
</tr>
<tr>
<td>50 – 54</td>
<td>C</td>
<td>2.00</td>
</tr>
<tr>
<td>45 – 49</td>
<td>C-</td>
<td>1.67</td>
</tr>
<tr>
<td>40 – 44</td>
<td>D+</td>
<td>1.33</td>
</tr>
<tr>
<td>35 – 39</td>
<td>D</td>
<td>1.00</td>
</tr>
<tr>
<td>30 – 34</td>
<td>D-</td>
<td>0.67</td>
</tr>
<tr>
<td>00 - 29</td>
<td>E</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Apart from the above grades the following status are also used:

| TD (Withdrawal) | This status is given to courses withdrawn during a specified duration as stipulated by the Senate. Credits will not be taken into account when computing Credits Counted, Credits Obtained, GPA and CPA. |
| TS (Incomplete) | This status is given to students who are unable to sit for the final examination or to complete the course work for a particular course due to illness as certified by a Medical Officer of the University or of a government hospital or due to other reasons acceptable to the Senate. Students must submit the medical certificate to the Faculty not later than 24 hours before the commencement of the examination of the said course. Credits will not be taken into account when computing the Credits Counted, Credit Obtained, GPA and CPA. |
| HS (Attendance Only) | This status is given to courses registered with Attendance Only status. Credits will not be taken into account when computing Credits Counted, Credits Obtained, GPA and CPA. |
| HL (Compulsory Attendance) | This is a passed grade given to courses registered with Compulsory Audit Course (HW) status. Passed (HL) credits will be taken into account when computing Credits Counted and Credit Obtained only but not in GPA and CPA. |
EXAMINATIONS

The end of semester examinations are the final examinations for courses taught through lectures. The allocation of marks for this should not exceed 50% of the overall evaluation mark for the course. Grades for each course will be displayed by the course lecturer and students may submit an appeal for re-evaluation of the examination grade for any course to the faculty within a specified duration and following a specified procedure. Appeals will not be entertained after the expiry date. Students will be charged a sum of RM50.00 for each of the courses appealed.

SPECIAL EXAMINATION

Special examination may be held for any student in the following cases:

(i) Student who are unable to sit for the final examination because of illness and validated by a medical officer from the university or government hospital or have given reasons accepted by the university.

or

(ii) Students in their final semester who have passed with Good Standing (KB) but failed in ONE (1) course taken in the last TWO (2) semesters of study not including the semester used for Practical/Industrial Training.

The special examination mark will be used to determine the results of the course based on the following:

(i) The special examination mark as in case (i) will be used to replace the previous final examination mark whereas the coursework marks remain the same.

(ii) Students as case (ii) who have passed the special examination with a grade D+ or a passing grade set by the faculty will be calculated as part of their GPA and CGPA.

If the student fails in his/her special examination he/she is required to repeat the course in the following semester (subject to the remaining duration of study).

Special examination may not be held in the following cases:

i) courses that have no final examination, or
ii) students who did not sit for the final examination and gave reasons that are not accepted by the university, or
iii) students who have been barred from sitting for the final examination

Special examination will only be conducted once in a semester unless with the approval of the Senate.
ACADEMIC PERFORMANCE

The student’s performance is evaluated based on GPA and CPA

GPA : Grade Point Average

GPA is the grade point average obtained by a student in a particular semester. GPA is computed as follows:

\[ \text{GPA} = \frac{\text{Total Point Value for the Semester}}{\text{Total Credits Counted for the Semester}} \]

CPA : Cumulative Grade Point Average

CPA is the cumulative grade point average obtained by a student for all semesters studied. CPA is computed as follows:

\[ \text{CPA} = \frac{\text{Total Point Value for the Semester}}{\text{Total Credits Counted for the Semester}} \]
Example of GPA and CPA calculation

Semester I

<table>
<thead>
<tr>
<th>Courses</th>
<th>Grade</th>
<th>Point Value</th>
<th>Credit</th>
<th>Total Point Value</th>
<th>Credits Counted</th>
<th>Credits Obtained</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKMM 1203</td>
<td>A-</td>
<td>3.67</td>
<td>3</td>
<td>11.01</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>SKMM 1013</td>
<td>A</td>
<td>4.00</td>
<td>3</td>
<td>12.00</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>SKMM 1503</td>
<td>B+</td>
<td>3.33</td>
<td>3</td>
<td>9.99</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>SKMM 1912</td>
<td>A-</td>
<td>3.67</td>
<td>2</td>
<td>7.34</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>SKEU 1002</td>
<td>A-</td>
<td>3.67</td>
<td>2</td>
<td>7.34</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>SSCE 1693</td>
<td>A-</td>
<td>3.67</td>
<td>3</td>
<td>11.01</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ULAB 1112</td>
<td>B+</td>
<td>3.33</td>
<td>2</td>
<td>6.66</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>18</td>
<td><strong>65.35</strong></td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>

GPA = 65.35/18 = 3.6

Semester 2

<table>
<thead>
<tr>
<th>Courses</th>
<th>Grade</th>
<th>Point Value</th>
<th>Credit</th>
<th>Total Point Value</th>
<th>Credits Counted</th>
<th>Credits Obtained</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKMM 1213</td>
<td>A</td>
<td>4.00</td>
<td>3</td>
<td>12.00</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>SKMM 1113</td>
<td>A-</td>
<td>3.67</td>
<td>3</td>
<td>11.01</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>SKMM 1512</td>
<td>A</td>
<td>4.00</td>
<td>2</td>
<td>8.00</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>SKMM 1922</td>
<td>B+</td>
<td>3.33</td>
<td>2</td>
<td>6.66</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>SSCE 1793</td>
<td>B+</td>
<td>3.00</td>
<td>3</td>
<td>9.00</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>UICI 1012</td>
<td>A-</td>
<td>3.67</td>
<td>2</td>
<td>7.34</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>15</td>
<td><strong>54.01</strong></td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

GPA = 54.01/15 = 3.60

CPA = (65.35 + 54.01)/(18 + 15) = 3.62

ACADEMIC PERFORMANCE RATING

The academic rating of a student is determined at the end of a regular semester using CPA as follows:

<table>
<thead>
<tr>
<th>Academic Performance Rating</th>
<th>CPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>KB – Good Status</td>
<td>CPA ≥ 2.00</td>
</tr>
<tr>
<td>KS – Probation Status</td>
<td>1.70 ≤ CPA &lt; 2.00</td>
</tr>
<tr>
<td>KG – Failed Status (Study Terminated)</td>
<td>CPA &lt; 1.70</td>
</tr>
</tbody>
</table>
Students who obtain CPA < 1.00 although the CGPA > 1.70 can with the Senate’s approval

(i) continue his study, or
(ii) be instructed to defer his study till the following semester, or
(iii) study will be terminated

The academic rating of a student for the short semester will not be accounted for. The grade obtained in that semester will be taken into account for the calculation of the CGPA in the following semester.

Students who have THREE (3) Probation Status (KS) continuously will be given the Failed Status (KG) and the student will be terminated from his program of study.

THE DEAN’S LIST

The Dean’s List is a recognition of academic excellence awarded to students with a GPA of 3.67 or above and have registered for at least TWELVE (12) credit hours for the particular semester excluding courses with HW & HS status.

The Dean’s List recognition will be written in the student’s transcript.

PROCEDURE FOR AWARDING DEGREE

The endorsement for the award is done for every regular semester. Students in the final semester who will be completing their study must apply for the award of the degree within the time given by the university. Students who have applied previously but did not complete their study are required to apply again. The application done in the previous semester is no longer valid. A penalty will be imposed on late application of degree award. Students who are not eligible for the application will be fined RM50.00 if they submit their application.

Students who do not submit their application for the award of a degree during the specified duration will be given a Good Status (Completed Program) or KB (TK).

Students who do not submit the application forms to the Faculty office after or within the time given will not be awarded the degree in the semester. However, the student may apply for the award to be given in following semester according to the time period given for that semester. Students who do not apply for the award will not be considered for registration of a postgraduate study at the university.

Students who do not submit their application for the award of degree within five years of completion of their programme will not be awarded with a degree except with the Senate’s approval.

A student is eligible to be awarded a degree after fulfilling the following conditions:

i. Obtained Good Pass (KB)
ii. Has passed all specified courses
iii. Has applied for graduation and has been approval by the faculty
iv. Has completed all four (4) short courses and one (1) test in UTM Professional Skills Certificate Programme
v. Other condition as specified

Students who have reached maximum duration of their studies with **Good Pass (Programme Not Completed)** or **KB(TK)** are not eligible to apply for graduation.

**DEFERMENT OF STUDY**

1) Students who have been certified sick by the university or a government Medical Practitioner may request for a deferment of study from the Dean of the Faculty. The semester approved for the deferment will not be counted as part of the total semesters needed to complete the study.

2) The maximum deferment for every application is **TWO (2) continuous semesters**. If the student requires more than **TWO (2) continuous semesters**, the case will be referred to the University Medical Panel to decide if the student should be allowed to continue or have his study terminated.

3) Students may also apply for deferment due to other reasons besides health. The application must be made before the last working day of week EIGHT (8) of the semester. The period for the deferment will be considered as one of the semesters that has been used. However, with the endorsement from the Dean, and approval from the Deputy Vice Chancellor (Academic and Internationalization), the semester requested for the deferment may be excluded from the calculation.

4) Students who have been asked to defer by the University due to misconduct will not have the semester be considered as the semester that has been used.

**LECTURE HOURS**

Lecture hours are as specified by the University being from Monday to Friday from 8:00 am to 6:00 pm. If necessary lectures may be held at night from 8:00 pm to 11:00 pm. The University allocates Wednesday afternoon starting from 2:00 pm to 6:00 pm for co-curricular courses. Lecture periods are generally limited to 1 hour/lecture. Lectures will commence on the hour as specified by the timetable and will stopped 10 minutes before the following period.

**PERMISSION NOT TO ATTEND CLASS**

Permission not to attend class can be given to students who submit an application to exempted from attending lecture/tutorial/laboratory/workshop/seminar for a short duration based on the following reasons:

* Visiting of a family member who is ill/attending a burial ceremony or;
* Attending a court proceeding or;
* Participating in sporting/cultural practice/competition; or
* Other reasons acceptable by the faculty

The application must be made using the Leave From Lecture Application Form available from the Faculty Academic Office. Consent of the course lecturer must be obtained. The duration for which a student may be granted permission not to attend class is limited to 20% of the number of lectures/tutorial/practical session for each semester.
APPLICATION FOR ACADEMIC TRANSCRIPT

Students who are eligible to apply for an academic transcript may do so at the Registrar’s Office (Academic Management Division) by filling in the Transcript Application Form (UTM.E/6-1) available from the said office. Students who are eligible to apply are:

* Students who have terminated their study from the University (Graduates Completed Programme or Dismissed from study).
* Students who obtained Failed Rating (dismissed)

Students may apply for their academic transcripts to be prepared in Malay or English. Academic transcripts will not be issued to students who are yet to settle their debt with the University.

DOCUMENT AND EXAMINATION RESULTS CERTIFICATION

Faculty Administrative officials namely the Deputy Registrar and Assistant Registrar have been empowered by the University to certify copies of the said documents. Students who require certification of certificates/examination results or other documents may see one of the above-mentioned officers by bringing along the original copies of the relevant documents.

CONFIRMATION LETTER FOR STUDENT STATUS

Students who require such certification/confirmation letters may submit an application to the Faculty Academic Office. This letter is only issued to students for the purpose of applying for financial assistance extension of scholarship/load, conducting off campus study/practical work, driving licence and other purposes deemed as necessary for the benefit of student education in the University.

CHANGE OF STUDY/PERMANENT ADDRESS

It is the responsibility of the student to inform the faculty administration of his/her latest address should there be any change in his/her study/permanent address in order to ensure that he/she can be easily contacted by the University. Students are required to use the Change of Address Form available from the Faculty Academic Office.

ACADEMIC AND PERSONAL RECORDS

Students may check their individual academic and personal records online via the website prepared by the university at https://aimsweb.utm.my and http://pmaya.fkm.utm.my.
PRIZES
AND
AWARD
ROYAL EDUCATION AWARD
The award is a contribution from the Keeper of The Ruler’s Seal of Malaysia and given to two outstanding First Class graduates comprising one Malay/Bumiputera graduate and one Non-Malay/Non-Bumiputera graduate. Each recipient will receive a special token in the forms of cheque/cash, Pingat Jaya Cemerlang and Certificate of Commendation.

CHANCELLOR AWARD
The Chancellor Award is given at every Convocation Ceremony to two excellent graduates who have obtained First Class for their Bachelor Degree and fulfilled the selection criteria and conditions set by the university in. Each recipient will receive a medal, cash and Certificate of Commendation. This award is also given to two postgraduate candidates.

TUN FATIMAH BT HJ. HASHIM GOLD MEDAL EXCELLENCE AWARD
This award is a contribution by the family of the late Tan Sri Dato’ Abdul Kadir bin Yusof and Tun Fatimah bt Hj. Hashim through the Kadir & Fatimah Foundation. This award is given to a female graduate who has shown excellence in academic and co-curricular activities. The award is in the forms of a gold medal and cash.

VICE-CHANCELLOR AWARD
The award is given to the most outstanding graduate from each faculty, UTMSPACE mainstream programmes and also part time programmes who have met the selection criteria and conditions set by the university. Each recipient from the faculties and UTMSPACE will receive the award in the forms of a medal, cash and Certificate of Commendation.

ACADEMIC EXCELLENCE AWARD
This award is given by the university to each Bachelor Degree graduate who obtained perfect academic achievement with a CGPA of 4.00 without taking into consideration his/her involvement and contribution to the academic and non-academic activities. The graduates must attain a CGPA of 4.00 for each academic semester. Other conditions and criteria will be determined by the university. Each recipient will receive cash, medal and Certificate of Commendation.

BOARD OF ENGINEERS MALAYSIA ACADEMIC EXCELLENCE AWARD
This award will be given to a Bachelor Degree graduate who has shown excellent achievement in any engineering programme. The selection criteria and conditions are determined by the university. The recipient will receive cash and certificate contributed by the Board of Engineers Malaysia.

UEM FOUNDATION ENGINEERING ACADEMIC EXCELLENCE AWARD
This award is given to a Bachelor Degree graduate with outstanding achievements, with a minimum grade B attainment for the Undergraduate Project (PSM) from any of the following faculties: Faculty of Civil Engineering, Faculty of Electrical Engineering, Faculty of Chemical Engineering and Faculty of Mechanical Engineering. The selection criteria used in determining the candidate are as stipulated by the university. Each recipient will receive a cash prize and certificate. The award is contributed by the UEM Foundation.
MALAKOFF ACADEMIC EXCELLENCE AWARD
This award will be given to four best graduates comprising two graduates from the Electrical Engineering Faculty and Mechanical Engineering Faculty. The selection criteria and conditions are determined by the university. Each recipient will receive cash contributed by MALAKOFF BERHAD.

UMW HOLDINGS BERHAD ACADEMIC EXCELLENCE AWARD
This award will be given to a Bachelor Degree graduate who has shown excellent achievement in any engineering programmes. The selection criteria and conditions are determined by the university. The recipient will receive cash, certificate and trophy contributed by UMW Holdings Berhad.

WAMY MALAYSIA ACADEMIC EXCELLENCE AWARD
This award will be given to a moslem Bachelor Degree graduate who has shown excellent academic achievement and outstanding personality. The selection criteria and conditions are determined by the university. The recipient will receive cash contributed by WAMY Malaysia.

TNB ACADEMIC EXCELLENCE AWARD
This award will be given to a Bachelor Degree graduate who has shown excellent achievement in any programme. The selection criteria and conditions are determined by the university. The recipient will receive cash and certificate contributed by Tenaga Nasional Berhad.

FELDA ACADEMIC EXCELLENCE AWARD
This award will be given to a Bachelor Degree graduate who has shown excellent achievement in any programmes. The selection criteria and conditions are determined by the university. The recipient will receive cash and certificate contributed by Federal Land Development Authority (FELDA).

YAYASAN EMKAY ACADEMIC EXCELLENCE AWARD
This award will be given to a Bachelor Degree graduate who has shown excellent achievement in any programmes. The selection criteria and conditions are determined by the university. The recipient will receive cash and certificate contributed by Yayasan EMKAY.

MAJLIS AGAMA ISLAM JOHOR ACADEMIC EXCELLENCE AWARD
This award will be given to a First Class Degree moslem graduate who has shown excellent academic achievement and outstanding personality. The selection criteria and conditions are determined by the university. The recipient will receive cash contributed by Majlis Agama Islam Johor.

PERBADANAN BEKALAN AIR (PBA), PENANG ACADEMIC EXCELLENCE AWARD
This award will be given to a Bachelor Degree graduate who has shown excellent achievement in any programmes. The selection criteria and conditions are determined by the university. The recipient will receive cash and certificate contributed by Perbadanan Bekalan Air Pulau Pinang.

SHELL ACADEMIC AWARD
The award will be given to seven best graduates, comprising one from Bachelor of Chemical Engineering, Bachelor of Chemical Engineering (Petroleum), Bachelor of Mechanical Engineering, Bachelor of Mechanical Engineering (Marine Technology), Bachelor of Electrical Engineering, Bachelor of Civil Engineering and Bachelor of
Science. Each recipient will receive cash contributed by Shell People Service Asia Sdn. Bhd.

ALUMNI AWARD
The award will be given to three outstanding graduates comprising one from engineering studies, management and science studies and Diploma studies. The award will be in the form of cash, certificate and souvenirs contributed by UTM Alumni.

FACULTY ACADEMIC AWARD
This award will be given to the best graduates in each faculty. The total number of recipients will be subject to the decision and resolution of the faculty. The award will be in the forms of medal, cash, souvenirs, books and acknowledgement certificate contributed by the government, organizations, associations and/or private companies.

DEAN'S AWARD
The award will be given to graduates who have attained CGPA of 3.50 and above. The recipient will receive certificates and medals. Customarily the award session will be held at the faculty a day before the convocation ceremony. The recipients are required to wear the medal during the Convocation Ceremony.
INBOUND STUDENT EXCHANGE

UTM’s Student Exchange Programme welcomes exchange students from countries around the world each semester. Studying at UTM on the Student Exchange combines the experience of university life at one of Malaysia’s leading universities with the unique opportunity to live in Johor Bahru.

OUTBOUND STUDENT EXCHANGE

The Student Exchange Programme offers you the opportunity to study for one or two semester at an overseas university and earn credit towards your UTM degree. The Student Exchange Programme is a once-in-a-lifetime experience where you can live in a new culture, study at a prestigious international university and exchange your career prospects.

UTM-HAVARD GLOBAL OUTREACH PROGRAMME

UTM-Havard Global Outreach Programme is an initiative to encourage the mobility of UTM students and to provide the opportunity for UTM students to experience the extraordinary environment of Harvard College academics, resources and residential life. As a visiting student at Harvard, you will join a vibrant community of motivated students and distinguished faculty as you satisfy your intellectual curiosity, earn academic credit, and explore the many facets of Harvard University and the Boston-Cambridge area.

UTM GLOBAL OUTREACH PROGRAMME (GOP)

GOP is an internationalization programme to further globalize the students of UTM through academic visit to universities around the world. This programme has opened up the horizon and extended students’ experience to the higher education in other countries. In this one or two weeks programme, the students are expected to gain new academic, cultural and international experience. The exposure of the overseas visits and organizing the GOP helps to develop students’ generic skills and add values to their study programmes.

Participating in the GOP, students will have the opportunity to broaden their personal, academic & professional horizons. Through this programme, students can:

* Globalize their educational experience by adding an international dimension to their degree,
* Enhance academic opportunities beyond those offered by UTM,
* Establish professional & career opportunities by networking with other students, academics & professional organization,
* Improve language skills, cross-cultural understanding & cross-cultural & interpersonal organization,
* Experience personal growth by developing self confidence, independence & social skills,
* Incorporate these new experiences into their resumes so that they stand out from the crowd in an ever increasingly global work force.
The programme focus area are distinguished by:

* A technical-based, experiential approach that redefines the classroom as students learn from academics, policymakers and other professionals in the real-world setting of communities, workplaces, organizations and natural environments.
* Genuine cultural immersion through cross discipline experience and local assimilation that enables students to make connections that promote academic progress, personal growth and intercultural understanding.
* Service learning that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility and strengthen communities.

**GOP FUND**

UTM GOP Fund is set up to assist the funding of the Global Outreach Programme which will see students being part of a delegation which spend one or two weeks in an international location approved by the University in order to gain new academic, cultural & international experience. It is designed to develop UTM’s students to be global ready graduates.

**SUMMER SCHOOL PROGRAMME**

This three week programme offers a number of interesting courses. It has a wide application related to the environment, local community, heritage and tradition. This course, incorporate theory and practice, blended with local culture and social activities. The summer school programme creates reciprocal partnership through which participants exchange ideas, share experience, discover new knowledge and establish network. Participants will earn and have hands-on experience by participating in various field trips and culture programme.
ACADEMIC ADVISING

Universiti Teknologi Malaysia in general and Faculty of Mechanical Engineering specifically practice academic advising where each student is placed under the guidance of an Academic Advisor who is appointed from among the academic staff in the faculty. The academic advising is aimed at assisting students to get used to the University education system which is very different from the school education system, to help students in solving problems related to academic matters such as study load, aim and objective of programmes, or problems related to appropriate studying techniques, and to help students in getting the maximum benefit from the semester system.

Academic Advisor will aid to solve the above-mentioned problems faced by students under his/her supervision. Undergraduate students are required to discuss with his/her Academic Advisor in deciding on the courses to be taken before registration for a particular semester.

AIMS AND OBJECTIVES

Generally emphasis is given on advice relating to academic matters and improvement of the student performance:

i. Guiding and assisting students to familiarise themselves with learning based on the semester system.
ii. Acting as an advisor to students especially in the academic field
iii. Guiding students to works a team
iv. Assisting any student who faces difficulties especially in the academic field
v. Acting as a link between students and staff (academic and general) and FKM
vi. Nurturing a balanced attitude and assisting to personality development of students in line with the need of the nation.

<table>
<thead>
<tr>
<th>ROLES &amp; FUNCTIONS OF AN ACADEMIC ADVISOR</th>
<th>ROLES OF STUDENTS</th>
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<tr>
<td>1. Improving student’s academic performance and self-confidence</td>
<td>1. Meeting the Academic Advisor during the first week to receive general briefing on the semester system and other matters related to studies.</td>
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<td>2. Selection of course and field of specialisation</td>
<td>2. Obtaining endorsement of course and examination registrations.</td>
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<td>3. Intellectual development</td>
<td>3. Seeking advice from the Academic Advisor on preparation of study programme in the aspects of course selection, total credit hours to register and duration of study.</td>
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<td>4. Improving relationship between student and academic staff</td>
<td>4. Obtaining endorsement for application to withdraw course</td>
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<td>5. Encouraging co-curricular activities</td>
<td>5. Seeking advice on the effects of registration and withdrawal of courses.</td>
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<td>6. Student registration</td>
<td>6. Informing and discussing with the Academic Advisor on academic performance and on any problem encountered throughout each semester</td>
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<td>7. Assisting students in overcoming problems in their course</td>
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SYNOPSIS OF GENERAL COURSES

SERVICE COURSES FROM FACULTY OF SCIENCE

SSCE 1693
Engineering Mathematics I
This is a first course in Engineering Mathematics. It covers topics including differentiation and integration which focus on hyperbolic and inverse functions. Improper integrals are also studied. Vectors and matrices including basic operations, solving related problems in 3 dimensions are discussed. In addition, vector spaces, eigenvalues and eigenvectors are introduced. Sketching of polar graphs is discussed. This course also covers complex numbers, function of complex variable, series and power series.

SSCE 1793
Differential Equations
This is an introductory course on differential equations. Topics include first order ordinary differential equations (ODEs), linear second order ODEs with constant coefficients up to fourth order, the Laplace transform and its inverse, Fourier series, and partial differential equations (PDEs). Students will learn how to classify and solve first order ODEs, use the techniques of undetermined coefficients, variation of parameters and the Laplace transform to solve ODEs with specified initial and boundary conditions, and use the technique of separation of variables to solve linear second order PDEs and the method of d’Alembert to solve wave equation.

SSCE 1993
Engineering Mathematics II
This course is about multivariable calculus of real and vector-valued functions. The basic theory of partial derivatives and multiple integrals of real functions with their applications are discussed. This theory is extended to vector valued functions to describe motion in space, directional derivatives, gradient, divergence and curl, line integrals, surface integrals and volume integral. Related theorems, namely Green’s Theorem, Stokes’ Theorem and Gauss Divergence Theorem and their applications are discussed.

SSCE 2193
Engineering Statistics
This course begins with basic statistics, elementary probability theory and properties of probability distributions. Introduction to sampling distribution, point and interval estimation of parameters and hypothesis testing are also covered. Simple linear regression and one-way analysis of variance are also taught in this course. Students are taught on how to use and incorporate statistical tools and software for solving engineering statistics problem through a group assignment.

SERVICE COURSES FROM FACULTY OF ISLAMIC CIVILIZATION UICI 1012

Islamic Civilization and Asian Civilization
The course familiarizes students with the Islamic Civilization and Asian Civilization. It discusses on the science of civilization that embraces an introductory to the science of civilization, the interactions of various civilizations (Malay, China and India) Islamic Civilization contemporary issues on the Islamic and Asia Civilization, Islamic in Malay Civilization and its role in establishing the Malaysian Civilization. At the end of the course, student will be extensively exposed to the history, principles, value and fundamental aspects of
the civilizational studies in Malaysia as well as to strengthen the integrity of Malaysian as citizen of a multi-racial country which has a high tolerance towards others. Throughout the learning process, some aspects of generic skills namely team working, communication skills and ethics will be emphasized.

**UICI 2022**

**Science, Technology and Mankind**
The course discusses the philosophy of knowledge in terms of its definitions, concepts, theories, history, culture, knowledge, and transfer of knowledge. It is also discussed about the science in terms of its concepts, history, cosmology, and Islamic view of learning science, methodology of Islamic science, the comparisons between Islamic science and Western science, as well as modern science and the divine. Next discussion is about technology in terms of its concepts, historical development, solution to technology issues, as well as technology and divinity. This course also discussed about the human; the concept and theory, the creation of man, the human role, the stages of human life, the glory factors, ethics, values and purpose of human creation.

**UICI 2032**

**Islam and Current Issues**
The course acquaints student with various topics on current issues and the Islamic approaches to overcome the problems and the challenges. The topic comprise discussions on globalization, clash of Eastern and Western civilizations, moral decadency, ethical issues in science and technology, economic issues, development and environmental issues, postmodernism, governance and administration, issues that challenge the credibility of Islam, as well as fundamentalism and extremism issues pertaining to the ethic relations and ethnic chauvinism and the current challenges of Muslim people will also be discussed. At the end of the course, student will be able to explain the Islamic views pertaining to current issues and able to provide answers and alternatives to the problems by referring to the Islamic principles. They are also able to work in team and equip themselves with communication and problem solving skills.

**UICI 2042**

**Islamic Institutions**
The course exposes students to the comprehensiveness of Islam via its distinctive institutions. It discusses on various institutions including family, social, education, economics, legislative and jurisdiction, enforcement and politics. The discussion will be focused on the concepts of family: Its internalizing and implementation, the concept of society and the social responsibility, Islamic philosophy and educational system, concepts of Islamic economics, insurance and banking, the concept and characteristics of law and legislation, the position of Islamic law in the Malaysian constitution, witness, allegation, evidence and demonstration, wilayah Al-Qadha’, wilayah Al-Hisbah and Al-Mazalim and the concepts of Islamic politics and its dominion. At the end of the course, students are able to understand the concepts and the roles of various Islamic institutions which can be an alternative solution to overcome the problem of Ummah. Students are also able to work in team and equipped with communication and problem solving skills.

**UICI 2052**

**Quran and Human Civilization**
The course exposes students to the status of Quran as a book of revelation in related with the human civilization. It discusses on the aspects of the Quran as a book from god; the real
meaning of civilization from the perspective of Quran compared to westerns; Quran as the source of human civilization. Also focused on this study is the characteristic of the ancient civilization as described in the Quran; the prophets of civilization, the perished nation and the collapse of civilization from the view of Quran.

**UICI 2062**  
*Science and the Philosophy of Solat*  
The course introduces student to the concept of solat and its philosophy in the eye of the modern science. The discussion also emphasize on various aspects and position about solat in Islam as well as one of the obligations in the Syariah; the hikmah (wisdom) of solat and why it is needed to being fulfilled by human. The ancient nation and their solat; how the true solat is being as the best instruments to get close to God. The subject also discussed about solat from the perspective of the scientific research and the benefit of solat to mankind.

**UICI 2072**  
*Introduction of Comparative Religion*  
This course is an introduction to understand all major religions of the world and make analytical comparisons among them. It discusses the comparative analysis on the world’s major religions such as Christianity, Islam, Judaism, Hinduism, Buddhism and Sikhism in various aspects. Among the topics discussed in every religion include the definition, concept, theology and beliefs, history, doctrines and practices. This course also discusses the meaning of dialogue between religions and other contemporary issues related to comparative religion.

**UICI 2082**  
*Family Management in Islamic Perspective*  
The course discusses the concept of marriage, marriage laws, goals and wisdom of marriage, mate selection, engagement, principles and conditions of marriage, dowry and wedding gifts, rights and responsibilities of marriage, rights and responsibilities of children, hadhanah, radha’ah and issues related to the family.

**UICI 2092**  
*Property Management and Planning*  
This course discuss the concept of property which includes categories of property, as well as the recent form of property such as the shares of the companies or cooperatives, leasing, hire purchase, and immovable property such as land, houses, and estate. Further discussion is on the basic concepts of estate planning from the perspective of Islamic law and its application within the scope of the law in Malaysia; which includes the distribution of property through faraid, matrimonial property, wills, endowment, gift and nomination.

**UICI 2102**  
*Biopsychosocial Spiritual*  
This course explains about the human being and their spiritual health; introduction, definition of spiritual, emotional and physical, the concept of (spiritual/soul) and physical, the relationships between roh and physical, as well as the role of spirituality in the development of human behaviour. This course also discusses the spiritual health in Islam, the criteria of healthy spiritual and spiritual disorder, factors that contributes to happiness and weak spirituality, spiritual therapy according to the Quran and Hadis. The next discussion is related to biopsychosocial-spiritual approach such as the definition of biopsychosocial-spiritual, the treatment approaches based on the biological-physiological, psychological, social and spiritual aspects as well as the importance of the application of biopsychosocial-spiritual methods in society will be discussed. The prevention of spiritual illness based on Islamic
principles: *Iman, shariah and akhlak (ethic)*, current issues related to spiritual problems in society and the methods to solve these problems will also be discussed in this course.

**UICI 2112**

*Introduction to Science Muamalat*

This course discuss an introduction to science of Muamalat, its philosophy, and principles, the birth of conventional economics and critism on it, Islam and economic activities, the importance of ethics in Islamic economics system, business principles, the advantage of Islamic Economics than conventional system and also economic institutions such as banking, insurance and stock market.

**UICI 2122**

*Philosophy of Islamic Arts*

The course discusses the philosophy of knowledge in terms of its definitions, concepts, theories, history, culture, knowledge and transfer of knowledge. It is also discussed about the science in terms of its concepts, history, cosmology, and Islamic view of learning science, methodology of Islamic science, the comparisons between Islamic science and Western science, as well as modern science and the divine. Next discussion is about technology in terms of its concepts, historical development, solutions to technology issues, as well as technology and divinity. This course also discussed about the human; the concept and theory, the creation of man, the human role, the stages of human life, the glory factors, ethics, values, and purpose of human creation.
SERVICE COURSES FROM FACULTY OF ELECTRICAL ENGINEERING

SKEU 1002
Electrical Technology
The students will be exposed to the concept and theory of basic electrical engineering. This subject will highlight the fundamentals of electrical engineering to enable the student to understand and apply simple electric circuits and network in their working environment. This subject will cover on DC and AC systems (single and three-phase system), current and voltage divider, nodal and loop analysis. Students will also be exposed on the magnet and electromagnet, single-phase transformer, and basic electrical machines and its applications.

SKEU 2012
Electronics
This course in electronic is directed towards students in non-electrical engineering major. Students are exposed to characteristics, functions and applications, of electronic devices such as diodes, bipolar junction transistors, field effect transistors, operational amplifiers, logic gates, and flip-flops. Some of the applications includerectifier circuits, power supply, amplifier, square wave generator, Boolean logic with OR, AND, NOT, NAND, NOR and XOR; and counter circuits using flip-flops.

SERVICE COURSES FROM FACULTY OF MANAGEMENT UHAS 1162

Art Customs and Beliefs of Malaysia (for International Students only)
This course is designed for first year foreign undergraduates. Students will be exposed to various aspects of the Malaysian culture such as the belief system, religious festivals, customs and etiquette of different racial groups in Malaysia. They will also be introduced to Malaysian traditional music, arts and crafts.

UHAS 1172
Malaysian Dynamics
This course covers various disciplines of social sciences, which includes knowledge of sociology, political science, history and international relations. This course will add value to the UTM students to develop self-esteem, promote unity among students, and produce dynamic students and global thinking.

UHAS 2032
Technocrat and Development
This course focuses on the technocrats’ roles and responsibilities toward the nation building process. This course covers topics on sociology, economics, politics, technology, professional ethics and globalization issues from various perspectives.

UHAS 2062
Introduction to Industrial Sociology
Industrial Psychology is part of the psychology discipline, which is related to behavioral science at the workplace. The course applies psychological principles in understanding various behaviours, which involve employees and work. Industrial psychology also considers personnel issues, workplace problems and behavioral management at the workplace.

UHAS 2072
Racial Relation
The course aims at introducing and exposing students to the aspects related to social relation sociology. This includes basic concepts of racial relations such as race, racism, ethnicity,
ethnocentrism, prejudice, stereotype, and form of races/ethnic identity in Malaysia, the Balkans, South Africa, the United States and South East Asia countries. The focus is more on causes, effects as well as the processes and methods of solving racial relation problems.

UHAS 2082
Malaysian Socio-Economic Development
The courses focuses on the meaning and measurement of development, development theories and development plan in Malaysia before and after independence, poverty eradication, society restructuring and development strategy of various sectors in Malaysia. The development strategy is viewed especially in urbanization, industrial sector, privatization, foreign investment, technology transfer and national industrial policies.

UHAS 2092
Professional Ethics
This course consists of basic debates on ethics (morale), ethical theories, ethical awareness, ethical principles and functions, ethical relations with professionalism, ethical problems in professions, value and structure of professional ethics, service obligation, obligation towards clients, obligation towards the profession, current ethical issues in management, medicine, engineering and business.

UHAS 2102
Introduction to Counseling
The aim of the course is to expose students to the fundamental aspects of counseling. This includes counseling concepts, basic counseling skills, career counseling, workplace counseling, industrial problems, interview and counselor’s role in industries.

UHAS 2112
Introduction to International Relations
The aim of this course is to explain the development of international relation. This course also discusses thematic issues such as economics and international trade, laws, military, human rights, Islam and International Relation, Globalization and new World Order.

UHAS 2122
Critical and Creative Thinking
The aim of the course is to develop students’ understanding of the concept, theory and practice of critical and creative thinking. Attention is on the critical and creative thinking techniques as well as obstacle factors to both thinking methods. The two thinking methods will help students to make decisions or solve problems either in group or individually.

UHAS 3102
Entrepreneurship & Enterprise Development
This course is designed to introduce students to the concepts and principles of entrepreneur and entrepreneurship and skills required for an entrepreneur. Techniques of identifying business opportunities, planning, source of funding and business development as well as management. Student will also be exposed to important aspects of designing good business plans based on models proposed by financial institutions and also agencies specially meant for entrepreneurs. Main emphasis will be given on developing entrepreneurship characteristics in the students and skills to manage business in an orderly and systematic manner.
SKMM 1013
Programming for Engineers
This course formally introduces the concept of computers, algorithms, programming languages, pseudocode and problem solving. The two programming languages introduced in this course are C and MATLAB. Topics covered in this course include data types, constants, variables, arithmetic operations, assignment statement, looping, formatted I/O, functions, arrays, matrix operations, data structures, plotting and model building.

SKMM 1113
Mechanics of Solids I
The course provides students with the knowledge to determine the strength and stiffness of engineering structures being used. The structures that will be used in this course are bars, pins, bolts, shafts and beams and the types of applied loadings are axial forces, deformations due to the change in temperature, torsional loads, transverse loads and combination of these loads. At the end of the course, students should be able to determine the mechanical properties of the materials with respect to their strength and stiffness. Students should be able to calculate stresses, strains and deformations in structures due to various types of loading conditions. In addition, they should be able to solve problems related to statically determinate and indeterminate structures.

SKMM 1203
Statics
This course introduces students to the part of mechanics which is a pre-requisite for most engineering courses including SKMM 1213, SKMM 2313 and SKMM 1113. The course enables students to acquire the essential basic knowledge of resultant and equilibrium of forces. It will examine key elements in producing free body diagrams for particles and rigid bodies, as essential first step in solving applied mechanics problems. Exposure to the concept of moment and equilibrium equations with reference of Newton’s Law enhances the relevance of friction, trusses, frame and machines applications. Students are also introduced to the concept of distributed forces, which include centroid and centre of gravity and the generated surface area and volume of revolution. Hence, students should will be able to demonstrate and apply the knowledge to continuing subjects that requires the analytical skills developed in this subject.

SKMM 1213
Dynamics
The course is an extension to SKMM 1203, which is the pre-requisite to this course. It introduces students to the part of mechanics which considers the action of forces in producing motion. This course provides an exposure to students on the theory of the kinetics and kinematics of particles and rigid bodies. The concepts of energy, work, momentum and impulse are also introduced. At the end of the course students should be able to apply the principles to study and analyse the behaviour and responses of dynamical systems. They should also be able to solve the dynamic problems related to the determination of forces energy and power to move a body.

SKMM 1503
Engineering Drawing
This subject introduces students to the use of technical drawing in an effective way for communicating and integrating with engineering concepts. Such environment will provide a
platform where the engineer can share and exchange information. This subject will also enlighten the student on the significant changes in the engineering and technical graphic due to the use of computer and CAD (Computer Aided Design) software. At the end of the course, student should be able to apply the skill and knowledge of engineering drawing to interpret design, using graphics method such as geometric drawing, orthographic projection, isometric, machine drawing, detailed drawing, and basic CAD software.

SKMM 1512
Introduction to Design
This course is designed to expose student to the concepts and methods to develop an efficient design process and applying it to solve engineering design problems creatively and effectively.

SKMM 1912
Experimental Methods
This course is conducted by lectures and laboratory experiments. For the first seven weeks, students are exposed to the experimental method theory followed by laboratory works for the next seven weeks. The lectures shall cover the fundamental or experimental method and the basic principles in measurements, instrumentation and analysis of results. It shall focus on the design of mechanical experiments, selection of sensors and transducers, estimation of errors and display of results. It shall also cover the analysis of the results and proper report writing. Student comprehension will be tested by two written examinations. During the practical sessions, several groups of 5 – 6 students will be formed to conduct several experiments. The students are expected to apply the theories thought earlier in the first part of the semester in designing the experiments, recording the data and displaying the results. The students will also conduct statistical analysis of the results and present the experimental outcome in a report.

SKMM 1922
Introduction to Mechanical Engineering Profession
This course comprises of two modules intended to introduce students to the field of mechanical engineering. The first module raises the student’s awareness to the importance and necessity of developing habits of systematic analysis for solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of generic skills to engineers. It also provides students of a clear overview of the different fields within Mechanical Engineering and a description of the mechanical engineer’s work and professional responsibilities. It discusses the education requirements for today’s mechanical engineers as well as exposes the students to the skill sets required of an engineer entrepreneur. The second module aims to expose students to the hands-on nature of mechanical engineering and introduces a range of workshop skills which forms necessary knowledge and experience in the work of a mechanical engineer.

SKMM 2123
Mechanics of Solids II
The course is an extension to SKMM 1113, which is the pre-requisite to this course. It aims to extend the student’s knowledge and understanding of the behavior of materials and structures under a variety of loading conditions. The course starts off with plane stress and plane strain transformation, following which several elastic failure criteria are investigated. The course provides an opportunity to investigate thick cylinders, structural deformation behavior by using the energy method, instability problems of struts and elasto-plastic bending of beams. Determinate and indeterminate problems will be examined. At the end of the course, students should be able to calculate and evaluate stress, strain and deformation of
structures in torsion and bending. They should also be able to evaluate failure modes and estimate fracture life of structures and components. The aspect of designing safe components and structures shall also be emphasized to the students.

SKMM 2223
Mechanics of Machines and Vibration
The course requires SKMM 1213 as the pre-requisite. It is designed to expose students to the application of concepts in mechanics (statics and dynamics) to solve real world mechanical engineering problems pertaining to various machines that include belt and pulley systems, gears, flywheels, governors and gyroscopes. Students will also be exposed to methods of balancing rotating masses and parts of a combustion engine. The concept of vibration with respect to one-degree-freedom is also studied. At the end of the course, the students should be able to solve problems related to various mechanical systems. In addition to that they should be able to evaluate analytically the parameters of components of various machines under study.

SKMM 2313
Mechanics of Fluids I
The principles aim of this course is to provide students with an understanding of the properties of fluids and to introduce fundamental laws and description of fluid behaviour and flow. It will emphasize on the concept of pressure, hydrostatic pressure equation and its application in the measurement of pressure, static force due to immersed surfaces, floatation and buoyancy analysis. Dynamic flow analysis inclusive of technique in solving flow problems is introduce especially to solve flow measurement mass or volumetric flow rate, momentum in flow and loss in pipe network. Lastly, some basic dimensional analysis and similarities will be introduced. At the end of the course, the student should be able to demonstrate and ability to analyse whether statically, dynamically or kinematically problems related directly to fluids.

SKMM 2323
Mechanics of Fluids II
This course is designed to enhance the basic knowledge that has been developed in the first stage of Fluid Mechanics and expose the students in analyzing hydrodynamically the flow field. It will emphasize on the analysis and the importance of boundary layer, ideal and compressible flow in practical engineering applications. The course will also provide the analysis of flow through fluid machines such as pump and turbine. At the end of the course, students should be able to demonstrate and apply the theory to solve problems related to flow of fluids.

SKMM 2413
Thermodynamics
Thermodynamics is a basic science that deals with energy. This course introduces students to the basic principles of thermodynamics. It will discuss basic concepts and introduces the various forms of energy and energy transfer as well as properties of pure substances. A general relation for the conservation of energy principle will be developed and applied to closed systems and extended to open systems. The second law of thermodynamics will be introduced and applied to cycles, cyclic devices and processes.

SKMM 2423
Applied Thermodynamics
Applied Thermodynamics is the science of the relationship between heat, work and the
properties of thermodynamics systems. It is concerned with the means necessary to convert thermal energy from available sources such as fossil fuels, natural gases, coal etc. into a useful mechanical work. The mechanical work can then be used for example to drive an electric generator for generating electricity. The mechanical work can also be used to drive a reciprocating compressor for producing compressed air. Heat engine is a name given to a thermodynamics system which operates in a cyclic manner and in doing so produces a network from the heat supplied to it. Examples of such system include internal combustion engines, vapor power plants and a gas turbine plants. Reversed heat engine is a thermodynamics system that is used to absorb heat from a cooled space and rejects the heat to a warmer space. Its applications are in refrigeration, heat pump and air conditioning systems. In this course, students will be thought on the basic components, principles of operation and methods to assess and improve the performance of these systems. Some aspects of energy sustainability is also included in this course.

SKMM 2433
Applied Thermodynamics & Heat Transfer

Applied Thermodynamics is the science of the relationship between heat, work and the properties of thermodynamics systems. Heat engine is a name given to a thermodynamics system which operates in a cyclic manner and in doing so produces a network from the heat supplied to it. Examples of such system include internal combustion engines, vapor power plants and a gas turbine plants. Reversed heat engine is a thermodynamics system that is used to absorb heat from a cooled space and rejects the heat to a warmer space. Its applications are in refrigeration, heat pump and air conditioning systems. In this course, students will be thought on the basic components, principles of operation and methods to assess and improve the performance of these systems. In this course, conduction, convection and radiation, the three basic modes of heat transfer with the covered. Emphasis will be on developing a physical and analytical understanding of the three modes of heat transfer, as well as its applications. This course also introduces methods for calculating rates of heat transfer by these three modes.

SKMM 2613
Materials Science

This course introduces students to the fundamentals of materials science and engineering with emphasis on atomic bonding, crystal structures and defects in metals. It will introduce students to the various classes of materials including metals, ceramics, polymers and composites and their fundamental structures. The course will also provide basic diffusion mechanisms, metal solidification phase diagrams and heat treatment processes. At the end of the course, students should be able to apply the knowledge of atomic bonding and crystal structures to predict the physical and mechanical behavior of materials, and use the principles of phase diagrams and heat treatments to the design of materials and their properties.

SKMM 2713
Manufacturing Processes

This course discusses the fundamental aspect of various traditional and non-traditional manufacturing processes for metal and non-metal components. It starts from the overall introduction on manufacturing aspects followed by polymer shaping processes, casting processes, joining processes, metal forming processes and machining processes including CNC and CAM. At the end of this course, the students should be able to select suitable manufacturing processes to produce a part/product. The knowledge gained from this course also allows students to make right decision in designing products based on process requirements.
SKMM 2921
Laboratory I
This course is introduced in second year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It consists of six laboratories; Strengths of Materials Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluid Laboratory. Students will be grouped into 5 to 6 for each experiment. It is based on the theory that have been learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each experiment and will be evaluated based on this report.

SKMM 3023
Applied Numerical Methods
This course introduces the steps involved in engineering analysis (mathematical modelling, solving the governing equation, and interpretation of the results). Examples of case studies in applied mechanics, strength of materials, thermal science, and fluid mechanics are presented. Methods for solving the nonlinear equations, simultaneous linear algebraic equations, eigenvalue problem, interpolation, numerical differentiation, numerical integration, initial value problems, boundary value problem and partial differential equation are introduced.

SKMM 3033
Finite Element Methods
This course gives students an exposure to the theoretical basis of the finite element method and its implementation principles, and introduces the use of available finite element application software for solving real-life engineering problems.

SKMM 3233
Control Engineering
The course shall cover the essential and basic theory of control engineering. It shall cover the followings: open and closed-loop systems, manipulation of block diagram, signal flow graph and Mason's rule, concept of transfer function, time response analysis, classification of system, control action, stability analysis, Routh criteria, root locus method, frequency analysis, Nyquist and Bode plots, relative stability from Nyquist and Bode diagrams and design of control system. MATLAB and simulink software package shall be taught and used as a tool in solving control engineering problems throughout the course.

SKMM 3242
Instrumentation
The course shall cover the essential and basic theory of instrumentation for undergraduate. It shall cover the followings: fundamentals and components of instrumentation system, characteristics of instrumentation system, signal conditioning, transducers and application of strain gauges in load measurements.

SKMM 3252
Mechatronics
The course provides students with an introduction to mechatronics and its application in the real world. It will examine a number of key topics of mechanical engineering, electrical/electronics and computer control disciplines with an emphasis on the integrated approach. At end of the course, students should be able to define and describe clearly the term ‘mechatronics’ and its philosophy, relate the importance and contribution of mechatronic system in industry, identify and describe clearly a mechatronic system and its main components, analyze and synthesize a basic mechatronic system and design simple
mechatronic system.

**SKMM 3443**  
**Heat Transfer**  
In this course, conduction, convection and radiation, the three basic modes of heat transfer will be covered. Emphasis will be on developing a physical and analytical understanding of the three modes of heat transfer, as well as its applications. Students will develop an ability to apply governing principles and physical intuition to solve single and multi-mode heat transfer problems. This course also introduces methods for calculating rates of heat transfer by these three modes. The calculations usually involved energy balances and may include flow of material to and from the system.

**SKMM 3523**  
**Components Design**  
This course is designed to expose students to analysis in machine design element failure theories. This includes failure due to static and fatigue loads. It involves fatigue strength and endurance level, modified stress Goodman diagram and fatigue design under tensile and combined stresses. The content will encompass the design and selection of bolts, welding, spring, ball and roller bearing, gears and belts. At the end of the course a student should have the capabilities to identify, make analysis and design the machine elements in the perspective of static and fatigue failure aspect.

**SKMM 3622**  
**Materials Technology**  
This course introduces students to the basic concepts required to understand and describe the mechanical behavior and failure mechanism of metals. It will emphasise on the concept of stress intensity factor and fracture mechanics to predict failure of materials and provide understanding on conditions under which fatigue and creep occur. The course will also introduce students to the theory of electromechanical corrosion in metallic materials, estimate the corrosion rate and understand the methods to control and manage corrosion. By the end of the course the student should be able to apply the criteria of failure to the design of materials and conduct failure analysis of engineering components. This course also covers the properties, processing and applications of non-metallic materials mainly polymer, ceramic and composite.

**SKMM 3623**  
**Materials Engineering**  
This course is designed to introduce students to the concept of fracture mechanics and how engineering materials respond to mechanical loads. The failure behavior of engineering materials will cover fracture, fatigue, creep, wear and corrosion. The course will also provide students with knowledge of how to conduct failure analysis and determine the root cause of failure under different mechanical loading. The mechanical behavior of polymeric materials, ceramics and composites will also be covered as well examples of case studies of selecting engineering materials for specific product designs.

**SKMM 3813**  
**Industrial Engineering**  
This course introduces students to various theories, principles and the importance in the area of industrial engineering and project management. It covers issues related to productivity, quality, work study, ergonomics, facilities planning and project scheduling. The contents give some exposure briefly the concept and application of overall discipline for an industrial engineer. Some calculations or measurements are introduced as an approach before deciding
the best alternative. Students should be able to describe fundamental aspects of project management and integrate knowledge in engineering and project management. In project management, students are exposed to steps in developing project plan, managing risks, scheduling resources reducing project duration, and progress and performance measurement. At the end of the course, students should be able to apply various concept and tools for selecting the best alternative in terms of man, machine, materials, method and management and planning and monitoring engineering projects.

SKMM 3915
Industrial Training
Industrial training exposes students to the real work setting in various industries for 12 weeks. The students are placed in industries that best suit their area of studies. It is an experiential learning that requires the students to learn the process and able to apply their knowledge acquired in class in actual industrial setting. The knowledge acquired during practical training may be used later in final year classes as well as to equip them with sufficient knowledge for job interviews.

SKMM 3931
Laboratory II
This course is introduced in third year of Mechanical Engineering programme involving two hours per week and experimental based courses. It consists of six laboratories; Strength of Materials Laboratory, Thermodynamics Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluids Laboratory. Students will be grouped into 5 to 6 for each experiment. It is based on the theory that have been learned in the particular courses at the same semester. In general, every student have to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each experiment and will be evaluated based on this report.

SKMM 3941
Laboratory III
This course is introduced in third year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It is divided into two parts; experimental work at System & Control and Vibration Laboratories and a problem-based-learning (PBL) laboratory (module) depending on the topics/labs facilitated by a lecturer. Students have to produce a short report for the experimental work similar to those in Lab I and II. The second part, i.e., the lab module is based on the PBL concept. Student have to plan and design their own experimental work right from the very beginning until the end of the module based on the topics given by the lecturer. Students will be grouped into 5 to 6 for each module. In general, every group have to conduct two experimental works and two modules. At the end of the session, student have to submit two short reports and two formal reports.

SKMM 4533
System Design
This course is designed for students to gain detailed topical exposure to design methodologies and principles specific to the practice of mechanical design. Emphasis is on developing efficient and effective design techniques as well as project-oriented skills from both technical and non-technical considerations. At the end of this course, students should be able to identify and apply appropriate methodology in performing design tasks, recognize the fundamental principles of mechanical design and practices, and formulate and apply general problem solving strategy in the analysis of situation, problem and
potential problem. At the end of this course, students should also be able to identify and apply industry standards in design communication.

**SKMM 4823**

**Engineering Management, Safety and Economics**

This course aims to prepare students with basic management knowledge, safety and engineering economy. The management part will examine key issues in management and organization, management yesterday and today, strategic management, organizational structure and design, human resource management, motivating employees and leadership. Major topics covered under safety are OSHA 1994, Factories and Machinery Act 1967, hazard identification, risk assessment and control, basic principles of accident prevention and occupational health. In engineering economy, students are exposed to engineering economic principles and methods of engineering economic analysis. At the end of the course, students should be able to describe fundamental aspects of management; integrate knowledge in engineering and management in making business decisions; apply the principles of hazard identification, risk assessment/control; plan, design and implement an effective safety program; and also perform engineering economic analysis to solve problems and evaluate engineering investment/projects.

**SKMM 4902**

**Engineering Professional Practice**

This course introduces students to engineering ethics and an engineer’s responsibilities towards safety, health and welfare of the public. It places emphasis on the engineer as a professional man, engineers & society, code of ethics and professional conduct, standards, laws and regulations pertaining to professional engineering practice. At the end of the course, students should be able to demonstrate and apply engineering professional ethics in their career as an engineer.

**SKMM 4912**

**Undergraduate Project I**

This course introduces the final year students on how to do academic research on their own by applying knowledge and skills they acquired from other courses. Given to a topic on a project, students have to identify a problem, gather relevant information to the problem and propose solution to problems. In this course, students have to do some literature surveys in order to understand the nature of the problem and investigate work done by other researchers in line with their work. The students are also required to propose a methodology on how to solve the problems. By the end of this course, the students are expected to submit and present their research proposal to be assessed by their supervisors and panel of assessors.

**SKMM 4924**

**Undergraduate Project II**

This course is the continuation of Undergraduate Project (UGP) 1. It enhances the students’ knowledge and ability to identify and solve problems through academic research. It will provide an exercise for the student in carrying out research with minimum supervision and ability to plan and manage their work effectively. This course will also develop the students’ capability to present, discuss and analyze results of the research clearly, effectively and confidently in both oral presentation and in dissertation.
COURSE ELECTIVES

SKMM 4113
Plasticity and Applications
This course addresses the background of metal under plastic behaviour and their possible generalizations under combined stresses. It also deals with the technologies and analyses in various metal forming applications. By the end of the course, the student should be able to: State and analyze the loading and unloading behavior of metal materials with the few hardening rules and their characteristics, Analyze the stresses and strains in 3-D, Apply the yield and failure criteria analysis for the starting of plastic behaviour, Analyze the plastic bending behavior of metal with hardening rule. The student should also be able to present, differentiate and simplify the various technologies and analysis on metal forming applications i.e. Sheet metal Forming, Blanking, Stamping, Cup- Drawing, Indentation, Stretching and drawing over a radius, Wire Drawing, Extrusion and Pultrusion processes.

SKMM 4123
Structural Analysis
This course builds upon the materials covered in SKMM 1113 and SKMM 2123, to develop an understanding of structural behaviour. Matrix analysis methods are used as the basis for computer-based structural analysis. Analytical techniques are used to analyse trusses, beams, frames, flat plates and domes. At the end of this course, the students should be able to differentiate between various types of space structures and determine member forces, deflections and extension and reactions in truss structures, using stiffness method, apply governing equations for rectangular flat and circular plates when subjected to lateral loads, using the exact and energy methods, apply the differential equations of infinite and semi-infinite beams on elastic foundation, when acted upon by load, point and couple loads. Students should be able to explain shell theory and determine membrane stresses in thin walled plate structures, in the light of designing thin shells of revolution under symmetric loads as well as assess and evaluate stresses obtained from Design by Analysis and Design by Rule according to standard design codes.

SKMM 4133
Failure of Engineering Components and Structures
This course introduces systematic approach in performing engineering failure analysis to identify the causes of failure. The procedure covers both metallurgical aspects and mechanics of materials analyses. The scope covers failure events due to static load, fatigue, creep and buckling. It also addresses component failure in specific application interest such as microelectronics devices.

SKMM 4143
Mechanics of Composite Materials
This course introduces students to some major views and theories in polymer based composite materials, on the types of materials, production methods, quality assurance, failure analysis, test methods and the mechanics of laminated composites. It will focus on key issues such as stress-strain relation, and interaction behavior due to extensional, coupling and bending stiffnesses. The course includes visits to related industries in order to understand the practical aspects of the course. It is expected that at the end of this course, the students are able to explain the different types of materials used to
form polymer-based composites, explain different types of production methods used
to form polymer-based composites components, determine properties of lamina using
Rule of Mixtures, develop stress-strain relation for unidirectional lamina to determine
extensional, coupling and bending stiffness matrix of laminate, state different modes of
micromechanic failure to evaluate types of failure criteria of laminates and explain
standard test procedures for strength, stiffness and toughness for quality assurance.

SKMM 4153
Applied Stress Analysis
The course is an extension of SKMM 1113 and SKMM 2123 where the basic
knowledge of stress, strain, displacement, equilibrium and compatibility are extended to
the use of stress function in rectangular and polar coordinates, with applications to
torsion, flexure, plane stress and plane strain problems. The theory is then supported
by experimental techniques which include strain gauging transducer design and data
acquisition and photoelasticity. It is expected that at the end of this course, the
students are able to apply the skills of mathematical manipulations at an advanced
level for stress analysis in terms of their applicability and limitations, evaluate the stress
functions of plane stress and plane strain problems in rectangular and polar
coordinate systems, determine stress distributions and resultants in beams, plates, cylinders
and discs by using the stress function concept, apply strain gauge technique to determine
the state of stress on a component, design and calibrate force, displacement, pressure,
torque and acceleration transducers and apply photoelasticity method to determine the
direction and magnitude of principal stresses.

SKMM 4163
Surface Mount Technology
This course presents an overview of surface mount electronics packaging. The scope covers
identification of surface mount components and printed circuit board, description of surface
mount technology processes, reliability aspects and manufacturing practices.

SKMM 4213
Mechanical Vibration
This subject covers the fundamentals of vibration analysis of 1, 2 and multi DOF mechanical
system including the effects of damping; free response, the significance of natural modes,
resonance frequency, mode shape, and orthogonality; vibration absorbers and vibration
control; and introduction to vibration measurement. A measurement project involves the
use of an accelerometer, signal conditioning and analysis instrumentation.

SKMM 4233
Mechanisms and Linkages
The course provides necessary techniques to study the motion of machines where position and
displacement, and advance kinematics analysis are addressed. The course focuses on the
application of kinematics theories to practical linkages and mechanisms. Statics and
dynamics mechanism force analysis are addressed. Students will be exposed to the design
and analysis of cam-and-follower systems. The course also introduces kinematic synthesis of
linkages and mechanisms.

SKMM 4243
Advanced Control
The course is structured to encompass the essentials and basic theory of design and analysis
of control system that are not covered by SKMM 3233. It will include the cascade
compensation technique using lead and lag compensator, non-linear system analysis, discrete system and state-space analysis. By the end of the course, students should be able to design lead and lag compensators that satisfy gain margin or phase margin specification, analyse the stability of non-linear feedback system using describing function, derive the response of a discrete system, analyse the stability of discrete system, derive state-space model for a dynamic system, derive the output response of a system represented by state-space model and design a constant state-feedback controller based on pole-placement method. MATLAB and Simulink software package shall be taught and used as a tool on solving the control engineering problems throughout the course.

SKMM 4253
Industrial Automation
The course is an elective for students seeking a specialty to mechanical engineering related to the field of industrial automation. It introduces students to the methods, tools, and technologies used to automate a product or a system. Primary automation technologies covered include programmable logic controllers (PLCs), PC-based control, robotics and NC machines. It is expected that students should be able to acquire knowledge on the principles of an industrial automation, identify industrial automation components and peripherals, develop or draw control system schematics using relay logic, develop and debug ladder logic programs for industrial PLCs, describe clearly a PC-based automation system, determine robot components, configuration and specification, develop basic NC part program, describe automated inventory control and inspection technologies, describe automation communication and networking and design an automated system.

SKMM 4273
Robotics
This course is designed to enable students to develop the necessary insight into the area of robotics. It will examine the fundamental elements of robot system related to anatomy and configuration, robot main components, programming feature and methods and robot 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 pre-requisites 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 students to explore the various control algorithm that address the stability, accuracy and robustness of 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 will be discussed to further strengthen the students’ understanding and insight into actual systems.

SKMM 4293
Noise
This course prepares the future engineers with the physical principles of noise together with the tools and analysis techniques for noise measurements. Students will be taught on the physics of sound, measurement instrumentations, analysis techniques, sound/noise inside room & enclosure, transmission of sound/noise through structure and outdoor sound/noise. Students will also be introduced and exposed to the typical noise measurement instrumentations available in the noise laboratory. International and domestic noise regulations are also highlighted. The project/s assigned to students during this course requires understanding on the basic principles of noise along with the use of noise measurement instrumentations and data analysis. At the end of this course, students should understand thoroughly all the underlying
physical principles of noise and should be able to measure and analyze noise levels whenever required.

SKMM 4313  
**Turbo-Machinery**  
Gas dynamics turbo machine theory and general concept, design aspects of axial flow compressors, design aspects of axial flow compressors, design aspects of axial flow compressors, design aspects of axial flow turbine, design aspects of radial flow compressor, design aspects of radial flow turbines.

SKMM 4323  
**Fluid Power System**  
This course introduces the theory and practical aspects of hydraulic and pneumatic systems, and their related issues. Students will be exposed to the function and operation of each system components, all related symbols and construction of circuits. Students will be able to carry out calculations to determine the size of components and their performance. Basic knowledge from this course will be able to guide students in order to select appropriate components, design simple circuits, handle and maintain the actual system in industrial sectors. Safety aspect as well as act and regulations in relation to hydraulic and pneumatic systems are introduced to highlight and promote safe and healthy working conditions.

SKMM 4333  
**Computational Fluid Dynamics**  

SKMM 4343  
**Hydraulics Machines and Pipes System**  
Basic elements of water flow in pipes which are applied to practical problems or pipelines and pipe networks for steady, quasi-steady and unsteady flow Hardy-Cross Method. Pressure wave and water hammer analysis method of characteristic. Pump operation and pipe system. Pump working range: selection of pump as an integrated part of the pipeline system. Operating point. Cavitation-NSPH.

SKMM 4413  
**Internal Combustion Engines**  
This course is an elective for students seeking knowledge and necessary insight into the topic of internal combustion engines. It introduces students to the basic principles of the design and operating characteristics of various types of internal combustion engines with major emphasis on reciprocating engines. It will examine two and four-stroke spark ignition (SI) and compression ignition (CI) engines. Thermochemistry and fuels, air and fuel induction, combustion and fluid motion, exhaust flow and emission, heat transfer in engines as well as friction and lubrication are covered within the course. By the end of the course, students should be able to analyse and evaluate the performance of SI and CI engines, explain the combustion process of SI and CI engines and describe the pollutants as well as emission control and treatment of internal combustion engines.
SKMM 4423
Power Plant Engineering
This course is designed as an elective for students to develop the necessary knowledge and understanding of power plant technology. It introduces different power generation methods and deals with how power plants are operated as well as the components in a power plant. Power generation applications will be treated in detail as well as deeper cycle studies of power generation with emphasis on thermal systems and analysis firmly based on thermodynamics. By the end of the course, students should be able to perform technical and economical assessments of a power plant. They should be able to describe the main features of power generation methods and alternative energy sources. The students should also be able to explain the environmental aspects of power generation.

SKMM 4433
Refrigeration and Air-Conditioning
This course is an elective for students seeking knowledge and necessary insight into the area of refrigeration and air-conditioning. It introduces students to the basic principles of the design and operations of refrigeration and air-conditioning systems. It will include analysis of vapour compression and vapour absorption refrigeration systems and a discussion on refrigerants. Students will be exposed to air-conditioning systems and equipment. Psychrometric analysis, comfort and inside design condition, heat load estimation and duct design are covered within the course. By the end of the course, students should be able to perform air-conditioning system analysis and design calculations using the principles of thermodynamics and fluid mechanics, psychrometric analysis and ASHRAE standards for heat load calculations.

SKMM 4443
Thermal Fluid System Design
This course introduces students to thermal fluid system design. The course begins with a review of fluid mechanics, thermodynamics and heat transfer, which are important fundamentals to the thermal design process exchangers such as boilers, condensers, cooling towers etc. Students are then taught the basic design principles, design methodology, system identification and description, component design and simulation. This is followed by the theory and design of heat exchangers. The course continues with aspects of system design, system simulation and system optimization. Students are exposed to various simulation and optimization techniques that can be used to optimize the design of both components and complete systems. By the end of this course, students are expected to be able to apply the knowledge in designing simple thermal systems, optimize the basic (workable) design, simulate the process, evaluate and optimize the performance of the system.

SKMM 4453
Combustion
This course is designed as an elective for students seeking knowledge and necessary insight into the area of combustion. Basic thermodynamics and chemical kinetics of combustion will be introduced. Types of fuel especially liquid and gaseous fuels will also be introduced. Premixed and non-premixed flames and where their applications can be found will be examined. Detonation phenomena will also be studied. Students will be exposed to pollutant formation and control. By the end of the course, students should be able to explain the basic concepts of combustion, identify areas of applications of combustion and perform basic calculations pertaining to fuels and their analysis. Students should also be able to analyse various types of flames and the combustion processes involved and explain the impact of pollution and emissions from combustion processes on the environment.
SKMM 4513
Computer Aided Design
This course is designed for students to gain knowledge on what is going on behind the screen of Computer Aided Design Software. This understanding makes the learning curve of new CAD software shorter as the students may be using other CAD software later when they work. Furthermore, the courses will also expose the student the capability of the programming within CAD software. With the programming knowledge the student will be able to model as well as using the programming to integrate engineering knowledge to CAD.
COURSE SYNOPSIS FOR B. ENG (MECHANICAL -MATERIALS)

SKMB 3612
Physical Metallurgy
The course introduces the student to the basics of materials crystal structures and stereographic projection. It also provides students with knowledge of atom diffusion in solids, phase diagrams and phase transformations, and modes of alloy strengthening mechanisms. The course will provide detailed knowledge on steels using the Fe-C phase diagram and various heat treatments and the effect on mechanical properties. At the end of the course students should be able to apply knowledge acquired on phase diagrams and atomic diffusion to read, construct and predict the materials structure and mechanical properties and design suitable heat treatments that would give the optimum performance through the use of the interrelationship between microstructures mechanical properties and processes.

SKMB 3623
Mechanical Properties of Materials
The course introduces students to the fundamentals of dislocation theory and the role of these dislocations in predicting the metal’s ability to deform plastically. It will focus on the mechanical behavior 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 applications in understanding and predicting the mechanical behavior of materials. At the end of the course the student should be able to link between the behavior of materials and their structures and design procedures to control failure of materials.

SKMB 3633
Materials Characterisation
This course provides students with an understanding of the principles of advanced techniques used in characterizing and determining the structure and properties of materials. These techniques include x-ray diffraction and x-ray analysis, analytical techniques of microscopy including light, scanning and transmission microscopy, as well as the basic principles of thermal analysis techniques.

SKMB 4613
Corrosion and Corrosion Control
This course introduces students to the basic principles of electrochemical and aqueous corrosion and environmental degradation of metals. It will examine the principles that lead to metal corrosion and oxidation based on thermodynamics and Pourbaix diagrams, mixed potential theory and theory and application of passivity. The course will also provide knowledge on the various forms of corrosion and methods to control by design, materials selection, cathodic protection, coatings and the use of inhibitors. At the end of the course the students should be able to apply the knowledge to determine whether corrosion will occur in any given environment and recognize the different types of corrosion as well as be able to design a corrosion control system for protection against environmental degradation.

COURSE ELECTIVES
SKMB 4023
Non Destructive Testing
This course is designed to acquaint students with the six major non destructive evaluation disciplines: radiography, ultrasonic, eddy current, magnetic particle, liquid penetrant and visual inspection as well as provide students with an overview of less common
NDT methods in general that gives an important contribution to the safety and the economic and ecological welfare of our society. NDT is the only choice for the test of an object which must not be destroyed, modified or degraded by the testing process. This is generally required for objects which will be used after testing, for example safety parts, pipelines, power plants and also materials under in-service inspection. NDT is based on physical effects at the surface or the inner structure of the object under test. Often the outcome of the test needs to be interpreted to give a useful result; sometimes different NDT methods must be combined, or verified by the other test methods. At the end of the course the students should be able to apply knowledge of using different NDT methods: acoustic emission testing, x-rays (radiographic testing) and Ultrasonic Testing for inner defects, Penetrant and Magnetic Particle Testing for surface cracks. Electronically linked methods like Eddy Current Testing, RADAR, Computer Tomography and Thermography and visual testing and leak testing.

SKMB 4623
Materials Selection
This course introduces students to the basic concepts of materials selection and provides systematic methodology for materials and process selection in engineering design. The course will emphasize on describing the relationship between component design and materials selection and how materials selection fits into the design process from concept to the final details. The interaction between the manufacturing process and material selection and the need to adopt concurrent engineering approach is described. The effect of environment impact on materials and process selection is also introduced. The course also provides students with case studies in which the methodology of materials and process selection is used. By the end of the course students should be able to perform the necessary calculations, identify the design/functional requirements of materials properties and perform the selection of candidate materials.

SKMB 4653
Advanced Materials
This course introduces students to the recent developments on the various classes of advanced materials used in applications such as aerospace, automotive, biomedical and electronic industries. It will emphasise on the important properties exhibited by metallic, polymeric, ceramics and composite materials that make them selected for high-end and advanced applications. The physical and mechanical properties of the various classes of advanced materials (superalloys, titanium and aluminium alloys, intermetallics and biomaterials) will be detailed as well as the processing techniques associated with producing these materials. The course will also cover the latest advanced materials being developed such as nanomaterials, shape memory alloys and other functional materials. At the end of the course students should be able to gain understanding of the physical and mechanical properties of advanced materials and apply the knowledge to select suitable materials for a given engineering project.

SKMB 4663
Materials Processing
This course introduces students to the manufacturing methods of engineering materials into the desired shapes. It starts with the basic concepts of manufacturing and processing and their applications to metals as it introduces students to solidification in casting, powder metallurgy, deformation processes. The course will examine the various processing methods for ceramics, polymers and composite materials. The course emphasizes on the role played by materials and their properties in selecting the
optimum manufacturing method. At the end of the course students should be able to demonstrate the ability to relate structure of materials to properties and processing method.

SKMB 4673
Surface Engineering
This course introduces students to the concepts of surface engineering and how surface engineering may be used to enhance the performance of engineering components. It will provide an overall view of the commonly used surface engineering techniques with emphasis on the strengths and limitations of each method. The course will also examine key issues on the role that surfaces play in materials behavior; concentrating on wear and corrosion processes. The factors affecting the selection of surface treatment method are also covered in terms of performance, properties and process factors. 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 the suitable surface treatment for a given application.

SKMB 4683
Nanomaterials
This course introduces students to fundamental aspects of nanomaterials. The importance of the nanoscale materials and their improved properties compared to conventional materials. The principles and relative merits of a range of techniques for the production of nanostructures including ultra-thin films and multilayers are discussed. The analytical and imaging characterization techniques and the recent applications of nanomaterials in electronics and biomaterials will be briefly discussed.

SKMB 4693
Modelling in Materials Engineering
This course introduces students to the basic concepts of computer modeling in materials science and engineering. The course covers basic principles in establishing numerical simulation for the evaluation of material properties and phenomena during material processing. It will emphasize on atomistic and microscopic evaluation of material properties and behavior by computer simulations. In detail molecular dynamic method will be given as an example of atomistic evaluation method, whereas phase-field method will be introduced as an example.
SKMI 3822
Quality Systems
This course emphasizes on the importance of quality in manufacturing systems. Statistical process control (SPC) techniques such as seven basic tools, variable and attribute control charts, process capability studies, acceptance sampling and reliability are covered. The principles of Quality Improvement strategies and quality management philosophies such as Six Sigma and ISO 9000 are highlighted. Students are required to work in groups to integrate the quality and statistical tools learned to solve case studies problems.

SKMI 3833
Operation Research
This course will cover both deterministic and non deterministic operations research. It focuses on developing mathematical models and applying operational research methods to solve problems in manufacturing and service industries. Topics covered include linear programming, sensitivity analysis, transportation model, network optimization, decision analysis, multicriteria decision analysis, queuing system etc.

SKMI 3843
Production Planning & Control
This course is designed to expose students to several theories and principles in Production Planning and Control (PPC) either in manufacturing or service sectors. It discusses issues on forecasting, capacity and aggregate planning, scheduling, inventory control and also computerized manufacturing system such as Manufacturing Requirement Planning (MRP), Demand Requirement Planning (DRP) and Enterprise Resources Planning (ERP). It also introduces basic lean concept as part of the latest issues in manufacturing system. At the end of the course, students should be able to apply knowledge in production planning and control for managing all the resources such as man, machines, materials and time in an organization. This is to ensure the system becomes more productive, effective and efficient.

SKMI 3853
Work Design and Productivity
This course is designed to introduce students to techniques in designing work in manufacturing and service industries to improve productivity. The importance of productivity and productivity measurement model will be discussed. This course will focus on method study and work measurement. Other concepts and approach will also be introduced such as Principles of Motion Economy, Design for Manufacture and Assembly (DFMA), Single Minute Exchange of Die (SMED) and Mistake Proofing (Poka Yoke). At the end of the course, students should be able to select the appropriate techniques, approaches and concepts in solving case studies problems that optimizes the use of resources such as man, machine, materials and time to improve productivity.

SKMI 3863
Engineering Economy & Accounting
This course is designed to equip students to acquire engineering economy and accounting concepts, principles and methods. The focus of this course is to provide understanding on engineering economic principles and methods and to apply it in engineering field. The course is divided to two parts. Part 1 is designed to teach
students to formulate cash-flow diagram, perform analysis on engineering economic problems and evaluate between alternative of engineering investments/projects to make economical decision. Part 2 is designed to teach students to perform cost estimates using traditional and current costing techniques in production process, prepare simple financial statement and interpret financial performance of business firms for decision making and control.

SKMI 4053
Safety and Engineering Management
This course aims to prepare students with basic management knowledge and safety. The management part touches key issues in management and organization, management yesterday and today, strategic management, organizational structure and design, human resource management, motivating employees and leadership. In addition to these, project management aspects are included such as developing a project plan, managing risk, scheduling resources and costs, reducing project duration, and Progress and Performance Measurement. Major topic covers for safety are OSHA 1994, Factories and Machinery Act 1967, hazard identification, risk assessment and control, basic principles of accident prevention and occupational health. At the end of the course, students should be able to describe fundamental aspects of management; integrate knowledge in engineering and management in making business decisions, managing a project using project management principles and techniques in planning, scheduling and controlling projects, and apply the principles of hazard identification, risk assessment/control; plan, design and implement an effective safety program.
COURSE ELECTIVES

SKMI 4063
Ergonomics And Occupational Safety
The course provides an introduction to ergonomics and occupational safety. In ergonomics, it concerns the study of human at work with the purpose of enhancing efficiency, productivity and comfort. It places human at the centre of reference with the components of machine, workspace and environment. In occupational safety, it emphasizes the study on the safety and health hazards which comprises the short and long term exposure. It covers basic principles of accident prevention, hazard identification, risk assessment and control. At the end of the course, students should be able to apply occupational safety and health principles and techniques in the design and analysis of workplace, processes and products.

SKMI 4083
Reliability and Maintenance
This course gives an introduction to reliability engineering concepts related to engineering. Relevant statistical tools to solve reliability engineering problems, statistical data analysis to estimate reliability of component and system and apply related reliability engineering knowledge to improve product quality. This course also covers major topics related to maintenance such as introduction to maintenance engineering, preventive maintenance, total productive maintenance (TPM), six major losses, overall equipment effectiveness (OEE), reliability and maintenance cost.

SKMI 4073
Industrial Systems Simulation
This course provides students with the concepts and tools to model manufacturing or service systems efficiently using a 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 building, model verification and validation, to full model experimentation and analysis of outputs are covered. Through this course, students will be able to develop computerized discrete-event simulation models and conduct scenario-based analysis and evaluation.

SKMI 4093
Supply Chain Management and Sustainability
This course aims to provide students with an understanding of the sustainability challenges and opportunities facing supply chain today. We will look at some of the factors that are contributing to the adoption of sustainability strategies, such as legislation that are penalizing negative environmental and social impacts and society’s expectation of business in terms of health, human rights and the environmental. The supply chains today cannot be concerned only with creating shareholder value; their performance is also measured in terms of social, environmental and economic impact. The main topic covered in the course are sustainable concept and framework, global warming, environmental legislation, sustainable design of products, renewable energy, closed-loop supply chains, facilities and locations decisions, transportation decisions, supplier management and strategic sustainability implementation.

SKMI 4813
Quality Engineering
This course covers process and product variation, Six Sigma, Quality Function
Development (QFD), Failure Mode Effect Analysis (FMEA), Gage Repeatability and Reproducibility (GRR), Short Run SPC and experimental method such as Taguchi Methods and Classical Experimental Designs. Students are required to work in groups to integrate these tools in solving case studies problems.

SKMI 4833
Facility Design
This course is designed to equip students with the basic knowledge on designing manufacturing facilities layout, manufacturing processes, work design and production planning control. Topics covered in this course include selection of the facility location, design layout procedures and algorithms, personnel requirements, line balancing, material handling and warehouse operations. At the end of the course, students should be able to design manufacturing plant layout by considering all engineering/manufacturing and supporting activities requirements, evaluate the best layout from the generated alternatives, select the best facility location, determine line balancing loss and select the appropriate material handling requirements for the manufacturing plant.
SKMP 3712
**Design for Manufacture & Assembly**
This course aims to provide students with the necessary concepts and procedures to understand the integration of manufacturing criteria into the product design process. This course will explore Design for Manufacture and Assembly (DfMA) principles for design of reliable and easy-to-produce components having minimal cost. Design of machined, powder metallurgy/particulates and casting parts will be considered, along with design of assemblies. Materials selection and the benefits of DfMA in reduction in part and assembly costs will also be discussed.

SKMP 3722
**Modern Manufacturing**
This course introduces automation and advanced techniques used in the modern manufacturing. Types of automation systems, applications, advantages and disadvantages are discussed. It also includes discussion on the principle of CAD/CAM and other applications in various manufacturing automation systems such as GT, CNC, FMS and CIMS. This course will also allow student to carry out small case studies in the real environments for exposing them on certain issues related to manufacturing automation.

SKMP 3813
**Manufacturing Systems**
Technology plays an important role in the success of a manufacturing system but what is more important is the systematic management of the technology and system. To ensure the effective use of technology and efficient manufacturing system, all resources have to be managed efficiently. This subject is an introduction to selected Industrial Engineering (IE) techniques for improving productivity of an organization. At the end of the course, students should be able to select appropriate techniques, approaches and concepts to reduce waste and optimize the use of resources such as man, machine, materials and time.

SKMP 3942
**Laboratory 3 CAD/CAM/CNC/CAE**
This course provides an in depth coverage on various aspects of computer aided application for advanced operations in manufacturing industries. This include the exposure on computer aided design (CAD) for modelling products, computer aided manufacturing (CAM) for simulation of machining operations, G & M codes for programming parts on computer numerical controlled (CNC) machines and computer aided engineering (CAE) for simulation of moulding process or parts under mechanical/thermal stresses. The students are directly exposed to several mini-exercises related to the use of CAD/CAM/CNC/CAE software throughout this course. At the end of this course, the students will be able to model products using CAD software, preparing CNC part programming, simulate machining conditions via CAM interface and finally use CAE software to simulate moulding conditions or mechanical/thermal stresses in parts.
SKMP 4723  
Tooling for Production  
This course gives a brief but overall introduction to various types of production tooling typically used in manufacturing operations with special emphasize on jigs, fixtures and sheet metal press dies. Students are given comprehensive exercises and assignments on the design of jigs, fixtures and various categories of sheet metal stamping operations such as shearing, bending and deep drawing.
COURSE ELECTIVES

SKMP 4013
Additive Manufacturing
Additive Manufacturing (AM) is the use of additive material processes for producing parts directly or indirectly from computer (CAD) models, without utilizing the tooling support. These technologies and techniques are the use of 3D printing technology for realizing end use of functional parts. In this course, students will learn about a variety range of AM technologies and their potential to support in making fast prototyping and manufacturing components. In addition, the important research challenges associated with these technologies in supporting of Advanced Manufacturing Technology and Precision manufacturing processes also will be discussed.

SKMP 4713
Industrial Automation
Industrial Automation is becoming more important in the near future to many organizations due to increasing global competition to produce products at the competitive price and quality. Knowledge in automation for future engineers is vital for allowing the designing a competitive and productive system. In this course, the students are exposed to various automation control systems that are commonly used in industries such as pneumatic, electro pneumatic, hydraulic, electro hydraulic, electric motor controls and Programmable Logic Control (PLC). At the end of this course, the students will be able to design a simple control system circuit for an automated system.

SKMP 4733
Product Design & 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 perspective of marketing, design and manufacturing into a single approach to product development. Aspect of sustainable design and manufacturing will also be covered. The course also provide practice in carrying small project to expose the various stages of product development. It also includes the various rapid prototyping and manufacturing systems.

SKMP 4743
Plastic Technology
This course provides a basic introduction but in-depth coverage of plastic mold design using CAD and CAE software, particularly for designing plastic injection mold. The CAD and simulation software (in the product and process design phases help the students to optimize the mold design. It is hoped that through this exposure the students will be able to further develop their design capability in actual working environment, thereby fill the presently serious gap of local engineering know how in this field.

SKMP 4753
Modern Machining
This course introduces students to several non-traditional machining processes. For each of the processes, it will examine the basic principles and the important machining parameters involved, as well as the equipment, tooling and application issues. Where appropriate, theoretical or empirical models employed to estimate process attributes such as material removal rate will be described. Case studies will also be presented.
SKMP 4763  
Quality Engineering & Metrology  
Product quality and the proper functioning of processes are among the important issues for any manufacturing and service organization. Manufacturing engineers play an important role in designing and performing experiments and subsequently analyzing the data collected to solve the problems on hand. This course emphasizes on the design and analysis of experiments, an important tool in industry as well as in research organization, for determining the effect of independent variables on the output of a system. In addition to the above, knowledge on measurement techniques is essential for manufacturing engineers. Product quality needs to be measured or inspected using the right techniques and the data collected need to be analysed correctly in order to ensure that decisions regarding production quality are made correctly.

SKMP 4773  
Engineering Economy & Accounting  
This course is designed to equip students to acquire engineering economy and accounting concepts, principles and methods. The focus of this course is to provide understanding on engineering economic principles and methods and to apply it in engineering field. The course is divided to two parts. Part 1 is designed to teach students to formulate cash-flow diagram, perform analysis on engineering economic problems and evaluate between alternative of engineering investments/projects to make economical decision. Part 2 is designed to teach students to perform cost estimates using traditional and current costing techniques in production process, prepare simple financial statement and interpret financial performance of business firms for decision making and control.

SKMP 4783  
Quality Engineering  
This course covers process and product variation, Six Sigma, Quality Function Deployment, Failure Mode Effect Analysis, Gage Repeatability and Reproducibility and Short Run SPC. This course will focus more on experimental methods such Classical Experimental Designs and Taguchi Methods. Students are required to work in groups to integrate these tools in solving case studies problems.

SKMP 4793  
CAD/CAM  
This course discusses about the important role of CAD in the design process, the Design/Manufacturing interface between CAD/CAM/CAE, the basic techniques involved in CAD/CAM/CAE, its importance in the selection, implementation and management of CAD/CAM/CAE system with the association to machine control, fundamentals of Numerical Control (NC) and others Advanced Manufacturing Technology processes. The course also involves hands-on experience in CAD/CAM/CAE.

SKMP 4833  
Project Management and Maintenance  
This course is designed to expose students to project management and maintenance. In project management, the course emphasizes the general management of project as well as project scheduling and analysis. In general project management the topic covers project manager, project planning, work breakdown structure (WBS) and negotiation and
conflict resolution. In project scheduling, topics such as PERT, critical path method (CPM), resource allocation, reducing project duration and project progress and performance measurement are addressed. Major topics covered under maintenance are introduction to maintenance engineering, preventive maintenance, total productive maintenance (TPM), six major losses, measuring overall equipment effectiveness (OEE), reliability and maintenance cost. At the end of the course, students should be able to apply knowledge in project management to plan, schedule and control projects as well as to apply basic maintenance concept and develop a total productive maintenance (TPM) program in a company.

SKMP4703
Sustainable Manufacturing
This course introduces students to 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 sustainable practice. Besides that, it is also introduces the new and innovative concept in sustainable development involving the transformation of 6Rs (reduce, reuse, recycle, recover, redesign, remanufacture) from the traditional 3Rs (reduce, reuse and recycle).
SKMA 3132
Aircraft Structures I
The course introduce the student to the various types of structural components used in aircraft, together with their functions and stress calculations under different types of loading. The lectures will include qualitative descriptions of methods of fabrication and provide a thorough introduction to quantitative methods of analysis. The first section covers the analysis of the statically determinate and indeterminate structure including the various type of truss analysis. Next section covers the analysis of the opened, closed and thin wall beam structure peculiar to aircraft, features discussion on the effect of the various types of load exerted and an introduction to structural idealization. Finally, this section also investigates the stress analysis of the multicell structures due to the acting loads and its design characteristics.

SKMA 3212
Flight Mechanics
Flight mechanics is an important aspect in the design and operation of an aircraft. A flight mission can only be operated successfully and safety if proper efforts are given to this aspect. Therefore, in this course students will be equipped with the fundamental concept of aircraft performance calculation and static stability determination needed to analyze and design aircraft. Proper due shall be given to both aspects of performance and static stability.

SKMA 3333
Aerodynamics
The course gives an introduction to aerodynamics with specific emphasis on aircraft. The purpose is to increase the understanding and interest in aerodynamics. The contents include; Fluid flow equations: Continuity equation, Euler and navier Stokes equations. Inviscid flow theory: complex potential function, Conformal and Kutta Joukowski transformation. 2D aerofoil theory (infinite wing theory): Vortex law, Biot-Savart and thin aerofoil theory, fourier theory, Thick and cambered aerofoil. Finite wing theory: Vortex system and horseshoe vortex, downwash and lift distribution. Introduction to industrial aerodynamics (vehicles and buildings).

SKMA 3423
Aerospace Propulsion System

SKMA 3812
Aviation Management
This course begins by emphasizing on the fundamental concepts of management. This follows by the general overview of the aviation industry that includes airport operations, aviation organizations, aviation rules and regulations. A detailed look on the main activities of the aviation industry is included. Several visits to the aviation
industry are organized throughout the period of the course.

**SKMA 4143**
**Aircraft Structures II**
This course gives students an understanding of the basic principles in the analysis of aircraft structural components and determine their strengths under the various operational loading conditions.

**SKMA 4223**
**Flight Dynamics and Control**
This course is about the dynamics behaviour of rigid body aircraft and the application of control system theory to design simple stability augmentation systems to more complex automatic flight control systems. This includes the application of modern multivariable control system design using state-space methods. Topics include axes system and notation, equation of motion of rigid body including translation, aircraft longitudinal and lateral dynamic stability, flying and handling qualities, stability augmentation and automatic flight control system, aerodynamics stability derivatives and multivariable state-space methods.

**SKMA 4253**
**Aircraft Instrumentation and Avionics**
Avionics and Aircraft instrumentation encompasses the basic aircraft avionics and instrumentation systems. The major topics covers for avionics include historical background, short, long and satellite navigations, radio navigation devices, radar and reliability. For aircraft instrumentation, this course covers major topics including an introduction to instrumentation system, component of instrumentation, air data and indicators signal conditioning, data acquisition system, transducers in aircraft, application of strain gauges in aircraft load measurement.

**SKMA 4513**
**Aircraft Design I**
This course will allow student to learn basic philosophy of aircraft design using traditional and modern design tools (CAD, CFD etc). Student will learn the basic methodology and decisions surrounding aircraft design. The course is a project based and students will used knowledge and skill from previous studies in aeronautics to conduct a practical aircraft design project. Students will work in teams to design the selected aircraft. Contents of learning include feasibility study, aerodynamic design, performance analysis and wing loading determination.

**SKMA 4523**
**Aircraft Design II**
This course gives students an exposure to the aircraft design. Students are splits into a number of groups to carry-out aircraft components design. The progress of the project is closely monitored by the lecturers. Lectures are given to provide the student with information as project goes along. Group presentation and feedback from lecturers are regularly arranged for student evaluation and design improvement.

**SKMA 4822**
**Aviation Economy**
This course aims to expose Aeronautical engineering students with fundamental elements of economics. The course begins by introducing key economic concepts
such as the cash flow diagram and factors. These fundamental concepts are applied on various decision making tools such as Net Present Value, Future Worth, Annual Worth, Rate of Return and Benefit/Cost Analysis.
COURSE SYNOPSIS FOR B. ENG (MECHANICAL – AUTOMOTIVE)

SKMV 3012
Automotive Technology
This course introduces students to the fundamental knowledge of automotive areas such as design principal, components or modern automotive system function and operation, interaction between one system and the other system. Students will then be taught to identify problem that may arise on the components or system. Students will also have some hands-on assignment to be done in automotive laboratory which will give them exposure to work on real automotive components and systems.

SKMV 3413
Internal Combustion Engine
This course is intended to provide students an introduction, terminology, definition and operating characteristics of internal combustion engines (ICE). It covers all topics needed for a basic engineering knowledge of the design, operation, analysis and performance of IC engines. Principles of all types of IC engines are covered including spark ignition (gasoline), compression ignition (diesels), four-stroke, and two-stroke engines. On top of that, students will be equipped with basic knowledge and understanding of engine heat transfer, frictions and lubrication.

SKMV 3941
Laboratory III
This course is introduced in third year of the study of Mechanical Engineering, three hours per week and experimental based course. It is divided into two parts; experimental work at Mechanics of Machine Laboratory and problem-based-learning (PBL) based laboratory (module). Students have to produce a short report for the experimental work same as experimental work at year 2. But for the module, it is based on PBL concept. Student have to plan and design their experimental work start from beginning until to the end based on the title and objective that have being given by the lecturer. Students will be grouped into 5 to 6 for each module. Generally, every group has to conduct two experimental works and two modules. At the end of the session, students have to submit two short reports and two formal reports.

SKMV 4212
Vehicle Electronics and Instrumentation
Vehicle Electronics and Instrumentation System is a subject that consists of several major topics. These major topics include introduction to Automotive Basic Electrical System and Components, General Electrical System Diagnosis, Automotive Starting System, Automotive Lighting and Accessories, Automotive Instrumentation System. The Basic of Electronic Engine Control and Typical Digital Engine Control System.

SKMV 4523
Automotive Engineering Design
This is a problem based learning course. In this course, students will have to undertaken (in group) one mechanical-automotive engineering design exercise. The main aim of this course is for the students to experience how to undertake real group design project. Students will have to go through the process of applying the various techniques and scientific principles (which they have learnt during their undergraduate course) for them to achieve their goals. Students will also be taught to be creative, brainstorm their ideas, discuss and apply the appropriate PR (public relation) to
earn cooperation and commitment from various level of people (such as technicians, lecturers and their own peers), departments and other agencies (such as automotive car and component manufacturers), in order to get sufficient details for their goals to materialise within the time allocated. Concurrently, students will be given lectures related to mechanical design process and engineering design method (technology-independent), based on relevant engineering design books.

SKMV 4792
Automotive Production Technology
This course introduces students to manufacturing processes involved in automotive production as well as some of the major issues related to automotive manufacturing. It will emphasize on casting and forming processes employed in the automotive industry. A brief review on machining and joining processes is also given. The course will also highlight some of the challenging issues such as Quality, Group Technology, Lean Manufacturing and Automation.
ELECTIVE I

SKMV 4213
Vehicle Dynamics
This course introduces students to the fundamentals of vehicle dynamics such as vehicle axis system, equation of motions, moments and products of inertia, body/chassis stiffness and vibrations. Students will be taught the knowledge to develop equation of motion of vehicle dynamics model and to analyze its performance in terms of ride, comfort & handling behavior.

SKMV 4413
Engine Turbocharging
This course is designed to deliver the principles of engine boosting and its significant role towards engine downsizing. The course will emphasize on the engine air induction system, in particular the turbocharging and supercharging systems. Students will be introduced to the science governing the operation of turbochargers and superchargers - which covers aerodynamics, gas dynamics and thermodynamics. The syllabus will enable the students to have the view of a turbocharger designer, as well as enable them to recognize the common problems relating to turbocharging and internal combustion engine. Engine downsizing is one of the crucial steps undertaken by engine manufacturers towards carbon reduction and sustainable technology. However, it requires significant technology advancement in all aspects of engine sub-systems to deliver the targeted performance. The specific contribution of engine boosting to meet these targets will be discussed and elaborated as part of the course.

ELECTIVE II

SKMV 4213
Vehicle Structures
This course is designed to expose students to the design of the modern passenger car structure. It will emphasize on the general architecture of the vehicle structure design specifications for the body structure, methodology for evaluation of body structure performance and manufacturing/assembly of body panels.

SKMV 4423
Vehicle Powertrain
This course introduces students to the fundamental of vehicle powertrain engineering systems. Students will be lectured on vehicle powertrain system that employs manual and automatic transmission that uses either dry friction clutch or hydraulic torque converter and how to predict its performances. Students will be taught on how to match engine (internal combustion engine – ICE) and the different types of transmission systems in predicting the vehicle performances. The performances predictions that will be covered in this course are how to determine vehicle gradeability, top speed, acceleration and steady state fuel consumptions. In conjunction to these students will be taught on how to determine top, bottom and intermediate gear ratios taking into consideration overgeering and undergeering conditions. The current new continuously variable transmission (CVT) technology and exploiting its capability to achieve the above vehicle performances will be highlighted.
COURSE SYNOPSIS FOR B. ENG (NAVAL ARCHITECTURE AND OFFSHORE GINEERING)

SKMO 1922
Introduction to Naval Architecture and Offshore Engineering
The course comprises two parts intended to introduce students to the field of naval architecture and offshore engineering. The first part raises the student’s awareness to the importance and necessity of developing systematic approach for solving naval architecture and offshore engineering problems. It introduces the importance of some generic skills to naval architects and offshore engineers. It also provides students an overview of the different fields within naval architecture and offshore engineering and a description of the naval architects and offshore engineer’s work and professional responsibilities. The second part aims to expose students to the hands-on nature of basic engineering workshop skills.

SKMO 2123
Ship and Offshore Structure I
This course is concerned with the knowledge on loading and stresses of ship and offshore structure. It begins with the components and functions on ship and offshore structures. The floating hull loading, shear forces and bending moments are then in detail discussed. The important structural strength analysis for ship and offshore structures will be highlighted on bending and buckling afterward.

SKMO 2322
Naval Architecture I
This course introduces students to basic naval architectural knowledge. It enables students to familiarise themselves with naval architectural terms, ship components and undertakes simple hydrostatics and stability calculations. Tools and techniques that are required in future naval architecture work are introduced here. The course includes hands-on individual and group projects.

SKMO 2343
Marine Hydrodynamics
Basic knowledge of marine hydrodynamics theory and CFD software are introduced. Enhancement of Knowledge in Mechanics of Fluids I started with some discussion on motion of Viscous/Real fluid and an Ideal fluid. Further discussion are also given in surface waves and hydrodynamic of slender bodies

SKMO 3133
Ship and Offshore Structure II
This course is divided into three main areas, namely ship/platform topside vibration, finite element methods and underwater structural failure. In the vibration it starts with introduction to the structural vibration, free vibration and forced vibration. It is then followed by the vibration calculation in ships and platform topside structure. Method of determining vibration characteristics and reducing vibration are given for design practices. FEM covers the analysis of statically indeterminate structure by the direct stiffness method of truss, beam and plane frames. The students are also required to carry out building frame project using FEM software. In the underwater structural failure, it reviews the various modes of structural failure and highlights the importance of fracture induced failure and contrasts it with the limited coverage given to fracture mechanics in underwater. This section will discuss some examples of well known failures/accidents attributed to cracking. Then, using a simple example we shall compare the failure load predicted from linear elastic fracture mechanics with the one predicted by
classical strength of materials. Ability to learn independently, working in team and interpret the results objectively will also be emphasized in this course.

SKMO 3333
**Naval Architecture II**
This course introduces students to further naval architectural knowledge. It enables students to familiarise themselves with naval architectural terms ship components and undertakes hydrostatics and stability calculations. Students will be able to carry out calculations to determine ship stability in all conditions. The content covers calculation of areas, moments and centroids, transverse stability, longitudinal stability, large angle stability, damage stability, launching.

SKMO 3523
**Ship and Offshore Design I**
This course firstly explains the concepts of engineering design and later relates them to the process and procedures in ship design. Emphasis is made on preliminary design calculations to satisfy owner’s requirements and related legislations. The hands on part will deals with design tasks, including hull form design (manually and computer aided) hydrostatics calculation and General Arrangement Design. The students will be given a real design job and working as consultant group to closely replicates the real ship design practice.

SKMO 3353
**Ship Resistance & Propulsion**
This course introduces students to ship hydrodynamics, dimensional analysis, fundamental of ship resistance, ship resistance and its components, fundamental of ship model testing and extrapolation methods and marine propulsors. The course also includes propeller theories, methods of propeller design and the study of cavitation phenomena together with the analysis of propeller-engine matching.

SKMO 3713
**Ship and Offshore Production Technology**
This course is essential as it prepare the student with the basic knowledge and exposure on construction process of ship & offshore structures. This course covers the hardware and software aspects of ship and offshore production technology. It begins with the introduction to shipbuilding industry, its importance and development in world economics and in Malaysia, Ship and offshore/production construction process flow chart and activities. Production/construction yards location, layout and facilities. Material treatment including surface preparation, cutting process, welding, painting process etc. that involve in the construction process. It followed by subassembly, block assembly and erection process of offshore structures. Upon completion, launching, transporting and upsetting process will also be discussed. On the soft engineering side, the quality control and production system will also be taught. Apart from normal lecture hours, the student is expected to carry out class assignment, field survey or site visits to ship and offshore production yards and technical writing. Therefore, the course is expected to develop and enhance the student ability to discuss and explain the related knowledge, to work in team effectively, long life learning and communication skills.

SKMO 3812
**Marine Transport & Economic**
The course focuses on delivering knowledge to students on two aspects of maritime
transport and economics. Firstly is on the basic definitions and process for the efficient operation of global port and shipping operations. Secondly is on the basic definition for the economics of port and shipping operations up to the concepts for appraising investment and financial performance. Additional knowledge is also given to students on the current issues influencing the world maritime scenario. The topics selected are globalization, technology and knowledge while addressing environmental issues.

**SKMO 3915  
Industrial Training**

Industrial training exposed students to the real work setting in various industries for 12 weeks. The students are placed in industries that best suit their area of studies. It is an experiential learning that requires the students to learn the process and able to apply their knowledge acquired in class in actual industrial setting. The knowledge acquire during practical training may be used later in final year class as well as to equip them with sufficient knowledge for job interviews.

**SKMO 4233  
Dynamics of Marine Vehicles**

Marine vehicles and structures are built for transportation and also to perform various marine activities such as fishing and offshore drilling. This course provides the knowledge of the characteristics of vessels/structures and the effect of the environment on their behaviour. The course begins with the introduction to effects of waves on vessels and structures. Since ocean waves are complex in nature, by incorporating linear wave theory statistical methods can be adopted to study the irregular behaviour of waves and relate to vessels/structures motions characteristics. Some of the topics include; Introduction to seakeeping and solving seakeeping in waves using strip theory. Introduction to manoeuvrability of vessels that are motions in the horizontal plane so that they can proceed on a straight path, turn or take other avoiding actions in calm water as well as in waves, wind and current. This course emphasises on the students’ ability to identify and solve the behaviour marine vehicles/structures problems by carrying the necessary calculation and analysis.

**SKMO 4422  
Marine and Offshore Engineering System**

The course covers the main engineering systems of the ship and offshore structure machinery. This includes the propulsion and auxiliary systems. Selected analyses of the thermodynamic processes of the system, description of the plant main components, operating principle and performances will be studied. This includes the marine diesel engine and steam turbine power plant, electric and hydraulic power system. Other important support system such as air conditioning, fire, condition and performance monitoring system will also be covered.

**SKMO 4533  
Ship and Offshore Design II**

This course is the continuation of Ship Design I course. Having design the ship hull forms and its related general arrangement to serve its functions done previously, this course continues by continuing the necessary design tasks including Stability Calculation and Assessment, Scantling Calculation and Strength Assessment, and Shell Expansion & Material take off. This course emphasis is Hands on Design Project works (in group) with continuous monitoring from the lecturer. Apart from providing
the necessary technical knowledge and skills, the course also aimed at developing the necessary generic skills such as team working, oral and written presentation skills, project management skills etc. The contents and conduct of the design project is as much as possible tailored to the real design practice in industry.

**SKMO 4823**  
**Engineering Management Environment & Safety**  
This course aims to prepare students with knowledge on basic principles of management, project management, marine environment and safety. The management part will examine key issues in management and organization, management yesterday and today, strategic management, organizational structure and design, human resource management, motivating employees and leadership. Project management shall cover network analysis, resources constrained project, crash time and project performance and risk assessment. Main topics covered under environment and safety will be IMO, MARPOL, SOLAS and the like. OSHA 1994, Factories and Machinery Act 1967 shall also be given mention. Safety topics cover hazard identification, risk assessment and control, basic principles of accident prevention and occupational health. At the end of the course, students should be able to describe fundamental aspects of management; integrate knowledge in engineering and management in making business decisions; apply the principles of hazard identification, risk assessment/control; plan, design and implement an effective safety program.

**SKMO 4912**  
**Undergraduate Project I**  
This course introduces the final year students on how to do academic research on their own by applying knowledge and skills they acquired from other courses. Given to a topic on a project students have to identify a problem, gather relevant information to the problem and propose solution to problems. In this course, students have to do some literature surveys in order to understand the nature of the problem and investigate work done by other researchers in line with their work. The students are also required to propose a methodology on how to solve the problems. By the end of this course, the students are expected to submit and present their research proposal to be assessed by their supervisors and panel of assessors.

**SKMO 4924**  
**Undergraduate Project II**  
This course is the continuation of Undergraduate Project (UGP) I. It enhances the students’ knowledge and ability to identify and solve problems through academic research. It will provide an exercise for the student in carrying out research with minimum supervision and ability to plan and manage their work effectively. This course will also develop the students’ capability to present, discuss and analyze results of the research clearly, effectively and confidently in both oral presentation and in dissertation.

**SKMO 4941**  
**Marine Laboratory I**  
This course is designed to enable students to apply knowledge of ship resistance and ship stability & motions in their laboratory works. This course will also train students to plan and manage their work within a given timeline. Its also develop students capability to present, discuss and analyse experimental results clearly, effectively and confidently in an oral presentation as well as in a written laboratory reports.
SKMO 4951
Marine Laboratory II
This course is designed to enable students to apply knowledge of seakeeping, manoeuvring and also ship propulsion in their laboratory works. This course will also train students to plan and manage their work within a given timeline. Its also develop students capability to present, discuss and analyse experimental results clearly, effectively and confidently in an oral presentation as well as in a written laboratory reports.
ELECTIVE COURSES:

Elective courses are offered to provide a wider area of study. Students can choose the courses according to their interest. Elective I tend to focus on general issues in marine industry. While Elective II covers more technically inclined matters. Details of each course are as follows;

ELECTIVE I
SKMO 4012
**Marine Meteorology and Oceanography**
This course gives an introduction to the courses 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.

SKMO 4132
**Marine Control Engineering**
The course encompasses control engineering analysis and the vessel’s auxiliary systems. This includes marine control engineering systems, hydraulic and electrical system. The students are expected to solving control engineering problems, analyse the performance and operation of marine control systems.

SKMO 4142
**Reliability of Ship and Offshore Structures**
This course provides reliability of ship and offshore structure as the complement of the failure probability for a rational measure of safety in structural design. The course applies the reliability method which deals with the uncertain nature of loads, resistance, etc. and leads to assessment of the reliability. The reliability method is based on analysis models for the structure in conjunction with available information about loads and resistances and their associated uncertainties. These are introduced to the analysis models that are usually imperfect, and the information about loads and resistances is usually incomplete. At the end of the course, the student should be able to calculate the reliability as assessed by reliability method that is generally not a purely physical property of the structure but rather a nominal measure of safety of the structure given a certain analysis model and a certain amount and quality of information.

ELECTIVE II
SKMO 4152
**Platform Pipeline and Sub-Sea-Technology**
This course provides the concepts of offshore platform, submarine pipeline and subsea-technology, basic calculation on strength and fatigue, safety on fatigue life, reliability assessment, design issues, fabrication, installation and operations of offshore platform, submarine pipelines and risers, and also understanding of the equipment used in subsea developments.

SKMO 4262
**Riser and Mooring Dynamics**
This course provides the design and installation operations of riser and mooring Systems. Emphasis is made on design of deep water moorings and riser system by the accepted industry practices and design codes and criteria. It starts with the types and layout of
risers layout and geometry of mooring and line types. Then the riser and mooring line design cycle is introduced and in this section the students calculate the environmental loads pretension and static equilibrium, and Vortex Induced Vibration (VIV), and analyze the static and dynamic performances including floater. The students also solve the dynamic performances of riser/mooring lines using simulation software (eg. MOSES) and analyze the fatigue of riser and mooring chains.

SKMO 4452
Marine Engineering System Project
Marine Engineering System Project is designed for final year students to perform marine systems design. Students are required to specifically design a typical marine engineering systems for a chosen ship or offshore vehicles. Students are then required to integrate these systems together to form a workable compromise and to fulfill the vessel’s intended function. The students are expected to understand the design processes, operations and selection of the auxiliary systems. During the course of the subject students are required to have numerous discussions and presentations to complete the design. Implementation of this course is via group project.
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2. Mohamad Hanafi bin Long - Asst. Engineer J29
3. Abdul Halim bin Abdul Rahman - Asst. Engineer J29

Combustion Laboratory

1. Suhaimi bin Ishak - Asst. Engineer J29
2. Rossli bin Ismail - Asst. Engineer J29
3. Suhaimi bin Ishak - Asst. Engineer J29

Fluid Laboratory

1. Sahlan bin Sadiron - Asst. Engineer J29
2. Nuruljannah bt Alias - Asst. Engineer J29

Mechanics of Machine Laboratory

1. Zulkefli bin Adnan - Asst. Engineer J29
2. Faezah bt Zianalabiden - Asst. Engineer J29

Mechanics of Materials & Structures Laboratory

1. Fadli Shah bin Abd. Kadir - Asst. Engineer J29
2. Mior Ramli bin Mior Sarip - Asst. Engineer J29

Systems & Control Laboratory

1. Abd. Rahim bin Mohamad - Asst. Engineer J29
2. Darulhilmi bin Darusani - Asst. Engineer J29

Design Studio (Studio Room)

1. Mohamed Reduan bin S.M Samsudin - Asst. Engineer J29

Electrical Laboratory

1. Abd. Rahim bin Mohamad - Asst. Engineer J29

Experimental Techniques Laboratory

1. Hamidah bt Hasan - Asst. Engineer J29
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<tr>
<th>No.</th>
<th>Name</th>
<th>Position</th>
<th>Department</th>
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<td>6.</td>
<td>Azizi bin Safar</td>
<td>Asst. Engineer J29</td>
<td>Material Science Laboratory</td>
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<td>Mohamed Ali bin Duki</td>
<td>Asst. Engineer J29</td>
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<td>Roslin bin Yasak</td>
<td>Asst. Vocational Training Officer J22</td>
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<td>Siti Norbiha bt A. Aziz</td>
<td>Asst. Vocational Training Officer J21</td>
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**Material Science Laboratory**

1. Dr. Norhayati Ahmad - Head of Laboratory/Senior Lecturer
2. Ayub bin Abu - Asst. Engineer J29
3. Jefri bin Samin - Asst. Engineer J29
5. Adnan bin Ali - Asst. Engineer J29
6. Siti Farahwahida bt Md. Nor - Asst. Engineer J29
7. Nor Hafizan bin Hussin - Asst. Operational N11

**Automotive Laboratory**

1. Dr. Saiful Anuar bin Abu Bakar - Head of Laboratory/Senior Lecturer
2. Shamsuri bin Ehsan - Asst. Engineer J29
3. Suriati bt Kasim - Asst. Engineer J29
4. Muhammad Abdul Sadid bin Sidik - Asst. Engineer J29
5. Husaini bin Mohamad Maskak - Asst. Engineer J29
7. Kunumon bin Rayin Kutty - Asst. Operational N11

**CENTRES OF EXCELLENCE**

**Institute of Vibration & Noise**

1. Ir. Dr. Mohd. Salman Leong - Director/Professor
3. Mohd. Hafizzi bin Md Idris - Research Officer Q41
4. Noraliza binti Omar - Asst. Engineer J29
5. Siti Rohana bt Mustaffa - Admin. Asst. (Clerical Operation) N17
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