ACADEMIC HANDBOOK SESSION 2022/2023

FOR BACHELOR DEGREE PROGRAMMES

FACULTY OF MECHANICAL AND MANUFACTURING ENGINEERING TECHNOLOGY

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

http://ftkmp.utem.edu.my/

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Chief Information Office

UTeM VISION, MISSION, MOTTO

Vision
To Be One of the World's Leading Innovative and Creative Technical Universities.

Mission
UTeM is committed to pioneer and contribute towards the prosperity of the nation and the world by:

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

Motto
Excellence Through Competency

UTeM GENERAL EDUCATION GOALS

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

Dean's Foreword

بِسْمِ اللهِ الرَّحْمٰنِ الرَّحِيْمِ

Dear students,

Welcome to the Faculty of Mechanical and Manufacturing Engineering (FTKMP). We are thrilled that you have chosen to become part of our family as the Bachelor of Mechanical Engineering Technology, Bachelor of Manufacturing Engineering Technology and Bachelor of Technology students.

FTKMP was established on 1st July 2018 after the Faculty of Engineering Technology (established on 11th April 2011) was restructured into two new faculties. The Faculty consists of the Department of Mechanical Engineering Technology (JTKM), the Department of Manufacturing Engineering Technology (JTKP), and the Department of Industrial Technology (JTI). Our extensive and diverse range of undergraduate curriculum enables us to offer eleven full-time degree programs. Your journey with us will not only be limited to the theory presented during lectures, you will also benefit from the hands-on (practical-oriented) teaching and learning experience. Our aim is for you to acquire the equipment handling and problem-solving skills required by the industry to ensure that you are ready for a career in the technological field of your choice.

This student handbook is intended to provide you with comprehensive information on the undergraduate programs offered by the faculty. Therefore, we strongly advise you to become familiar with the information in this handbook since it will be a helpful resource to guide you during your time here.

Finally, I hope that you will strive hard, take this opportunity to obtain a strong technological foundation, and develop the skills necessary to solve problems relating to mechanical and manufacturing engineering technology as well as industrial technology. I wish you success in your studies and in your future endeavors.

Thank you.

Sincerely,

PROFESSOR. TS. DR. EFFENDI BIN MOHAMAD
Dean
Faculty of Mechanical and Manufacturing Engineering Technology

FTKMP VISION, MISSION AND MOTTO

Vision

Internationally referred in mechanical and manufacturing engineering technology programme.

Mission

To advance knowledge and skill in mechanical and manufacturing engineering technology excellence that will best serve the nation.

Motto

Home of engineering technology.

FACULTY OBJECTIVES

To provide high quality and demanding engineering technology programme that meet current need of industry and society.

To produce highly skilled and competence workforce that is recognized by professional bodies nationally and internationally.

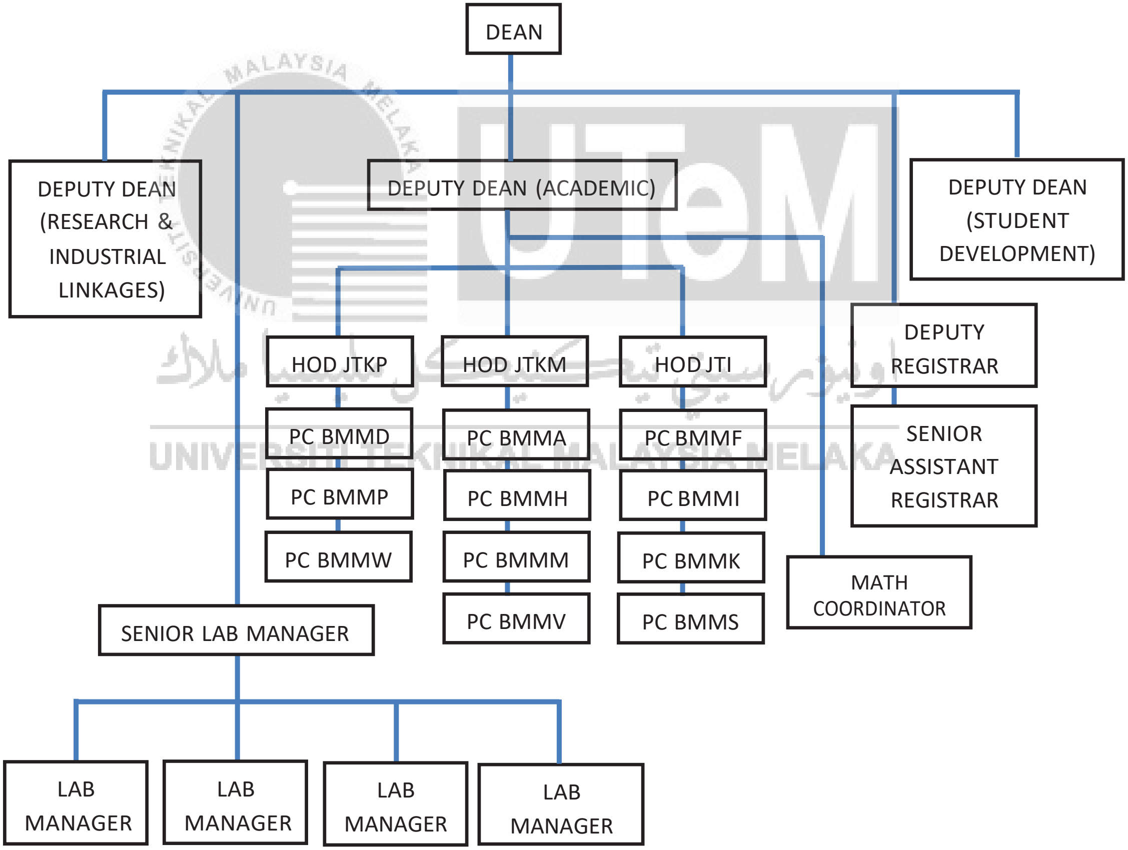
To implement modern and innovative approaches in our teaching and learning environment.

To establish network, good relationship and collaboration with universities and industries.

To participate in activities that supports the intellectual and economic development of business, industry, government and stakeholders.

ORGANIZATION CHART

The faculty is headed by a Dean, assisted by three Deputy Deans, each responsible for Academic, Research & Industrial Linkages and Students Development, respectively. Head of Departments (HOD) and Program Coordinators (PC) manage the degree programs. Senior lab manager and lab managers manage the laboratories facilities and assistant engineers. Deputy Registrar and Senior Assistant Registrar are responsible for the administration of the faculty's office and staff welfare.



PROGRAMMES OFFERED

NO	PROGRAMME NAME	SHORT CODE
1	Bachelor of Mechanical Engineering Technology (Automotive Technology) with Honours	BMMA
2	Bachelor of Mechanical Engineering Technology (Refrigeration and Air-Conditioning Systems) with Honours	BMMH
3	Bachelor of Mechanical Engineering Technology (Maintenance Technology) with Honours	BMMM
4	Bachelor of Mechanical Engineering Technology with Honours	BMMV
5	Bachelor of Manufacturing Engineering Technology (Product Design) with Honours	BMMD
6	Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honours	BMMP
7	Bachelor of Manufacturing Engineering Technology with Honours	BMMW
8	Bachelor of Technology in Automotive with Honours	BMMF
9	Bachelor of Technology in Industrial Machining with Honours	BMMI
10	Bachelor of Technology in Welding with Honours	BMMK
11	Bachelor of Technology in Air Conditioning and Refrigeration with Honours	BMMS

PROGRAMME DURATION

BMMA, BMMH, BMMM, BMMV, BMMD, BMMP and BMMW durations are within minimum of 4 years and up to maximum of 6 years.

BMMF, BMMI, BMMK and BMMS durations are within minimum of 3 and half years and up to maximum of 6 years.

GRADING SYSTEM

A student's achievement for each course in a programme is based on the grades that are illustrated in Table 1.

Table 1: Marks, Grades and Points Awarded

MARKS	GRADE	POINTS	ACHIEVEMENTS
80 – 100	A	4.0	Distinction
75 – 79	A-	3.7	Distinction
70 – 74	B+	3.3	Merit
65 – 69	B	3.0	Merit
60 – 64	B-	2.7	Merit
55 – 59	C+	2.3	Pass
50 – 54	C	2.0	Pass
47 – 49	C-	1.7	Conditional Pass
44 – 46	D+	1.3	Conditional Pass
40 – 43	D	1.0	Conditional Pass
0 – 39	E	0.0	Fail

ACADEMIC CLASSIFICATION

A student's achievement is evaluated based on Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA). A student's academic status will be provided at the end of each semester based on CGPA as shown in Table 2.

Table 2: Academic Status Classification

STATUS	CGPA
Good (KB)	CGPA ≥ 2.00
Conditional (KS)	1.70 ≤ CGPA < 2.00
Fail (KG)	CGPA < 1.70

(Note: KB = Kedudukan Baik, KS = Kedudukan Bersyarat, KG = Kedudukan Gagal)

ACADEMIC ADVISORY SYSTEM

Students are free to take courses offered by the faculty at any semester based on their capability, as long as it complies with the rules and regulations set up by the faculty and university academic board. Students need to plan their own study carefully and the faculty shall appoint an academic advisor to guide them during their duration of study in the university.

Characteristics of the Semester System:

- Students are free to take any courses offered in each semester based on their ability; and conditions of course selection are determined by the faculty and university's academics regulations.
- Students should plan their study and learning appropriately or as advised by their academic advisor.

The Importance of Academic Advisor:

- Students need to be guided in term of courses taken under the semester system, where they are free to determine the number of courses to be taken based on their capability or in case the student obtained a Conditional Position (KS) in the previous semester. They need to plan carefully to take courses which are suitable for them to carry and fully aware on its implication to their whole study period in the university.
- Semester system is a flexible system for a student with high, moderate or less capability to complete their study based on their own capability whilst complying with the maximum study period set up by the university.
- The academic advisor is able to provide an advice not only in the academic matter, but also in the aspects of how the students can adapt themselves to the semester system, culture shock of studying in the university, time management and private matters that may affect the students' study performance.
- In the condition where the student is not with the same batch of other students during the study period due to difference in the courses taken, difficulty may be expected for him/her to discuss on the matter of study with the others. Thereby, the role of academic advisor is important.

Roles and Responsibilities of student and academic advisor in the Academic Advisory System are as follows:

ACADEMIC ADVISOR	STUDENT
• Conduct a meeting with students at least twice per semester.	• Always be open-minded when meeting with the academic advisor.
• Make sure student understand the academic system in UTeM.	• Attend meetings conducted by the academic advisor.
• Guide and make sure student's courses registration is based on his/her current academic result.	• Regard the academic advisor as a mentor and seek advice on the academic matters from them.
• Supervise the student study progress and provide guidance in making a good study planning.	• Learn to have a good understanding of the academic system and his/her Curriculum Structure.
• Inspire students so that they will always be motivated in their study.	• Get the certification of registration form, copy of certificates and reference letter from the academic advisor (if any).
• Ensure the student's record and file is always updated – make sure no course is missed to fulfill the requirement for the award of a Bachelor's Degree.	• Keep records on all courses that have already been taken during the period of study to prevent missed course and fulfill the requirement for degree award.
• Verify and approve the pre-registration of the new semester courses in the SMP portal.	• Perform pre-registration of the new semester courses in the SMP portal.

GPA & CGPA CALCULATION

A student's overall achievement is based on Grade Point Average (GPA) obtained for a particular semester and Cumulative Grade Point Average (CGPA) for the semesters that have been completed.

Grade Point Average (GPA)

GPA is the grade point average obtained in a particular semester. It is based on the following calculations:

Total Points, JMN = $k_1m_1 + k_2m_2 + \ldots\ldots\ldots k_nm_n$

Total Calculated Credits, JKK = $k_1 + k_2 + \ldots\ldots\ldots k_n$

GPA = JMN / JKK
= $[k_1m_1 + k_2m_2 + \ldots\ldots\ldots k_nm_n] \;/\; [k_1 + k_2 + \ldots\ldots\ldots k_n]$

Where : k_n = Credit for n course
m_n = Points from the n course

Cumulative Grade Point Average (CGPA)

CGPA is the cumulative grade point average obtained for the semesters that have been completed. It is based on the following calculations:

CGPA = $[JMN_1 + JMN_2 + \ldots\ldots\ldots JMN_n] \;/\; [JKK_1 + JKK_2 + \ldots\ldots\ldots JKK_n]$

Where: JMN_n = Total points obtained in n semester
JKK_n = Total credits in n semester

GRADUATION REQUIREMENT

A Bachelor degree shall be awarded to the student if he/she fulfills all the following conditions:

1. Must get Good Status (KB) in the final semester and ended up with Awarded Status (KBA).
2. Pass all the courses required as listed in the programme curriculum structure.
3. Apply for the award of the degree, approved by faculty and certified by university senate.
4. Meet all the other requirements set by the university.
5. Students do not have any debt with the university.

ACADEMIC HANDBOOK SESSION 2022/2023

FOR BACHELOR DEGREE PROGRAMMES

CURRICULUM STRUCTURE ENGINEERING TECHNOLOGY PROGRAMMES

FTKMP

FACULTY OF MECHANICAL AND MANUFACTURING ENGINEERING TECHNOLOGY

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (AUTOMOTIVE TECHNOLOGY) PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Programme Educational Objectives (PEO) is specific goals describing expected achievements of graduates in their career and professional life after graduation. To produce, after 3 to 5 years of graduation:

PEO1	Graduates who are able to practice the knowledge in Mechanical Engineering Technology (Automotive Technology).
PEO2	Graduates who are able to engage with continuous development and adapt to evolving technologies.
PEO3	Graduates who are able to adapt professional ethics and leadership to meet the needs of the society.

PROGRAMME OUTCOMES (PO)

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

PO1	Ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialisation principles to defined and applied engineering procedures, processes, systems or methodologies in the field of Mechanical Engineering Technology (Automotive Technology).
PO2	Ability to solve broadly-defined engineering problems systematically to reach substantiated conclusions, using tools and techniques appropriate to Mechanical Engineering Technology (Automotive Technology).
PO3	Ability to design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Ability to plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.
PO5	Ability to select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.
PO6	Ability to demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities relevant to engineering technology practice.
PO7	Ability to demonstrate an understanding of the impact of engineering technology practices, taking into account the need for sustainable development.
PO8	Ability to demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO9	Ability to function effectively as individuals, and as members or leaders in diverse technical teams.
PO10	Ability to communicate effectively on broadly-defined engineering activities with the engineering community and society at large.
PO11	Ability to demonstrate an awareness of project management, business practices and entrepreneurship.
PO12	Ability to recognise the need for professional development and to engage in independent and lifelong learning.

Bachelor of Mechanical Engineering Technology (Automotive Technology) with Honours (BMMA)

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BMMU 1013	*Matematik Teknikal* Technical Mathematics	P	3	
	BMMM 1062	*Fizik* Physics	P	2	
	BMMA 1303	*Grafik Kejuruteraan* Engineering Graphics	K	3	
	BMMP 1313	*Bahan Kejuruteraan* Engineering Materials	K	3	
	BMMA 1313	*Prinsip Elektrik dan Elektronik* Principles of Electric and Electronics	K	3	
	BLHW 1762	*Falsafah dan Isu Semasa* Philosophy and Current Issues	W	2	
	BLLW 1142	*Bahasa Inggeris untuk Tujuan Akademik* English for Academic Purposes	W	2	
	BKKX XXX1	*Kokurikulum I* Cocurriculum I	W	1	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 2	BMMU 1023	*Kalkulus untuk Teknologi* Calculus For Technology	P	3	
	**BMMA 2353	*Permodelan dan Analisis Berkomputer* Modelling and Computer Analysis	K	3	BMMA 1303
	BMMA 1333	*Statik* Statics	K	3	
	BMMP 1303	*Amalan Pembuatan* Manufacuring Practices	K	3	
	BMMP 2503	*Pengukuran dan Instrumentasi* Measurement and Instrumentation	K	3	
	BLHW 2772	*Penghayatan Etika dan Peradaban* Appreciation of Ethics and Civilizations	W	2	
	BKKX XXX1	*Kokurikulum II* Cocurriculum II	W	1	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMMU 2043	*Kaedah Statistik* Statistical Methods	P	3	
	BEEA 1343	*Pengaturcaraan Komputer* Computer Programming	K	3	
	BMMH 2303	*Termodinamik* Thermodynamics	K	3	
	BMMA 2363	*Teknologi Pembuatan* Manufacturing Technology	K	3	
	**BMMM 2313	*Dinamik dan Mekanik Mesin* Dynamics and Mechanics of Machine	K	3	BMMA 1333
	**BLLW 2152	*Penulisan Akademik* Academic Writing	W	2	BLLW 1142
TOTAL CREDITS THIS SEMESTER				17	
SEMESTER 4	BMMU 2033	*Kalkulus Lanjutan untuk Teknologi* Advanced Calculus for Technology	P	3	
	BMMA 1323	*Reka Bentuk Kejuruteraan* Engineering Design	K	3	
	**BMMM 2303	*Mekanik Pepejal* Solid Mechanics	K	3	BMMA 1333
	BMMH 2313	*Mekanik Bendalir* Fluid Mechanics	K	3	
	BMMA 2343	*Teknologi Mikropemproses* Microprocessor Technology	K	3	
	BLHC 4032	*Pemikiran Kritis dan Kreatif* Critical and Creative Thinking	W	2	
	BLLW XXX2	*Bahasa Ketiga* Third Language	W	2	
TOTAL CREDITS THIS SEMESTER				19	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BMMH 3323	*Kawalan dan Instrumentasi* Control and Instrumentation	K	3	
	BMMA 3503	*Sistem Brek Kenderaan* Vehicle Brake System	K	3	
	BMMA 3513	*Enjin Pembakaran Dalaman* Internal Combustion Engine	K	3	
	BMMA 3573	*Sistem Pengurusan Kuasa Kenderaan* Vehicle Powertrain Management System	K	3	
	BMMA 3533	*Dinamik Kenderaan* Vehicle Dynamics	K	3	
	BMMA 3543	*HVAC untuk Automotif* HVAC for Automotive	K	3	
	#BMXX XXX0	*Kursus Persediaan Pensijilan Profesional* Professional Certificate Preparation Course	P	0	
TOTAL CREDITS THIS SEMESTER				18	
SEMESTER 6	BMMU 4053	*Etika Kejuruteraan dan KKKP* Engineering Ethics and OSHE	P	3	
	**BMMU 3764	*Projek Sarjana Muda I* Bachelor Degree Project I	K	4	
	**BLLW 3162	*Bahasa Inggeris untuk Interaksi Profesional* English for Professional Interaction	W	2	BLLW 2152
	*BMMX XXX3	*Elektif I* Elective I	E	3	
	*BMMX XXX3	*Elektif II* Elective II	E	3	
	*BMMX XXX3	*Elektif III* Elective III	E	3	
	***BLHX XXX2	*Elektif Umum* General Elective	W	2	
TOTAL CREDITS THIS SEMESTER				20	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BMMA 4593	*Sistem Penggantungan Kenderaan* Vehicle Suspension System	K	3	
	BMMA 4603	*Sistem Transmisi Kenderaan* Vehicle Transmission System	K	3	
	BMMA 4713	*Prestasi Enjin* Engine Performance	K	3	
	BMMA 4723	*Sistem Pengeluaran Kejat* Lean Production System	K	3	
	**BMMU 4774	*Projek Sarjana Muda II* Bachelor Degree Project II	K	4	BMMU 3764
	BTMW 4012	*Keusahawanan Teknologi* Technology Entrepreneurship	W	2	
TOTAL CREDITS THIS SEMESTER				18	
SEMESTER 8	BMMU 4786	*Latihan Industri* Industrial Training	K	6	
	BMMU 4796	*Laporan Latihan Industri* Industrial Training Report	K	6	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				141	

** Pre-requisite COURSE
W University Compulsory
P Faculty Core
K Programme Core
E Elective

* For Elective I, II and III students may choose any THREE (3) COURSES from the list below:

NO.	CODE	COURSE NAME
1	BMMA 3523	*Sistem Elektrik dan Elektronik Automotif* Automotive Electric and Electronic System
2	BMMA 4583	*Reka Bentuk dan Simulasi Kenderaan* Vehicle Design and Simulation
3	BMMA 4613	*Sistem Keselamatan dan Keselesaan Automatif* Automotive Safety and Comfort System
4	BMMM 4623	*Analisis Minyak dan Serpihan* Oil and Wear Debris Analysis
5	BMMA 4833	*Teknologi Pneumatik dan Hidraulik* Pneumatic and Hydraulic Technology

*** For General elective, students may choose any ONE (1) COURSE from the list below:

CODE	COURSE NAME
BLHW 1722	*Falsafah Sains dan Teknologi* Philosophy of Science and Technology
BLHH 1032	*Psikologi Industri dan Organisasi* Industrial and Organizational Psychology
BLHC 4012	*Komunikasi Keorganisasian* Organizational Communication
BLHC 4022	*Kemahiran Perundingan* Negotiation Skills

\# For Professional Certificate Preparation Course, student may choose any ONE (1) certificate from the list below:

CODE	CERTIFICATE NAME
BMMA 3100	Certified CATIA V6 – Part Design Associate
BMMA 3110	Certified Hypermesh

BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (REFRIGERATION AND AIR-CONDITIONING SYSTEMS) PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Programme Educational Objectives (PEO) is specific goals describing expected achievements of graduates in their career and professional life after graduation. To produce, after 3 to 5 years of graduation:

PEO1	Graduates who are able to practice the knowledge in Mechanical Engineering Technology (Refrigeration and Air-Conditioning Systems).
PEO2	Graduates who are able to engage with continuous development and adapt to evolving technologies.
PEO3	Graduates who are able to adapt professional ethics and leadership to meet the needs of the society.

PROGRAMME OUTCOMES (PO)

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

PO1	Ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialisation principles to defined and applied engineering procedures, processes, systems or methodologies in the field of Mechanical Engineering Technology (Refrigeration and Air-Conditioning Systems).
PO2	Ability to solve broadly-defined engineering problems systematically to reach substantiated conclusions, using tools and techniques appropriate to Mechanical Engineering Technology (Refrigeration and Air-Conditioning Systems).
PO3	Ability to design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Ability to plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.
PO5	Ability to select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.
PO6	Ability to demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities relevant to engineering technology practice.
PO7	Ability to demonstrate an understanding of the impact of engineering technology practices, taking into account the need for sustainable development.
PO8	Ability to demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO9	Ability to function effectively as individuals, and as members or leaders in diverse technical teams.
PO10	Ability to communicate effectively on broadly-defined engineering activities with the engineering community and society at large.
PO11	Ability to demonstrate an awareness of project management, business practices and entrepreneurship.
PO12	Ability to recognize the need for professional development and to engage in independent and lifelong learning.

Bachelor of Mechanical Engineering Technology (Refrigeration and Air-Conditioning Systems) with Honours (BMMH)

	CODE	COURSE	CATEGORY	CREDIT	PRE- REQUISITE
SEMESTER 1	BMMU 1013	*Matematik Teknikal* Technical Mathematics	P	3	
	BMMM 1062	*Fizik* Physics	P	2	
	BMMA 1303	*Grafik Kejuruteraan* Engineering Graphics	K	3	
	BMMP 1313	*Bahan Kejuruteraan* Engineering Materials	K	3	
	BMMA 1333	*Statik* Statics	K	3	
	BMMP 2503	*Pengukuran dan Instrumentasi* Measurement and Instrumentation	K	3	
	BLHW 1762	*Falsafah dan Isu Semasa* Philosophy and Current Issues	W	2	
	BKKX XXX1	*Kokurikulum I* Cocurriculum I	W	1	
TOTAL CREDITS THIS SEMESTER				20	
SEMESTER 2	BMMU 1023	*Kalkulus untuk Teknologi* Calculus for Technology	P	3	
	BMMH 1213	*Asas Elektrik dan Elektronik HVAC* Fundamental of HVAC Electric and Electronic	K	3	
	BMMP 1303	*Amalan Pembuatan* Manufacturing Practices	K	3	
	BMMA 1323	*Reka Bentuk Kejuruteraan* Engineering Design	K	3	
	BMMH 2303	*Termodinamik* Thermodynamics	K	3	
	BLLW 1142	*Bahasa Inggeris untuk Tujuan Akademik* English for Academic Purposes	W	2	
	BKKX XXX1	*Kokurikulum II* Cocurriculum II	W	1	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMMU 2043	*Kaedah Statistik* Statistical Methods	P	3	
	BEEA 1343	*Pengaturcaraan Komputer* Computer Programming	K	3	
	**BMMM 2303	*Mekanik Pepejal* Solid Mechanics	K	3	BMMA 1333
	**BMMM 2313	*Dinamik dan Mekanik Mesin* Dynamic and Mechanics of Machine	K	3	BMMA 1333
	**BMMA 2353	*Permodelan dan Analisis Berkomputer* Modelling and Computer Analysis	K	3	BMMA 1303
	BLHW 2772	*Penghayatan Etika dan Peradaban* Appreciation of Ethics and Civilization	W	2	
	BTMW 4012	*Keusahawanan Teknologi* Technology Enterpreneurship	W	2	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 4	BMMU 2033	*Kalkulus Lanjutan untuk Teknologi* Advanced Calculus for Technology	P	3	
	BMMH 2313	*Mekanik Bendalir* Fluid Mechanics	K	3	
	BMMH 2413	*Projek Rekabentuk HVAC* HVAC Design Project	K	3	
	BMMH 2503	*Asas HVAC dan Penyejukan* Fundamental of HVAC and Refrigeration	K	3	
	BMMH 3553	*Pemindahan Haba* Heat Transfer	K	3	
	**BLLW 2152	*Penulisan Akademik* Academic Writing	W	2	BLLW 1142
	BLLW XXX2	*Bahasa Ketiga* Third Language	W	2	
TOTAL CREDITS THIS SEMESTER				19	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BMMH 3323	*Kawalan dan Instrumentasi* Control and Instrumentation	K	3	
	BMMH 3533	*Beban Pemanasan dan Penyejukan* Heating and Cooling Load	K	3	
	BMMH 3573	*Rekabentuk Sistem Penyejukan* Refrigeration System Design	K	3	
	BMMH 4593	*Akustik dan Getaran Gunaan HVAC* HVAC Applied Acoustics & Vibration	K	3	
	**BLLW 3162	*Bahasa Inggeris untuk Interaksi Profesional* English for Professional Interaction	W	2	BLLW 2152
	***BLHX XXX2	*Elektif Umum* General Elective	W	2	
TOTAL CREDITS THIS SEMESTER				16	
SEMESTER 6	BMMH 3563	*Sistem Pengagihan Udara* Air Distribution System	K	3	
	BMMH 3574	*Penyaman Udara dan Penyejukan Kenderaan* Transportation Air Conditioning and Refrigeration	K	4	
	BMMH 3613	*Kualiti Udara Dalaman* Indoor Air Quality	K	3	
	**BMMU 3764	*Projek Sarjana Muda I* Bachelor Degree Project I	K	4	
	**BMMH 4603	*Sistem Elektrik dan Kawalan HVAC* HVAC Electrical and Control System	K	3	BMMH 1213
	BLHC 4032	*Pemikiran Kritis dan Kreatif* Critical and Creative Thinking	W	2	
	#BMXX XXX0	*Kursus Persediaan Pensijilan Profesional* Professional Certificate Preparation Course	P	0	
TOTAL CREDITS THIS SEMESTER				19	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BMMU 4053	*Etika Kejuruteraan dan KKKP* Engineering Ethics and OSHE	P	3	
	BMMH 3523	*Klasifikasi Sistem Penyaman Udara* Classification of Air Conditioning System	K	3	
	**BMMU 4774	*Projek Sarjana Muda II* Bachelor Degree Project II	K	4	BMMU 3764
	*BMMH XXX3	*Elektif I* Elective I	E	3	
	*BMMH XXX3	*Elektif II* Elective II	E	3	
	*BMMH XXX3	*Elektif III* Elective III	E	3	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 8	BMMU 4786	*Latihan Industri* Industrial Training	K	6	
	BMMU 4796	*Laporan Latihan Industri* Industrial Training Report	K	6	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				142	

** Pre-requisite COURSE
W University Compulsory
P Faculty Core
K Programme Core
E Elective

* For Elective I, II and III students may choose any THREE (3) COURSES from the list below:

NO.	CODE	COURSE
1.	BMMH 3543	*Penyelenggaraan Sistem HVAC* Maintenance of HVAC System
2.	BMMH 3583	*Permodelan dan Analisis HVAC* HVAC Modelling and Analysis
3.	BMMM 3593	*Penentukuran Instrumen* Instrument Calibration
4.	BMMH 4613	*Teknologi Hijau HVAC* HVAC Green Technology
5.	BMMH 4623	*Pengurusan Projek* Project Management
6.	BMMH 4633	*Pembuatan Kejat* Lean Manufacturing
7.	BMMH 4643	*Jig dan Lekapan* Jig and Fixtures
8.	BMMH 4653	*Pengamalan Industri Terkehadapan* Industrial Forward Practice
9.	BMMH 4663	*Kewangan, Kos dan Ekonomi Kejuruteraan* Engineering Financial, Costing and Economics
10.	BMMH 4673	*Pengurusan Pembuatan* Manufacturing Management

*** For General elective, students may choose any ONE (1) COURSE from the list below:

CODE	COURSE NAME
BLHW 1722	*Falsafah Sains dan Teknologi* Philosophy of Science and Technology
BLHH 1032	*Psikologi Industri dan Organisasi* Industrial and Organizational Psychology
BLHC 4012	*Komunikasi Keorganisasian* Organizational Communication
BLHC 4022	*Kemahiran Perundingan* Negotiation Skills

For Professional Certificate Preparation Course, student may choose any ONE (1) certificate from the list below:

CODE	CERTIFICATE NAME
BMMA 3100	Catia V6 – Part Design Associate Certification
BMMA 3110	Hypermesh Certification
BMMD 3100	Solidworks Associate Certification
BMCG 2520	Autocad Professional Certification Preparation

BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (MAINTENANCE TECHNOLOGY) PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Programme Educational Objectives (PEO) is specific goals describing expected achievements of graduates in their career and professional life after graduation. To produce, after 3 to 5 years of graduation:

PEO1	Graduates who are able to practice the knowledge in Mechanical Engineering Technology (Maintenance Technology).
PEO2	Graduates who are able to engage with continuous development and adapt to evolving technologies.
PEO3	Graduates who are able to adapt professional ethics and leadership to meet the needs of the society.

PROGRAMME OUTCOMES (PO)

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

PO1	Ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialisation principles to defined and applied engineering procedures, processes, systems or methodologies in the field of Mechanical Engineering Technology (Maintenance Technology).
PO2	Ability to solve broadly-defined engineering problems systematically to reach substantiated conclusions, using tools and techniques appropriate to Mechanical Engineering Technology (Maintenance Technology).
PO3	Ability to design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Ability to plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.
PO5	Ability to select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.
PO6	Ability to demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities relevant to engineering technology practice.
PO7	Ability to demonstrate an understanding of the impact of engineering technology practices, taking into account the need for sustainable development.
PO8	Ability to demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO9	Ability to function effectively as individuals, and as members or leaders in diverse technical teams.
PO10	Ability to communicate effectively on broadly-defined engineering activities with the engineering community and society at large.
PO11	Ability to demonstrate an awareness of project management, business practices and entrepreneurship.
PO12	Ability to recognise the need for professional development and to engage in independent and lifelong learning.

Bachelor of Mechanical Engineering Technology (Maintenance Technology) with Honours (BMMM)

	CODE	COURSE	CATEGORY	CREDIT	PRE- REQUISITE
SEMESTER 1	BMMU 1013	*Matematik Teknikal* Technical Mathematics	P	3	
	BMMM 1062	*Fizik* Physics	P	2	
	BMMA 1303	*Grafik Kejuruteraan* Engineering Graphics	K	3	
	BMMP 1313	*Bahan Kejuruteraan* Engineering Materials	K	3	
	BMMP 1323	*Proses Pembuatan* Manufacturing Process	K	3	
	BMMP 2503	*Pengukuran dan Instrumentasi* Measurement and Instrumentation	K	3	
	BLHW 1762	*Falsafah dan Isu Semasa* Philosophy and Current Issues	W	2	
	BKKX XXX1	*Kokurikulum I* Cocurriculum I	W	1	
TOTAL CREDITS THIS SEMESTER				20	
SEMESTER 2	BMMU 1023	*Kalkulus untuk Teknologi* Calculus for Technology	P	3	
	BMMA 1333	*Statik* Statics	K	3	
	BMMA 1313	*Prinsip Elektrik dan Elektronik* Principles of Electric and Electronic	K	3	
	BMMH 2303	*Termodinamik* Thermodynamics	K	3	
	**BMMA 2353	*Permodelan dan Analisis Berkomputer* Modelling and Computer Analysis	K	3	BMMA 1303
	BLLW 1142	*Bahasa Inggeris untuk Tujuan Akademik* English for Academic Purposes	W	2	
	BKKX XXX1	*Kokurikulum II* Cocurriculum II	W	1	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMMU 2043	*Kaedah Statistik* Statistical Methods	P	3	
	BMMA 1323	*Reka Bentuk Kejuruteraan* Engineering Design	K	3	
	BMMH 2313	*Mekanik Bendalir* Fluid Mechanics	K	3	
	**BMMM 2313	*Dinamik dan Mekanik Mesin* Dynamics and Mechanics of Machine	K	3	BMMA 1333
	BMMM 2323	*Teknologi Perkakasan Mesin* Machine Tool Technology	K	3	
	BMMM 2333	*Teknologi Pneumatik dan Hidraulik* Pneumatic and Hydraulic Technology	K	3	
	BLLW XXX2	*Bahasa Ketiga* Third Language	W	2	
TOTAL CREDITS THIS SEMESTER				20	
SEMESTER 4	BMMU 2033	*Kalkulus Lanjutan untuk Teknologi* Advanced Calculus for Technology	P	3	
	BMMH 3323	*Kawalan dan Instrumentasi* Control and Instrumentation	K	3	
	**BMMM 2303	*Mekanik Pepejal* Solid Mechanics	K	3	BMMA 1333
	BMMM 2343	*Asas Tribologi* Basic Tribology	K	3	
	BMMM 2502	*Pengenalan kepada Penyelenggaraan* Introduction to Maintenance	K	2	
	**BLLW 2152	*Penulisan Akademik* Academic Writing	W	2	BLLW 1142
	BLHW 2772	*Penghayatan Etika dan Peradaban* Appreciation of Ethics and Civilizations	W	2	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BMMM 3513	*Motor Industri* Industrial Motor	K	3	
	BMMM 3523	*Teknologi Penyelenggaraan dan Pengurusan Aset* Maintenance Technology and Asset Management	K	3	
	BMMM 3533	*Teknologi Penghantaran* Transmission Technology	K	3	
	BMMM 3543	*Diagnostik dan Pengenalpastian Masalah Penyelenggaraan* Maintenance Diagnostic and Troubleshooting	K	3	
	BMMM 3553	*Penyelenggaraan Mesin Mekanikal* Mechanical Machine Maintenance	K	3	
	**BLLW 3162	*Bahasa Inggeris untuk Interaksi Profesional* English for Professional Interaction	W	2	BLLW 2152
	***BIPW XXX2	*Elektif Umum* General Elective	W	2	
	#BMXX XXX0	*Kursus Persediaan Pensijilan Profesional* Professional Certificate Preparation Course	P	0	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 6	BMMU 3764	*Projek Sarjana Muda I* Bachelor Degree Project I	K	4	
	BMMM 3583	*Analisis dan Pemantauan Getaran* Vibration Analysis and Monitoring	K	3	
	BLHC 4032	*Pemikiran Kritis dan Kreatif* Critical and Creative Thinking	W	2	
	*BMMM XXX3	*Elektif I* Elective I	E	3	
	*BMMM XXX3	*Elektif II* Elective II	E	3	
	*BMMX XXX3	*Elektif III* Elective III	E	3	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BMMU 4053	*Etika Kejuruteraan dan KKPP* Engineering Ethics and OSHE	P	3	
	BMMM 4564	*Pemeriksaan dan Penyelenggaraan Bangunan* Building Inspection and Maintenance	K	4	
	BMMM 4602	*Kesedaran Penyelenggaraan dalam Reka Bentuk* Maintenance Awareness in Design	K	2	
	BMMM 4623	*Analisis Minyak dan Serpihan* Oil and Wear Debris Analysis	K	3	
	**BMMU 4774	*Projek Sarjana Muda II* Bachelor Degree Project II	K	4	BMMU 3764
	BTMW 4012	*Keusahawanan Teknologi* Technology Entrepreneurship	W	2	
TOTAL CREDITS THIS SEMESTER				18	
SEMESTER 8	BMMU 4786	*Latihan Industri* Industrial Training	K	6	
	BMMU 4796	*Laporan Latihan Industri* Industrial Training Report	K	6	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				143	

** Pre-requisite COURSE
W University Compulsory
P Faculty Core
K Programme Core
E Elective

* For Elective I, II and III students may choose any THREE (3) COURSES from the list below:

NO.	CODE	COURSE
1	BMMH 3543	*Penyelenggaraan Sistem HVAC* Maintenance of HVAC System
2	BMMM 3573	*Penyelenggaraan Berasaskan Keadaan* Condition Based Maintenance
3	BMMM 3593	*Penentukuran Instrumen* Instrument Calibration
4	BMMM 3603	*Teknologi Kawalan Industri* Industrial Control Technology
5	BMMM 4613	*Kebolehárapan, Kebolehsenggaraan dan Risiko* Reliability, Maintainability and Risk

*** For General elective, students may choose any ONE (1) COURSE from the list below:

CODE	COURSE NAME
BLHW 1722	*Falsafah Sains dan Teknologi* Philosophy of Science and Technology
BLHH 1032	*Psikologi Industri dan Organisasi* Industrial Psychology and Organization
BLHC 4012	*Komunikasi Keorganisasian* Organizational Communication
BLHC 4022	*Kemahiran Perundingan* Negotiation Skills

\# For Professional Certificate Preparation Course, student may choose any ONE (1) certificate from the list below:

CODE	CERTIFICATE NAME
BMCG 2520	AutoCAD Professional Certification
BMMD 3100	Certified Solidworks Associate

BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Programme Educational Objectives (PEO) is specific goals describing expected achievements of graduates in their career and professional life after graduation. To produce, after 3 to 5 years of graduation:

PEO1	Graduates who are able to practice the knowledge in Mechanical Engineering Technology.
PEO2	Graduates who are able to engage with continuous development and adapt to evolving technologies.
PEO3	Graduates who are able to adapt professional ethics and leadership to meet the needs of the society.

PROGRAMME OUTCOMES (PO)

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

PO1	Ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialisation principles to defined and applied engineering procedures, processes, systems or methodologies in the field of Mechanical Engineering Technology.
PO2	Ability to solve broadly-defined engineering problems systematically to reach substantiated conclusions, using tools and techniques appropriate to Mechanical Engineering Technology.
PO3	Ability to design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Ability to plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.
PO5	Ability to select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.
PO6	Ability to demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities relevant to engineering technology practice.
PO7	Ability to demonstrate an understanding of the impact of engineering technology practices, taking into account the need for sustainable development.
PO8	Ability to demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO9	Ability to function effectively as individuals, and as members or leaders in diverse technical teams.
PO10	Ability to communicate effectively on broadly-defined engineering activities with the engineering community and society at large.
PO11	Ability to demonstrate an awareness of project management, business practices and entrepreneurship.
PO12	Ability to recognise the need for professional development and to engage in independent and lifelong learning.

Bachelor of Mechanical Engineering Technology with Honours (BMMV)

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BMMU 1013	*Matematik Teknikal* Technical Mathematics	P	3	
	BEEE 1013	*Fizik Teknikal* Technical Physics	P	3	
	BMMA 1303	*Grafik Kejuruteraan* Engineering Graphics	K	3	
	BMMA 1333	*Statik* Statics	K	3	
	BMMA 1313	*Prinsip Elektrik dan Elektronik* Principles of Electric and Electronic	K	3	
	BMMP 1303	*Amalan Pembuatan* Manufacturing Practices	K	3	
	BKKX XXX1	*Kokurikulum I* Cocurriculum I	W	1	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 2	BMMU 1023	*Kalkulus untuk Teknologi* Calculus for Technology	P	3	
	BMMV 1013	*Kimia Teknikal* Technical Chemistry	P	3	
	BMMP 1313	*Bahan Kejuruteraan* Engineering Materials	K	3	
	BMMA 1323	*Reka Bentuk Kejuruteraan* Engineering Design	K	3	
	BMMP 2503	*Pengukuran dan Instrumentasi* Measurement and Instrumentation	K	3	
	BLHW 2772	*Penghayatan Etika Dan Peradaban* Appreciation of Ethics and Civilizations	W	2	
	BLLW 1142	*Bahasa Inggeris untuk Tujuan Akademik* English for Academic Purposes	W	2	
TOTAL CREDITS THIS SEMESTER				19	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMMU 2033	*Kalkulus Lanjutan untuk Teknologi* Advanced Calculus for Technology	P	3	
	BMMP 1323	*Proses Pembuatan* Manufacturing Process	K	3	
	BMMH 2303	*Termodinamik* Thermodynamics	K	3	
	BMMH 2313	*Mekanik Bendalir* Fluid Mechanics	K	3	
	BMMA 2343	*Teknologi Mikropemproses* Microprocessor Technology	K	3	
	**BLLW 2152	*Penulisan Akademik* Academic Writing	W	2	BLLW 1142
	BKKX XXX1	*Kokurikulum II* Cocurriculum II	W	1	
TOTAL CREDITS THIS SEMESTER				18	
SEMESTER 4	BMMU 2043	*Kaedah Statistik* Statistical Methods	P	3	
	**BMMM 2303	*Mekanik Pepejal* Solid Mechanics	K	3	BMMA 1333
	**BMMM 2313	*Dinamik dan Mekanik Mesin* Dynamics and Mechanics of Machine	K	3	BMMA 1333
	BMMM 2333	*Teknologi Pneumatik dan Hidraulik* Pneumatic & Hydraulic Technology	K	3	
	**BMMA 2353	*Permodelan dan Analisis Berkomputer* Modelling and Computer Analysis	K	3	BMMA 1303
	BMMH 3553	*Pemindahan Haba* Heat Transfer	K	3	
	BLHW 1762	*Falsafah dan Isu Semasa* Philosophy and Current Issues	W	2	
TOTAL CREDITS THIS SEMESTER				20	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BMMH 2503	*Asas HVAC dan Penyejukan* Fundamental of HVAC and Refrigeration	K	3	
	BMMV 3033	*Pengurusan Projek* Project Management	K	3	
	BMMV 3043	*Getaran Mekanikal* Mechanical Vibration	K	3	
	BMMH 3323	*Kawalan dan Instrumentasi* Control and Instrumentation	K	3	
	BMMU 3803	*Projek Rekabentuk Bersepadu* Integrated Design Project	K	3	
	**BLLW 3162	*Bahasa Inggeris untuk Interaksi Profesional* English for Professional Interaction	W	2	BLLW 2152
	***BLHX XXX2	*Elektif Umum* General Elective	W	2	
	#BMXX XXX0	*Kursus Persediaan Pensijilan Profesional* Professional Certificate Preparation Course	P	0	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 6	BMMV 3053	*Simulasi Berkomputer* Computer Simulation	K	3	
	BMMV 3063	*Kelestarian dan Alam Sekitar* Environment and Sustainability	K	3	
	BMMU 3764	*Projek Sarjana Muda I* Bachelor Degree Project I	K	4	
	BTMW 4012	*Keusahawanan Teknologi* Technology Enterpreneurship	W	2	
	*BMMV 4XX3	*Elektif I* Elective I	E	3	
	*BMMV 4XX3	*Elektif II* Elective II	E	3	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BMMU 4053	*Etika Kejuruteraan dan KKPP* Engineering Ethics and OSHE	P	3	
	**BMMU 4774	*Projek Sarjana Muda II* Bachelor Degree Project II	K	4	BMMU 3764
	BLHC 4032	*Pemikiran Kritis dan Kreatif* Critical and Creative Thinking	W	2	
	BLLW 1XX2	*Bahasa Ketiga* Third Language	W	2	
	BMMV 4XX3	*Elektif III* Elective III	E	3	
	BMMV 4XX3	*Elektif IV* Elective IV	E	3	
TOTAL CREDITS THIS SEMESTER				17	
SEMESTER 8	BMMU 4786	*Latihan Industri* Industrial Training	K	6	
	BMMU 4796	*Laporan Latihan Industri* Industrial Training Report	K	6	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				142	

** Pre-requisite COURSE
W University Compulsory
P Faculty Core
K Programme Core
E Elective

* For Elective I, II, III & IV students may choose any FOUR (4) COURSES from the list below:

NO.	CODE	COURSE
1.	BMMV 4103	*Prinsip Teknologi Alam Sekitar* Principle of Enviromental Technology
2.	BMMV 4113	*Teknologi Air dan Air Sisa* Water and Waste Water Technology
3.	BMMV 4123	*Teknologi Kualiti Udara dan Kawalan Pencemaran* Air Quality and Pollution Control Technology
4.	BMMV 4133	*Teknologi Pengurusan Sisa Pepejal* Solid Waste Management Technology
5.	BMMV 4143	*Penilaian Kesan Terhadap Alam Sekitar* Environmental Impact Assessment
6.	BMMV 4153	*Pengurusan Sisa Industri dan Sisa Berjadual* Industrial and Hazardous Waste Management
7.	BMMV 4203	*Teknologi Kapal Kecil* Small Craft Technology
8.	BMMV 4213	*Seni Bina Kapal* Naval Architecture
9.	BMMV 4223	*Pengurusan dan Pengeluaran Marin* Marine Production and Management
10.	BMMV 4233	*Sistem Teknologi Marin* Marine Technology System
11.	BMMV 4243	*Struktur Marin Laut Dalam* Marine Offshore Structures
12.	BMMV 4253	*Pemeriksaan dan Penyelenggaraan Marin* Marine Inspection and Maintenance
13.	BMMV 4303	*Kejuruteraan Perkhidmatan Bangunan* Building Services Engineering
14.	BMMV 4313	*Utiliti Bangunan* Building Utilities
15.	BMMV 4323	*Pengurusan Bangunan Pintar* Smart Building Management
16.	BMMV 4333	*Kelestarian dan Bangunan Hijau* Green Building and Sustainability
17.	BMMV 4343	*HSE Bangunan* Building HSE
18.	BMMV 4353	*Teknik Penyelenggaraan Bangunan* Building Maintenance Technique

*** For General elective, students may choose any ONE (1) COURSE from the list below:

CODE	COURSE NAME
BLHW 1722	*Falsafah Sains Dan Teknologi* Philosophy of Science and Technology
BLHH 1032	*Psikologi Industri dan Organisasi* Industrial Psycology and Organization
BLHC 4012	*Komunikasi Keorganisasian* Organizational Communication
BLHC 4022	*Kemahiran Perundingan* Negotiation Skills

For Professional Certificate Preparation Course, student may choose any ONE (1) certificate from the list below:

CODE	CERTIFICATE NAME
BMMD 3100	Certified Solidworks Associate
BMCG 2520	AutoCAD Professional Certification

BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (PRODUCT DESIGN) PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Programme Educational Objectives (PEO) is specific goals describing expected achievements of graduates in their career and professional life after graduation. To produce, after 3 to 5 years of graduation:

PEO1	Graduates who are able to practice the knowledge in Manufacturing Engineering Technology (Product Design).
PEO2	Graduates who are able to engage with continuous development and adapt to evolving technologies.
PEO3	Graduates who are able to adapt professional ethics and leadership to meet the needs of the society.

PROGRAMME OUTCOMES (PO)

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

PO1	Ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialisation principles to defined and applied engineering procedures, processes, systems or methodologies in the field of Manufacturing Engineering Technology (Product Design).
PO2	Ability to solve broadly-defined engineering problems systematically to reach substantiated conclusions using tools and techniques appropriate to Manufacturing Engineering Technology (Product Design).
PO3	Ability to design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Ability to plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.
PO5	Ability to select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.
PO6	Ability to demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities relevant to engineering technology practice.
PO7	Ability to demonstrate an understanding of the impact of engineering technology practices, taking into account the need for sustainable development.
PO8	Ability to demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO9	Ability to function effectively as individuals, and as members or leaders in diverse technical teams.
PO10	Ability to communicate effectively on broadly-defined engineering activities with the engineering community and society at large.
PO11	Ability to demonstrate an awareness of project management, business practices and entrepreneurship.
PO12	Ability to recognise the need for professional development and to engage in independent and lifelong learning.

Bachelor of Manufacturing Engineering Technology (Product Design) with Honours (BMMD)

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BMMU 1013	*Matematik Teknikal* Technical Mathematics	P	3	
	BMMA 1333	*Statik* Statics	K	3	
	BMMD 1304	*Lukisan Kejuruteraan dan CAD* Engineering Drawings and CAD	K	4	
	BMMP 1303	*Amalan Pembuatan* Manufacturing Practices	K	3	
	BMMA 1313	*Prinsip Elektrik dan Elektronik* Principle of Electric and Electronic	K	3	
	BKKX XXX1	*Kokurikulum I* Cocurriculum I	W	1	
		TOTAL CREDITS THIS SEMESTER		17	
SEMESTER 2	BMMU 1023	*Kalkulus untuk Teknologi* Calculus for Technology	P	3	
	BMMP 1313	*Bahan Kejuruteraan* Engineering Materials	K	3	
	BMMP 1323	*Proses Pembuatan* Manufacturing Processes	K	3	
	BEEA 1343	*Pengaturcaraan Komputer* Computer Programming	K	3	
	BMMM 2313	*Dinamik dan Mekanik Mesin* Dynamics and Mechanics of Machine	K	3	
	BLHW 1762	*Falsafah dan Isu Semasa* Philosophy and Current Issues	W	2	
	BLLW 1142	*Bahasa Inggeris untuk Tujuan Akademik* English for Academic Purposes	W	2	
	BKKX XXX1	*Kokurikulum II* Co-Curriculum II	W	1	
		TOTAL CREDITS THIS SEMESTER		20	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMMU 2043	*Kaedah Statistik* Statistical Methods	P	3	
	BMMM 2303	*Mekanik Pepejal* Solid Mechanics	K	3	
	BMMD 2313	*Termo Bendalir* Thermo Fluid	K	3	
	**BMMD 2504	*Grafik Kejuruteraan Lanjutan dan CAD* Advanced Engineering Graphics & CAD	K	4	BMMD 1304
	**BLLW 2152	*Penulisan Akademik* Academic Writing	W	2	BLLW 1142
	BLHW 2772	*Penghayatan Etika dan Peradaban* Appreciation of Ethics and Civilization	W	2	
	***BLXX XXX2	*Elektif Umum* General Elective	W	2	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 4	BMMU 2033	*Kalkulus Lanjutan untuk Teknologi* Advanced Calculus for Technology	P	3	
	BMMD 2324	*Reka Bentuk dan Pembangunan Produk* Product Design and Development	K	4	
	BMMP 2333	*Kawalan Kualiti* Quality Control	K	3	
	BMMP 2343	*Sistem Kawalan* Control System	K	3	
	BMMD 3523	*Teknologi CNC* CNC Technology	K	3	
	BLLW XXX2	*Bahasa Ketiga* Third Language	W	2	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BMMD 2513	*Pembuatan Terbantu Komputer* Computer Aided Manufacturing	K	3	
	BMMP 3354	*Kejuruteraan Industri* Industrial Engineering	K	4	
	BMMD 3533	*Reka Bentuk untuk Pembuatan dan Pemasangan* Design for Manufacturing and Assembly	K	3	
	BMMD 3543	*Pembuatan Pantas* Rapid Manufacturing	K	3	
	BMMD 3553	*Reka Bentuk Ergonomik* Ergonomics Design	K	3	
	**BLLW 3162	*Bahasa Inggeris untuk Interaksi Profesional* English for Professional Interaction	W	2	BLLW 2152
	BTMW 4012	*Keusahawanan Teknologi* Technology Enterpreneurship	W	2	
	#BMXX XXX0	*Kursus Persediaan Pensijilan Profesional* Professional Certificate Preparation Course	P	0	
TOTAL CREDITS THIS SEMESTER				20	
SEMESTER 6	BMMD 3563	*Reka Bentuk Alat Pengeluaran* Production Tool Design	K	3	
	**BMMD 3573	*Reka Bentuk Elemen Mesin* Design of Machine Element	K	3	BMMM 2313
	**BMMD 3583	*CAE* CAE	K	3	BMMM 2303
	BMMU 3764	*Projek Sarjana Muda I* Bachelor Degree Project I	K	4	
	BLHC 4032	*Pemikiran Kritis dan Kreatif* Critical and Creative Thinking	W	2	
	*BMMX 38X4	*Elektif I* Elective I	E	4	
TOTAL CREDITS THIS SEMESTER				19	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BMMD 4013	*Pembangunan Lestari* Sustainable Development	P	3	
	BMMU 4053	*Etika Kejuruteraan & KPPP* Engineering Ethics and OSHE	P	3	
	BMMD 4594	*Projek Reka Bentuk* Design Project	K	4	
	**BMMU 4774	*Projek Sarjana Muda II* Bachelor Degree Project II	K	4	BMMU 3764
	*BMMD 48X4	*Elektif II* Elective II	E	4	
TOTAL CREDITS THIS SEMESTER				20	
SEMESTER 8	BMMU 4786	*Latihan Industri* Industrial Training	K	6	
	BMMU 4796	*Laporan Latihan Industri* Industrial Training Report	K	6	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				143	

** Pre-requisite COURSE
W University Compulsory
P Faculty Core
K Programme Core
E Elective

* For Elective I, students may choose any ONE (1) COURSE from the list below:

CODE	COURSE NAME
BMMD 3804	*Reka Bentuk Industri* Industrial Design
BMMP 3814	*Sistem Pembuatan* Manufacturing System

* For Elective II, students may choose any ONE (1) COURSE from the list below:

CODE	COURSE NAME
BMMD 4814	*Reka Bentuk Acuan* Mould Design
BMMD 4824	*Pembuatan Komponen Automotif* Automotive Component Manufacturing
BMMD 4834	*Reka Bentuk dan Teknologi Pembungkusan* Packaging Design and Technology
BMMP 4834	*IoT in Manufacturing* IoT Pembuatan

*** For General elective, students may choose any ONE (1) COURSE from the list below:

CODE	COURSE NAME
BLHW 1722	*Falsafah Sains dan Teknologi* Philosophy of Science and Technology
BLHH 1032	*Psikologi Industri dan Organisasi* Industrial Psycology and Organization
BLHC 4012	*Komunikasi Keorganisasian* Organizational Communication
BLHC 4022	*Kemahiran Perundingan* Negotiation Skills

For Professional Certificate Preparation Course, student may choose any ONE (1) certificate from the list below:

CODE	CERTIFICATE NAME
BMMD 3100	Certified SolidWorks Associate
BMMA 3110	Certified Hypermesh

BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (PROCESS AND TECHNOLOGY) PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Programme Educational Objectives (PEO) is specific goals describing expected achievements of graduates in their career and professional life after graduation. To produce, after 3 to 5 years of graduation:

PEO1	Graduates who are able to practice the knowledge in Manufacturing Engineering Technology (Process and Technology).
PEO2	Graduates who are able to engage with continuous development and adapt to evolving technologies.
PEO3	Graduates who are able to adapt professional ethics and leadership to meet the needs of the society.

PROGRAMME OUTCOMES (PO)

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

PO1	Ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialisation principles to defined and applied engineering procedures, processes, systems or methodologies in the field of Manufacturing Engineering Technology (Process and Technology).
PO2	Ability to solve broadly-defined engineering problems systematically to reach substantiated conclusions using tools and techniques appropriate to Manufacturing Engineering Technology (Process and Technology).
PO3	Ability to design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Ability to plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.
PO5	Ability to select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.
PO6	Ability to demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities relevant to engineering technology practice.
PO7	Ability to demonstrate an understanding of the impact of engineering technology practices, taking into account the need for sustainable development.
PO8	Ability to demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO9	Ability to function effectively as individuals, and as members or leaders in diverse technical teams.
PO10	Ability to communicate effectively on broadly-defined engineering activities with the engineering community and society at large.
PO11	Ability to demonstrate an awareness of project management, business practices and entrepreneurship.
PO12	Ability to recognise the need for professional development and to engage in independent and lifelong learning.

Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honours (BMMP)

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BMMU 1013	*Matematik Teknikal* Technical Mathematics	P	3	
	BMMD 1304	*Lukisan Kejuruteraan dan CAD* Engineering Drawing and CAD	K	4	
	BMMA 1313	*Prinsip Elektrik dan Elektronik* Principle of Electric and Electronic	K	3	
	BMMA 1333	*Statik* Statics	K	3	
	BMMP 1303	*Amalan Pembuatan* Manufacturing Practices	K	3	
	BKKX XXX1	*Kokurikulum I* Cocurriculum I	W	1	
TOTAL CREDITS THIS SEMESTER				17	
SEMESTER 2	BMMU 1023	*Kalkulus untuk Teknologi* Calculus for Technology	P	3	
	BMMP 1313	*Bahan Kejuruteraan* Engineering Materials	K	3	
	BMMP 1323	*Proses Pembuatan* Manufacturing Processes	K	3	
	BEEA 1343	*Pengaturcaraan Komputer* Computer Programming	K	3	
	BMMM 2313	*Dinamik dan Mekanik Mesin* Dynamics and Mechanics of Machine	K	3	
	BLHW 1762	*Falsafah dan Isu Semasa* Philosophy and Current Issues	W	2	
	BLLW 1142	*Bahasa Inggeris untuk Tujuan Akademik* English for Academic Purposes	W	2	
	BKKX XXX1	*Kokurikulum 2* Cocurriculum 2	W	1	
TOTAL CREDITS THIS SEMESTER				20	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMMU 2043	*Kaedah Statistik* Statistical Methods	P	3	
	BMMM 2303	*Mekanik Pepejal* Solid Mechanics	K	3	
	BMMD 2313	*Termo Bendalir* Thermo Fluid	K	3	
	BMMP 2503	*Pengukuran dan Instrumentasi* Measurement and Instrumentation	K	3	
	**BLLW 2152	*Penulisan Akademik* Academic Writing	W	2	BLLW 1142
	BLHW 2772	*Penghayatan Etika Dan Peradaban* Appreciation of Ethics and Civilizations	W	2	
	***BLHX XXX2	*Elektif Umum* General Elective	W	2	
TOTAL CREDITS THIS SEMESTER				18	
SEMESTER 4	BMMU 2033	*Kalkulus Lanjutan untuk Teknologi* Advanced Calculus for Technology	P	3	
	BMMP 2333	*Kawalan Kualiti* Quality Control	K	3	
	BMMD 2324	*Reka Bentuk dan Pembangunan Produk* Product Design and Development	K	4	
	BMMP 2343	*Sistem Kawalan* Control System	K	3	
	BMMP 2514	*CAD / CAM* CAD / CAM	K	4	
	BLLW XXX2	*Bahasa Ketiga* Third Language	W	2	
TOTAL CREDITS THIS SEMESTER				19	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BMMP 3354	*Kejuruteraan Industri* Industrial Engineering	K	4	
	BMMP 3573	*Pengujian Bahan dan Analisis Patah* Materials Testing and Fracture Analysis	K	3	
	BMMP 3533	*Proses Pembuatan Termaju* Advanced Manufacturing Processes	K	3	
	**BMMP 2543	*Pemilihan Bahan* Material Selection	K	3	BMMP 1313
	BMMP 4553	*Teknologi Kepingan Logam* Sheet Metal Technology	K	3	
	**BLLW 3162	*Bahasa Inggeris untuk Interaksi Profesional* English for Professional Interaction	W	2	BLLW 2152
	BTMW 4012	*Keusahawanan Teknologi* Technology Entrepreneurship	W	2	
	#BMXX XXX0	*Kursus Persediaan Pensijilan Profesional* Professional Certificate Preparation Course	P	0	
TOTAL CREDITS THIS SEMESTER				20	
SEMESTER 6	**BMMP 3523	*Teknologi Pencantuman* Joining Technology	K	3	BMMP 1323
	BMMP 3563	*Jig & Lekapan* Jigs & Fixtures	K	3	
	**BMMP 3584	*Pemesinan Termaju* Advanced Machining	K	4	BMMP 2514
	BMMU 3764	*Projek Sarjana Muda I* Bachelor Degree Project I	K	4	
	BLHC 4032	*Pemikiran Kritis dan Kreatif* Critical and Creative Thinking	W	2	
	*BMMP 38X4	*Elektif I* Elective I	E	4	
TOTAL CREDITS THIS SEMESTER				20	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BMMU 4053	*Etika Kejuruteraan dan KKPP* Engineering Ethics and OSHE	P	3	
	BMMD 4013	*Pembangunan Lestari* Sustainable Development	P	3	
	**BMMU 4774	*Projek Sarjana Muda II* Bachelor Degree Project II	K	4	BMMU 3764
	BMMP 3593	*Teknologi Plastik* Plastic Technology	K	3	
	*BMMX 48X4	*Elektif II* Elective II	E	4	
TOTAL CREDITS THIS SEMESTER				17	
SEMESTER 8	BMMU 4786	*Latihan Industri* Industrial Training	K	6	
	BMMU 4796	*Laporan Latihan Industri* Industrial Training Report	K	6	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				143	

** Pre-requisite COURSE
W University Compulsory
P Faculty Core
K Programme Core
E Elective

* For Elective I, students may choose any ONE (1) COURSE from the list below:

CODE	COURSE NAME
BMMP 3804	*Pembuatan Lean* Lean Manufacturing
BMMP 3814	*Sistem Pembuatan* Manufacturing System

* For Elective II, students may choose any ONE (1) COURSE from the list below:

CODE	COURSE NAME
BMMD 4814	*Reka Bentuk Acuan* Mould Design
BMMD 4824	*Pembuatan Komponen Automotif* Automotive Component Manufaturing
BMMP 4834	*IoT in Manufacturing* IoT Dalam Pembuatan

*** For General elective, students may choose any ONE (1) COURSE from the list below:

CODE	COURSE NAME
BLHW 1722	*Falsafah Sains dan Teknologi* Philosophy of Science and Technology
BLHH 1032	*Psikologi Industri dan Organisasi* Industrial Psycology and Organization
BLHC 4012	*Komunikasi Organisasi* Organizational Communication
BLHC 4022	*Kemahiran Perundingan* Negotiation Skills

\# For Professional Certificate Preparation Course, student may choose any ONE (1) certificate from the list below:

CODE	CERTIFICATE NAME
BMMA 3100	Certified CATIA V6 – Part Design Associate
BMCG 2520	AutoCAD Professional Certification

BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Programme Educational Objectives (PEO) is specific goals describing expected achievements of graduates in their career and professional life after graduation. To produce, after 3 to 5 years of graduation:

PEO1	Graduates who are able to practice the knowledge in Manufacturing Engineering Technology.
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PEO3	Graduates who are able to adapt professional ethics and leadership to meet the needs of the society.

PROGRAMME OUTCOMES (PO)

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

PO1	Ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialisation principles to defined and applied engineering procedures, processes, systems or methodologies in the field of Manufacturing Engineering Technology.
PO2	Ability to solve broadly-defined engineering problems systematically to reach substantiated conclusions using tools and techniques appropriate to Manufacturing Engineering Technology.
PO3	Ability to design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Ability to plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.
PO5	Ability to select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.
PO6	Ability to demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities relevant to engineering technology practice.
PO7	Ability to demonstrate an understanding of the impact of engineering technology practices, taking into account the need for sustainable development.
PO8	Ability to demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO9	Ability to function effectively as individuals, and as members or leaders in diverse technical teams.
PO10	Ability to communicate effectively on broadly-defined engineering activities with the engineering community and society at large.
PO11	Ability to demonstrate an awareness of project management, business practices and entrepreneurship.
PO12	Ability to recognise the need for professional development and to engage in independent and lifelong learning.

Bachelor Degree of Manufacturing Engineering Technology with Honours (BMMW)

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BMMU 1013	*Matematik Teknikal* Technical Mathematics	P	3	
	BMMD 1304	*Lukisan Kejuruteraan dan CAD* Engineering Drawings and CAD	K	4	
	BMMA 1313	*Prinsip Elektrik dan Elektronik* Principle of Electric and Electronic	K	3	
	BMMP 1323	*Proses Pembuatan* Manufacturing Processes	K	3	
	BEEA 1343	*Pengaturcaraan Komputer* Computer Programming	K	3	
	BKKX XXX1	*Kokurikulum I* Cocurriculum I	W	1	
TOTAL CREDITS THIS SEMESTER				17	
SEMESTER 2	BMMU 1023	*Kalkulus untuk Teknologi* Calculus for Technology	P	3	
	BMMW 1303	*CAD / CAM dan Teknologi CNC* CAD / CAM and CNC Tech.	K	3	
	BMMP 1313	*Bahan Kejuruteraan* Engineering Materials	K	3	
	BMMA 1333	*Statik* Statics	K	3	
	BMMM 2303	*Mekanik Pepejal* Solid Mechanics	K	3	
	BLHW 1762	*Falsafah dan Isu Semasa* Philosophy and Current Issue	W	2	
	BLLW 1142	*Bahasa Inggeris untuk Tujuan Akademik* English for Academic Purposes	W	2	
	BKKX XXX1	*Kokurikulum II* Cocurriculum II	W	1	
TOTAL CREDITS THIS SEMESTER				20	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMMU 2043	*Kaedah Statistik* Statistical Methods	P	3	
	BMMD 2313	*Termo Bendalir* Thermo Fluid	K	3	
	BMMW 2313	*Robotik dan Automasi Industri* Industrial Robotic and Automation	K	3	
	BMMW 2323	*Pengurusan Data dan Pengoptimuman Proses* Data Management and Process Optimization	K	3	
	BMMP 2333	*Kawalan Kualiti* Quality Control	K	3	
	**BLLW 2152	*Penulisan Akademik* Academic Writing	W	2	BLLW 1142
	BLHC 4032	*Pemikiran Kritis dan Kreatif* Critical and Creative Thinking	W	2	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 4	BMMU 2033	*Kalkulus Lanjutan untuk Teknologi* Advanced Calculus for Technology	P	3	
	BMMM 2313	*Dinamik dan Mekanik Mesin* Dynamics and Mechanics of Machine	K	3	
	BMMW 2333	*Pembuatan Tambahan* Additive Manufacturing	K	3	
	BMMW 2343	*Reka Bentuk Produk dan Pembuatan* Product Design and Manufacturing	K	3	
	**BMMD 3583	*CAE* CAE	K	3	BMMM 2303
	BLLW 1XX2	*Bahasa Ketiga* Third Language	W	2	
	***BLHX XXX2	*Elektif Umum* General Elective	W	2	
TOTAL CREDITS THIS SEMESTER				19	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BMMW 3353	*Pengurusan Pembuatan* Manufacturing Management	K	3	
	BMMW 3363	*Integrasi Proses Perniagaan* Business Process Integration	K	3	
	BMMD 3553	*Reka Bentuk Ergonomik* Ergonomics Design	K	3	
	**BMMU 3803	*Projek Rekabentuk Bersepadu* Integrated Design Project	K	3	BMMW 2343
	BTMW 4012	*Keusahawanan Teknologi* Technology Entrepreneurship	W	2	
	*BMMW XXX3	*Elektif I* Elective I	E	3	
	*BMMW XXX3	*Elektif II* Elective II	E	3	
	#BMXX XXX0	*Kursus Persediaan Pensijilan Profesional* Professional Certificate Preparation Course	P	0	
TOTAL CREDITS THIS SEMESTER				20	
SEMESTER 6	BMMW 3383	*Industri Internet of Things* Industrial Internet of Things	K	3	
	BMMW 3373	*Pembuatan Visual* Visual Manufacturing	K	3	
	BMMP 3533	*Proses Pembuatan Termaju* Advanced Manufacturing Processes	K	3	
	BMMU 3764	*Projek Sarjana Muda I* Bachelor Degree Project I	K	4	
	**BLLW 3162	*Bahasa Inggeris untuk Interaksi Profesional* English for Professional Interaction	W	2	BLLW 2152
	*BMMW XXX3	*Elektif III* Elective III	E	3	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BMMD 4013	*Pembangunan Lestari* Sustainable Development	P	3	
	BMMU 4053	*Etika Kejuruteraan dan KKPP* Engineering Ethics and OSHE	P	3	
	BMMW 4393	*Kewangan, Kos dan Ekonomi Kejuruteraan* Engineering Financial, Costing and Economics	K	3	
	**BMMU 4774	*Projek Sarjana Muda II* Bachelor Degree Project II	K	4	BMMU 3764
	BLHW 2772	*Penghayatan Etika dan Peradaban* Appreciation of Ethics and Civilizations	W	2	
	*BMMW XXX3	*Elektif IV* Elective IV	E	3	
TOTAL CREDITS THIS SEMESTER				18	
SEMESTER 8	BMMU 4786	*Latihan Industri* Industrial Training	K	6	
	BMMU 4796	*Laporan Latihan Industri* Industrial Training Report	K	6	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				143	

** Pre-requisite COURSE
W University Compulsory
P Faculty Core
K Programme Core
E Elective

* For Elective I & II, students may choose any TWO (2) COURSES from the list below:

NO.	CODE	COURSE
1.	BMMW 3803	*Struktur Komponen Kapal Terbang* Aircraft Structural Components
2.	BMMW 3813	*Jig dan Lengkapan untuk Aeroangkasa* Aerospace Jigs and Fixtures
3.	BMMW 3823	*Rekabentuk Industri* Industrial Design
4.	BMMW 3833	*Komunikasi Visual* Visual Communication
5.	BMMW 3843	*Struktur Data dan Algoritma* Data Structure and Algorithm
6.	BMMW 3853	*Perkilangan Digital dan Simulasi* Digital Factory and Simulation

* For Elective III, students may choose any ONE (1) COURSE from the list below:

NO.	CODE	COURSE
1.	BMMW 3863	*Komponen Komposit Aeroangkasa* Composite Components for Aerospace
2.	BMMW 3873	*Pengukuran dan Pemeriksaan Aeroangkasa* Aerospace Measurement and Inspection
3.	BMMW 3883	*Senibina Produk dan Ujian Kebolehgunaan* Product Architecture and Userbility Testing
4.	BMMW 3893	*Rekabentuk & Pembangunan Produk Pengguna* Consumer Product Design and Development
5.	BMMW 3903	*Keselamatan Siber dalam Pembuatan Digital* Cyber Security in Digital Manufacturing
6.	BMMW 3913	*Kecerdasan Buatan* Artificial Intelligence

* For Elective IV, students may choose any ONE (1) COURSE from the list below:

NO.	CODE	COURSE
1.	BMMW 4923	*Komponen Logam Aeroangkasa* Metallic Components for Aerospace
2.	BMMW 4933	*Pemesinan Komponen Aeroangkasa* Aerospace Component Machining
3.	BMMW 4943	*Rekabentuk dan Teknologi Pembungkusan* Packaging Design and Technology
4.	BMMW 4953	*Rekabentuk dan Pembangunan Kenderaan* Vehicle Design and Development
5.	BMMW 4963	*Komunikasi IT Dalam Pembuatan Digital* IT Communication in Digital Manufacturing
6.	BMMW 4973	*Perusahaan Pembuatan Termaju* Advanced Manufacturing Enterprise

*** For General elective, students may choose any ONE (1) COURSE from the list below:

CODE	COURSE NAME
BLHW 1722	*Falsafah Sains dan Teknologi* Philosophy of Science and Technology
BLHH 1032	*Psikologi Industri dan Organisasi* Industrial Psycology and Organization
BLHC 4012	*Komunikasi Organisasi* Organizational Communication
BLHC 4022	*Kemahiran Perundingan* Negotiation Skills

For Professional Certificate Preparation Course, student may choose any ONE (1) certificate from the list below:

CODE	CERTIFICATE NAME
BMMA 3100	Certified CATIA V6 – Part Design Associate
BMMA 3110	Certified Hypermesh

ACADEMIC HANDBOOK SESSION 2022/2023

FOR BACHELOR DEGREE PROGRAMMES

CURRICULUM STRUCTURE
TECHNOLOGY PROGRAMMES

FTKMP

FACULTY OF MECHANICAL AND MANUFACTURING ENGINEERING TECHNOLOGY

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BACHELOR OF TECHNOLOGY IN INDUSTRIAL MACHINING WITH HONOURS

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Programme Educational Objectives (PEO) is specific goals describing expected achievements of graduates in their career and professional life three to five years after the graduation.

PEO1	To produce machining technologist that perform related work including machinist, designer, manufacturer, maintenance, facility manager and production manager.
PEO2	To produce technopreneurs in machining related technology.
PEO3	To produce relevant, respected and referred professionals in machining technology.

PROGRAMME OUTCOMES (PO)

Programme Outcomes (PO) are statements describing what students are expected to be able to attain upon the graduation. These relate to the skills, knowledge, and behaviours that students acquire through their programme of studies.

PO1	Apply knowledge of technology fundamentals to broadly-defined procedures processes, systems and methodologies in industrial machining.
PO2	Able to suggest and apply latest tools and techniques to solve broadly-defined problems.
PO3	Demonstrate strong analytical and critical thinking skills to solve broadly-defined problems in industrial machining.
PO4	Able to communicate and articulate effectively in both verbal and written among technologist communities and society at large.
PO5	Demonstrate understanding of the societal related issues and the consequent responsibilities relevant to broadly-defined technology practices.
PO6	Recognize the needs for professional development and to engage independent lifelong learning in specialist technologists.
PO7	Demonstrate an awareness of management and technopreneurship practices in real perspective.
PO8	Demonstrate professionalism and social and ethical consideration.
PO9	Demonstrate leadership quality, mentoring and work effectively in diverse teams.

Bachelor of Technology in Industrial Machining with Honours (BMMI)

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BMMI 1013	*Draf Produk dan Spesifikasi* Product Drafting and Specification	K	3	
	BMMI 1023	*Ketepatan Piawai Produk* Standard Product Precision	K	3	
	BMMI 1033	*Sifat Bahan Kerja dan Perkakas Pemotong* Workpiece and Cutting Tool Properties	K	3	
	BMMI 1043	*Jig dan Lekapan* Jig and Fixture	K	3	
	BLLW 1142	*Bahasa Inggeris untuk Tujuan Akademik* English for Academic Purpose	W	2	
	BLLW 1222	*Bahasa Ketiga- Mandarin 1* Third Language	W	2	
	BKKX XXX1	*Kokurikulum I* Cocurriculum I	W	1	
TOTAL CREDITS THIS SEMESTER				17	
SEMESTER 2	BTMW 1112	*Asas Keusahawanan* Basic Technopreneur	W	2	
	BMMI 1054	*Pemasangan dan Baikpulih Perkakas* Tool Setup and Refurbishment	K	4	
	BMMI 1063	*Kelestarian Pemesinan* Sustainable Machining	K	3	
	BMMI 1073	*Pemantauan Keadaan dalam Pemesinan* Condition Monitoring in Machining	K	3	
	BMMI 1083	*Penilaian Kebolehmesinan* Assesment of Machinability	K	3	
	**BLLW 2152	*Penulisan Akademik* Academic writing	W	2	BLLW 1142
	BKKX XXX1	*Kokurikulum II* Cocurriculum II	W	1	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMMI 2094	*Ketepatan dan Kemasan dalam Teknologi CNC* Precision and Finishing in CNC Technology	K	4	
	BMMI 2103	*Ketepatan dan Kemasan dalam Teknologi EDM and Pengisaran* Precision and Finishing in EDM and Grinding Technology	K	3	
	BMMI 2114	*Produk CADCAM Prismatik* Prismatic CADCAM Product	K	4	
	BLHW 1762	*Falsafah dan Isu Semasa* Philosophy and Current Issues	W	2	
	**BLLW3162	*Bahasa Inggeris untuk Interaksi Profesional* English for Professional Interaction	W	2	BLLW 2152
TOTAL CREDITS THIS SEMESTER				15	
SEMESTER 4	BTMW 2124	*Capstone Teknousahawan 1* Capstone Technopreneurship 1	P	4	
	BMMI 2123	*Pemesinan Pelbagai Paksi* Multi Axis Machining	K	3	
	BMMI 2134	*Produk CADCAM Kompleks* Complex CADCAM Product	K	4	
	BMMI 2143	*Rawatan Haba dalam Komponen Termesin* Heat Treatment of Machined Component	K	3	
	BMMI 3154	*Teknik Pemasangan* Assembly Method	K	4	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BTMW 3134	*Capstone Teknokeusahawanan 2* Capstone Technopreneurship 2	P	4	
	BMMI 3214	*Kerja dan Pemulihan Komponen Termesin* Rework and Rehabilitation of Machined Component	K	4	
	BMMI 3224	*Estetika Permukaan untuk Komponen Termesin* Surface Aesthetics of Machined Component	K	4	
	BLHW 2772	*Penghayatan Etika dan Peradaban* Appreciation of Ethics and Civilization	W	2	
	*BMMI 3XX4	*Elektif* Elective	E	4	
	BMXX XXX0	*Kursus Persediaan Pensijilan Profesional* Professional Certificate Preparation Course	P	0	
TOTAL CREDITS THIS SEMESTER				18	
SEMESTER 6	BMMU 3134	*Projek Tahun Akhir 1* Final Year Project 1	K	4	
	BMMI 3234	*Penyelenggaraan Mesin* Machine Maintenance	K	4	
	BMMI 3244	*Pengurusan Projek dan Penyeliaan* Project Management and Supervision	K	4	
	BMMI 3254	*Akta dan Penilaian Risiko dan Pengeluaran Pemesinan* Acts and Risks Assessment in Machining Production	K	4	
TOTAL CREDITS THIS SEMESTER				16	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SHORT SEMESTER	**BMMU 3186	*Projek Tahun Akhir 2* Final Year Project 2	K	6	BMMU 3134
TOTAL CREDITS THIS SEMESTER				6	
SEMESTER 7	BMMU 4212	*Latihan Industri* Industrial Training	K	12	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				120	

**	Pre-requisite COURSE
W	University Compulsory
P	Faculty Core
K	Programme Core
E	Elective

* For Elective, students may choose any ONE (1) COURSE from the list below:

NO.	CODE	COURSE NAME
1	BMMI 3164	*Pembuatan Perkakas dan Dai* Tool and Die Making
2	BMMI 3174	*Pemesinan Pantas* Rapid Machining
3	BMMI 3184	*Pemesinan Aeroangkasa* Aerospace Machining
4	BMMI 3194	*Teknologi Faktor Kemanusiaan* Human Factor Technology
5	BMMI 3204	*Perancangan Pengeluaran dalam Pemesinan* Production Planning in Machining

BACHELOR OF TECHNOLOGY IN WELDING WITH HONOURS

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Programme Educational Objectives (PEO) is specific goals describing expected achievements of graduates in their career and professional life three to five years after the graduation.

PEO1	To produce welding technologist that perform related welding work including maintenance, fabricator, designer, safety advisor, and production manager.
PEO2	To produce technopreneurs in related welding technology.
PEO3	To produce relevant, respected, and referred professionals in welding technology.

PROGRAMME OUTCOMES (PO)

Programme Outcomes (PO) are statements describing what students are expected to be able to attain upon the graduation. These relate to the skills, knowledge, and behaviours that students acquire through their programme of studies.

PO1	Apply knowledge of technology fundamentals to broadly-defined procedures processes, systems and methodologies in welding technology.
PO2	Able to suggest and apply latest tools and techniques to solve broadly-defined problems.
PO3	Demonstrate strong analytical and critical thinking skills to solve broadly-defined problems in welding technology.
PO4	Able to communicate and articulate effectively in both verbal and written among technologist communities and society at large.
PO5	Demonstrate understanding of the societal related issues and the consequent responsibilities relevant to broadly-defined technology practices.
PO6	Recognize the needs for professional development and to engage independent lifelong learning in specialist technologists.
PO7	Demonstrate an awareness of management and technopreneurship practices in real perspective.
PO8	Demonstrate professionalism and social and ethical consideration.
PO9	Demonstrate leadership quality, mentoring, and work effectively in diverse teams.

Bachelor Of Technology In Welding With Honours (BMMK)

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BMMK 1014	Keselamatan Dalam Kimpalan Safety in Welding	K	4	
	BMMK 1024	*Cad dan Grafik Kimpalan* Cad and Welding Graphics	K	4	
	BMMK 1034	*Teknologi Fabrikasi Logam* Metal Fabrications Technology	K	4	
	BLLW 1142	*Bahasa Inggeris untuk Tujuan Akademik* English for Academic Purposes	W	2	
	BLLW 1222	*Bahasa Ketiga-Mandarin 1* Third Language	W	2	
	BKKX XXX1	*Kokurikulum I* Cocurriculum I	W	1	
		TOTAL CREDITS THIS SEMESTER		17	
SEMESTER 2	BTMW 1112	*Asas Keusahawanan* Basic Technopreneur	W	2	
	BMMK 1043	*Rekabentuk Produk dalam Kimpalan* Product Design In Welding	K	3	
	BMMK 1054	*Dokumentasi Kimpalan* Welding Documentation	K	4	
	BMMK 1064	*Proses Kimpalan Bukan Konvensional* Non-Conventional Welding Process	K	4	
	BLHW 1762	*Falsafah dan Isu Semasa* Philosophy and Current Issues	W	2	
	**BLLW 2152	*Penulisan Akademik* Academic writing	W	2	BLLW 1142
	BKKX XXX1	*Kokurikulum II* Cocurriculum II	W	1	
		TOTAL CREDITS THIS SEMESTER		18	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMMK 2074	*Kecacatan Kimpalan* Imperfection in Welding	K	4	
	BMMK 2084	*Sifat Bahan Kimpalan* Materials Behaviour in Welding	K	4	
	BMMK 2094	*Pengurusan Keselamatan* Safety Management	K	4	
	BMMK 2104	*Analisis Rekabentuk Kimpalan* Welding Design Analysis	K	4	
	**BLLW3162	*Bahasa Inggeris untuk Interaksi Profesional* English for Professional Interaction	W	2	BLLW 2152
TOTAL CREDITS THIS SEMESTER				18	
SEMESTER 4	BTMW 2124	*Capstone Teknousahawanan 1* Capstone Technopreneurship 1	P	4	
	BMMK 2114	*Analisis Berpandukan Komputer* Computer Aided Analysis	K	4	
	BMMK 2124	*Perkakasan Elektrik Kimpalan* Electrical Welding Equipment	K	4	
	BMMK 2134	*Ujian Tanpa Musnah* Non Destructive Test	K	4	
	BLHW 2772	*Penghayatan Etika dan Peradaban* Appreciation of Ethics and Civilizations	W	2	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BTMW 3134	*Capstone Teknousahawanan 2* Capstone Technopreneurship 2	P	4	
	BMMK 3144	*Ekonomi Kimpalan dan Perolehan* Economic of Welding and Procurement	K	4	
	BMMK 3184	*Jaminan Kualiti Kimpalan* Welding Quality Assurance	K	4	
	*BMMK 31X4	*Elektif* Elective	E	4	
	BMXX XXX0	*Kursus Persediaan Pensijilan Profesional* Professional Certificate Preparation Course	P	0	
TOTAL CREDITS THIS SEMESTER				16	
SEMESTER 6	BMMU 3134	*Projek Tahun Akhir 1* Final Year Project 1	K	4	
	BMMK 3193	*Sistem Fizikal Siber dalam Kimpalan* Cyber Physical Systems in Welding	K	3	
	BMMK 3204	*Penambahbaikan dalam Kimpalan* Reclamation in Welding	K	4	
	BMMK 3214	*Pemantauan dan Pengurusan Pengeluaran* Managing Production and Supervision	K	4	
TOTAL CREDITS THIS SEMESTER				15	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SHORT SEMESTER	**BMMU 3186	*Projek Tahun Akhir 2* Final Year Project 2	K	6	BMMU 3134
TOTAL CREDITS THIS SEMESTER				6	
SEMESTER 7	BMMU 4212	*Latihan Industri* Industrial Training	K	12	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				120	

**	Pre-requisite COURSE
W	University Compulsory
P	Faculty Core
K	Programme Core
E	Elective

* For Elective, students may choose any ONE (1) COURSE from the list below:

NO.	CODE	COURSE
1.	BMMK 3154	*Ujian Tanpa Musnah Profesional* Non Dectructive Test Professional
2.	BMMK 3164	*Teknologi Kimpalan Profesional* Welding Technology Professional
3.	BMMK 3174	*Pemeriksaan Kimpalan Profesional* Welding Inspection Professional

BACHELOR OF TECHNOLOGY IN AUTOMOTIVE WITH HONOURS

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Programme Educational Objectives (PEO) is specific goals describing expected achievements of graduates in their career and professional life three to five years after the graduation.

PEO1	To produce automotive technologist that perform automotive related work including diagnostic specialist and retrofit specialist.
PEO2	To produce technopreneurs in automotive related technology.
PEO3	To produce relevant, respected, and referred professionals in automotive technology.

PROGRAMME OUTCOMES (PO)

Programme Outcomes (PO) are statements describing what students are expected to be able to attain upon the graduation. These relate to the skills, knowledge, and behaviours that students acquire through their programme of studies.

PO1	Apply knowledge of technology fundamentals to broadly-defined procedures processes, systems and methodologies in automotive.
PO2	Able to suggest and apply latest tools and techniques to solve broadly-defined problems.
PO3	Demonstrate strong analytical and critical thinking skills to solve broadly-defined problems in automotive.
PO4	Able to communicate and articulate effectively in both verbal and written among technologist communities and society at large.
PO5	Demonstrate understanding of the societal related issues and the consequent responsibilities relevant to broadly-defined technology practices.
PO6	Recognize the needs for professional development and to engage independent lifelong learning in specialist technologists.
PO7	Demonstrate an awareness of management and technopreneurship practices in real perspective.
PO8	Demonstrate professionalism and social and ethical consideration.
PO9	Demonstrate leadership quality, mentoring and work effectively in diverse teams.

Bachelor of Technology in Automotive with Honours (BMMF)

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BMMF 1014	*Industri & Teknologi Automotif* Automotive Industry & Technology	K	4	
	BMMF 1023	*Lukisan Automotif* Automotive Drafting	K	3	
	BMMF 1034	*Amalan Bengkel Automotif* Automotive Workshop Practice	K	4	
	BLLW 1142	*Bahasa Inggeris untuk Tujuan Akademik* English for Academic Purpose	W	2	
	BLLW 1222	*Bahasa Ketiga- Mandarin 1* Third Language	W	2	
	BKKX XXX1	*Kokurikulum I* Co-curriculum I	W	1	
TOTAL CREDITS THIS SEMESTER				16	
SEMESTER 2	BTMW 1112	*Asas Teknousahawanan* Basic Technopreneur	W	2	
	BMMF 1043	*Penyeliaan Tempat Kerja* Shopfloor Supervision	K	3	
	BMMF 1054	*Pembuatan Komponen Automotif* Automotive Component Fabrication	K	4	
	BMMF 1064	*Rekabentuk & Pemasangan Komponen Automotif* Automotive Component Design & Assembly	K	4	
	BLHW 1762	*Falsafah dan Isu Semasa* Philosophy and Current Issues	W	2	
	**BLLW 2152	*Penulisan Akademik* Academic writing	W	2	BLLW 1142
	BKKX XXX1	*Kokurikulum II* Co-curriculum II	W	1	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMMF 2073	*Pengurusan Projek* Project Management	K	3	
	BMMF 2084	*Servis Sistem Elektronik Automotif* Autotronic System Service	K	4	
	**BLLW 3162	*Bahasa Inggeris untuk Interaksi Profesional* English for Professional Interaction	W	2	BLLW 2152
	*BMMF 2XX4	*Elektif I* Elective I	E	4	
	*BMMF 2XX4	*Elektif II* Elective II	E	4	
TOTAL CREDITS THIS SEMESTER				17	
SEMESTER 4	BTMW 2124	*Capstone Teknousahawanan 1* Capstone Technopreneurship 1	P	4	
	BMMF 2134	*Penyenggaraan Sistem Kuasa Kenderaan* Powertrain System Service	K	4	
	BLHW 2772	*Penghayatan Etika dan Peradaban* Appreciation of Ethics and Civilizations	W	2	
	*BMMF 2XX4	*Elektif III* Elective III	E	4	
	*BMMF 2XX4	*Elektif IV* Elective IV	E	4	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BTMW 3134	*Capstone Teknousahawanan 2* Capstone Technopreneurship 2	P	4	
	BMMF 3183	*Perundangan Automotif* Automotive Legislation	K	3	
	BMMF 3192	*Pemasaran Kenderaan* Vehicle Marketing	K	2	
	*BMMF 3XX4	*Elektif V* Elective V	E	4	
	*BMMF 3XX4	*Elektif VI* Elective VI	E	4	
	BMXX XXX0	*Kursus Persediaan Pensijilan Profesional* Professional Certificate Preparation Course	P	0	
TOTAL CREDITS THIS SEMESTER				17	
SEMESTER 6	BMMU 3134	*Projek Tahun Akhir 1* Final Year Project 1	K	4	
	BMMF 3243	*Pengurusan Aset dan Barangan* Asset and Inventory Management	K	3	
	BMMF 3256	*Pengurusan Kualiti* Quality Management	K	6	
	BMMF 3263	*Penilaian Risiko* Risk Assessment	K	3	
TOTAL CREDITS THIS SEMESTER				16	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SHORT SEMESTER	**BMMU 3186	*Projek Tahun Akhir 2* Final Year Project 2	K	6	BMMU 3134
TOTAL CREDITS THIS SEMESTER				6	
SEMESTER 7	BMMU 4212	*Latihan Industri* Industrial Training	K	12	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				120	

** Pre-requisite COURSE
W University Compulsory
P Faculty Core
K Programme Core
E Elective

* For Elective I, students may choose any ONE (1) COURSE from the list below:

ELECTIVE	CODE	COURSE NAME
1	BMMF 2094	*Servis dan Penyelenggaraan Kenderaan Komersial* Commercial Vehicle Servicing and Maintenance
2	BMMF 2104	*Rekabentuk Permukaan* Surface Design

* For Elective II, students may choose any ONE (1) COURSE from the list below:

ELECTIVE	CODE	COURSE NAME
1	BMMF 2114	*Penyelenggaraan Pemacu Kenderaan* Drivetrain Maintenance
2	BMMF 2124	*Permodelan Automotif* Automotive Modelling

* For Elective III, students may choose any ONE (1) COURSE from the list below:

ELECTIVE	CODE	COURSE NAME
1	BMMF 2144	*Analisa Prestasi Kenderaan* Vehicle Performance Analysis
2	BMMF 2154	*Rekabentuk Luaran* Exterior Design

* For Elective IV, students may choose any ONE (1) COURSE from the list below:

ELECTIVE	CODE	COURSE NAME
1	BMMF 2164	*Diagnosis Masalah Kenderaan* Vehicle Fault Diagnosis
2	BMMF 2174	*Pembuatan Semula Komponen* Component Remanufacturing

* For Elective V, students may choose any ONE (1) COURSE from the list below:

ELECTIVE	CODE	COURSE NAME
1	BMMF 3204	*Penyenggaraan Hibrid* Hybrid Servicing
2	BMMF 3214	*Rekabentuk Dalaman* Interior Design

* For Elective VI, students may choose any ONE (1) COURSE from the list below:

ELECTIVE	CODE	COURSE NAME
1	BMMF 3224	*Penyenggaraan Kenderaan Elektrik* Electric Vehicle Servicing
2	BMMF 3234	*Mengecat* Painting

BACHELOR OF TECHNOLOGY IN AIR CONDITIONING AND REFRIGERATION WITH HONOURS

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Programme Educational Objectives (PEO) is specific goals describing expected achievements of graduates in their career and professional life after graduation.

PEO1	To produce air conditioning and refrigeration system technologist that can perform and manage installation and maintenance of air conditioning and refrigeration work.
PEO2	To produce technopreneurs in air conditioning and refrigeration related technology.
PEO3	To produce relevant, respected, and referred professionals in air conditioning and refrigeration installation and maintenance technology.

PROGRAMME OUTCOMES (PO)

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

PO1	Apply knowledge of technology fundamentals to broadly-defined procedures processes, systems and methodologies in air conditioning and refrigeration technology.
PO2	Able to suggest and apply latest tools and techniques to solve broadly-defined problems.
PO3	Demonstrate strong analytical and critical thinking skills to solve broadly-defined problems in air conditioning and refrigeration technology.
PO4	Able to communicate and articulate effectively in both verbal and written among technologist communities and society at large.
PO5	Demonstrate understanding of the societal related issues and the consequent responsibilities relevant to broadly-defined technology practices.
PO6	Recognize the needs for professional development and to engage independent lifelong learning in specialist technologists.
PO7	Demonstrate an awareness of management and technopreneurship practices in real perspective.
PO8	Demonstrate professionalism and social and ethical consideration.
PO9	Demonstrate leadership quality, mentoring and work effectively in diverse teams.

Bachelor of Technology in Air Conditioning and Refrigeration with Honours (BMMS)

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BMMS 1013	*Revolusi Industri* Industrial Revolutions	K	3	
	BMMS 1026	*CAD Termaju dalam HVAC* Advance CAD in HVAC	K	6	
	BMMS 1034	*Keselamatan Persekitaran HVAC* Safety in HVAC Environment	K	4	
	BLLW 1142	*Bahasa Inggeris untuk Tujuan Akademik* English for Academic Purpose	W	2	
	BLLW 1222	*Bahasa Ketiga- Mandarin 1* Third Language	W	2	
	BKKX XXX1	*Kokurikulum I* Co-curriculum I	W	1	
TOTAL CREDITS THIS SEMESTER				18	
SEMESTER 2	BTMW 1112	*Asas Teknousahawanan* Basic Technopreneur	W	2	
	BMMS 1044	*Aplikasi Piawai HVAC Untuk Bangunan Komersial* Application of HVAC Standard for Commercial Building	K	4	
	BMMS 1056	*Perniagaan dalam HVAC* Bussiness in HVAC	K	6	
	BLHW 1762	*Falsafah dan Isu Semasa* Philosophy and Current Issues	W	2	
	**BLLW 2152	*Penulisan Akademik* Academic writing	W	2	BLLW 1142
	BKKX XXX1	*Kokurikulum II* Co-curriculum II	W	1	
TOTAL CREDITS THIS SEMESTER				17	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMMS 2063	*Psikologi Perindustrian* Industrial Psychology	K	3	
	BMMS 2076	*Aplikasi Industri Penyejukan* Applied of Industrial Refrigeration	K	6	
	BMMS 2086	*Pengurusan Projek Bangunan Komersial HVAC* HVAC Commercial Building Project Management	K	6	
	**BLLW 3162	*Bahasa Inggeris untuk Interaksi Profesional* English for Professional Interaction	W	2	BLLW 2152
TOTAL CREDITS THIS SEMESTER				17	
SEMESTER 4	BTMW 2124	*Capstone Teknousahawanan 1* Capstone Technopreneurship 1	P	4	
	BMMS 2096	*Pengurusan Perawatan Air untuk HVAC* HVAC Water Treatment Management	K	6	
	BMMS 2106	*Pengawasan Loji Penyejuk* Chiller Plant Monitoring	K	6	
	BLHW 2772	*Penghayatan Etika dan Peradaban* Appreciation of Ethics and Civilizations	W	2	
TOTAL CREDITS THIS SEMESTER				18	
SEMESTER 5	BTMW 3134	*Capstone Teknousahawanan 2* Capstone Technopreneurship 2	P	4	
	BMMS 3116	*Kawalan Kualiti Udara Dalaman* Indoor Air Quality Control	K	6	
	BMMS 3126	*Pemeriksaan HVAC* HVAC Inspection	K	6	
	BMXX XXX0	*Kursus Persediaan Pensijilan Profesional* Professional Certificate Preparation Course	P	0	
TOTAL CREDITS THIS SEMESTER				16	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 6	BMMU 3134	*Projek Tahun Akhir 1* Final Year Project 1	K	4	
	BMMS 3146	*Perancangan dan Pembangunan Projek HVAC* HVAC Project Planning and Development	K	6	
	BMMS 3156	*Pengujian & Pertauliahan Komersial HVAC* Testing & Commissioning Commercial HVAC	K	6	
TOTAL CREDITS THIS SEMESTER				16	
SHORT SEMESTER	**BMMU 3186	*Projek Tahun Akhir 2* Final Year Project 2	K	6	BMMU 3134
TOTAL CREDITS THIS SEMESTER				6	
SEMESTER 7	BMMU 4212	*Latihan Industri* Industrial Training	K	12	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				120	

**	Pre-requisite COURSE
W	University Compulsory
P	Faculty Core
K	Programme Core
E	Elective

ACADEMIC HANDBOOK SESSION 2022/2023

FOR BACHELOR DEGREE PROGRAMMES

COMPULSORY COURSES FOR INTERNATIONAL STUDENTS

FTKMP

FACULTY OF MECHANICAL AND MANUFACTURING ENGINEERING TECHNOLOGY

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

COMPULSORY COURSES FOR INTERNATIONAL STUDENTS

International students are required to register nine (9) university compulsory courses that are equivalent to 16 credits. The list of courses that they have to register is as shown in Table 1. All of the courses are delivered in English language.

Table 1: List of Compulsory Courses for Undergraduate Programme for International Students

NO.	CODE	COURSE	CREDIT
Academic English		Academic English (No IELTS/TOEFL/MUET)	9 months/ 6 months/ 3 months
1.	BLLW 1142	English for Academic Purposes	2
2.	BLLW 2152	Academic Writing	2
3.	BLLW 3162	English for Professional Interaction	2
4.	BLLW 1172	Communicative Malay Language I	2
5.	BIPW 1762	Philosophy and Current Issues	2
6.	BIPW 2752	*Malaysian Culture*	2
7.	BLLW 1212	Arabic Language I	2
	BLLW 1222	Mandarin Language I	
	BLLW 1232	Japanese Language I	
	BLLW 1242	Korean Language I	
	BLLW 1252	German Language 1	
8.	BKK* 1**1	Co-curiculum I	1
9.	BKK* 1**1	Co-curiculum II	1
TOTAL CREDIT			**16 credit**

Minimum English Language Requirements

International students whose first language is not English are required to obtain an appropriate score in an approved examination in English language (such as IELTS, TOEFL, Malaysian University English Test - MUET) before they can embark on an academic programme. Applicants need to show either a standard or a higher level of ability in English.

Academic English Language Programme

If the students do not have the required standard of English, the University may offer them a pre-sessional Academic English Language programme conducted by the Centre for Languages and Human Development to meet required scores in order to gain admission for their undergraduate and postgraduate degrees at UTeM. Applicants need to achieve a minimum of 5.0 for IELTS, 500 for TOEFL or Band 3.0 for MUET.

Exemptions

Exemptions from this requirement will be considered for applicants:
1. Whose native language is English.
2. Who have studied a degree programme in Malaysia, if it is taught in English.

For the co-curriculum courses, students who have registered for co-curriculum I (for example, Football) are **not allowed** to take the same course for co-curriculum II. However, students who failed in the co-curriculum course can register for other co-curriculum course.

With respect to the third language courses, such as Arabic, Mandarin, Japanese, Korean and German, there are three conditions that need to be followed:
1. Students **are not allowed** to register in their native language;
2. Students who failed in their third language course have the option to register in a third language course different from the earlier course taken; and
3. Students who intend to improve their grade in course taken have to take the same course.

ACADEMIC HANDBOOK SESSION 2022/2023

FOR BACHELOR DEGREE PROGRAMMES

SUMMARY OF COURSES ENGINEERING TECHNOLOGY PROGRAMMES

FTKMP

FACULTY OF MECHANICAL AND MANUFACTURING ENGINEERING TECHNOLOGY

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITY COMPULSORY COURSES (W)

BKKX XXX1
COCURRICULUM I & COCURRICULUM II/
KOKURIKULUM I & KOKURIKULUM II

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply the technique in the relevant field.
2. Demonstrate the ability to participate in a team in the relevant field.

***LIST OF FIELDS**

CODE	COURSE
BKKC 1061	Koir
BKKC 1141	Silat Gayong
BKKC 1601	Gamelan
BKKC 1611	Cak Lempong
BKKC 1631	Nasyid
BKKC 1641	Seni Khat
BKKC 1761	Kompang
BKKC 1791	Catur
BKKE 1451	Perniagaan Sukan
BKKE 1461	Agropreneur
BKKE 1551	Keusahawanan
BKKE 1561	Fiqh Muamalat
BKKI 1531	Reka Cipta
BKKI 1781	Seni Foto
BKKL 1391	Pengurusan Kendiri
BKKL 1411	Pengurusan Kesihatan
BKKL 1501	Aplikasi Falak Dalam Ibadah
BKKM 1501	Rakan Polis
BKKM 1561	Budi Penyayang
BKKM 1811	Fiqh Amali
BKKM 1821	Tahsin Al-Quran
BKKM 1831	Prs & Sahabat Khidmat
BKKM 1911	Kelestarian Amalan Hijau
BKKM 1921	Pengurusan Tenaga Elektrik
BKKM 1931	Teknologi Hijau Dan Alam Sekitar
BKKP 1741	Pengucapan Awam (Bahasa Melayu)
BKKS 1011	Bola Sepak
BKKS 1031	Bola Tampar
BKKS 1071	Sepak Takraw
BKKS 1091	Senamrobik
BKKS 1101	Badminton
BKKS 1141	Kembara
BKKS 1151	Berbasikal
BKKS 1281	Hoki
BKKS 1311	Sofbol
BKKS 1351	Bola Baling
BKKS 1361	Ragbi
BKKS 1501	Petanque
BKKV XXXX	Kor SUKSIS
BKKV XXXX	Kor SISPA
BKKV XXXX	Kelana Siswa
BKKV 1571	Bulan Sabit Merah
BKKV XXXX	PALAPES
BKKV 1851	Pertolongan Cemas

***Remark: Subject to change by IPTK**

BLLW XXX2
THIRD LANGUAGE/
BAHASA KETIGA

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Demonstrate the ability to converse in third language (selected) with correct and accurate pronunciation and respond to it accordingly.
2. Construct sentences with correct grammar and demonstrate writing skills.
3. Interpret the information in the simple text.

LIST OF COURSES*

CODE	COURSE
BLLW 1212	Bahasa Arab I
BLLW 1222	Bahasa Mandarin I
BLLW 1232	Bahasa Jepun I
BLLW 1242	Bahasa Korea I
BLLW 1252	Bahasa Jerman 1

Remark: Subject to change by CELL/ *PPB

BLLW 1142
ENGLISH FOR ACADEMIC PURPOSES/
BAHASA INGGERIS UNTUK AKADEMIK

LEARNING OUTCOMES

By the end of the course, students should be able to:

1. Apply correct grammar rules according to context.
2. Demonstrate knowledge of various reading skills in the reading tasks given.

SYNOPSIS

This course aims to develop students' reading skills and grammar. A variety of academic reading texts and reading skills are explored to facilitate students' comprehension of the texts. These reading skills are also necessary in assisting students to master study skills. Grammar elements are taught in context to develop students' accuracy in the use of the language. This course also includes elements of blended learning.

REFERENCES

1. Pattison, T. (2015). Critical Reading: English for Academic Purposes. Pearson Higher Education & Professional Group.
2. de Chazal, E., & Rogers, L. (2013). Oxford EAP: A Course in English for Academic Purposes. Oxford: Oxford University Press.
3. Paterson, K. & Wedge, R. (2013). Oxford Grammar for EAP. Oxford: Oxford University Press.

BLLW 2152
ACADEMIC WRITING/
PENULISAN AKADEMIK

LEARNING OUTCOMES
At the end of the course, students should be able to:
1. Prepare clear and detailed descriptions of a product related to fields of interest.
2. Express arguments systematically in a composition.
3. Prepare short reviews of technical materials.

SYNOPSIS
This course aims to equip the students with the skills to communicate clear and detailed viewpoints in writing. The students are expected to have a stand on topics of their fields by providing advantages and disadvantages to support their arguments. From time to time, consultations with the students will be conducted throughout the completion of their assignments. This serves as the formative evaluation in the course. Grammar components are embedded in the course to support the required writing skills. Blended learning is incorporated in this course.

REFERENCES
1. Blass, L & Vargo, M. (2018). Pathways: Reading, Writing, and Critical Thinking 3. Mason: Cengage Learning, Inc
2. de Chazal, E., & Rogers, L. (2012). Oxford EAP: A Course In English For Academic Purposes. Oxford: Oxford University Press.
3. Paterson, K. & Wedge, R. (2013). Oxford Grammar for EAP. UK: Oxford University Press.

PRE-REQUISITE
BLLW 1142
ENGLISH FOR ACADEMIC PURPOSES/
BAHASA INGGERIS UNTUK AKADEMIK

BLLW 3162
ENGLISH FOR PROFESSIONAL INTERACTION/
BAHASA INGGERIS UNTUK INTERAKSI PROFESIONAL

LEARNING OUTCOMES
At the end of the course, students should be able to:
1. Listen and infer based on situations in context.
2. Respond to standard spoken language using communication strategies.
3. Display detailed descriptions by expanding and supporting points of view using relevant examples.

SYNOPSIS
This course which is designed based on a blended and student-centred learning approach aims to develop students' listening skills as well as communication skills and strategies. Among the elements covered are professional interactions that include group discussion and public speaking. Students are also required to express ideas with relevant examples in public speaking and online assessments. They are also exposed to the rudiments of grammar implicitly via the communicative activities.

REFERENCES
1. Fry, R. (2016). 101 Smart Questions To Ask On Your Interview. U.K.: New Page Books.
2. Cooper, S. (2016). 100 Tricks To Appear Smart In Meetings: How To Get By Without Even Trying. Andrews McMeel Publishing.
3. Hood, J.H. (2013). How To Book Of Meetings: A Complete Guide For Every Business. South Australia: Magill.
4. Carmine, G. (2014). Talk like TED: The 9 Public-Speaking Secret Of The World's Top Minds. New York: St Martins Press.
5. Jason, S.W. (2013). Workplace Communication For The 21st Century: Tools And Strategies That Impact The Bottom Line. California: Praeger.

PRE-REQUISITE
BLLW 2152
ACADEMIC WRITING/
PENULISAN AKADEMIK

BLHW 1762
PHILOSOPHY AND CURRENT ISSUES/
FALSAFAH DAN ISU SEMASA

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Explain current issues based on philosophy, National Education Philosophy and Rukun Negara.
2. Explain current issues based on major thought streams in various philosophical streams.
3. Explain current issues through the perspective of comparative philosophy as the basis for establishing inter-cultural dialogue.

SYNOPSIS
This course covers the relationship of philosophy with the Philosophy of National Education and Rukun Negara. The use of philosophy as a tool to purify the culture of thought in life through art and thinking methods as well as human concepts. The main topics in philosophy namely epistemology, metaphysics and ethics are discussed in the context of current issues. Emphasis is given to philosophy as the basis for inter-cultural dialogue and fostering common values. At the end of this course, students will be able to see the disciplines of knowledge as a comprehensive body of knowledge and related to each other.

REFERENCES
1. Dzulkifli, A. R. & Rosnani, H (2019). New Interpretation of National Education Philosophy and Its Implementation Post 2020. Kuala Lumpur: IIUM Press.
2. Rosnani Hashim (2017). Revitalization of Philosophy and Philosophical Inquiry in Muslim Education. Gombak: Kull of Education, IIUM.
3. Al-Attas, S. M. Naquib (1991). The Concept of Education in Islam. Kuala Lumpur: ISTAC.

BLHW 2772
APPRECIATION OF ETHICS AND CIVILIZATIONS/
PENGHAYATAN ETIKA DAN PERADABAN

LEARNING OUTCOMES
At the end of this course, students will be able to:
1. Explain the theory and concept of ethics from different perspectives of civilization.
2. Explain the importance of contemporary issues related to various fields according to the mold of ethics and civilization.
3. Discuss the system, level of development, social and cultural progress across cultures for Malaysia.

SYNOPSIS
This course discusses the theories and concepts of knowledge, ethics and civilization based on the comparison of systems, social and cultural progress across diverse cultures. In addition, this course also explains about contemporary issues related to various fields according to the mold of ethics and civilization. This course approach can build Malaysians who come from various cultural backgrounds across cultural values to produce human culture with good values.

REFERENCES
1. Puga, I. & Easthope R. (2017). An analysis of C. Wright Mills's The sociological imagination. London: Routledge.
2. MacKinnon, B. (2015). Ethics: Theory and Contemporary Issues (8th) ed). Stamford CT: Cengage Learning.

BTMW 4012
TECHNOLOGY ENTREPRENEURSHIP/
KEUSAHAWANAN TEKNOLOGI

LEARNING OUTCOMES

Upon completion of the course, students should be able to:

1. Recognize the importance of entrepreneurship, the role of entrepreneurship in today's society, and the technical knowledge of the entrepreneurial process.
2. Explain the basic concepts of interdisciplinary competences in management, and create technology-based businesses.
3. Present a business plan project and develop an entrepreneurial profile.

SYNOPSIS

The course provides students with technological knowledge about entrepreneurship as well as the skills to turn such knowledge into practice. The teaching and learning (T&L) activities include case study and field work with the aim to inculcate entrepreneurship values and entrepreneurship acculturation with a view to successfully launch and subsequently manage their enterprises. Students will be exposed with the support systems available or government agencies in starting new ventures, including the tactics commonly employed by entrepreneurs starting a business. The course allows students to critically evaluate business in terms of technical feasibility, investment potential, and risks.

REFERENCES

1. Barringer, B.R, and Ireland, R.D. (2012). Entrepreneurship 4th Edition. Pearson.
2. Scarborough, N.M. (2011). Essentials of Entrepreneurship and Small Business Management 6th.Edition. Pearson.
3. UiTM Entrepreneurship Study Group. Revised Edition (2010). Fundamentals of Entrepreneurship. Pearson.

BLHC 4032
CRITICAL AND CREATIVE THINKING/
PEMIKIRAN KRITIS DAN KREATIF

LEARNING OUTCOMES

At the end of the course, students should be able to:

1. Identify basic principles of critical and creative thinking skills.
2. Analyze collected and traceable information to make decisions.
3. Form a new concept or idea of a solution.

SYNOPSIS

This course is designed to give students an introduction to the principles of critical and creative thinking, and problem-solving. Students will be exposed to the roles of the right brain and left brain, mental determination, elements of critical and creative thinking as well as problem solving. This course is conducted in accordance with the concept of problem-based learning (PBL).

REFERENCES

1. Aziz Yahya, Aida Nasirah Abdullah, Hazmilah Hasan, Raja Roslan Raja Abd Rahman. (2011) Critical and Creative Thinking Module 2. Melaka. Penerbit UTeM.
2. Buzan, T. & Buzan, B. (2006). The Mind Map Book, Essex: BBC Active, Pearson Education.
3. Claxton, G. & Lucas, B. (2007). The Creative Thinking Plan, London: BBC Books.
4. Reichenbach, W. (2000). Introduction to Critical Thinking, McGraw-Hill College.

GENERAL ELECTIVE COURSES (W)

BLHW 1722
PHILOSOPHY OF SCIENCE AND TECHNOLOGY/
FALSAFAH SAINS DAN TEKNOLOGI

LEARNING OUTCOMES

At the end of this course, students will be able to:

1. Explain the importance of the concept of knowledge in the philosophy of science and technology.
2. List the challenges and importance of global issues regarding science and technology that have an impact on society and global life.

SYNOPSIS

This course discusses the concept of knowledge in philosophy, science and technology that targets the importance of knowledge according to Islamic and Western scholars. In addition, this course also emphasizes on methodology in Islamic science, concepts and achievements of Islamic civilization in various fields as well as applying the challenges and importance of global issues regarding science and technology that are growing and impacts in society and global life. This course is able to open the minds of students to life in a team to form a wave of creative human thinking.

REFERENCES

1. Nor Azaruddin Husni Hj Nuruddin. (2017). Challenging Issues for Science & Technology In Malaysia an Overview. Kuala Lumpur: Institut Kefahaman Islam Malaysia.
2. Abdul Rahman Abdullah. (2010). Wacana Falsafah Sains Sejarah Dan Pemikiran. Pulau Pinang: Pusat Kajian Pengurusan Pembangunan Islam Universiti Sains Malaysia.
3. Daniel Zainal Abidin. (2007). Meneroka Kecemerlangan Quran daripada Teropong Sains. Selangor: PTS Milennia.
4. Nik Salida Suhaila Nik Saleh, et.al. (2007). Sains Islam Merentasi Zaman. Nilai: Universiti Sains Islam Malaysia.
5. Yahaya Jusoh & Azhar Muhammad. (2007). Pendidikan Falsafah Sains Al-Quran. Johor: Penerbit Universiti Teknologi Malaysia.

BLHC 4012
ORGANIZATIONAL COMMUNICATION/
KOMUNIKASI KEORGANISASIAN

LEARNING OUTCOMES

At the end of this course, students will be able to:

1. Discuss the basic principles of organizational communication skills for the purpose of interaction within the organization.
2. Provide feedback on issues related to the development of organizational communication skills.
3. Solve organizational communication problems based on the context of the actual organizational environment.

SYNOPSIS

This course will expose students to the basic ideas of organization in general and organizational communication. In addition, students will also be able to know the theories related to organizational communication and understand the important elements in the organization such as leadership, formal communication and informal communication. In addition, students will be aware of barriers, problem solving and decision making skills in organizational communication. Eventually, students will have an understanding of organizational climate, technological and organizational relationships and corporate communication within the organization.

REFERENCES

1. Miller, K. (2012). Organizational Communication. (4rd. ed). Belmont: Thomson Wadsworth Publishing Company.
2. Dennis K. Mumby (2018). Organizational Communication: A Critical Approach. (2nd ed). SAGE Publications, Incorporated.

BLHH 1032
INDUSTRIAL AND ORGANIZATIONAL PSYCHOLOGY/ PSIKOLOGI INDUSTRI DAN ORGANISASI

LEARNING OUTCOMES

At the end of this course, students will be able to:

1. Relate environmental processes and theories in the workplace in the world of organization and industry.
2. Demonstrate leadership characteristics in group assignment activities.
3. Respond to the role and responsibilities as a prospective employee in the organization.

SYNOPSIS

This course provides exposure to the psychological aspects of the world of work in the industrial sector as well as problems related to behavior in the organization. There are several topics discussed including current issues in workplace psychology, personnel planning, workplace stress and engineering psychology.

REFERENCES

1. Schultz & Schultz, Duane (2017). Psychology and Work Today. New York: Prentice Hall.
2. Azlina A. B. (2016). Industrial Psychology and Human Resource Management. Terengganu: Universiti Malaysia Terengganu Publishers.

BLHC 4022
NEGOTIATION SKILLS/ KEMAHIRAN PERUNDINGAN

LEARNING OUTCOMES

At the end of this course, students will be able to:

1. Identify basic concepts in the negotiation process using effective communication practices.
2. Conclude on the best consulting techniques based on various theoretical approaches.
3. Solve consulting issues based on effective consulting skills techniques based on various situations.

SYNOPSIS

This course will discuss the basic concepts of consultation, critical and creative thinking techniques, effective communication techniques and effective listening and questioning techniques. Students are also exposed to the knowledge and skills needed to carry out and manage the various consultation processes effectively. In addition, critical and creative thinking skills, as well as the effective communication skills required to carry out the consultation process will also be discussed.

REFERENCES

1. Lemiwki, R., Barry, B. & Saunders, D. (2016). Essentials Of Negotiation. USA: McGraw Hill Education.
2. Covey, S. (2013) The 3rd Alternative: Solving Life's Most Difficult Problems. New York: Free Press
3. Fisher, R & Ury. (2011). Getting To YES: Negotiating Agreement Without Giving In. Third Edition. Penguin Books.

PROGRAMME CORE COURSES (P)

BMMU 1013
TECHNICAL MATHEMATICS/
MATEMATIK TEKNIKAL

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Explain the concepts of matrices, trigonometry, complex numbers and three-dimensional vector operations.
2. Use appropriate methods to solve matrices, trigonometry, complex numbers and three-dimensional vector operations.
3. Solve application problems using appropriate techniques.

SYNOPSIS

This course has four components; matrices, trigonometry, complex numbers and three-dimensional vector operations. In matrices, it covers some fundamental concepts such as determinants, inverses of square matrices and techniques for solving systems of linear equations using matrices. In trigonometry, the use of trigonometric identities to solve trigonometric equations and its applications will be emphasized. In complex numbers, it covers some fundamental concepts of imaginary numbers and its representations on the complex plane, as well as the representations of the polar and exponential forms of the complex numbers. Three-dimensional coordinate system and vectors operations will also be introduced. This includes the concepts of the dot and the cross products of vectors.

REFERENCES

1. Samsudin, A., Mukhtar, M.F., Hairol Anuar, S.H. & Irianto I. (2021). Introductory: Technical Mathematics for Engineering Technology (2nd Edition). Penerbit UTeM.
2. Miller, J. & Gerken, D. (2016). College Algebra & Trigonometry. Mcgraw-Hill Education.
3. Sullivan, M. (2019). Algebra And Trigonometry, Loose-Leaf Edition (11th ed.). Pearson Education.
4. Lial, M.L., Hornsby, J., Schneider, D.I. & Daniels, C. (2016). College Algebra And Trigonometry. Global Edition, Pearson Education Limited.
5. Larson, R. (2016). Algebra And Trigonometry With Calchat And Calview (10th ed,). Brooks Cole.

BMMU 1023
CALCULUS FOR TECHNOLOGY/
KALKULUS UNTUK TEKNOLOGI

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Use appropriate methods to find the limits and continuity of a function.
2. Use appropriate methods to differentiate and integrate various functions.
3. Solve application problems using appropriate techniques.

SYNOPSIS

This course introduces the differential and integral calculus of a single variable, with applications. The topics covered are limits and continuity of a function, the derivative with all techniques and methods to differentiate, applications of differentiation such as approximation, related rates, maximum and minimum values, as well as optimization problems. Integration covers methods like substitution, integration by parts, integration by partial fraction decomposition and trigonometric substitution. While its applications cover the area of a bounded region or area between curves as well as the volume of a solid of a revolution.

REFERENCES

1. Azmi, E.F., Zainal, N.A., Hamzah, K. & Said, R.M. (2020). Elementary Calculus For Technology, Module For Engineering Technology Degree Programmes. Penerbit UTeM.
2. James, S. (2016). Calculus (8th ed.). Cengage Learning.
3. Joel, H., Maurice, D.W. & Thomas, G.B. (2016). University Calculus: Early Transcendentals (3rd ed.). Pearson Education.
4. Zill, D.G. & Dewar, J.M. (2016). Essentials of Precalculus with Calculus Previews. Jones and Bartlett Publishers.
5. Larson, R. & Edwards, B. (2014). Calculus (10th ed.). Boston, MA Brooks.
6. Komzsik, L. (2014). Applied Calculus of Variations for Engineers. Boca raton, FL CRC Press.

BMMU 2033
ADVANCED CALCULUS FOR TECHNOLOGY/
KALKULUS LANJUTAN UNTUK TEKNOLOGI

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply the basic knowledge of vector functions and multivariable calculus to solve the related problems.
2. Use appropriate methods to find the solutions of the differential equations.
3. Solve application problems using appropriate techniques.

SYNOPSIS

This course has two parts. The first part introduces the vector-valued functions which include the derivative, integration, arc length and curvature of vector functions, partial derivatives that include limits and continuity, chain rule, and maximum and minimum values, and multiple integrals which include the double and triple integrals of multivariable functions. The second part of the course covers the solutions of ordinary differential equations. The topics include solving the first order differential equations using the separable, exact differentiation, and linear equations methods. While solutions of the second order equations covers the homogeneous and the non-homogeneous equations using the undetermined coefficients methods and variation parameters.

REFERENCES

1. Stewart, J., Clegg, D.K., & Watson, S. (2020). Calculus: Early Transcendentals. Cengage Learning.
2. Anton, H., Bivens, I.C., & Davis, S. (2016). Calculus: late Transcendental. John Wiley & Sons.
3. Stewart, J., Clegg, D.K., & Watson, S. (2021). Multivariable Calculus. Cengage Learning.
4. Zill, D.G. (2016). Differential Equations with boundary-value problems. Nelson Education.
5. James, S. (2016). Calculus (8th Edition). Cengage Learning.

BMMU 2043
STATISTICAL METHODS/
KAEDAH STATISTIK

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply the knowledge of probability and statistics to solve the related problems.
2. Solve problems in statistical inferences related to hypothesis testing, regression and ANOVA.
3. Execute some real problems using Microsoft Excel data analysis application.

SYNOPSIS

This course covers the concept of probability and statistics and their real application problems. Probability topics include all the basic concepts of probability such as events and probability, mutually exclusive events, independent events, multiplication rule, addition rule, conditional probability, discrete and continuous random variables. The inferential statistics covers topics like sampling, hypothesis testing, correlation, simple linear regression, chi-square independent test and ANOVA. Students will be exposed to statistical data analysis application in Microsoft Excel to solve real application questions.

REFERENCES

1. Hasim, N.A.H., Hussin, N.H., Ahmad, A. & Miswan, N.H. (2019). Statistical Methods for Technology, (Work Book) for Engineering Technology Degree Programs. Penerbit UTeM.
2. Paolella, M.S. (2018), Fundamental Statistical Inference: A Computational Approach. John Wiley & Sons, Incorporated. ISBN: 9781119417880 (EBook).
3. Steyer, R. & Nagel, W. (2017), Probability and Conditional Expectation: Fundamentals for the Empirical Sciences, John Wiley & Sons, Incorporated. ISBN: 9781119243502 (EBook).
4. Hahn, G.J., Meeker, W.Q. & Escobar, L.A. (2017). Statistical Intervals: A Guide for Practitioners and Researchers (2nd ed.). John Wiley & Sons, Incorporated. ISBN: 9781118594957. (EBook)
5. Rohatgi, V.K. & Saleh, A.K.E. (2015). An Introduction to Probability and Statistics (3rd ed.). John Wiley & Sons, Incorporated. ISBN: 9781118799659 (EBook).

BMMU 4053
ENGINEERING ETHICS & OCCUPATIONAL SAFETY, HEALTH, AND ENVIRONMENT (OSHE)/
ETIKA KEJURUTERAAN & KPPP

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Perform the principles of professional ethics and various behavior or conduct that need to be observed, control and solve by a professional engineering technologist.
2. Practice the occupational safety and health that the employees exposed themselves in the workplace environment and how to prevent the hazard.
3. Explain the responsibilities of engineering technologies in the scope of their function in any organization either as an employee or as an employer and have a feeling of being responsible to the society and the environment.

SYNOPSIS

This course will discuss the concept and cases of engineering ethics ; Introduction to professional ethics, engineering ethics as preventive ethics, framing the ethical problems, methods for moral problem solving, creative middle ways, organizing principles, utilitarian concept, minimalist views, respect for persons, reversibility, universal ability, responsible engineering technologists, reasonable care, good works, honesty, integrity, reliability, conflict of interest, engineering technologist as employees, engineering technologist as employers, engineers and environment, international engineering professionalism. At the end of the course, the student will be taught on the OSHA, critical safety and health hazards, first aids procedures and practice, its organization and how the OSHA manage to monitor the safety and the health effectively, case study on the occupational safety and health.

REFERENCES

1. Harris, C. E., Michael S. Pritchard, and Michael J. Rabins. Engineering Ethics: Concepts and Cases. Belmont, CA: Wadsworth, 2009. Print.
2. Fleddermann, C. B. (2014). Engineering Ethics (4th ed.). Pearson.
3. Martin, M. K. & Schinzinger, R. (2010). Engineering Ethics (2nd ed.). McGraw-Hill.
4. Undang-undang Malaysia. Akta 768, Akta Teknologis dan Juruteknik (2015). Occupational Safety and Health Act, 1994
5. Factories and Machinery Act, 1967.

BMMA, BMMH AND BMMM PROGRAMME CORE COURSES (P)

BMMM 1062
PHYSICS/
FIZIK

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Explain the basic laws and comprehend the basic concept of physic.
2. Show the understanding of physics concepts systematically by accurate measurement.
3. Discuss the importance of physics concepts in application of energy management.

SYNOPSIS

The topics covers in this course are; Forces, Acceleration and Newton's Second Law of Motion, Motion with a Changing Velocity, Circular Motion, Conservation of Energy, Linear Momentum, Fluids, Elasticity and Oscillations, Heat, electric Forces and Fields, Electric Potential, Electric Current and Circuits, Magnetic Forces and Field, Electromagnetic Induction.

REFERENCES

1. Raymond A. Serway and John W. Jewett, 2018, Physics for Scientists and Engineers, Chapter 1-39, Brooks Cole Cengage Learning.
2. John D. Cutnell and Kenneth W. Johnson, 2012, Physics, Wiley.
3. Douglas C. Giancoli, 2009, Physics for Scientists & Engineers with Modern Physics 4th Edition, Prentice Hall.
4. Giambatista, A., Richardson, B.M and Richardson R.C., 2010, College Physics 2nd Edition, Mc-Graw Hill.

BMMP, BMMD AND BMMW PROGRAMME CORE COURSES (P)

BMMD 4013
SUSTAINABLE DEVELOPMENT/
PEMBANGUNAN LESTARI

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Describe the elements of design for Dematerialization, Detoxification, Revalorization and Renewal.
2. Design, various product type with minimum environmental effect.
3. Analyze the environmental effect of product throughout its lifecycle.

SYNOPSIS

Sustainable design or green product design is to incorporate product design to eliminate negative environmental impact completely through skillful, sensitive design. Manifestations of sustainable design require no non-renewable resources, impact the environment minimally, and relate people with the natural environment.

REFERENCES

1. Bhavik R. Bakshi, (2019) Sustainable Engineering : Principles and Practice, Cambridge University Press.
2. Adisa Azapagic, Slobodan Perdan, (2011) Sustainable Development in Practice. Wiley-Blackwell.
3. David T. Allen, David R. Shonnard, (2012) Sustainable Engineering: Concepts, Design and Case Studies, Prentice Hall.
4. J. Paulo Davim, (2010) Sustainable Manufacturing, John Wiley and Sons, Inc.
5. M.K. Ghosh Roy (2011) Sustainable Development: Environment, Energy and Water Resources. ANE Books. Ltd.
6. Michael F. Ashby, (2016) Materials and Sustainable Development, Butterworth – Heinemann Publishing, Elseivier Ltd.

COURSE DETAILS FOR JTKM PROGRAMMES

BMMA COURSE CORE COURSES (K)

SEMESTER 1

BMMA 1303
ENGINEERING GRAPHICS/
GRAFIK KEJURUTERAAN

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Apply fundamental of technical drawing to produce standard mechanical part and assemblies drawing documents.
2. Construct typical mechanical engineering drawing using CAD software.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams.

SYNOPSIS

The course concentrates on computer aided design (CAD) software. AutoCAD engineering drawing software is used to produce standard engineering drawing. The students will be exposed to cad interface, editing commands, coordinate system, template preparation and layer in order to produce various types of engineering drawings.

REFERENCES

1. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. and Novak, J. E.,Lockhart S., 2016, Technical Drawing With Engineering Graphics, 15th Ed., Pearson & Prentice Hall, New Jersey.
2. Mark Dix, Paul Riley, 2017, Discovering Autocad 2017, Prentice Hall, London.
3. Scott Onstott, 2013, Autocad 2014 And Autocad Lt 2014 Essential, John Wiley & Sons, Inc.
4. Cheryl R. Shrock And Steve Heather, 2014, Beginning Autocad 2015, Industrial Press, Inc.

BMMP 1313
ENGINEERING MATERIALS/
BAHAN KEJURUTERAAN

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Explain the structures, properties and processing of engineering materials.
2. Display the ability to determine the microstructures and mechanical properties of various materials.
3. Construct the solution for engineering material problems.

SYNOPSIS

This course introduces basic concepts of engineering materials that covers introduction to engineering materials, inter-atomic bonding, crystalline structure and imperfections in solid. Explanation on different type of engineering materials (i.e. metal, polymer, ceramic, composite and semiconductor), its mechanical properties, basic application and processing are also included. Introduction to the binary phase diagrams (composition and microstructure correlation) is also given.

REFERENCES

1. Callister W.D. and Rethwisch D.G, 2011, Fundamentals of Materials Science and Engineering, 8th Edition, John Wiley & Sons.
2. Smith W. F., 2011, Foundation of Materials Science and Engineering, 5th Edition, Mcgraw Hill.
3. Askeland D. R., 2011, The Science and Engineering of Materials, 6th Edition, Cl-Engineering.
4. Serah, A. M., 2017, Engineering Materials for Engineering Technologist. Melaka: Universiti Teknikal Malaysia Melaka.

BMMA 1313
PRINCIPLE OF ELECTRIC & ELECTRONIC/
PRINSIP ELEKTRIK & ELEKTRONIK

LEARNING OUTCOMES
At the end of this course, the students should be able to:
1. Explain the basic electrical and electronic concept in solving circuits problem.
2. Develop electrical circuits and measure voltage, current and resistance using appropriate instruments.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams.

SYNOPSIS
This course will cover on the topics of electrical and electronic components, emphasizing on electric circuit theory such as components and measurement instruments, circuit analysis. For electronic principle, it will cover on the topics of electronic devices such as operational amplifiers and digital electronics it will deals with topics such as system numbers, logic gates, boolean operation, combination logic circuits, and digital circuit application.

REFERENCES
1. Thomas L. Floyd, 2014, Principles Of Electric Circuits, 9th Ed., Prentice Hall.
2. Thomas L.Floyd, 2015, Digital Fundamental, 11th Ed., Pearson Education.
3. Alexander, C.K. and Sadiku, Matthew N. O, 2017, Fundamental Of Electric Circuit, 6th Ed., Mcgraw Hill.
4. Nilsson, J. W. and Riedel, S. A., 2015, Electric Circuit, 10th Ed., Prentice Hall.
5. Roger Tohkeim, 2014, Digital Electronics Principles & Applications, 8th Ed., Mcgraw Hill.

SEMESTER 2

BMMA 2353
MODELING AND COMPUTER ANALYSIS/
PERMODELAN DAN ANALISIS BERKOMPUTER

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply fundamental of engineering and technical drawing in mechanical design using advance CAD tools.
2. Conduct computer modelling, design and analysis using advanced CAD tools.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams.

SYNOPSIS
This course will empower the students with fundamental knowledge and technical skills of 3d solid modelling skills using industry-proven 3d mechanical cad software. The students will learn about the different techniques for creating surface and solid models with emphasis on design intent. The course includes hands-on exercises and best practice methods for students to interpret common error messages during part, assembly and drafting stages.

REFERENCES
1. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. And Novak, J. E.,Lockhart S., 2016, Technical Drawing With Engineering Graphics, 15th Ed., Pearson & Prentice Hall, New Jersey.
2. Lombard, Matt, 2019, Mastering SolidWorks, John Wiley & Sons, Inc.
3. Planchard, D. & M. Planchard, Engineering Design With Solidworks 2017, Mission, Kansas : SDC Publications.com, 2017.
4. Kirstie Plantenberg (2011), Introduction To Catia V5 Release 19 (A Hands-On Tutorial Approach), Schroff Development.

PRE-REQUISITE
BMMA 1303
ENGINEERING GRAPHICS/
GRAFIK KEJURUTERAAN

BMMA 1333
STATICS/
STATIK

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Describe the physical sciences of statics concepts.
2. Construct statics experiments to recognize the engineering mechanics of statics principles.
3. Explain effectively as an individual and assist group members for experimental and assignment works.

SYNOPSIS

An introduction to the basic concept of statics as physical sciences, system of units, scalars and vectors, free body diagram, forces system, force system resultants and moment, equilibrium of a particle, equilibrium of a rigid body, structural analysis (trusses analysis and simple frames and machines), friction and center of gravity and centroid.

REFERENCES

1. Hibbeler R.C., 2017, Engineering Mechanics Statics, 14th SI Ed., Prentice Hall, New York.
2. Beer, F. P. And Johnston Jr., E. R. And Eisenberg, E. R., 2015, Vector Mechanics for Engineers - Statics, 11th Ed. in SI Units, Mcgraw Hill, New York.
3. Meriam, J. L. and Kraige L. G., 2014, Engineering Mechanics Static SI Version, 8th Ed., John Wiley & Sons, New York.
4. Pytel and Kiusaalas. 2017. Engineering Mechanics-Static. 4th Ed. Cengage Learning.
5. Michael P., Gary G., F. Constanzo 2013. Engineering Mechanics- Statics, 2nd Ed., McGraw-Hill Higher Education.

BMMP 1303
MANUFACTURING PRACTICES/
AMALAN PEMBUATAN

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Describe proper use of basic engineering equipments and requirement.
2. Build product based on technical drawing that meet specific tolerance.
3. Perform the process according to the proper procedure.

SYNOPSIS

The practice consists of introduction to basic knowledge of using manual hand tools and equipment, machine tools, welding, fabrication, lathe, milling, and some manual work within manufacturing daily activities. It introduces common equipments for performing manufacturing works such as lathe and milling machine, arc welding, tig/mig welding, sheet metal forming etc. Due to its nature as introductory course, students are required to prepare at home before having the practice to acquire any knowledge concerning the practices.

REFERENCES

1. Kalpakjian, S. and Schmid R. (2014), Manufacturing Engineering and Technology, 7th Edition, Prentice Hall.
2. Mikell P. Groover, Fundamentals of Modern Manufacturing Materials, Processes, and Systems, 4th Edition, John Wiley & Sons, 2010.
3. Mikell P. Groover, Principles of Modern Manufacturing SI Version, 5th Edition, John Wiley & Sons, 2013.

BMMP 2503
MEASUREMENT AND INSTRUMENTATION/
PENGUKURAN DAN INSTRUMENTASI

LEARNING OUTCOMES
At the end of this course, the students should be able to:
1. Analyse the basic elements of common measurement systems.
2. Perform suitable measurement methods for a given issue.
3. Measure the performance of a measurement system.

SYNOPSIS
Measurement and instrumentation course covers three main areas; dimensional metrology, measurement analysis, and surface/texture measurement. In the dimensional metrology, students will be expose to three types of measurements; linear, angle and geometrical. Besides that, measurement of screw thread also covered in this course. Students will be taught from basic measuring instruments and will be introduced to the usage of the high precision measuring instruments that are Coordinate Measuring Machine and CNC Roundness measuring. In the measurements analysis, students will be required to describe the standard Measurement, measurement process, process capability, measurement errors, limits, tolerances and fits. In surface/texture measurement, students will perform the measurement of surface texture.

REFERENCES
1. Lau Kok Tee, and Saiful Naim Sulaiman (2020) Dimensional Measurement and Instrumentation for Technologist, Penerbit Universiti, Universiti Teknikal Malaysia Melaka
2. Connie, D. (2015). Fundamentals of Dimensional Metrology, 6th Edition. Cengage Learning.
3. Kalpakjian, S., Schimd, S. R., (2014). Manufacturing Engineering and Technology, 7th Edition. Prentice Hall.
4. Bucher, J. L. (2012). The Metrology Handbook, 2nd Edition. SQ Quality Press.
5. Campbell, R. G., Roth, E. S. (2002). Integrated Product Design and Manufacturing Using Geometrical Dimensioning and Tolerancing. Marcel Dekker, Inc.

SEMESTER 3

BEEA 1343
COMPUTER PROGRAMMING/
PENGATURCARAAN KOMPUTER

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Describe and convert the problems into the appropriate solutions.
2. Solve problems using software engineering principles.
3. Complete code by applying suitable programming structures in a group assignment

SYNOPSIS
In this course, students will be exposed to the basic principles of computer and software development methodology. The course also includes basic principles of programming such as syntax, semantic, compiling, and linking. Students will also learn programming techniques using C++ such as data type, operator, selection, repetition, function, array, file, and pointer.

REFERENCES
1. Abdul Kadir, (2016) C++ programming: a practical hands-on for self-learning, Penerbit Universiti, UTeM.
2. Gaddis, T., (2018), Starting Out with C++: From Control Structures through Objects, 8th Edition, Global Edition, Pearson Education.
3. Daniel Liang, Y, (2013), Introduction to Programming with C++, 3rd Edition, Pearson Education.
4. Deitel, H.M. and Deitel, P.J., (2010), C++ How to Program,9th Edition, Pearson Education.
5. Nell, D., (2014), Programming and Problem Solving with C++: Comprehensive, 6th Edition, Jones & Bartlett Learning.

BMMA 2363
MANUFACTURING TECHNOLOGY/
TEKNOLOGI PEMBUATAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Explain the fundamental concepts of manufacturing processes.
2. Display the ability of various manufacturing processes.
3. Integrate various skills of manufacturing techniques as an individual or a group.

SYNOPSIS

In this course, students will be introduced to commonly used manufacturing technologies that can be widely categorized into four major focus areas; metal removal processes, near-net shape and forming processes, joining processes and surface treatment process. For the metal removal processes, the students will be exposed to turning, milling and abrasive machining. In the area of near-net shape and forming processes, wide range of processes will be introduced such as casting, rolling, forming, forging and extrusion. In addition to that near-net-shape processes for plastic, ceramic and metal powder will also be covered. And finally, the joining processes will familiarize the students to fusion and solid state welding. This course covers most commonly used manufacturing technology in Malaysia, as a fundamental knowledge and skills in preparing student for manufacturing industries.

REFERENCES

1. S. Kalpakjian, S.R. Schmid, Manufacturing Engineering and Technology SI Edition, Prentice Hall, 2014.
2. M.P. Groover, Fundamentals of Modern Manufacturing. Materials, Processes and Systems 5th Edition, John Wiley & Sons, Inc, 2014.
3. M. P. Groover, Introduction To Manufacturing Processes, 3rd Edition, Hoboken, NJ: Wiley, 2012.
4. P. N. Rao, Manufacturing Technology Foundry, Forming and Welding, 4th Ed., Mc Graw Hill, 2013.
5. P. N. Rao, Manufacturing Technology Metal Cutting and Machine Tools, 3rd Ed., Mc Graw Hill, 2013.
6. Amitabha Ghosh, Asok Kumar Mallik, Manufacturing Science, EWP New Dehli, 2010.

BMMM 2313
DYNAMICS & MECHANICS OF MACHINE/
DINAMIK & MEKANIK MESIN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Describe the concept and principle of dynamics and mechanics of machine element.
2. Demonstrate the dynamics and mechanics of machine laboratory experiments.
3. Synthesize dynamics and mechanics of machine into engineering practices.

SYNOPSIS

Introduction to basic principles based on kinematic and kinetic dynamics. The concept of displacement, distance, velocity, speed and acceleration. Application of newton's second law. The principle of work and energy, impulse and momentum of particles and rigid bodies. Transmission system based on the friction of motion, such as belts, brakes and dibble. Based delivery systems such as chains and gear teeth. Gear system. Balancing the dynamic system that includes balancing the body rotating plane and a parallel plane. Balancing of reciprocating motion as the body line of engines, radial engines and engine Gyroscopic motion that includes a couple gyroscope. Gyro scope coupling effects. Simple harmonic motion and vibration consists of moving one degree of freedom. Free vibration. Damped free vibration. Forced damped vibration. Speed control of the cycle flywheel.

REFERENCES

1. Beer, F. P., Johnson, E.R., Clausen, W. E., (2013) Vector Mechanics For Engineers, Dynamics Si Units, 10th Edition. Mcgraw-Hill.
2. Hibbeler, R. C. (2013) Engineering Mechanics, Dynamics, 12th Edition. Prentice Hall.
3. Meriam, J. L. And Kraige, L. G. 2013. Engineering Mechanics, SI Version, 7th Edition. John Wiley.
4. Bedford, A. and Fowler, W. 2008. Engineering Mechanics: Dynamics (SI Units). 5th Edition.Prentice Hall.
5. Cleghorn, W. L., 2005, Mechanics of Machines, Oxford University Press.

PRE-REQUISITE
BMMA 1333
STATICS/ STATIK

BMMH 2303
THERMODYNAMICS/
TERMODINAMIK

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply the basic concepts of thermodynamics, the First Law of Thermodynamics and the Second Law of Thermodynamics to closed and open systems.
2. Follow instructions in laboratory sheets when conducting thermodynamic experiments.
3. Complete individual or group assignments within the time given.

SYNOPSIS
This course covers the basic concepts and definitions of engineering thermodynamics, energy, work and heat, properties of pure substances (relationships of *P-v, T-v, P-T* and *T-s* diagrams), First Law of Thermodynamics, Second Law of thermodynamics and Entropy.

REFERENCES
1. Cengel, Y. A. and Boles, M. A..2014. Thermodynamics: An Engineering Approach, 8th Ed, McGraw Hill. Singapore.
2. S.C. Gupta,2008. Thermodynamics, 1st Ed, Pearson Education(Singapore) Pte. Ltd
3. Sonntag, R.E., Borgnakke. C, Van. and Gordon J., 2008. Fundamentals of Thermodynamics, 7th Edition, John Wiley & Sons, Inc.New York.
4. Eastop, T. D., And Mcconkey, A., 2011, Applied Thermodynamics for Engineering Technologists, 5th Ed, Pearson & Prentice Hall. New York.

SEMESTER 4

BMMA 1323
ENGINEERING DESIGN/
REKA BENTUK KEJURUTERAAN

LEARNING OUTCOMES
At the end of this course, the students should be able to:
1. Categorize the methods and design concepts used in the engineering design process.
2. Composes a working design prototype to meet specified needs with appropriate consideration on the learned methods in the engineering process.
3. Develop an awareness of project management in the engineering design process.

SYNOPSIS
The methodology of design solutions and best practices in product design. Latest product development: the determination of market needs, determination design specifications, engineering concept generation, concept selection, detailed product specification, functional analysis, material selection. Innovative solutions. Creativity in the industry design, design visualization and anthropometric. Portfolio preparation and presentation.

REFERENCES
1. Ulrich, K. T. and Eppinger, S. D. 2016. Product Design and Development, New York McGraw-Hill Education.
2. Rudolph J Eggert, Second Edition 2005. Engineering Design. Pearson Prentice Hall.
3. Ullman, D.G. 2016.The Mechanical Design Process, 5th Ed., New York McGraw-Hill Education.
4. Cross, N., 2008. Engineering Design Methods: Strategies for Product Design, 4th Ed., John Wiley And Sons, West Sussex UK.

BMMM 2303
SOLID MECHANICS/
MEKANIK PEPEJAL

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply the knowledge and principles of mechanics of materials in engineering design.
2. Display appropriate experimental techniques in mechanics of material through laboratory experiments.
3. Demonstrate the ability to complete engineering project using the principle of mechanics of material in group effectively.

SYNOPSIS
The course contains topics of introduction, stress, strain, hooke's law, bending, mechanical properties, transformation of stress, axial load, transformation of strain torsion, beam bending, transverse shear, combined loadings, deflection of beams and shafts and Mohr's circle.

REFERENCES
1. Hibbeler R.C., 2013, Statics and Mechanics of Materials, 3rd SI Ed., Prentice Hall, New York.
2. Beer. F.P. Et Al. 2012. Mechanics Of Materials, 6th Edition in SI Units. Mcgraw-Hill.
3. Beer. F.P. Et Al. 2011. Statics and Mechanics of Materials, 1st Edition. Mcgraw-Hill.
4. Beer, F. P. And Johnston Jr., E. R. and Eisenberg, E. R., 2010, Vector Mechanics For Engineers - Statics, 9th Ed. in SI Units, Mcgraw Hill, New York.
5. Roy Craig Jr., 2011, Mechanics of Materials, 3rd Ed., John Wiley & Sons, New York.

PRE-REQUISITE
BMMA 1333
STATICS / STATIK

BMMH 2313
FLUID MECHANICS/
MEKANIK BENDALIR

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply fluid mechanics concept in solving fluid statics and fluid dynamics problem.
2. Measure related parameter by using appropriate techniques in fluid mechanics application.
3. Demonstrate the ability to complete tasks and assignment as a leader or a member in group effectively.

SYNOPSIS
Introduction to this course is about the basic physical properties of fluids. Then it covers the definition of pressure and head. Next it followed by derivation of hydrostatic equation and its application in pressure measurement, static forces analysis on immersed surface and buoyancy analysis. For fluid dynamics, it started with introduction to fluid dynamics and fluid flow analysis. Then it is continued by derivation of flow equations, the application of energy equation and bernoulli equation in the calculation of flow velocity, discharge, and head lost in piping systems. The last topic for this course is dimensional analysis and its application.

REFERENCES
1. Munson, B. R., Young D. F. and Okiishi, T. H., 2012, Fundamentals of Fluid Mechanics, 7th Ed., John Wiley & Sons, Inc, Asia.
2. Som, S. K. and Biswas, G., 2010, Introduction to Fluid Mechanics and Fluid Machines, Revised 2nd Ed., Tata McGraw-Hill, New Delhi.
3. Douglas, J. F., Gasiorek J. M. and Swaffield, J. A., 2011, Fluid Mechanics, 6th Ed., Prentice Hall, Spain.
4. Kundu, P. K., Cohen, I. M. and Dowling, D. R., 2011, Fluid Mechanics, 5th Ed., Academic Press, Waltham, USA.

BMMA 2343
MICROPROCESSOR TECHNOLOGY/
TEKNOLOGI MIKROPEMPROSES

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Describe the basic concepts of digital system, combinational and sequential logic circuit.
2. Explain the microprocessor fundamental, internal architecture of microprocessor and programming technique.
3. Demonstrate the ability to complete tasks and assignment in group effectively.

SYNOPSIS

This course will essentially divide into two sections; digital electronics and microprocessor. The first section covers topics on digital electronic that include Introduction to Digital Concepts, Logic Gates, Combinational Logic and Data Control Devices Flip Flops and Sequential Logic Circuits. The next section will deal with topics such as Microprocessor Fundamentals, Introduction to Intel 8085 Microprocessor Hardware, Introduction to Intel 8085 Microprocessor Software and Programming Techniques with Additional Instructions.

REFERENCES

1. Thomas L. Floyd, 2015, Digital Fundamentals, 11th Edition, Prentice Hall.
2. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, 5th Edition, Prentice Hall, 2002.
3. William Kleitz, Digital and Microprocessor Fundamental, 4th Edition, Prentice Hall, 2003.
4. Barry B. Brey, The Intel Microprocessor, 8th Edition, Prentice Hall, 2009.
5. Charles M. Gilmore, Microprocessors: Principles and Applications, 2nd Edition, Mcgraw-Hill,1996.

SEMESTER 5

BMMH 3323
CONTROL & INSTRUMENTATION/
KAWALAN & INSTRUMENTASI

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Explain the dynamic behaviour and the details of the system through the analysis of the response system, response and stability of frequency.
2. Display the concept of controller and sensor elements/ transducer through learning and application of the device behaviour.
3. Explain effectively either individually or in group for any assignment and experiment.

SYNOPSIS

Introduction to Control System. Mathematical Modelling. Time Response. Stability of linear feedback system. Improve transient response and steady-state error: PID control. Root locus. Introduction to measurement and instrumentation. Static nature of performance measurement and instrumentation. Analysis of experimental data. Experimental uncertainty analysis. Signal Measurement system.

REFERENCES

1. Alan S. Moris and Reza Langari, Measurement and Instrumentation: Theory and Application, Academic Press, 2011.
2. HS Kalsi, Electronic Instrumentation, McGraw Hill, 2011.
3. Uday A. Bakshi and Ajay V. Bakshi, Electrical Measurements and Instrumentation, Technical Publication, 2014.
4. Norman S. Nise, Control Systems Engineering, 6th Edition, John Wiley & Sons Inc., 2011.
5. Richard C. Dort, Robert H. Bishop, Modern Control Systems, 12th Edition, Pearson, 2011.
6. Gopal, M, Control Systems: Principles and Design, 4th Edition, Mc Graw Hill, 2012. 7. Khalil Azha Mohd Annuar et. al., Control & Instrumentation, Penerbit UTeM, 2015.

BMMA 3503
VEHICLE BRAKE SYSTEM/
SISTEM BREK KENDERAAN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Explaining the concept, operation and maintenance of existing automotive brake system and a combination of latest regenerative brake system.
2. Demonstrate the concept, operation and maintenance of existing and latest automotive brake systems.
3. Perform a case study on automotive braking system in team.

SYNOPSIS
This course provides an introduction to the basic knowledge of hydraulic brake system comprising the existing system and the combination of latest braking control. This course will assist students to understand the basic theory of brake operation, diagnosis, identify problems and repair procedures. This course is also touch on the phenomenon of vibration and noise on the brakes in practice and theory as well as identifying the ways to solve the problem encounter. Among the topic cover: basic operating system and brakes, brake system maintenance, mechanical brake, hydraulic brake control, anti-lock braking system with electronic brake distribution, regenerative braking control, brake noise and vibration issues.

REFERENCES
1. Hassan, M.Z. 2017 Fugitive Modelling of Braking Noise, UTeM Press.
2. Dietsche, K. H. & Klingebiel, M. 2011. Bosch Automotive Handbook, 8th Edition, Warrendale, PA Robert Bosch GmbH.
3. Reza N. Jazar, 2013, Vehicle Dynamics: Theory and Application, 2nd Ed., New York Springer.
4. Orthwein, 2004. Clutches And Brakes: Design And Selection. 2nd Edition. Marcel Dekker. Basel, New York.

BMMA 3513
INTERNAL COMBUSTION ENGINE/
ENJIN PEMBAKARAN DALAMAN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Classify the functions of major automotive engine subsystems.
2. Dismantle and assemble engine to diagnose engine malfunctions.
3. Demonstrate good working relation with team members.

SYNOPSIS
This module aims to expose students to the operation of the internal combustion engine technology. The course also discuss how the service, repair, maintenance, design and test the performance of conventional internal combustion engines. In addition, students have to solve engineering problems in real time by leveraging their knowledge and learn new information to solve problems of related engines.

REFERENCES
1. Ganesan, V., 2012. Internal Combustion Engine. 4th ed. McGraw Hill, USA.
2. Gupta, H.N. 2013. Fundamentals of Internal Combustion Engine, 2nd Ed. Prentice Hall, India.
3. Society of Automotive E, 2007 Transmissions & Drivelines. SAE International, USA.
4. Birch, T.W. 2012. Automatic Transmission and Transaxles. Prentice Hall.
5. Malcolm James Nunney, 2008. Light and Heavy Vehicle Technology, Macmillan Company, UK.
6. Anthonye. Schwaller, 2005, Total Automotive Technology, Thomson Delmar Learning, USA.

BMMA 3573
VEHICLE POWERTRAIN MANAGEMENT SYSTEM/ SISTEM PENGURUSAN KUASA KENDERAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Investigate the input and output signals come from sensors and actuators in powertrain subsystem.
2. Fix the fault cause by sensors and actuators in powertrains system.
3. Demonstrate an understanding of the impact of engineering practices, taking into account the need for sustainable development.

SYNOPSIS

This course will be discussed on theory, operation and application on engine and transmission management system. Topics will be covered are electronic fuel injection (EFI), diesel management system, engine control unit (ECU), on-board diagnostic system, electronic transmission control system and sensor or actuators inside powertrain management system.

REFERENCES

1. V.A.W. Hilllier, Peter Coombes, David Rogers, 2007, Hillier. S Fundamental of Motorvehicle Technology: Book 2 Powertrain Electronics, 5th Edition, Nelson Thornes.
2. Bosch. R., 2006, Gasoline-Engine Management: System and Components, 3rd Edition, Wiley.
3. Bosch, R., 2005, Diesel-Engine Management: System and Components, 4th Edition, Wiley.
4. Bosch, R., 2011, Bosch Automotive Handboook, 8th Edition, Warrendale, PA Robert Bosch GmbH.

BMMA 3533
VEHICLE DYNAMICS/ DINAMIK KENDERAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Explain the basics of vehicle handling/ride and primary factors that affect it.
2. Constructs mathematical model using the computer software in modelling vehicle dynamics.
3. Demonstrate physical and mathematical model to predict the dynamic response of a vehicle.

SYNOPSIS

To discuss an introduction and the basic concept of vehicle dynamics, fundamental approach towards vehicle dynamics modelling, vehicle response to various driver and ambient inputs, road loads, mechanics of tire, relation between ride and handling, steering and suspension system.

REFERENCES

1. James Balkwill, 2018. Performance vehicle dynamics: Engineering and applications. Oxford: Butterworth-Heinermann
2. Giancarlo Genta & Alessandro Genta, 2017. Road vehicle dynamics: Fundamental of modeling and simulation. World Scientific Publishing Co. Pte. Ltd
3. Dean Karnopp, 2013. Vehicle Dynamics, Stability, and Control 2nd Edition, Crc Press.
4. Rajesh Rajamani, 2012. Vehicle dynamics and control, 2nd edition. New York Springer
5. Georg Rill, 2012. Road Vehicle Dynamics: Fundamental and Modeling, Boca Raton, Florida CRC Press

BMMA 3543
HVAC FOR AUTOMOTIVE/
HVAC UNTUK AUTOMOTIF

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply basic concept of air conditioning in Automotive HVAC System.
2. Performs testing, servicing and troubleshooting in Automotive HVAC.
3. Explain the environmental law, safety and social responsibility that correlate with Automotive HVAC.

SYNOPSIS
This course is to prepare the students with comprehensive knowledge on heating, ventilating, and air conditioning (HVAC) system of automotive application. The topics covered in this course are automotive heating and air conditioning, basic air conditioning system and its components, coolant agent. Apart from that, the regulations set by the department of environment (DOE) and department of occupational safety & health (DOSH) are also being exposed to students. Last but not least, apart from hands on training, students will also be taught on how to service the air conditioning and heating system, repairing air conditioning and HVAC electronic controlled system.

REFERENCES
1. Chris Johanson, 2015, Auto heating and Air Conditioning, The Goodheart-Willcox Company, Inc, Tinley Park, Illinois.
2. Roger W. Haines, C. Lewis Wilson, 2010. HVAC Systems Design Handbook Mcgraw-Hill: New York.
3. Mike Stubblefield, John H. Haynes, 2011. The Haynes repair manual for automotive heating and air-conditioning systems. North America, USA Haynes.
4. Guy W. Gupton. 2002. HVAC Controls: Operation & Maintenance. Fairmont Press: Lilburn, GA.
5. Boyce H. Dwiggins. 2001. Automotive Heating and Air Conditioning. Delmar Thomson Learning: Albany, NY.

SEMESTER 6

BMMU 3764
BACHELOR DEGREE PROJECT I/
PROJEK SARJANA MUDA I

LEARNING OUTCOMES
At the end of the course, students should be able to:
1. Apply Knowledge to proposal preparation of industry-based or practice- priented project.
2. Imitate appropriate existing concepts in engineering technology fields.
3. Adhere to project’s dateline and related procedure.
4. Explain the project proposal in oral and written forms effectively.
5. Report literature review and preliminary findings in a scientific manner.

SYNOPSIS
The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem-based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES
1. Bachelor Degree Project Manual, Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan, Universiti Teknikal Malaysia Melaka.

BMMA 4583
VEHICLE DESIGN AND SIMULATION/
REKA BENTUK DAN SIMULASI KENDERAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Propose solutions to be used in solving a finite element analysis (FEA) problem.
2. Adapt pre-processing, solving and post processing methods in CAE standard software to solve a specific problem. Adapt pre-processing, solving and post processing methods in CAE standard software to solve a specific problem.
3. Demonstrate effectively either as a member or leader in group to solve problems using CAE tools.

SYNOPSIS

This module is intended to study the modelling, simulation and analysis of vehicle systems by using computational aided engineering (CAE) standard software. It covers general study of two major fields of CAE: finite element analysis (FEA) and computational fluid dynamics (CFD). From the linear and non-linear analysis on mechanical components, design optimization to wind tunnel analysis. This module also covers the application of CAE in vehicle design and development. Altair hyperworks software is used accordance to its widely uses in automotive industry for meshing and its general-purpose solvers.

REFERENCES

1. Saeed Moaveni (2015) Finite Element Analysis: Theory and Application with ANSYS, 4th Ed., Boston: Pearson Higher Education Inc.
2. Blundell M.V and Harty D. (2006) Multibody System Approach to Vehicle Dynamics, Elsevier Butterworth-Heinemann.
3. Wong J. Y. (2008) Theory of Ground Vehicles, 4th Ed. John Wiley & Sons.
4. Johnston, B. (2010) Vector Mechanics for Engineer -Dynamics, 9th Ed. Boston, MA McGraw-Hill Education.
5. Hibbeler R C (2017) Engineering Mechanics – Static, 14th Ed. Essex, England: Pearson Education Limited.

BMMA 4613
AUTOMOTIVE SAFETY & COMFORT SYSTEM/
SISTEM KESELAMATAN & KESELESAAN AUTOMOTIF

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Differentiate automotive safety & comfort system based on its application.
2. Construct simulation of automotive safety and comfort system experiments.
3. Demonstrate effectively either individually or in group for any assignment and experiment.

SYNOPSIS

This course will focus on theory, operation and application for automotive safety and comfort system in modern vehicle. Topics discussed include active safety system such as antilock braking system, traction control system, electronic stability program, and adaptive cruise control, as well as passive safety system such as supplemental restraint system and occupant protection system. Besides, driving assistance system and basic human factor engineering or ergonomics are also discussed.

REFERENCES

1. Bosch, R., 2006, Safety, Comfort and Convenience Systems, 3rd Edition, Wiley.
2. Bosch, R., 2011, Bosch Automotive Handboook, 8th Edition, Warrendale, PA Robert Bosch GmbH.
3. Jurgen, Ronald K., 2006, Adaptive Cruise Control, Warrendale, PA SAE International.
4. Julian Happian-Smith. 2002. An Introduction to Modern Vehicle Design. Burlington, MA SAE International.
5. Vivek D. Bhise, (2012). Ergonomics in The Automotive Design Process, Boca Raton, FL CRC Press.

BMMA 3523
AUTOMOTIVE ELECTRIC & ELECTRONIC SYSTEM/
SISTEM ELEKTRIK & ELEKTRONIK AUTOMOTIF

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Implement electrical and electronic system in automotive application.
2. Assemble electrical and electronic equipment appropriate for experiments.
3. Demonstrate the ability to complete tasks and assignment as a leader or a member in group effectively.

SYNOPSIS

This course focuses on theory, operation and application of electrical and electronic automotive system. Topics covered include vehicle electrical wiring system, sensors and actuators, battery charging system, starter system, lighting system, chassis electrical system, additional system, mechatronics, automotive network and the CAN-bus system.

REFERENCES

1. Tom Denton, 2018, Automobile Mechanical & Electrical Systems, Abingdon, Oxon: Routledge.
2. Ehsani Mehrdad et.al, 2018, Modern Electric, Hybrid Electric, And Fuel Cell Vehicles, Boca Raton, FL: CRC Press.
3. Halderman, Juames D., 2016, Hybrid and Alternative Fuel Vehicles, 4th Ed., Boston, MA Pearson
4. Bosch, R., 2007, Automotive Electrics-Automotive Electronics: Systems and Components, Bently.
5. Bosch, R., 2011, Bosch Automotive Handboook, 8th Edition, Warrendale, PA Robert Bosch GmbH.

BMMM 4623
OIL & WEAR DEBRIS ANALYSIS/
ANALISIS MINYAK DAN SERPIHAN

LEARNING OUTCOMES

After completing the course, students will be able to:

1. Analyze oil and wear debris using various oil analysis methods to determine oil quality.
2. Integrate the data collected through various oil analysis methods in order to analyze failures & cause of parameter changes in the oil.
3. Demonstrates problem solving of real-life condition regards to oil analysis issues in a group assignment.

SYNOPSIS

This course the discuss role of oil and wear debris analysis as a method that applied in machinery maintenance. Properties of oil properties such as density, viscosity, etc are introduced. The effect of temperature and other factor that affects oil degradation during the machine operation are discussed. Standard testing and analysis method typically employed to characterize oil properties are introduced in this course. This course also discusses basic analysis method on wear debris samples resulting from the machinery components interactions that can be used to identify and troubleshoot the machines problem. Method of collecting oil and wear debris samples at regular rate also introduced.

REFERENCES

1. H. P. Bloch and F.K. Gentner, 2012. Machinery Failure Analysis and Troubleshooting, 4th Ed. Vol.2, Butterworth-Heinemann.
2. J. Denis, J. Briant, And J.C. Hipeaux, 2000, Lubricant Properties and Testing, Edition Technip.
3. R. C Mortier, M. F. Fox, S.T. Orszulik, 2012, Chemistry and Technology of Lubricants, Springer.
4. B. Bhushan, 2000, Modern Tribology Handbook, CRC Press.

BMMA 4833
PNEUMATIC AND HYDRAULIC TECHNOLOGY/
TEKNOLOGI HIDRAULIK DAN PNEUMATIK

LEARNING OUTCOMES
After completing the course, students will be able to:
1. Apply knowledge of engineering fundamentals in order to analyse performance of hydraulic and pneumatic system
2. Construct hydraulic and pneumatic system manually and using software.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams

SYNOPSIS
This course covers the introduction of the hydraulic and pneumatic systems, types of pump, compressor and their working principles, types of valve, actuator and their usage, performance of the fluid power system, others fluid power system ancillaries and sensors, fluid power system circuit design and analysis with manual control and electrical control, fluid power symbols, the usage of computer software to design and simulate the fluid power system circuit, the usage of programmable logic controller in fluid power system circuit design and the application of fluid power in robotic and mobile hydraulic.

REFERENCES
1. Esposito A. 2009. Fluid Power with Applications. 7th Ed., New Jersey : Pearson Prentice Hall.
2. Noack, Steffen, 2001. Hydraulics in mobile equipment, SAE Society of Automotive Engineers.
3. Watson, Ben, 2011. Modern diesel technology mobile equipment hydraulics:a systems and troubleshooting approach, Delmar Cengage Learning.
4. Erjavec, Jack, 2015. Automotive technology a systems approach, 6th Ed., Clifton Park, NY: Cengage Learning

SEMESTER 7

BMMU 4774
BACHELOR DEGREE PROJECT II/
PROJEK SARJANA MUDA II

LEARNING OUTCOMES
After completing the course, students will be able to:
1. Discuss solution to the proposed industry-based or practice-oriented project.
2. Demonstrate project findings using appropriate techniques with an understanding of its limitations.
3. Display self-reliance in working independently and cooperates in group activities.
4. Display the ability to present the project findings in oral and written forms effectively.
5. Report literature review and project potential in scientific manner with a recognition of the strengths, weaknesses and opportunity for improvements.

SYNOPSIS
This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES
1. Bachelor Degree Project Manual, Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan, Universiti Teknikal Malaysia Melaka.

PRE-REQUISITE
BMMU 3764
BACHELOR DEGREE PROJECT I/
PROJECT SARJANA MUDA I

BMMA 4593
VEHICLE SUSPENSION SYSTEM/
SISTEM PENGGANTUNGAN KENDERAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Construct the vehicle suspension and steering system and predict the suspension and steering design factor performances.
2. Demonstrate standard suspension and steering tests and measure the system performances.
3. Demonstrate good working relation with team members.

SYNOPSIS

Introduction to chassis load and tire contact forces. Modelling of chassis dynamics in vertical, lateral and longitudal directions. Performance criteria in suspension design. The use of suspension test machine for investigating the suspension characteristics. Effects of suspension parameters to the chassis dynamics. Semi-active and active suspension system.

REFERENCES

1. John C. Dixon, 2009, Suspension geometry and computation, Chichester John Wiley & Sons.
2. Emanuele Guglielmino, Tudor Sireteanu, Charles W. Stammers, Gheorghe Ghita. Marius Giuclea, 2010, Semi-Active Suspension Control: improved vehicle ride and road friendliness, London: Springer-Verlag London Limited.
3. August P. Staiforth, 1999, Design, Construction and Tuning of Car Suspension, Hayness Press.
4. Module: Vehicle Suspension System for Technologist.

BMMA 4713
ENGINE PERFORMANCE/
PRESTASI ENJIN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Associate the historical development with the future trend of engine.
2. Measure the basic engine parameter and emission.
3. Demonstrate teamwork effectively in accomplishing any assignment or experiment.

SYNOPSIS

History of vehicle engines and transmissions. Engine geometry. Performance parameters of gas exchange for 4-stroke and two stroke. Spark ignition engine combustion. The market situation for the development of vehicles, gearboxes and components. The selection of the transmission ratio of the vehicle. Basic approach to the performance of automotive engines, power conversion, adjustment of the engine and transmission, transmission system design principles.

REFERENCES

1. Pickerill, Ken, 2018. Today's Tecnician: Automotive Engine Performance. 7th Ed. Boston, Massachusetts: Cengage Learning.
2. Bosch, R., 2007, Automotive Electrics-Automotive Electronics : Systems and Components, 5th Edition, Stuttgart, Professional Engineering publishing.
3. Victor Hillier, Peter Coombes, 2007: Fundamentals of motor vehicle technology, Oxford University Press.
4. Richard D. Atkins, 2009, An Introduction to Engine Testing and Development, Warrendale, PA SAE International.
5. Hüseyin Abut, John H. L. Hansen, Kazuya Takeda, 2007, Advances for in-vehicle and mobile systems, New York, NY Springer.

BMMA 4603
VEHICLE TRANSMISSION SYSTEM/
SISTEM TRANSMISI KENDERAAN

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Analyze the vehicle transmission system based on general and specific transmission design principles.
2. Complete transmission mechanism experiment with confidence.
3. Demonstrate teamwork effectively in accomplishing any assignment or experiment.

SYNOPSIS

Vehicle transmission design engineering has been enriched with many variations, such as automatic transmissions, continuously variable transmissions (CVT), the torque converter clutch transmission, dual clutch transmission, four-wheel drive transmission. The purpose of this course is to explain the development of a motor vehicle transmission as part of the development of vehicle systems. The aim is to explain the basic relationship between the drive unit, motor and transmission system and transmission system functions such as selecting the appropriate gear, the right gear, power profile, fuel consumption, life and reliability.

REFERENCES

1. Naunheimer, Harald, Bertsche, Bernd, Ryborz, Joachim, Novak, Wolfgang, 2014. Automotive transmissions: fundamentals, selection, design and application, Berlin: Springer.
2. Erjavec, J., 2011. Automatic Transmissions and Transaxles. Clifton Park, NY Delmar Cengage Learning.
3. Erjavec, J., 2011. Manual Transmissions and Transaxles, New York: Delmar Cengage Learning.
4. Fischer R, Kucukay F, Jrgens G, Najork R and Pollak B, 2015. The Automotive Transmission Book, Switzerland: Springer International Publishing.
5. Mashadi, Behrooz & Crolla, David, 2012. Vehicle powertrain systems, Chichester Wiley.

BMMA 4723
LEAN PRODUCTION SYSTEM/
SISTEM PENGELUARAN KEJAT

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Examine the lean practices for manufacturing.
2. Perform lean waste analysis effectively to identify and eliminate the types of waste apparent in a manufacturing system.
3. Construct a value stream map to fit a situation or specific problem using lean manufacturing tool and techniques.

SYNOPSIS

Lean Production System is based upon the principle of eliminating waste at all levels throughout the production system. This module reviews the skills and techniques required to analyze production system and to design improved methods and layouts. It will use Value Stream Mapping to understand and appraise the current state; future state mapping will be used to develop a vision of value-added flow. The focus of this module will be on the application of the technique through studies and industrial experience.

REFERENCES

1. Fredendall, Lawrence D. and Thurer, M., 2016. An Introduction to Lean Work Design: Standard Practices and Tools of Lean, Volume II. Business Expert Press: New York, USA.
2. William A. Levinson., 2013. Lean management system LMS: a framework for continual lean improvement. Boca Raton, FL: CRC Press.
3. Santos, S., Wysk, R.A and Torres, J.M., 2006. Improving Production with Lean Thinking. John Wiley and Sons, Inc.: New Jersey, USA.
4. Tapping, D., Luyster,T. and Shuker, T, 2002 Value Stream Management, Productivity Press.
5. Womack, J. P. and Jones, D.T., 2003. Lean Thinking, Simon & Schuster.
6. Shingo, S., 1989. A study of the Toyota Production System from an Industrial Engineering Viewpoint, Productivity Press.

SEMESTER 8

BMMU 4786
INDUSTRIAL TRAINING/
LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the course, students should be able to:
1. Build technical competencies, knowledges, skills and attitude for life long learning.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Develop effective communication with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

BMMU 4796
INDUSTRIAL TRAINING REPORT/
LAPORAN LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the course, students should be able to:
1. Produce industrial training report
2. Present report orally on working experience

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE
Student required to pass Industrial Training BMMU 4786 in order to pass Industrial training report.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

BMMH COURSE CORE COURSES (K)

SEMESTER 1

**BMMA 1303
ENGINEERING GRAPHICS/
GRAFIK KEJURUTERAAN**

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Apply fundamental of technical drawing to produce standard mechanical part and assemblies drawing documents.
2. Construct typical mechanical engineering drawing using CAD software.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams.

SYNOPSIS

The course concentrates on computer aided design (CAD) software. Autocad engineering drawing software is used to produce standard engineering drawing. The students will be exposed to cad interface, editing commands, coordinate system, template preparation and layer in order to produce various types of engineering drawings.

REFERENCES

1. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. and Novak, J. E.,Lockhart S., 2016, Technical Drawing With Engineering Graphics, 15th Ed., Pearson & Prentice Hall, New Jersey.
2. Mark Dix, Paul Riley, 2017, Discovering Autocad 2012, Prentice Hall, London.
3. Scott Onstott, 2013, Autocad 2014 And Autocad Lt 2014 Essential, John Wiley & Sons, Inc.
4. Cheryl R. Shrock And Steve Heather, 2014, Beginning Autocad 2015, Industrial Press, Inc.

**BMMP 1313
ENGINEERING MATERIALS/
BAHAN KEJURUTERAAN**

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Explain the structures, properties and processing of engineering materials.
2. Display the ability to determine the microstructures and mechanical properties of various materials.
3. Construct the solution for engineering material problems.

SYNOPSIS

This course introduces basic concepts of engineering materials that covers introduction to engineering materials, interatomic bonding, crystalline structure and imperfections in solid. Explanation on different type of engineering materials (i.e. metal, polymer, ceramic, composite and semiconductor), its mechanical properties, basic application and processing are also included. Introduction to the binary phase diagrams (composition and microstructure correlation) is also given.

REFERENCES

1. Callister W.D. and Rethwisch D.G, 2011, Fundamentals of Materials Science and Engineering, 8th Edition, John Wiley & Sons.
2. Smith W. F., 2011, Foundation of Materials Science and Engineering, 5th Edition, Mcgraw Hill.
3. Askeland D. R., 2011, The Science and Engineering of Materials, 6th Edition, Cl-Engineering.
4. Serah, A. M., 2017, Engineering Materials for Engineering Technologist. Melaka: Universiti Teknikal Malaysia Melaka.

BMMP 2503
MEASUREMENT AND INSTRUMENTATION/
PENGUKURAN DAN INSTRUMENTASI

LEARNING OUTCOMES
At the end of this course, the students should be able to:
1. Analyse the basic elements of common measurement systems.
2. Perform suitable measurement methods for a given issue.
3. Measure the performance of a measurement system.

SYNOPSIS
Measurement and instrumentation course covers three main areas; dimensional metrology, measurement analysis, and surface/texture measurement. In the dimensional metrology, students will be expose to three types of measurements; linear, angle and geometrical. Besides that, measurement of screw thread also covered in this course. Students will be taught from basic measuring instruments and will be introduced to the usage of the high precision measuring instruments that are Coordinate Measuring Machine and CNC Roundness measuring. In the measurements analysis, students will be required to describe the standard Measurement, measurement process, process capability, measurement errors, limits, tolerances and fits. In surface/texture measurement, students will perform the measurement of surface texture.

REFERENCES
1. Lau Kok Tee, and Saiful Naim Sulaiman (2020) Dimensional Measurement and Instrumentation for Technologist, Penerbit Universiti, Universiti Teknikal Malaysia Melaka.
2. Connie, D. (2015). Fundamentals of Dimensional Metrology, 6th Edition. Cengage Learning.
3. Kalpakjian, S., Schimd, S. R., (2014). Manufacturing Engineering and Technology, 7th Edition. Prentice Hall.
4. Bucher, J. L. (2012). The Metrology Handbook, 2nd Edition. SQ Quality Press.
5. Campbell, R. G., Roth, E. S. (2002). Integrated Product Design and Manufacturing Using Geometrical Dimensioning and Tolerancing. Marcel Dekker, Inc.

BMMA 1333
STATICS/
STATIK

LEARNING OUTCOMES
At the end of this course, the students should be able to:
1. Describe the physical sciences of statics concepts.
2. Construct statics experiments to recognize the engineering mechanics of statics principles.
3. Explain effectively as an individual and assist group members for experimental and assignment works.

SYNOPSIS
An introduction to the basic concept of statics as physical sciences, system of units, scalars and vectors, free body diagram, forces system, force system resultants and moment, equilibrium of a particle, equilibrium of a rigid body, structural analysis (trusses analysis and simple frames and machines), friction and center of gravity and centroid.

REFERENCES
1. Hibbeler R.C., 2017, Engineering Mechanics Statics, 14th SI Ed., Prentice Hall, New York.
2. Beer, F. P. And Johnston Jr., E. R. And Eisenberg, E. R., 2015, Vector Mechanics for Engineers - Statics, 11th Ed. in SI Units, Mcgraw Hill, New York.
3. Meriam, J. L. and Kraige L. G., 2014, Engineering Mechanics Static SI Version, 6th Ed., John Wiley & Sons, New York.
4. Pytel and Kiusaalas. 2017. Engineering Mechanics-Static. 3rd Ed. Cengage Learning.
5. Michael P., Gary G.,F. Constanzo 2013. Engineering Mechanics- Statics. Mcgraw-Hill Higher Education.

SEMESTER 2

BMMP 1303
MANUFACTURING PRACTICES/
AMALAN PEMBUATAN

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Demonstrate proper use of all equipment and requirement.
2. Produce product based on technical drawing that meet specific tolerance.
3. Perform the process according to the proper procedure.

SYNOPSIS

The practice consists of introduction to basic knowledge of using manual hand tools and equipment, machine tools, welding, fabrication, lathe, milling, and some manual work within manufacturing daily activities. It introduces common equipments for performing manufacturing works such as lathe and milling machine, arc welding, tig/mig welding, sheet metal forming etc. Due to its nature as introductory course, students are required to prepare at home before having the practice to acquire any knowledge concerning the practices.

REFERENCES

1. Kalpakjian, S. and Schmid R. (2014), Manufacturing Engineering and Technology, 7th Edition, Prentice Hall.
2. Mikell P. Groover, Fundamentals of Modern Manufacturing Materials, Processes, and Systems, 4th Edition, John Wiley & Sons, 2010.
3. Mikell P. Groover, Principles of Modern Manufacturing SI Version, 5th Edition, John Wiley & Sons, 2013.

BMMH 1213
FUNDAMENTAL OF HVAC ELECTRIC & ELECTRONIC/
ASAS ELEKTRIK & ELEKTRONIK HVAC

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Explain the basic electrical and electronic principles, circuit schematic components relate to HVAC system.
2. Develop electrical circuits and justify measured values using appropriate approach for HVAC system.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams.

SYNOPSIS

This course provides students with a fundamental understanding of electrical, electronic which directly related to HVAC system and components.

REFERENCES

1. Allan.R.Hambley, 2014, Electrical Engineering Principles and Applications, Pearson Education.
2. Thomas. E.Kissell, 2019, Electricity, Electronics, and Control Systems for HVAC, Pearson Education. Thomas.
3. L.Floyd, 2015, Digital Fundamental, 11th Edition, Pearson Education.
4. Nilsson, J. W. and Riedel, S. A., 2015, Electric Circuit, 10th Edition, Edinburg Gate Pearson Education Limit.
5. Ray C.Mullin and Phil Simmons, 2015, Electrical Wiring Residential, 18th Edition, Cengage Learning.

BMMA 1323
ENGINEERING DESIGN/
REKA BENTUK KEJURUTERAAN

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Categorize the methods and design concepts used in the engineering design process.
2. Composes a working design prototype to meet specified needs with appropriate consideration on the learned methods in the engineering process.
3. Develop an awareness of project management in the engineering design process.

SYNOPSIS

The methodology of design solutions and best practices in product design. Latest product development: the determination of market needs, determination design specifications, engineering concept generation, concept selection, detailed product specification, functional analysis, material selection. Innovative solutions. Creativity in the industry design, design visualization and anthropometric. Portfolio preparation and presentation.

REFERENCES

1. Rudolph J Eggert, Second Edition 2010. Engineering Design. Pearson Prentice Hall.
2. Ulrich, K. T. and Eppinger, S. D. 2015. Product Design and Development.
3. Mcgraw-Hill Ullman, D.G. 2015.The Mechanical Design Process.
4. Mcgraw-Hill Education (Asia), Singapore. Cross, N., 2008. Engineering Design Methods: Strategies for Product Design, 4th Ed., John Wiley And Sons, West Sussex UK.

BMMH 2303
THERMODYNAMICS/
TERMODINAMIK

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply the basic concepts of thermodynamics, the First Law of Thermodynamics and the Second Law of Thermodynamics to closed and open systems.
2. Follow instructions in laboratory sheets when conducting thermodynamic experiments.
3. Complete individual or group assignments within the time given.

SYNOPSIS

This course covers the basic concepts and definitions of engineering thermodynamics, energy, work and heat, properties of pure substances (relationships of *P-v, T-v, P-T* and *T-s* diagrams), First Law of Thermodynamics, Second Law of thermodynamics and Entropy.

REFERENCES

1. S.C. Gupta,2008. Thermodynamics, 1st Ed, Pearson Education(Singapore) Pte. Ltd.
2. Cengel, Y. A. and Boles, M. A..2014. Thermodynamics: An Engineering Approach, 8th Ed, McGraw Hill. Singapore.
3. Sonntag, R.E., Borgnakke. C, Van. and Gordon J., 2008. Fundamentals of Thermodynamics, 7th Edition, John Wiley & Sons, Inc.New York.
4. Eastop, T. D., And Mcconkey, A., 2011, Applied Thermodynamics for Engineering Technologists, 5th Ed, Pearson & Prentice Hall. New York.

SEMESTER 3

BEEA 1343
COMPUTER PROGRAMMING /
PENGATURCARAAN KOMPUTER

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Produce computer programming code based on principles, structures and techniques in C++.
2. Construct programming language code by applying suitable C++ programming techniques to solve a given problem.
3. Work in group effectively while performing group assignment.

SYNOPSIS

Throughout the course, students will be introduced with basic principles of computers and software development methodology. The course also consists of basic programming principles such as syntax, semantic, compiling, and linking. Programming techniques using C++ such as data type and operator, selection, repetition, function, array, file, and pointer are learnt towards the end of this course.

REFERENCES

1. Abdul Kadir, (2016), C++ Programming A Practical Hands-on for self-learning, 1st Edition, Penerbit Universiti, Universiti Teknikal Malaysia Melaka.
2. Gaddis, T., (2018), Starting Out with C++: From Control Structures through Objects, 8th Edition, Global Edition, Pearson Education.
3. Daniel Liang, Y, (2013), Introduction to Programming with C++, 3rd Edition, Pearson Education.
4. Deitel, H.M. and Deitel, P.J., (2010), C++ How to Program,9th Edition, Pearson Education.
5. Nell, D., (2014), Programming and Problem Solving with C++: Comprehensive, 6th Edition, Jones & Bartlett Learning.

BMMM 2303
SOLID MECHANICS/
MEKANIK PEPEJAL

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply the knowledge and principles of mechanics of materials in engineering design.
2. Display appropriate experimental techniques in mechanics of material through laboratory experiments.
3. Demonstrate the ability to work and communicate effectively in engineering project using the principle of mechanics of material.

SYNOPSIS

The course contains topics of introduction, stress, strain, hooke's law, bending, mechanical properties, transformation of stress, axial load, transformation of strain torsion, beam bending, transverse shear, combined loadings, deflection of beams and shafts and Mohr's circle.

REFERENCES

1. Hibbeler R.C., 2013, Statics and Mechanics of Materials, 3rd SI Ed., Prentice Hall, New York.
2. Beer. F.P. Et Al. 2012. Mechanics Of Materials, 6th Edition in SI Units. Mcgraw-Hill.
3. Beer. F.P. Et Al. 2011. Statics and Mechanics of Materials, 1st Edition. Mcgraw-Hill.
4. Beer, F. P. And Johnston Jr., E. R. and Eisenberg, E. R., 2010, Vector Mechanics For Engineers - Statics, 9th Ed. in SI Units, Mcgraw Hill, New York.
5. Roy Craig Jr., 2011, Mechanics of Materials, 3rd Ed., John Wiley & Sons, New York.

PRE-REQUISITE

BMMA 1333
STATICS / STATIK

BMMM 2313
DYNAMICS & MECHANICS OF MACHINE/
DINAMIK & MEKANIK MESIN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Describe the concept and principle of dynamics and mechanics of machine element.
2. Demonstrate the dynamics and mechanics of machine laboratory experiments.
3. Synthesize dynamics and mechanics of machine into engineering practices.

SYNOPSIS
Introduction to basic principles based on kinematic and kinetic dynamics. The concept of displacement, distance, velocity, speed and acceleration. Application of newton's second law. The principle of work and energy, impulse and momentum of particles and rigid bodies. Transmission system based on the friction of motion, such as belts, brakes and dibble. Based delivery systems such as chains and gear teeth. Gear system. Balancing the dynamic system that includes balancing the body rotating plane and a parallel plane. Balancing of reciprocating motion as the body line of engines, radial engines and enginev. Gyroscopic motion that includes a couple gyroscope. Gyro scope coupling effects. Simple harmonic motion and vibration consists of moving one degree of freedom. Free vibration. Damped free vibration. Forced damped vibration. Speed control of the cycle flywheel.

REFERENCES
1. Beer, F. P., Johnson, E.R., Clausen, W. E., (2013) Vector Mechanics For Engineers, Dynamics Si Units, 10th Edition. Mcgraw-Hill.
2. Hibbeler, R. C. (2013) Engineering Mechanics, Dynamics, 12th Edition. Prentice Hall.
3. Meriam, J. L. And Kraige, L. G. 2013. Engineering Mechanics, SI Version, 7th Edition. John Wiley.
4. Bedford, A. and Fowler, W. 2008. Engineering Mechanics: Dynamics (SI Units). 5th Edition.Prentice Hall.
5. Cleghorn, W. L., 2005, Mechanics of Machines, Oxford University Press.

PRE-REQUISITE
BMMA 1333
STATICS/ STATIK

BMMA 2353
MODELING AND COMPUTER ANALYSIS/
PERMODELAN DAN ANALISIS BERKOMPUTER

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply fundamental of engineering and technical drawing in mechanical design using advance CAD tools.
2. Conduct computer modelling, design and analysis using advanced CAD tools.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams.

SYNOPSIS
This course will empower the students with fundamental knowledge and technical skills of 3d solid modelling skills using industry-proven 3d mechanical cad software. The students will learn about the different techniques for creating surface and solid models with emphasis on design intent. The course includes hands-on exercises and best practice methods for students to interpret common error messages during part, assembly and drafting stages.

REFERENCES
1. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. And Novak, J. E.,Lockhart S., 2016, Technical Drawing With Engineering Graphics, 15th Ed., Pearson & Prentice Hall, New Jersey.
2. Planchard, D. & M. Planchard, Engineering Design With Solidworks 2012, Schroff Development Corporation, 2012.
3. Kirstie Plantenberg (2011), Introduction To Catia V5 Release 19 (A Hands-On Tutorial Approach), Schroff Development.

PRE-REQUISITE
BMMA 1303
ENGINEERING GRAPHICS/
GRAFIK KEJURUTERAAN

SEMESTER 4

BMMH 2413
HVAC DESIGN PROJECT/
PROJEK REKABENTUK HVAC

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Define problem, objective and HVAC design project life cycle.
2. Developing the HVAC project come with challenges and risks using appropriate tools.
3. Demonstrate the project management skills and show ability to work effectively as individuals, members or leaders in project teams.

SYNOPSIS

This course provides students the step in the HVAC design project development with consideration use of a large air conditioning system are the design, construction, commissioning, operation, energy efficiency upgrading and maintenance.

REFERENCES

1. Roger Legg, 2017, Air Conditioning System Design, B-H.
2. Engineering Design A Project-Based Introduction-Clive L. Dym, Wiley [4th Edition 2013].
3. Product Design and Development- Karl Ulrich, McGraw-Hill, [6th Edition, 2015].
4. Project Management For Engineering, Business, and Technology-J.M.Nicholas, Routledge, [4th Edition, 2011]

BMMH 2313
FLUID MECHANICS/
MEKANIK BENDALIR

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply fluid mechanics concept in solving fluid statics and fluid dynamics problem.
2. Measure related parameter by using appropriate techniques in fluid mechanics application.
3. Demonstrate the ability to complete tasks an assignment as a leader or a member in group effectively.

SYNOPSIS

Introduction to this course is about the basic physical properties of fluids. Then it covers the definition of pressure and head. Next it followed by derivation of hydrostatic equation and its application in pressure measurement, static forces analysis on immersed surface and buoyancy analysis. For fluid dynamics, it started with introduction to fluid dynamics and fluid flow analysis. Then it is continued by derivation of flow equations, the application of energy equation and Bernoulli equation in the calculation of flow velocity, discharge, and head lost in piping systems. The last topic for this course is dimensional analysis and its application.

REFERENCES

1. Munson, B. R., Young D. F. and Okiishi, T. H., 2012, Fundamentals of Fluid Mechanics, 7th Ed., John Wiley & Sons, Inc, Asia.
2. Som, S. K. and Biswas, G., 2010, Introduction to Fluid Mechanics and Fluid Machines, Revised 2nd Ed., Tata McGraw-Hill, New Delhi.
3. Douglas, J. F., Gasiorek J. M. and Swaffield, J. A., 2011, Fluid Mechanics, 6th Ed., Prentice Hall, Spain.
4. Kundu, P. K., Cohen, I. M. and Dowling, D. R., 2011, Fluid Mechanics, 5th Ed., Academic Press, Waltham, USA.

BMMH 3553
HEAT TRANSFER/
PEMINDAHAN HABA

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Solve analytically and numerically problems related to performance evaluation and design of heat transfer equipment's
2. Assemble laboratory equipment's according to the parameters investigated when conducting heat transfer equipment's.
3. Complete individual or group assignments within the time given.

SYNOPSIS

The introduction of the concept and definition of heat transfer engineering, energy, work, material thermal properties, mass transfer, the laws of the theory, empirical and analytical relationships. Numerical rules. Unsteady state conduction. Numerical analysis. Heat Transfer Simulation solution. Natural convection. Forced convection in laminar and turbulent flow in the plane and pipes. Phase change heat transfer. Thermal radiation on the body and a black surface. Low rate of heat transfer. Evaporation and condensation.

REFERENCES

1. Holman, J.P (2001). Heat Transfer. 8th SI Edition. McGraw Hill: Singapore.
2. Incopera, F.P. & Dewitt, D.P. (2002). Fundamental of Heat and Mass Transfer. 4th Edition, John Wiley and Sons: Toronto.
3. Cengel, Yunus A. (2003). Heat transfer: A Practical Approach. 2nd Edition, McGraw Hill: New York.

BMMH 2503
FUNDAMENTAL OF HVAC AND REFRIGERATION/
ASAS HVAC & PENYEJUKAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Manipulate the principle of vapour compression refrigeration cycle for air-conditioning.
2. Perform experiment on vapour compression cycle application.
3. Justify the important of recovering of recycling used refrigerants to prevent environmental damage.

SYNOPSIS

This course cover fundamental of air conditioning system including psychometric chart, carnot cycle and thermodynamics properties. The application of this course limited to small capacity air conditioning system such as split unit, window unit and variable refrigerant flow (VRF).

REFERENCES

1. Mcquiston. F. C. and Parker J. D. 1982. Heating Ventilation and Air Conditioning: Analysis and Design. 2nd Ed. New York: John Wiley.
2. Yunus A.C. & Michael A.Boles. 1994. Thermodynamic An Engineering Approach. 2nd Ed. Singapore: Mc Graw Hill Inc.
3. Jones W.P. 1980. Air Conditioning Applications and Design. New York: Edward Arnold (Publisher) Ltd.
4. Jones W.P. 1985. Air Conditioning Engineering. New York: Edward Arnold (Publisher) Ltd.
5. Johnson W.M. 1997. Practical Cooling Technology. New York: Delmar Publisher USA

SEMESTER 5

BMMH 3323
CONTROL & INSTRUMENTATION/
KAWALAN & INSTRUMENTASI

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Explain the dynamic behavior of the system through analysis of the system response.
2. Display the concept of controller and sensor elements/ transducer through learning and application of the device behaviour3.
   Explain effectively either individual or in group for any assignment and experiment.

SYNOPSIS

At first, this course shall discuss the concept of instrumentation, the important of sensor, signal conditioning and data acquisition. Then it shall discuss the fundamental of control system; open and closed loop system; transfer function; block diagram reduction and signal flow graphs; modelling for electrical system, mechanical system and electromechanical system; transient and steady-state performance for first and second order systems; routh hurwitz criteria for stability and steady-state error analysis.

REFERENCES

1. Syed Najib and Maslan, 2nd Control Systems Engineering, Penerbit Utem, 2006.
2. Khalil Azha Mohd Annuar Et. Al., Control & Instrumentation, Penerbit Utem, 2015.
3. Alan S. Moris and Reza Langari, Measurement and Instrumentation: Theory and Application, Academic Press, 2011.
4. Norman S. Nise, Control Systems Engineering, 6th Edition, John Wiley & Sons Inc., 2011.
5. Richard C. Dort, Robert H. Bishop, Modern Control Systems, 12th Edition, Pearson, 2011.

BMMH 3573
REFRIGERATION SYSTEM DESIGN/
REKABENTUK SISTEM PENYEJUKAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. To practice safety in potentially harmful situation
2. To develop the skills and knowledge required for the installation and maintenance of industrial and maintenance of industrial refrigeration systems with respect to various codes and standards.
3. To develop an appreciation for conservation and environmental issue.

SYNOPSIS

This course in refrigeration systems requires the use of tools and equipment, measuring instruments and materials and supplies. It involves sizing, installing, troubleshooting and repairing industrial refrigeration systems. It includes information on types and operation of industrial refrigeration systems and component parts.

REFERENCES

1. Rodolfo H.Mascheroni (2016) Operations in Food Refrigeration: ISBN 9781138198920
2. Andrew D Althouse (2016) Modern Refrigeration and Air Conditioning: ISBN 13 9781631263545
3. Stephen L.Herman (2013) Electricity and Controls for HVAC-R: ISBN 13 9781133278207
4. Russell E.Smith (2014) Electricity for Refrigeration, Heating and Air Conditioning: ISBN 13 97811337399128
5. A C Bryant (1997) Refrigeration Equipment: ISBN 9780750636889
6. Wilbert F.Stoeker (1998) Industrial Refrigeration Handbook: ISBN 13 9780070616233

BMMH 3533
HEATING & COOLING LOAD/
BEBAN PEMANASAN & PENYEJUKAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Differentiate Cooling and Heating Loss calculation procedure using Manual calculation and CHVAC Software.
2. Design residential and commercial building with different building characteristics of Thermal Material, Air Infiltration and Ventilation effects using CLTD Method.
3. Function effectively as members or leaders in order to complete the project goal.

SYNOPSIS

The burden of cooling and heating can take place using various means of conduction, convection and radiation. Other factors such as weather, the nature of the materials used and the ventilation system also plays a role in cooling and heating load calculations.

REFERENCES

1. ASHRAE Press, 2007, Air Conditioning System Design Manual, 2nd Edition, Butterworth-Heinneman.
2. Jan, F.K., Peter S.C., and Ari R., 2009, Heating and Cooling of Buildings: Design for Efficiency, 2nd Edition, CRC Press.
3. McQuiston F.C., Jerald D.P., and Jeffrey D.S., 2004, Heating, Ventilating and Air Conditioning Analysis & Design, 6th Edition, Wiley.
4. Howard D.G. and Esko T., 2001, Industrial Ventilation Design Handbook, 1st Edition, Academic Press.
5. Thomas E.M., 1997, HVAC Principles and Applications Manual, 1st Edition, McGraw Hill Professional.

BMMH 4593
HVAC APPLIED ACOUSTIC & VIBRATION/
AKUSTIK & GETARAN GUNAAN HVAC

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Design the acoustics and vibration control system for air conditioning and cooling system.
2. Measure accurately the acoustics and vibration level of HVAC machinery and construct the control system.
3. Initiate the society awareness of the impact of acoustics and vibration of HVAC on the human health and safety.

SYNOPSIS

Explain the general picture of acoustic design in delivering the basic understanding about sound and vibration, their relationship with the cooling and air conditioning system, topics covers terminology, acoustic position, designing criteria, equipment selection/ guidelines application. Solving the noise problems.

REFERENCES

1. Frank Fahy, David Thompson, Fundamentals of Sound and Vibration, 2nd Edition, Crc Press, 2015.
2. Michael Norton, Denis, Karczub, Fundamentals of Noise and Vibration Analysis for Engineers, 2nd Edition, Cambridge, 2003.
3. Osama A. B. Hassan, Building Acoustic and Vibration, Theory and Practice, World Scientific, 2009.
4. Jens Blauert, Ning Xiang, Acoustics for Engineers, Spinger, 2009.
5. Robert D. Finch, Introduction to Acoustics, Prentice Hall, 2008.

SEMESTER 6

BMMH 3613
INDOOR AIR QUALITY/
KUALITI UDARA DALAMAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:
1. Identify indoor air quality (IAQ) problems using appropriate techniques and sampling strategy.
2. Demonstrates IAQ report based on IAQ assessment in appropriate manner.
3. Conduct IAQ problems maintenance procedure effectively with planning among team members.

SYNOPSIS

The course provides students with a dynamic understanding of indoor air quality and the effects of health, comfort and productivity. Student will learn about IAQ regulations ASHRAE guidelines, common indoor air quality problems and solutions, indoor air quality assessment of commercial buildings and how to achieve effective air quality in the workplace for optimum working conditions.

REFERENCES

1. Dudzinska, Marzenna R Management (2011) Management of indoor air quality, Boca Raton:CRC Press, ISBN: 9780415672665 (TD883.17.M36 2011 1000299272)
2. Robert Jennings Heinsohn John M.Cimbala (2013), Environment health: indoor air quality Point Pleasant, NJ: Apple Academic Press, Inc, ISBN: 9781926895208 (TD883.17.E58 2013 1000301221)
3. Hess-Kosa, K. (2016). Indoor air quality: the latest sampling and analytical methods. CRC Press.
4. Haines, R. W., & Myers, M. E. (2010). HVAC systems design handbook. McGraw-Hill.
5. Enteria, N., Awbi, H., & Yoshino, H. (Eds.). (2017). Desiccant Heating, Ventilating, and Air-Conditioning Systems. Springer Singapore.

BMMH 3563
AIR DISTRIBUTION SYSTEM/
SISTEM PENGAGIHAN UDARA

LEARNING OUTCOMES

Upon completion of this course, student should be able to:
1. Explain the terminology of air ducting system and ventilation system.
2. Construct ducting layout according to cods and standard of building and HVAC.
3. Demonstrate and understanding of air ducting system towards health, safety and legal awareness.

SYNOPSIS

Introduction to the definition and airway terminology, channel design, channel measurement method with Aspect Ratio and Ductulator, Diffuser selection and grilles, material and coating material for the channel HVAC industry, the preparation of Single Line Diagram (SLD) and the layout, and concept of CAV and VAV

REFERENCES

1. S. Don Swenson, HVAC – Heating, Ventilating, and Air Conditioning, ATP.
2. Thomas E. Mull, Hvac- Priniciples and Apploications Manual.
3. Awbi H.B., 2000, Air Distributions in Rooms, 1st Edition, Elsevier Science.
4. Naima, 1997, A Guide to Insulated Air Duct Systems.
5. Lama, Airflow in Ducts, Lama Book.

BMMH 3574
TRANSPORTATION AIR-CONDITIONING & REFRIGERATION/ PENYEJUKAN & PENYAMAN UDARA PENGANGKUTAN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Identify in depth problem based on concept, components and design of vehicle air conditioning system.
2. Demonstrate vehicle air conditioning system experiment and report the result in appropriate manner.
3. Function effectively as members or group leader in achieving Transportation Air Conditioning System project goal

SYNOPSIS
Detailed explanation of the reality of vehicle cooling systems in learning to adapt to various cooling systems.

REFERENCES
1. Automotive Heating and Air Conditioning, 6th Edition, Classroom Manual, Mark Schnubel, 2017.
2. ASHRAE Handbook, Fundamental 2017.
3. Automotive Service, Inspection, Maintenance, Repair, 5th Edition, Tim Gilles, 2016.
4. Thomas S.B., 2009, Automotive Heating & Air Conditioning, 5th Edition, Prentice Hall.
5. John H., 2000, Haynes Automotive Heating and Air Conditioning Systems Manual, 3rd Edition, Haynes Manuals Inc.
6. Boyce D., 2001, Automotive Air Conditioning, 8th Edition, Delmar Cengage Learning.
7. James H., 2005, Marine Refrigeration and Air Conditioning, Cornell Maritime Press.
8. John V.A., And Milton R., 1991, Auto Air Conditioning Technology, Goodheart-Wilcox Publisher.

BMMH 4603
HVAC ELECTRICAL & CONTROL SYSTEM/ SISTEM ELEKTRIK & KAWALAN HVAC

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Explain electrical operation used in HVACR system.
2. Construct electrical circuit for HVACR system to optimize operation parameters by using the chosen control method.
3. Demonstrate an understanding of the impact of engineering practices towards thermal comfort, air quality and effectiveness of energy consumption.

SYNOPSIS
Introduction to electricity in the HVAC system. Electrical components and measurement equipment. Analysis in the heat pump circuit. Phases and complex numbers, filters, transformers.

REFERENCES
1. Dale R. Patrick, Stephen W. Fardo, Electrical Distibution System, 2nd Ed. The Fairmont Press, Inc
2. Steven J. Marrano, Craig DiLouie, The Electrical System Design & Specification Handbook for Industrial Facilities, The Fairmont Press, Inc
3. Robert McDowall, 2008, Fundamentals of HVAC Control System, Elsevier
4. Roger W. and Douglas C., 2006, Control Systems for Heating, Ventilating and Air Conditioning, Birkhäuser.
5. Thomas E.K., 2007, Electricity, Electronics and Control System for HVAC, 4th Edition, Prentice Hall.

PRE-REQUISITE
BMMH 1213
FUNDAMENTAL OF HVAC ELECTRIC & ELECTRONIC/ ASAS ELEKTRIK & ELEKTRONIK HVAC

BMMU 3764
BACHELOR DEGREE PROJECT I/
PROJEK SARJANA MUDA I

LEARNING OUTCOMES
At the end of the course, students should be able to:
1. Apply Knowledge to proposal preparation of industry-based or practice- priented project.
2. Imitate appropriate existing concepts in engineering technology fields.
3. Adhere to project's dateline and related procedure.
4. Explain the project proposal in oral and written forms effectively.
5. Report literature review and preliminary findings in a scientific manner

SYNOPSIS
The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES
1. Manual Projek Sarjana Muda (PSM), Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan, Universiti Teknikal Malaysia Melaka.

SEMESTER 7

BMMU 4774
BACHELOR DEGREE PROJECT II/
PROJEK SARJANA MUDA II

LEARNING OUTCOMES
After completing the course, students will be able to:
1. Discuss solution to the proposed industry-based or practice-oriented project.
2. Demonstrate project findings using appropriate techniques with an understanding of its limitations.
3. Display self-reliance in working independently and cooperates in group activities.
4. Display the ability to present the project findings in oral and written forms effectively.
5. Report literature review and project potential in scientific manner with a recognition of the strengths, weaknesses and opportunity for improvement.

SYNOPSIS
This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES
1. Manual Projek Sarjana Muda (PSM), Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan, Universiti Teknikal Malaysia Melaka.

PRE-REQUISITE
BMMU 3764
BACHELOR DEGREE PROJECT I/
PROJECT SARJANA MUDA I

BMMH 3523
CLASSIFICATION OF AIR CONDITIONING SYSTEM/
KLASIFIKASI SISTEM PENYAMAN UDARA

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Differentiate type of HVAC system and operation.
2. Demonstrate the operation of different type of HVAC system.
3. Demonstrate an understanding of the impact of HVAC system towards health and energy effectiveness.

SYNOPSIS
A lesson on concept classification of air conditional system. Topics cover in this course are selection criteria for air conditioning systems, classification of air conditioning systems according to substance used.

REFERENCES
1. McQuiston and Parker, 1998, Heating, Ventilation and Air Conditioning Analysis and Design, 3rd Edition, Wiley.
2. Edward G Pita, 2000, Air Conditioning Principles and System: An Energy Approach, 4th Edition, John Wiley.
3. Jan F. Kreider and Ari Rabl, 1987, Heating and Cooling of Buildings: Design for Efficiency, McGraw Hill.
4. ASHRAE Handbooks Volume 1,2,3 & 4.

BMMH 3543
MAINTENANCE OF HVAC SYSTEM/
PENYELENGGARAAN SISTEM HVAC

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Evaluate the performance of any HVAC System and construct maintenance instruction to solve any HVAC problem.
2. Demonstrate maintenance procedure and management of maintenance system.
3. Complete maintenance procedures effectively with planning among team members.

SYNOPSIS
HVAC environment, average temperature. Energy economics: units, degree-days, thermal fluidity. Heat loss calculation, heat absorption pump, and heater storage. Ventilation and air-conditioning: sensible heat, mechanical ventilation. Hot water and cold-water storage.

REFERENCES
1. Robert C. Rosaler, 1998, HVAC Maintenance and Operation Handbook, McGraw-Hill Professional.
2. David W. Bearg, 1993, Indoor Air Quality and HVAC System, Lewis Publishers.
3. Guy W. Gupton, 2002, HVAC Control: Operation and Maintenance, the Fairmont Press, Inc.
4. Samuel C. Sugarman, 2005, HVAC Fundamentals, the Fairmont Press, Inc.
5. Samuel C.S., Samuel C.M., 1992, HVAC System: Operations, Maintenance and Optimization, 1st Edition, Prentice Hall.

BMMH 4613
HVAC GREEN TECHNOLOGY/
TEKNOLOGI HIJAU HVAC

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Discover current problem in HVAC components/ system in order to develop new "Green HVAC" concepts.
2. Perform calculation of energy saving from "Green HVAC" system as compared to conventional system and manipulate benefits of renewable energy sources.
3. Build awareness of necessity of "Green HVAC" invention and its impact on indoor air quality and carbon.

SYNOPSIS

"Green HVAC" Is defined as a good air quality which reduce pollution on environment such as global warming and also cost effective.

REFERENCES

1. David J. And Kim M., 2004, Green Remodeling: Changing the World One Room at A Time, New Society Publishers.
2. American Society of Heating, Refrigeration and Air Conditioning Engineers, 2006, ASHRAE Green Guide: The Design, Construction, and Operation of Sustainable Buildings, 2nd Ed, Butterworth-Heinemann.
3. HVAC Excellence and Ferris State University, 2008, Green Mechanical System, 1st Edition, Esco Press.
4. Jayamaha L., 2006, Energy Efficient Building Systems: Green Strategies for Operations and Maintenance, 1st Edition, McGraw Hill Professional.
5. ASHRAE Press, 2007, Air Conditioning System Design Manual, 2nd Edition, Butterworth-Heinneman.

BMMH 3583
HVAC MODELING & ANALYSIS/
PERMODELAN & ANALISIS HVAC

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Understand the operation, advantages and limitation of HVAC software.
2. Construct piping and ducting layout of HVAC System using software.
3. Able to accommodate with each other in resolving conflicts, different value and characteristics in achieving goal.

SYNOPSIS

HVAC software is related to the software psychometric, sizing piping and others. Introduction to computer-aided fluid dynamics (Computational Fluid Dynamics, CFD). Law of conservation of fluid flow and boundary conditions. Finite volume methods for diffusion problems. Finite volume methods for diffusion-flow problems. Solution algorithm for pressure-velocity relationship for steady flow. Solution to discredited equation. Finite volume method for unsteady flow. The use and role of the boundary method.

REFERENCES

1. Peerless HVAC (C-20) Software Only, 2009.
2. Versteeg, H.K. and Malalasekera, W., 2007, An Introduction to Computational Fluid Dynamics: The Finite Volume Method, 2nd Ed, Pearson Education Limited, Great Britain.
3. Anderson, J.D.A, 1995, Computational Fluid Dynamics, McGraw Hill Books Company, New York.
4. Tannehill, J., 1997, Computational Fluid Dynamics and Heat Transfer, 2nd Ed, Taylor and Francis.
5. Date, A.W., 2005, Introduction to Computational Fluid Dynamics, Cambridge University Press.

BMMM 3593
INSTRUMENT CALIBRATION/
PENENTUKURAN INSTRUMEN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Determine the importance of calibration and common calibration procedure for industrial instruments.
2. Perform industrial instrument calibration using acceptable international standard.
3. Discuss the calibration procedure with the team and report the calibration result.

SYNOPSIS
Introduction to calibration where students are exposed to the importance of gather precise and consistent data from test equipment. Students also been teaching on how to maintained high quality calibration system.

REFERENCES
1. Richard S. Figliola & Donald E. Beasley, Theory and Design for Mechanical Measurements, 6th Ed. John Wiley & Sons, Inc, 2014.
2. N.V. Ragavendra & L. Krishnamurthy, Engineering Metrology & Measurements, Oxford University Press, 2013.

BMMH 4623
PROJECT MANAGEMENT/
PENGURUSAN PROJEK

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply the core concepts and principles, functions, and process in project management.
2. Justify the important skills required and the necessary implementation methodology/ formulation in project management.
3. Develop a comprehensive & viable Project Proposal a deliver a presentation of the proposal.

SYNOPSIS
This course focuses on the principles of project management including the importance and interrelationship of all its components. Students will be familiarized with the Project Management process group functions (initiating, planning, executing, controlling and closing) and project knowledge areas (integration, scope, time, cost, quality, human resources, communications, risks and procurement). Various tools for supporting the analysis of works in engineering project management will be introduced. Topics including initiating and planning the project, working with the management, project appraisal & sensitivity, creating budget and work breakdown structure, managing uncertainty & risk, building project plan, implementing and revising project plan, completing the project and contract laws.

REFERENCES
1. Meredith, Mantel, Shafer and Sutton (2014). Core Concepts: Project Management in practice, 5th Edition, John Wiley & Sons.
2. Pinto, K. Jeffrey. (2016). Project Management, Achieving Competitive Advantage, 4th Edition. Pennsylvania State University, Prentice Hall.
3. Rosenau, M. (2005). Successful Project Management, 3 Ed., John Wiley & Sons.
4. Meredith, J., Mantel, S. and Mantel, S. Jr. (2009). Project Management: A Managerial Approach. New York, John Wiley & Sons Inc.

BMMH 4633
LEAN MANUFACTURING/
PEMBUATAN KEJAT

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Describe the philosophy and foundation of industrial lean manufacturing.
2. Follow appropriate analytical technique to identify and eliminate the types of waste apparent in a HVAC industrial manufacturing system.
3. Propose industrial value stream mapping to appraise the current state.

SYNOPSIS

Lean Manufacturing is based upon the principle of eliminating waste at all levels throughout the manufacturing system. This module reviews the skills and techniques required to analyse manufacturing system and to design improved methods and layouts. It will use Value Stream Mapping to understand and appraise the current state; future state mapping will be used to develop and vision of value added flow. The focus of this module will be on the application of the technique through studies and industrial experience and will identify the benefits to be gained by their successful.

REFERENCES

1. Williams, M.F. (2000). Lean Manufacturing: Tools, Techniques, and How to Use Them. St.Lucie Press.
2. Tapping, D.,Luyster,T.and Shuker,T (2002). Value Stream Management. The Productivity Press.
3. Womack, J.P. and Jones, D.T.(1999). Lean Thinking. Simon & Schuster.
4. Shingo, S (1989). A Study of the Toyota Production System from an Industrial Engineering Viewpoint. Productivity Press
5. Womack, J. P., Jones, D. T. and Ross, D. (1995). The Machine that Change the World: the Story of Lean Production. Rawson Associates.

BMMH 4643
JIG AND FIXTURES/
JIG DAN LEKAPAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Show competencies in design requirements for jigs and fixtures.
2. Design and construct jigs and fixtures.
3. Prepare a technical document on jig and fixtures design.

SYNOPSIS

This course starts with an introduction of jigs and fixtures that is used to facilitate production works, making interchangeable pieces of work possible to save production cost. Jigs and fixture are used to locate and hold the work that is to be machined. Also, the use of this device can result in such a degree of accuracy that workpieces can be assembled with a minimum amount of fitting. A jig and fixture can be designed for a particular job. The form to be used depends on the shape and requirement of the workpiece to be machined.

REFERENCES

1. E.G. Hoffman (2004) Jig and Fixture Design 5th edition, Thomson Delmar Learning Publisher.
2. E.K. Henriksen (1973) Jig and Fixture Design Manual, Industrial Press, New York.

BMMH 4653
INDUSTRIAL FORWARD PRACTICE/
PENGAMALAN INDUSTRI TERKEHADAPAN

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Outline the various systems used in a manufacturing plant and their role in an Industry 4.0 world.
2. Demonstrate smartness in Smart Factories, smart products or smart services.
3. Present the power of Cloud Computing in a networked economy.

SYNOPSIS

The world is at the onset of the Fourth Industrial Revolution and this revolution is very much driven by the smarts in automating decision making and processes. Advancements in IT has resulted in immense improvements in computational power across nearly all electronic devices and enhanced capabilities in connecting the dots in an increasingly networked society. Digital platforms in the Cloud provides a perfect canvas for inventing new business models and for intelligent algorithms to analyse data and derive knowledge for operationalize use by cyber physical systems. This course provides a comprehensive coverage on, among others, the role of data, manufacturing systems, various Industry 4.0 technologies, applications and case studies. In particular, we also draw input from researchers and practitioners on what are the opportunities and challenges brought about by Industry 4.0, and how organisations and knowledge workers can be better prepared to reap the benefits of this latest revolution.

REFERENCES

1. Alp Ustundag & Emre Cevikcan (2018). Industry 4.0: Managing The Digital Transformation,1st Edition. Springer
2. Fran Yáñez (2017).The Goal is Industry 4.0: Technologies and Trends of the Fourth Industrial Revolution. Independently Published.
3. Alasdair Gilchrist. (2016). Industry 4.0: The Industrial Internet of Things, 1st Edition. Apress
4. Giacomo Veneri and Antonio Capasso (2018) .Hands-On Industrial Internet of Things: Create a powerful Industrial IoT infrastructure using Industry 4.0. Packt Publishing.

BMMH 4663
ENGINEERING FINANCIAL, COSTING AND ECONOMICS/
KEWANGAN, KOS DAN EKONOMI KEJURUTERAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Describe the role of engineering financial, costing and economics.
2. Adapt the concepts, principle and techniques in engineering financial, costing and economics.
3. Identify cost effectiveness in engineering financial, costing and economics.

SYNOPSIS

The course covers engineering financial, cost and finance in making final decisions. Engineering financial is crucial as it can help to assess the financial state of business as well as to select the best decision making and also allocating capital. It also helps to understand the financial sensitivity of project decisions and the use of decision tools for integrating business requirements. Besides, cost management which consists of production cost relationship, elements of the production process, managerial and cost accounting, inventory management, cost estimating methodology and cost control alternatives will be discussed in details in this subject. Apart from that, engineering economics will discuss about the time value of money and interest relationship, which are useful to define certain project criteria that are utilized by engineers and project managers to select the best economic choice among several alternative. Projects examined will include both product and service producing investments. The effects of escalation, inflation and taxes on the economic analysis of alternative are also discussed. Management of risk incorporates the concepts of probability and statistics in the evaluation of alternative. The evaluation allows management to determine the probability of success of failure of the project.

REFERENCES
1. Blank, L and Tarquin, A. Engineering Economy,7th Edition, McGraw Hill, 2012
2. Whitman D. anf Terry R. (2012) Fundamentals of Engineering Economics and Decision Analysis Morgan& Claypool Publishers.
3. W.G Sullivan, E.M Wicks,C.P. Koelling "Engineering Economy". Prentic hall international 14th Ed, 2009
4. Hartman, Joseph c. (2006) Engineering Economy and the Decision making Process. Prentice Hall.

BMMH 4673
MANUFACTURING MANAGEMENT/
PENGURUSAN PEMBUATAN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Describe the role of manufacturing management related to HVAC Industrial Engineering.
2. Demonstrate manufacturing operation scenarios using Industrial Engineering tools and techniques.
3. Prepare a technical document on related to topics HVAC Manufacturing Management.

SYNOPSIS
Students will be introduced to the concept of productivity and the various Industrial Engineering (IE) tools and techniques to improve productivity. Thus, during the first part of the course, emphasis will be on constructing activities on Forecasting, Work System Design, Strategic Capacity Planning, and Facility Layout in order to attain efficiency and effectiveness in manufacturing operations. In the second part, teaching and learning activities related to Material Requirement Planning, Inventory Control, Production Scheduling and Simulation Modelling. Lastly, the topic of Lean Manufacturing will also be included in order to introduce to the students on the recent focus by many companies to eliminate wastes in the operations

REFERENCES
1. Stevenson, W.J., Chuong, S.C (2010). Operations Management: An Asian Perspective, 11th Edition. McGraw Hill.
2. Garcia-Diaz, Alberto and Smith, J.MacGregor (2008). Facilities Planning & Design. Prentice Hall.
3. Arnold, J.R. Tony, Chapman, Stephen N. and Clive, Lloyd M. (2012). Introduction to Materials Management. Pearson International.
4. Garcia-Diaz, Alberto, and James MacGregor Smith. Facilities planning and design. Prentice Hall, 2008.

SEMESTER 8

**BMMU 4786
INDUSTRIAL TRAINING/
LATIHAN INDUSTRI**

LEARNING OUTCOME
At the end of the course, students should be able to:
1. Build technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Develop effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years program for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

**BMMU 4796
INDUSTRIAL TRAINING REPORT/
LAPORAN LATIHAN INDUSTRI**

LEARNING OUTCOME
At the end of the course, students should be able to:
1. Produce industrial training report
2. Present report orally on working experience

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE
Student required to pass Industrial Training BMMU 4786 in order to pass Industrial training report.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

BMMM COURSE CORE COURSES (K)

SEMESTER 1

BMMA 1303
ENGINEERING GRAPHICS/
GRAFIK KEJURUTERAAN

LEARNING OUTCOMES
At the end of this course, the students should be able to:
1. Apply fundamental of technical drawing to produce standard mechanical part and assemblies drawing documents.
2. Construct typical mechanical engineering drawing using CAD software.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams.

SYNOPSIS
The course concentrates on computer aided design (CAD) software. AutoCAD engineering drawing software is used to produce standard engineering drawing. The students will be exposed to cad interface, editing commands, coordinate system, template preparation and layer in order to produce various types of engineering drawings.

REFERENCES
1. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. and Novak, J. E.,Lockhart S., 2016, Technical Drawing With Engineering Graphics, 15th Ed., Pearson & Prentice Hall, New Jersey.
2. Mark Dix, Paul Riley, 2012, Discovering Autocad 2012, Prentice Hall, London.
3. Scott Onstott, 2011, Autocad 2012 And Autocad Lt 2012 Essential, John Wiley & Sons, Inc.
4. Cheryl R. Shrock And Steve Heather, 2015, Beginning Autocad 2015, Industrial Press, Inc.

BMMP 1313
ENGINEERING MATERIALS/
BAHAN KEJURUTERAAN

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Explain the structures, properties and processing of engineering materials.
2. Display the ability to determine the microstructures and mechanical properties of various materials.
3. Construct the solution for engineering material problems.

SYNOPSIS
This course introduces basic concepts of engineering materials that covers introduction to engineering materials, inter-atomic bonding, crystalline structure and imperfections in solid. Explanation on different type of engineering materials (i.e. metal, polymer, ceramic, composite and semiconductor), its mechanical properties, basic application and processing are also included. Introduction to the binary phase diagrams (composition and microstructure correlation) is also given.

REFERENCES
1. Callister W.D. and Rethwisch D.G, 2011, Fundamentals of Materials Science and Engineering, 8th Edition, John Wiley & Sons.
2. Smith W. F., 2011, Foundation of Materials Science and Engineering, 5th Edition, Mcgraw Hill.
3. Askeland D. R., 2011, The Science and Engineering of Materials, 6th Edition, CI-Engineering.
4. Serah, A. M., 2017, Engineering Materials for Engineering Technologist. Melaka: Universiti Teknikal Malaysia Melaka.

BMMP 1323
MANUFACTURING PR0CESS/
PROSES PEMBUATAN

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Explain the fundamental concepts of manufacturing processes.
2. Display the application of various manufacturing processes.
3. Construct various skills of manufacturing techniques as an individual or a group.

SYNOPSIS

This course introduces the students to manufacturing and the aspects of manufacturing, metal-casting processes and equipment's, forming and shaping processes and equipment's, joining processes, manufacturing materials, and material-removal processes and machines.

REFERENCES

1. S. Kalpakjian, S.R. Schmid, 2014. Manufacturing Engineering and Technology SI Edition, Prentice Hall.
2. M.P. Groover, 2010. Fundamentals of Modern Manufacturing. Materials, Processes and Systems 4th Edition, John Wiley & Sons, Inc.
3. M. P. Groover, 2012. Introduction To Manufacturing Processes, 3rd Edition, Hoboken, NJ: Wiley.
4. P. N. Rao, 2009. Manufacturing Technology Foundry, Forming and Welding, 1st Edition, Mc Graw Hill.
5. P. N. Rao, 2009. Manufacturing Technology Metal Cutting and Machine Tools, 2nd Edition, Mc Graw Hill.
6. Amitabha Ghosh, Asok Kumar Mallik, 2009. Manufacturing Science, EWP New Dehli.

BMMP 2503
MEASUREMENT AND INSTRUMENTATION/
PENGUKURAN DAN INSTRUMENTASI

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Analyse the basic elements of common measurement systems.
2. Perform suitable measurement methods for a given issue.
3. Measure the performance of a measurement system.

SYNOPSIS

Measurement and instrumentation course covers three main areas; dimensional metrology, measurement analysis, and surface/texture measurement. In the dimensional metrology, students will be expose to three types of measurements; linear, angle and geometrical. Besides that, measurement of screw thread also covered in this course. Students will be taught from basic measuring instruments and will be introduced to the usage of the high precision measuring instruments that are Coordinate Measuring Machine and CNC Roundness measuring. In the measurements analysis, students will be required to describe the standard Measurement, measurement process, process capability, measurement errors, limits, tolerances and fits. In surface/texture measurement, students will perform the measurement of surface texture.

REFERENCES

1. Lau Kok Tee, and Saiful Naim Sulaiman (2020) Dimensional Measurement and Instrumentation for Technologist, Penerbit Universiti, Universiti Teknikal Malaysia Melaka
2. Connie, D. (2015). Fundamentals of Dimensional Metrology, 6th Edition. Cengage Learning.
3. Kalpakjian, S., Schimd, S. R., (2014). Manufacturing Engineering and Technology, 7th Edition. Prentice Hall.
4. Bucher, J. L. (2012). The Metrology Handbook, 2nd Edition. SQ Quality Press.

SEMESTER 2

BMMA 2353
MODELING AND COMPUTER ANALYSIS/
PERMODELAN DAN ANALISIS BERKOMPUTER

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply fundamental of engineering and technical drawing in mechanical design using advance CAD tools.
2. Conduct computer modelling, design and analysis using advanced CAD tools.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams.

SYNOPSIS
This course will empower the students with fundamental knowledge and technical skills of 3D solid modelling skills using industry-proven 3D mechanical CAD software (SolidWork). The students will learn about the different techniques for creating surface and solid models with emphasis on design intent. The course includes hands-on exercises and best practice methods for students to interpret common error messages during part, assembly and drafting stages.

REFERENCES
1. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. And Novak, J. E.,Lockhart S., 2016, Technical Drawing With Engineering Graphics, 15th Ed., Pearson & Prentice Hall, New Jersey.
2. Planchard, D. & M. Planchard, Engineering Design With Solidworks 2012, Schroff Development Corporation.
3. Kirstie Plantenberg 2011, Introduction To Catia V5 Release 19 (A Hands-On Tutorial Approach), Schroff Development.

PRE-REQUISITE
BMMA 1303
ENGINEERING GRAPHICS/
GRAFIK KEJURUTERAAN

BMMA 1333
STATICS/
STATIK

LEARNING OUTCOMES
At the end of this course, the students should be able to:
1. Describe the physical sciences of statics concepts.
2. Construct statics experiments to recognize the engineering mechanics of statics principles.
3. Explain effectively as an individual and assist group members for experimental and assignment works.

SYNOPSIS
An introduction to the basic concept of statics as physical sciences, system of units, scalars and vectors, free body diagram, forces system, force system resultants and moment, equilibrium of a particle, equilibrium of a rigid body, structural analysis (trusses analysis and simple frames and machines), friction and center of gravity and centroid.

REFERENCES
1. Hibbeler R.C., 2016, Engineering Mechanics Statics, 14th SI Ed., Prentice Hall, New York.
2. Beer, F. P. And Johnston Jr., E. R. And Eisenberg, E. R., 2016, Vector Mechanics for Engineers - Statics, 11th Ed. in SI Units, Mcgraw Hill, New York.
3. Meriam, J. L. and Kraige L. G., 2011, Engineering Mechanics Static SI Version, 7th Ed., John Wiley & Sons, New York.
4. Pytel and Kiusaalas. 2009. Engineering Mechanics-Static. 3rd Ed. Cengage Learning.
5. Michael P., Gary G.,F. Constanzo 2009. Engineering Mechanics- Statics. Mcgraw-Hill Higher Education.

BMMA 1313
PRINCIPLE OF ELECTRIC & ELECTRONIC/
PRINSIP ELEKTRIK & ELEKTRONIK

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Explain the basic of electrical and electronics principles, circuit schematics and components.
2. Develop electrical circuit and justify the measured values using appropriates approach.
3. Demonstrate ability to work effectively as individuals, members or leaders in technical teams.

SYNOPSIS

This course will cover on the topics of electrical and electronic components, emphasizing on electric circuit theory such as components and measurement instruments, circuit analysis. For electronic principle, it will cover on the topics of electronic devices such as operational amplifiers and digital electronics it will deals with topics such as system numbers, logic gates, boolean operation, combination logic circuits, and digital circuit application.

REFERENCES

1. Thomas L. Floyd, 2010, Principles Of Electric Circuits, 9th Ed., Prentice Hall.
2. Thomas L.Floyd, 2009, Digital Fundamental, 10th Ed., Pearson Education.
3. Alexander, C.K., 2008, Fundamental Of Electric Circuit, Mcgraw Hill.
4. Nilsson, J. W. and Riedel, S. A., 2008, Electric Circuit, Prentice Hall.
5. Roger Tohkeim, 2008, Digital Electronics Principles & Applications, Mcgraw Hill.

BMMH 2303
THERMODYNAMICS/
TERMODINAMIK

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply the basic concepts of thermodynamics, the First Law of Thermodynamics and the Second Law of Thermodynamics to closed and open systems.
2. Follow instructions in laboratory sheets when conducting thermodynamic experiments.
3. Complete individual or group assignments within the time given.

SYNOPSIS

This course covers the basic concepts and definitions of engineering thermodynamics, energy, work and heat, properties of pure substances (relationships of *P-v, T-v, P-T* and *T-s* diagrams), First Law of Thermodynamics, Second Law of thermodynamics and Entropy.

REFERENCES

1. Cengel, Y. A. and Boles, M. A..2014. Thermodynamics: An Engineering Approach, 8th Ed, McGraw Hill. Singapore.
2. S.C. Gupta,2008. Thermodynamics, 1st Ed, Pearson Education(Singapore) Pte. Ltd.
3. Sonntag, R.E., Borgnakke. C, Van. and Gordon J., 2008. Fundamentals of Thermodynamics, 7th Edition, John Wiley & Sons, Inc.New York.
4. Eastop, T. D., And Mcconkey, A., 2011, Applied Thermodynamics for Engineering Technologists, 5th Ed, Pearson & Prentice Hall. New York.

SEMESTER 3

BMMM 2313
DYNAMICS & MECHANICS OF MACHINE/
DINAMIK & MEKANIK MESIN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Describe the concept and principle of dynamics and mechanics of machine element.
2. Demonstrate the dynamics and mechanics of machine laboratory experiments.
3. Synthesize dynamics and mechanics of machine fundamentals into engineering practices.

SYNOPSIS

Introduction to basic principles based on kinematic and kinetic dynamics. The concept of displacement, distance, velocity, speed and acceleration. Application of newton's second law. The principle of work and energy, impulse and momentum of particles and rigid bodies. Transmission system based on the friction of motion, such as belts, brakes and dibble. Based delivery systems such as chains and gear teeth. Gear system. Balancing the dynamic system that includes balancing the body rotating plane and a parallel plane. Balancing of reciprocating motion as the body line of engines, radial engines and v-engine. Gyroscopic motion that includes a couple gyroscope. Gyro scope coupling effects. Simple harmonic motion and vibration consists of moving one degree of freedom. Free vibration. Damped free vibration. Forced damped vibration. Speed control of the cycle flywheel.

REFERENCES

1. Beer, F. P., Johnson, E.R., Clausen, W. E., 2013. Vector Mechanics For Engineers, Dynamics Si Units, 10th Edition. Mcgraw-Hill.
2. Hibbeler, R. C. 2013. Engineering Mechanics, Dynamics, 12th Edition. Prentice Hall.
3. Meriam, J. L. And Kraige, L. G. 2013. Engineering Mechanics, SI Version, 7th Edition. John Wiley.
4. Bedford, A. and Fowler, W. 2008. Engineering Mechanics: Dynamics (SI Units). 5th Edition.Prentice Hall.
5. Cleghorn, W. L., 2005. Mechanics of Machines, Oxford University Press.

PRE-REQUISITE

BMMA 1333
STATICS/ STATIK

BMMM 2333
PNEUMATIC AND HYDRAULIC TECHNOLOGY/
TEKNOLOGI HIDRAULIK DAN PNEUMATIK

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply knowledge of engineering fundamentals in order to analyse performance of hydraulic and pneumatic system
2. Construct hydraulic and pneumatic system manually and using software.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams

SYNOPSIS
This course covers the introduction of the hydraulic and pneumatic systems, types of pump, compressor and their working principles, types of valve, actuator and their usage, performance of the fluid power system, others fluid power system ancillaries and sensors, fluid power system circuit design and analysis with manual control and electrical control, fluid power symbols, the usage of computer software to design and simulate the fluid power system circuit, the usage of programmable logic controller in fluid power system circuit design and the application of fluid power in robotic and mobile hydraulic.

REFERENCES
1. Ilango S. 2011. Introduction to Hydraulics and Pneumatics. Prentice Hall-India. New Delhi.
2. Esposito A. 2013. Fluid Power with Applications .7th Ed. Pearson New International Edition.
3. Ilango, S. and Soundararajan, V. 2011 Introduction to Hydraulics and Pneumatics. 2nd. Ed. Prentice Hall-India, New Delhi
4. Robert H. Bishop 2017. The Mechatronics Handbook 2nd Ed. CRC Press, London

BMMM 2323
MACHINE TOOL TECHNOLOGY/
TEKNOLOGI PERKAKASAN MESIN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Determine the machining parameter to produce a product.
2. Construct a logical sequence in maintaining the tool & die components to its specification.
3. Demonstrate good work and safety habits, while using hand tools and power equipment.

SYNOPSIS
This course introduces the basic principles and methods of machine tools technology. The course introduces students to the safety, job planning, measurements, layout tools and procedure involving machine tools. This course emphasizes the applications towards machining criteria such as cutting speed, feed rate and other machining geometry. In addition, this course introduces the basic programming for cnc machine such as turning and machining centers. Students will be introduced to the new manufacturing technologies and processes.

REFERENCES
1. Kibbe, R.R., Neely, J.E., White, W.T, & Meyer, R.O., 2010, Machine Tool Practices, 9th Edition, Upper Saddle River, NJ: Prentice Hall.
2. Prakash Joshi, 2007. Machine Tools Handbook, McGraw Hill Professional
3. DeGarmo, E. P., Black, J. T. and Kohser, R. A., 2017, Materials and Processes in Manufacturing, 12th Edition, John Wiley and Sons, New York.
4. Kalpakjian, S., and Schmid, S. R., 2014, Manufacturing Engineering Technology, 7th Edition, Prentice Hall International.

BMMA 1323
ENGINEERING DESIGN/
REKA BENTUK KEJURUTERAAN

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Categorize the methods and design concepts used in the engineering design process.
2. Composes a working design prototype to meet specified needs with appropriate consideration on the learned methods in the engineering process.
3. Develop an awareness of project management in the engineering design process.

SYNOPSIS

The methodology of design solutions and best practices in product design. Latest product development: the determination of market needs, determination design specifications, engineering concept generation, concept selection, detailed product specification, functional analysis, material selection. Innovative solutions. Creativity in the industry design, design visualization and anthropometric. Portfolio preparation and presentation.

REFERENCES

1. Rudolph J Eggert, Second Edition 2010. Engineering Design. Pearson Prentice Hall.
2. Ulrich, K. T. and Eppinger, S. D. 2015. Product Design and Development.
3. Mcgraw-Hill Ullman, D.G. 2015.The Mechanical Design Process.
4. Mcgraw-Hill Education (Asia), Singapore. Cross, N., 2008. Engineering Design Methods: Strategies for Product Design, 4th Ed., John Wiley And Sons, West Sussex UK.

BMMH 2313
FLUID MECHANICS/
MEKANIK BENDALIR

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply fluid mechanics concept in solving fluid statics and fluid dynamics problem.
2. Measure related parameter by using appropriate techniques in fluid mechanics application.
3. Demonstrate the ability to compete tasks and assignment as a leader or a member in group effectively.

SYNOPSIS

Introduction to this course is about the basic physical properties of fluids. Then it covers the definition of pressure and head. Next it followed by derivation of hydrostatic equation and its application in pressure measurement, static forces analysis on immersed surface and buoyancy analysis. For fluid dynamics, it started with introduction to fluid dynamics and fluid flow analysis. Then it is continued by derivation of flow equations, the application of energy equation and bernoulli equation in the calculation of flow velocity, discharge, and head lost in piping systems. The last topic for this course is dimensional analysis and its application.

REFERENCES

1. Munson, B. R., Young D. F. and Okiishi, T. H., 2012, Fundamentals of Fluid Mechanics, 7th Ed., John Wiley & Sons, Inc, Asia.
2. Som, S. K. and Biswas, G., 2010, Introduction to Fluid Mechanics and Fluid Machines, Revised 2nd Ed., Tata McGraw-Hill, New Delhi.
3. Douglas, J. F., Gasiorek J. M. and Swaffield, J. A., 2011, Fluid Mechanics, 6th Ed., Prentice Hall, Spain.
4. Kundu, P. K., Cohen, I. M. and Dowling, D. R., 2011, Fluid Mechanics, 5th Ed., Academic Press, Waltham, USA.

SEMESTER 4

BMMH 3323
CONTROL & INSTRUMENTATION/
KAWALAN & INSTRUMENTASI

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Explain the dynamic behaviour and the details of the system through the analysis of the response system, response and stability of frequency.
2. Display the concept of controller and sensor elements/ transducer through learning and application of the device behaviour.
3. Explain effectively either individually or in group for any assignment and experiment.

SYNOPSIS
Introduction to Control System. Mathematical Modelling. Time Response. Stability of linear feedback system. Improve transient response and steady-state error: PID control. Root locus. Introduction to measurement and instrumentation. Static nature of performance measurement and instrumentation. Analysis of experimental data. Experimental uncertainty analysis. Signal Measurement system.

REFERENCES
1. Alan S. Moris and Reza Langari, 2011. Measurement and Instrumentation: Theory and Application, Academic Press.
2. HS Kalsi, 2011. Electronic Instrumentation, McGraw Hill.
3. Uday A. Bakshi and Ajay V. Bakshi, 2014. Electrical Measurements and Instrumentation, Technical Publication.
4. Norman S. Nise, 2011. Control Systems Engineering, 6th Edition, John Wiley & Sons Inc.
5. Richard C. Dort, Robert H. Bishop, 2011. Modern Control Systems, 12th Edition, Pearson.
6. Gopal, M, 2012. Control Systems: Principles and Design, 4th Edition, Mc Graw Hill.
7. Khalil Azha Mohd Annuar et. al., 2015. Control & Instrumentation, Penerbit UTeM.

BMMM 2303
SOLID MECHANICS/
MEKANIK PEPEJAL

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply the knowledge and principles of mechanics of materials in engineering design.
2. Display appropriate experimental techniques in mechanics of material through laboratory experiments.
3. Demonstrate the ability to complete engineering project using the principle of mechanics of material in group effectively.

SYNOPSIS
The course contains topics of introduction, stress, strain, hooke's law, bending, mechanical properties, transformation of stress, axial load, transformation of strain torsion, beam bending, transverse shear, combined loadings, deflection of beams and shafts and Mohr's circle.

REFERENCES
1. Hibbeler R.C., 2017, Statics and Mechanics of Materials, 5th Ed., Pearson.
2. Beer. F.P. Et Al. 2012. Mechanics Of Materials, 6th Edition in SI Units. Mcgraw-Hill.
3. Roy R. Craig, Jr. And Eric. M. Taleff 2020 Mechanics of Materials, 4th Ed. Wiley and Sons, New York
4. Beer, F. P. And Johnston Jr., E. R., Mazurek D.F., Cornwell P.J. dan Self, B.P., E. R., 2018, Vector Mechanics For Engineers , 12th Ed. in SI Units, Mcgraw Hill, New York.

PRE-REQUISITE
BMMA 1333
STATICS/ STATIK

BMMM 2343
BASIC TRIBOLOGY/
ASAS TRIBOLOGI

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Explain the basic principles of tribology and its importance in mechanical system.
2. Construct the tribological testing to determine the surface roughness, friction, wear and lubricant thickness.
3. Demonstrate the current tribological issue and it corrective action in a team.

SYNOPSIS

Introduction to basics and principles of Tribology, characterization of solid surface, interaction between solid surfaces, friction and wear, lubrication regimes and lubricants, rolling element bearing, tribological components failure, lube oil condition monitoring, micro/nano-Tribology.

REFERENCES

1. Raymond G., Bayer G. 2004. Mechanical Wear Fundamentals and Testing, 2nd Edition. Marcel Dekker, New York.
2. Strafford K.N., Smart R.S.C., Sare I. and Subramaniam C. 2017. Surface Engineering Processes and Applications, Technomic Publishing Co.
3. Suh, N. P. 1986. Tribophysics. Englewood Cliffs, NJ. Prentice-Hall.
4. Murphy, W., Black J. and Hastings G. 2016. Handbook of Biomaterial Properties, 2nd Ed. Springer, New York.

BMMM 2502
INTRODUCTION TO MAINTENANCE/
PENGENALAN KEPADA PENYELENGGARAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Explain the principles in planning and implementing a maintenance work.
2. Construct the effective and productive approach used in current maintenance issue.
3. Demonstrate the appropriate techniques to be applied in maintenance work.

SYNOPSIS

Students will be introduced to the principle and management in maintenance engineering, such as Maintenance Strategy, Maintenance Systems, Maintenance Cost/ Budget, Turnaround Management, Basic TPM and OEE, Basic Reliability Centered Maintenance and Risk Based Inspection.

REFERENCES

1. Mobley, R.K.,, 2014, Maintenance Engineering Handbook, 8th Ed. McGraw-Hill Professional.
2. Smith, R., Mobley,R.K., 2003, Industrial Machinery Repair: Best Maintenance Practices Pocket Guide (Plant Engineering), Butterworth-Heinemann.
3. Mobley, R. K., 2002, An Introduction to Predictive Maintenance, 2nd Edition, Butterworth- Heinemann.
4. Joel Levitt, 2010, Complete Guide to Predictive and Preventive Maintenance, Industrial Press.

SEMESTER 5

BMMM 3513
INDUSTRIAL MOTOR/
MOTOR INDUSTRI

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Explain the working principle fundamental of industrial motor.
2. Construct the motor and drive connection for industrial motor.
3. Propose motor maintenance and troubleshooting for industrial motor.

SYNOPSIS

This course talks about basic electrical machine. The course contains all about motor principle, components, electrical circuit connection, behaviour, selection, efficiency and motor maintenance.

REFERENCES

1. Riazollah Firoozian, 2014, Servo Motor and Industrial Control, Springer US.
2. Rex Miller, 2013, Industrial Electricity and Motor Controls, McGraw Hill.

BMMM 3523
MAINTENANCE TECHNOLOGY & ASSET MANAGEMENT/ TEKNOLOGI PENYELENGGARAAN & PENGURUSAN ASET

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Distinguish the method and strategy for maintenance and asset management.
2. Reproduce by using computerized maintenance management system in maintenance problem.
3. Organise the best practices of maintenance and asset management.

SYNOPSIS

Students will be introduced to the maintenance strategy, calculating the life of each unit machine and instrument. Identifying maintenance workshop and scheduling, maintenance organization, effective use of maintenance resources, maintenance system, maintenance best practices, engineering economy such as weibull and pareto analysis, cost estimation, asset replacement analysis, risk analysis and control, application of reliability data, accident prevention, fire protection and cost control.

REFERENCES

1. Terry Wireman, 2014, Benchmarking Best Practices for Maintenance, Reliability and Asset Management 3rd. Ed. Industrial Press.
2. John D. Campbell, Andrew K.S. Jardine, Joel McGlynn, 2016, Asset Management Excellence: Optimizing Equipment Life-Cycle Decisions, 2nd Edition, CRC Press.
3. Nicholas Anthony John Hastings, 2010, Physical Asset Management, Springer.
4. John S. Mitchell, 2012, Physical Asset Management Handbook, 4th. Ed. Reliabilityweb.com

BMMM 3533
TRANSMISSION TECHNOLOGY/
TEKNOLOGI PENGHANTARAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Categorize the function of basic components in transmission system
2. Assemble the transmission system using different gear types
3. Demonstrate methods in analysing transmission system gear ratio and maintenance

SYNOPSIS

Introduction to gear drive: arrangement and tooth forms. Gearbox rating. Bearings and seals. Lubrication systems. Materials and heat treatments. Gear quality. Effect of quantity on cost. Planetary gear arrangement analysis. Gearbox installation. Gear unit operation: testing, start-up, condition monitoring. Maintenance analysis: scheduled maintenance

REFERENCES

1. Jack Erjavec, 2010, Today's Technician: Manual Transmissions and Transaxles, 5th Edition, Delmar Cengage Learning.
2. Lynwander, 2009, Gear Drive System: Design and Application, BBS.
3. Lechner and H. Naunheimer, 2011, Automotive Transmission.
4. Su, D. 2007. Gearing, Transmissions and Mechanical Systems, Wiley and Sons.
5. Haideri, F. 2006, Transmmision System Design, Nirali Prakashan Publishing.

BMMM 3543
MAINTENANCE DIAGNOSTIC AND TROUBLESHOOTING/
DIAGNOSTIK DAN PENGENALPASTIAN MASALAH PENYELENGGARAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Analyse the techniques of machine diagnostics.
2. Display the methods of monitoring diagnostics data processing using methods of data analysis and diagnostics.
3. Demonstrate understanding in current diagnostics issues and able to explain the findings.

SYNOPSIS

Students will be exposed to basic diagnostics techniques and methods used in identifying the failure of the machinery system. Fault tree analysis method is important for the purpose of monitoring data for maintenance of a machine system as well. This course will also discuss the diagnostics data processing and distribution of statistical diagnostics for smooth management of maintenance work.

REFERENCES

1. H. P. Bloch and F.K. Gentner, 2012. Machinery Failure Analysis and Troubleshooting, 4th Ed. Vol.2, Butterworth-Heinemann.
2. J.H. Williams, A. Davies, P.R. Drake, 2009. Condition Based Maintenance and Machine Diagnostics, Springer, R. K. Mobley, 2014, Maintenance Engineering Handbook,8th Ed., Mcgraw Hill, Ny.
3. P. Kiameh, 2012, Power Plant Equipment Operation and Maintenance Guide, Mcgraw Hill Education.
4. N.P. Lieberman, 2009, Troubleshooting Process Operations, Pennwell Co.

BMMM 3553
MECHANICAL MACHINE MAINTENANCE/
PENYELENGGARAAN MESIN MEKANIKAL

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Identify the different techniques in mechanical machine.
2. Display maintenance techniques in mechanical components.
3. Demonstrate problem solving of real life condition regards to machine maintenance issues.

SYNOPSIS
The student will be exposed to the maintenance techniques, troubleshooting and fault diagnosis for mechanical equipment. Among the basic maintenance methods are: condition based monitoring, vibration analysis, alignment dynamic balancing and mechanical seals. Students also will be learned about troubleshooting and maintenance of various machines and components such as valve, pump, compressor, gear and turbine. The essential steps of disassemble, check, troubleshoot, repair and reassemble of mechanical components will be stressed in this course. All the works done will be written in the given report format. Some of the project or practical work will be done in group. High assessment mark will be given to assignment that implemented by following the procedure and completed in a period of time.

REFERENCES
1. Joel Levitt, 2010, TPM Reloaded: Total Productive Maintenance, 1st Edition, Industrial Press.
2. Daniel E. Whitney, 2004, Mechanical Assemblies: Their Design, Manufacture and Role in Product Development, Oxford University Press.
3. Smith, Ricky, and Bruce Hawkins. 2004 Lean Maintenance: Reduce Costs, Improve Quality, and Increase Market Share. Amsterdam: Elsevier Butterworth Heinemann.

SEMESTER 6

BMMU 3764
BACHELOR DEGREE PROJECT I/
PROJEK SARJANA MUDA I

LEARNING OUTCOMES
At the end of the course, students should be able to:
1. Apply knowledge to proposal preparation of industry-based or practice- oriented project.
2. Imitate appropriate existing concepts in engineering technology fields.
3. Adhere to project's dateline and related procedure.
4. Explain the project proposal in oral and written forms effectively.
5. Report literature review and preliminary findings in a scientific manner.

SYNOPSIS
The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES
1. Manual Projek Sarjana Muda (PSM), Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan, Universiti Teknikal Malaysia Melaka.

BMMM 3583
VIBRATION ANALYSIS AND MONITORING/
ANALISIS DAN PEMANTAUAN GETARAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:
1. Analyze machinery health condition using vibration-based condition monitoring method.
2. Measure vibration monitoring method using spectral analysis and other signal processing methods to predict machinery health condition.
3. Discuss the measured machinery vibration level with the team and present the machinery faults.

SYNOPSIS

Principle of vibration analysis, principle of vibration measurement and instrumentation, signal processing (sampling rate, filtering, time domain and frequency domain, power spectral density etc.) model testing, vibration based condition monitoring on gear, shaft, bearing and motor.

REFERENCES

1. Robert Bond Randall, 2014. *Vibration-based Condition Monitoring: Industrial, Aerospace and Automotive Applications,* John Wiley and Sons, ISBN 978-0-470-74785-8
2. Allan G. Piersol, Thomas L. Paez, Cyril M. Harris, 2015. *Harris' Shock and Vibration Handbook,* McGraw Hill Professional, ISBN 978-0-071-50819-3.
3. National Instruments, Machine Condition Monitoring Technical Library, 2013, National Instruments Inc. WWW.NI.COM.
4. Mechefske, Chris, 2013. Machine Condition Monitoring and Fault Diagnosis: Lecture Notes, Queens University.

BMMM 3573
CONDITION BASED MAINTENANCE/
PENYELENGGARAAN BERASASKAN KEADAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:
1. Apply various condition based maintenance methods to monitor and identify engineering related problems.
2. Construct techniques by using various condition based maintenance methods and analyse abnormality from the collected data.
3. Demonstrate understanding in current condition based maintenance issues and able to explain the findings.

SYNOPSIS

Introduction of CBM and maintenance management, vibration monitoring method and fault detection, lubricant condition monitoring and fault detection, thermal monitoring condition, CBM in electrical machines, corrosion monitoring and non-destructive test (NDT) and non-destructive evaluation (NDE).

REFERENCES

1. Mohamed Ben-Daya, Uday Kumar, D. N. Prabhakar Murthy, 2016. Introduction to Maintenance Engineering: Modelling, Optimization and Management, John Wiley & Sons.
2. Diego Galar Pascual, Uday Kumar, 2016. Maintenance Audits Handbook: A Performance Measurement Framework, Crc Press.
3. Fuh-Gwo Yuan, 2016. Structural Health Monitoring (SHM) In Aerospace Structures, Woodhead Publishing.

BMMM 3593
INSTRUMENT CALIBRATION/
PENENTUKURAN INSTRUMEN

LEARNING OUTCOMES

Upon completion of this course, students should be able to:

1. Determine the importance of calibration and common calibration procedure for industrial instruments.
2. Organise industrial instrument calibration using acceptable international standard.
3. Discuss the calibration procedure with the team and report the calibration result.

SYNOPSIS

Introduction to calibration where students are exposed to the importance of gather precise and consistent data from test equipment. Students also been teaching on how to maintained high quality calibration system.

REFERENCES

1. Richard S. Figliola & Donald E. Beasley, 2014. Theory and Design for Mechanical Measurements, 6th Ed. John Wiley & Sons, Inc.
2. N.V. Ragavendra & L. Krishnamurthy, 2013. Engineering Metrology & Measurements, Oxford University Press.

BMMM 4613
RELIABILITY, MAINTAINABILITY & RISK/
KEBOLEHARAPAN, KEBOLEHSENGGARAAN DAN RISIKO

LEARNING OUTCOMES

After completing the course, students will be able to:

1. Analyse important data with regards to reliability, maintainability and risks of machine.
2. Apply modelling method in diagnosing machine problems.
3. Propose the appropriate techniques to be applied in reliability, maintainability and risk.

SYNOPSIS

Students will be exposed to statistical method of machine failures, Pareto analysis, trend analysis, weibull and graphic analysis of machines reliability, the courses include maintainability analysis, Fault Tree Analysis, reliability block diagram.

REFERENCES

1. Gulati, R, and Smith, R., 2009, Maintenance and Reliability best practices, Industrial Press Inc
2. Stephen J, 2005, Improving maintenance and reliability through culture change, Industrial Press Inc.
3. Narayan, V., 2004, Effective Maintenance Management: Risk and reliability strategies for optimizing performance, Industrial Press Inc.
4. David John Smith,2005., Reliability, Maintainability and Risk: Practical Methods for Engineer, 7th. Ed. Butterworth-Heinemann.
5. Dhillon B.S.,2006. , Maintainability, Maintenance and Reliability for Engineers

BMMH 3543
MAINTENANCE OF HVAC SYSTEM/
PENYELENGGARAAN SISTEM HVAC

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Evaluate the performance of any HVAC System and construct maintenance instruction to solve any HVAC problem.
2. Demonstrate maintenance procedure and management of maintenance system.
3. Complete maintenance procedures effectively with planning among team members.

SYNOPSIS

HVAC environment, average temperature. Energy economics: units, degree-days, thermal fluidity. Heat loss calculation, heat absorption pump, and heater storage. Ventilation and air-conditioning: sensible heat, mechanical ventilation. Hot water and cold-water storage.

REFERENCES

1. Robert C. Rosaler, 1998, HVAC Maintenance and Operation Handbook, McGraw-Hill Professional.
2. David W. Bearg, 1993, Indoor Air Quality and HVAC System, Lewis Publishers.
3. Guy W. Gupton, 2002, HVAC Control: Operation and Maintenance, the Fairmont Press, Inc.
4. Samuel C. Sugarman, 2005, HVAC Fundamentals, the Fairmont Press, Inc.
5. Samuel C.S., Samuel C.M., 1992, HVAC System: Operations, Maintenance and Optimization, 1st Edition, Prentice Hall.

BMMM 3603
INDUSTRIAL CONTROL TECHNOLOGY/
TEKNOLOGI KAWALAN INDUSTRI

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Analyze the basic concepts, terminologies and operating principle of the elements related to industrial control system.
2. Construct the PLC wiring system and programming language for a specific problem-based application.
3. Perform individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

This course will provide the students both theoretical concepts related to industrial control system and a practical to the Programmable logic controller (PLC) which is generally used in the industrial control. Extensive practical-oriented and hands on session will be given using OMRON PLC Training Kit equipment. The graphical programming tools, GRAFCET will be introduced in the course. Nevertheless, IR 4.0 elements such as big data and analytics segment also embedded in the course. The topics as listed below:

1. Introduction to Industrial Control
2. Discrete control elements and Relay Ladder diagram
3. Programmable logic controller (PLC)
4. Discrete sensors and actuators
5. GRAFCET

This course is the authentic problem based purposely to expose the students with real engineering problems in the industries.

REFERENCES

1. John Stenerson. 2003. Industrial Automation and Process Control. Prentice Hall.
2. Mikell P. Groover. 2008. Automation, Production Systems, and Computer-Integrated Manufacturing, 2nd Ed., Prentice Hall.
3. Killian C.T. 2001. Modern Control Technology: Components and Systems, 2nd Ed, Delmar.
4. Pérez Adrover. 2012. Introduction to PLCs: A Beginner's Guide to Programmable Logic Controllers.
5. Dag H. Hanssen. 2015. Programmable Logic Controllers: A Practical Approach to IEC 61131-3 using CoDeSys.

SEMESTER 7

BMMU 4774
BACHELOR DEGREE PROJECT II/
PROJEK SARJANA MUDA II

LEARNING OUTCOMES
After completing the course, students will be able to:
1. Discuss solution to the proposed industry-based or practice- oriented project.
2. Demonstrate project findings using appropriate techniques with an understanding of its limitations.
3. Display self-reliance in working independently and cooperates in group activities.
4. Display the ability to present the project findings in oral and written forms effectively.
5. Report literature review and project potential in scientific manner with a recognition of the strengths, weaknesses and opportunity for improvement.

SYNOPSIS
This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES
1. Manual Projek Sarjana Muda (PSM), Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan, Universiti Teknikal Malaysia Melaka.

PRE-REQUISITE
BMMU 3764
BACHELOR DEGREE PROJECT I/
PROJEK SARJANA MUDA I

BMMM 4602
MAINTENANCE AWARENESS IN DESIGN/
KESEDARAN PENYELENGGARAAN DALAM REKA BENTUK

LEARNING OUTCOMES
After completing the course, students will be able to:
1. Justify the maintainability and reliability of a product and a system.
2. Integrate design and reliability tools in problem solving during product and system development.
3. Present the finding of reliability and design of a system or product in a team.

SYNOPSIS
Parameters that can be used when designing the MTTR, MTBF, learn from failure-feedback information to the machine design, FMEA, QFD, the House of Quality, analysis of serial and parallel system, redundancy concept, multiple criteria and resource allocation.

REFERENCES
1. Stephen J, 2005, Improving maintenance and reliability through culture change, Industrial Press Inc
2. David John Smith,2005., Reliability, Maintainability and Risk: Practical Methods for Engineer, 7th Ed. Butterworth-Heinemann
3. Rudolph Frederickstapelberg, 2009, Handbook of Reliability, Availability, Maintainability and Safety in Engineering Design.
4. Ricardo Manzini.Alberto Regattieri.Hoang Pham. Emilio Ferrari,2010, Maintenance for Industrial System, Springer.

BMMM 4623
OIL & WEAR DEBRIS ANALYSIS/
ANALISIS MINYAK DAN SERPIHAN

LEARNING OUTCOMES

After completing the course, students will be able to:

1. Analyze oil and wear debris using various oil analysis methods to determine oil quality.
2. Integrate the data collected through various oil analysis methods in order to analyze failures and cause of parameter changes in the oil.
3. Demonstrates problem solving of real life condition regards to oil analysis issues in a group assignment.

SYNOPSIS

This course the discuss role of oil and wear debris analysis as a method that applied in machinery maintenance. Properties of oil properties such as density, viscosity, etc are introduced. The effect of temperature and other factor that affects oil degradation during the machine operation are discussed. Standard testing and analysis method typically employed to characterize oil properties are introduced in this course. This course also discusses basic analysis method on wear debris samples resulting from the machinery components interactions that can be used to identify and troubleshoot the machines problem. Method of collecting oil and wear debris samples at regular rate also introduced.

REFERENCES

1. H. P. Bloch and F.K. Gentner, 2012. Machinery Failure Analysis and Troubleshooting, 4th Ed. Vol.2, Butterworth-Heinemann.
2. J. Denis, J. Briant, And J.C. Hipeaux, 2000, Lubricant Properties and Testing, Edition Technip.
3. R. C Mortier, M. F. Fox, S.T. Orszulik, 2012, Chemistry and Technology of Lubricants, Springer.
4. Bhushan, B, 2001., Vol. 2, Modern Tribology Handbook, Crc Press.
5. Bhushan, B. 2013. Introduction to Tribology 2nd. Ed. Wiley and Sons.

BMMM 4564
BUILDING INSPECTION AND MAINTENANCE/
PEMERIKSAAN DAN PENYELENGGARAAN BANGUNAN

LEARNING OUTCOMES

After completing the course, students will be able to:

1. Distinguish the system of mechanical services and basic electrical in building.
2. Construct maintenance and checking procedures for equipment and system in building through laboratory experiments.
3. Integrate mechanical services provided in building system into engineering practices.

SYNOPSIS

Students will be exposed to basic plant facilities, equipment and plant operations as well as various methods of plant inspection and essential practical skills necessary to ensure smooth operation of a plant. Basically in buildings: thermal comfort, the average temperature of the radiation, the index of the cold. Energy Economics: units, degree days, thermal conductivity. Calculation of heat loss: the thermal resistance, conductivity terms, polietana. Heating: district heating, heat pump, absorption, storage heaters. Ventilation and air cooling: thermal taste, mechanical ventilation. Water supply, hot and cold water: ball valve, zeolite, the secondary circulation. Sewage systems: close, sanitary equipment, ventilation flue. Service area and the plant: electricity sub-stations, mechanical aerators.

REFERENCES

1. Kevin Ruelle, Rick Kaletsky, 2006. OSHA Inspections: Preparation and Response, 10th Printing, National Safety Council.
2. Clifford Matthews, 2004. Handbook of MechanicalIn-Service Inspection: Pressure Systems and Mechanical Plant, Wiley.
3. Brian Wood, 2009, Building Maintenance, Wiley-Blackwell.
4. Ryan Cuzan, 2009, Manager's guide to building preventive maintenance, CRC press.
5. Chanter B., and Swallow,P., 2007, Building Maintenance management, Blackwell.

SEMESTER 8

BMMU 4786
INDUSTRIAL TRAINING/
LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the course, students should be able to:
1. Build technical competencies and skills gained through their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Develop effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor f Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

BMMU 4796
INDUSTRIAL TRAINING REPORT/
LAPORAN LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the course, students should be able to:
1. Produce industrial training report.
2. Present report orally on working experience.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE
Student required to pass Industrial Training BMMU 4786 in order to pass Industrial training report.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

BMMV COURSE CORE COURSES (K)

SEMESTER 1

BEEE 1013
TECHNICAL PHYSICS/
FIZIK TEKNIKAL

LEARNING OUTCOMES

Upon completion of this course, the student should be able to:

1. Apply the physics concept systematically in engineering.
2. Display an ability to follow lab procedure in handling physic experiment through lab session.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

This course will discuss about Mechanics: Physical Quantities and Measurements, Kinematics of Linear Motion, Force, Momentum and Impulse, Work, Energy and Power, Static, Circular Motion, etc. Properties of Matter: Static, Dynamics, Circular Motion, Simple Harmonic, Moment of Inertia, Density and Specific Gravity, Hydrostatics, Elasticity, Friction, Viscosity, Osmosis, Diffusion, Acceleration and Newton's Second Law of Motion, Motion with a Changing Velocity and Ohm law. Thermodynamics, Wave, Light & Sound. All topics covered are basic knowledge that essential for engineering programs.

REFERENCES

1. Giancolli DC, "Physics for Scientists and Engineers with Modern Physics", 5th Edition, Pearson Prentice Hall, 2021.
2. "Physics for Scientists and Engineers with Modern Physics", 10th Edition, Cengage learning, 2019.
3. Giambatista A., Richardson B.M and Richardson R.C., "College Physics", 5th Edition, Mc-Graw Hill, 2020.
4. Walker J.S., "Physics", 5th Edition, Addison Wesley, 2017.

BMMA 1333
STATICS/
STATIK

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Describe the physical sciences of statics concepts.
2. Construct statics experiments to recognize the engineering mechanics of statics principles.
3. Explain effectively as an individual and assist group members for experimental and assignment works.

SYNOPSIS

An introduction to the basic concept of statics as physical sciences, system of units, scalars and vectors, free body diagram, forces system, force system resultants and moment, equilibrium of a particle, equilibrium of a rigid body, structural analysis (trusses analysis and simple frames and machines), friction and center of gravity and centroid.

REFERENCES

1. Hibbeler R.C., 2017, Engineering Mechanics Statics, 14th SI Ed., Prentice Hall, New York.
2. Beer, F. P. And Johnston Jr., E. R. And Eisenberg, E. R., 2016, Vector Mechanics for Engineers - Statics, 11th Ed. in SI Units, Mcgraw Hill, New York.
3. Meriam, J. L. and Kraige L. G., 2014, Engineering Mechanics Static SI Version, 8th Ed., John Wiley & Sons, New York.
4. Pytel and Kiusaalas. 2017. Engineering Mechanics-Static. 4th Ed. Cengage Learning.
5. Michael P., Gary G.,F. Constanzo 2013. Engineering Mechanics- Statics.2nd Es. Mcgraw-Hill Higher Education.

BMMA 1303
ENGINEERING GRAPHICS/
GRAFIK KEJURUTERAAN

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Apply fundamental of technical drawing to produce standard mechanical part and assemblies drawing documents.
2. Construct typical mechanical engineering drawing using CAD software.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams.

SYNOPSIS

The course concentrates on computer aided design (CAD) software. AutoCAD engineering drawing software is used to produce standard engineering drawing. The students will be exposed to cad interface, editing commands, coordinate system, template preparation and layer in order to produce various types of engineering drawings.

REFERENCES

1. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. and Novak, J. E.,Lockhart S., 2016, Technical Drawing With Engineering Graphics, 15th Ed., Pearson & Prentice Hall, New Jersey.
2. Mark Dix, Paul Riley, 2017, Discovering Autocad 2017, Prentice Hall, London.
3. Scott Onstott, 2013, Autocad 2014 And Autocad Lt 2014 Essential, John Wiley & Sons, Inc.
4. Cheryl R. Shrock And Steve Heather, 2014, Beginning Autocad 2015, Industrial Press, Inc.

BMMA 1313
PRINCIPLE OF ELECTRIC & ELECTRONIC/
PRINSIP ELEKTRIK & ELEKTRONIK

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Apply basic electrical and electronic concept in solving circuits problem.
2. Develop electrical circuit and justify the measured values using appropriates approach.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams.

SYNOPSIS

This course will cover on the topics of electrical and electronic components, emphasizing on electric circuit theory such as components and measurement instruments, circuit analysis. For electronic principle, it will cover on the topics of electronic devices such as operational amplifiers and digital electronics it will deals with topics such as system numbers, logic gates, boolean operation, combination logic circuits, and digital circuit application.

REFERENCES

1. Thomas L. Floyd, 2014, Principles Of Electric Circuits, 9th Ed., Prentice Hall.
2. Thomas L.Floyd, 2015, Digital Fundamental, 11th Ed., Pearson Education.
3. Alexander, C.K., 2017, Fundamental Of Electric Circuit, 6th Ed., Mcgraw Hill.
4. Nilsson, J. W. and Riedel, S. A., 2015, Electric Circuit, 10th Ed., Prentice Hall.
5. Roger Tohkeim, 2014, Digital Electronics Principles & Applications, 8th Ed., Mcgraw Hill.

SEMESTER 2

BMMV 1013
TECHNICAL CHEMISTRY/
KIMIA TEKNIKAL

LEARNING OUTCOMES
At the end of this course, the students should be able to:
1. Explain the fundamental of chemistry principle.
2. Demonstrate technical chemistry principles through laboratory experiment
3. Discuss technical solution for engineering problems using relevant chemistry principles.

SYNOPSIS
The course introduce the concepts in chemistry: Chemistry and Measurement; Atoms, Molecules and Ions; Chemical Reaction and Stoichiometry; Electronic Structure and Periodic Table; Chemical Bonding; Properties of Matter; Thermochemistry.

REFERENCES
1. Chang, Raymond (2019). “Chemistry”. 13th Ed. McGraw Hill. USA.
2. Timberlake (2020). “Basic Chemistry”. 6th Ed. Pearson Education International.
3. Halimaton Hamdan et al. (2001). “Kimia Asas Sains dan Kejuruteraan”. Johor Bahru.

BMMA 1323
ENGINEERING DESIGN/
REKA BENTUK KEJURUTERAAN

LEARNING OUTCOMES
At the end of this course, the students should be able to:
1. Categorize the methods and design concepts used in the engineering design process.
2. Composes a working design prototype to meet specified needs with appropriate consideration on the learned methods in the engineering process.
3. Develop an awareness of project management in the engineering design process.

SYNOPSIS
The methodology of design solutions and best practices in product design. Latest product development: the determination of market needs, determination design specifications, engineering concept generation, concept selection, detailed product specification, functional analysis, material selection. Innovative solutions. Creativity in the industry design, design visualization and anthropometric. Portfolio preparation and presentation.

REFERENCES
1. Ulrich, K. T. and Eppinger, S. D. 2016. Product Design and Development, New York McGraw-Hill Education.
2. Rudolph J Eggert, Second Edition 2005. Engineering Design. Pearson Prentice Hall.
3. Ullman, D.G. 2016.The Mechanical Design Process, 5th Ed., New York McGraw-Hill Education.
4. Cross, N., 2008. Engineering Design Methods: Strategies for Product Design, 4th Ed., John Wiley And Sons, West Sussex UK.

BMMP 1303
MANUFACTURING PRACTICES/
AMALAN PEMBUATAN

LEARNING OUTCOMES

At the end of this course, the students should be able to:

1. Demonstrate proper use of all equipment and requirement
2. Produce product based on technical drawing that meet specific tolerance.
3. Perform the process according to the proper procedure.

SYNOPSIS

The practice consists of introduction to basic knowledge of using manual hand tools and equipment, machine tools, welding, fabrication, lathe, milling, and some manual work within manufacturing daily activities. It introduces common equipment for performing manufacturing works such as lathe and milling machine, arc welding, TIG/MIG welding, sheet metal forming etc. Due to its nature as introductory course, students are required to prepare at home before having the practice to acquire any knowledge concerning the practices.

REFERENCES

1. Kalpakjian, S. and Schmid R. (2020), Manufacturing Engineering and Technology, 8th Edition, Prentice Hall.
2. Mikell P. Groover, Fundamentals of Modern Manufacturing Materials, Processes, and Systems, 7th Edition, John Wiley & Sons, 2019.
3. Mikell P. Groover, Principles of Modern Manufacturing SI Version, 6th Edition, John Wiley & Sons, 2016.

BMMP 1313
ENGINEERING MATERIALS/
BAHAN KEJURUTERAAN

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Explain the structures, properties and processing of engineering materials.
2. Display the ability to determine the microstructures and mechanical properties of various materials.
3. Construct solution for engineering material problems.

SYNOPSIS

This course introduces basic concepts of engineering materials that covers introduction to engineering materials, inter-atomic bonding, crystalline structure and imperfections in solid. Explanation on different type of engineering materials (i.e. metal, polymer, ceramic, composite and semiconductor), its mechanical properties, basic application and processing are also included. Introduction to the binary phase diagrams (composition and microstructure correlation) is also given.

REFERENCES

1. Callister W.D. and Rethwisch D.G, 2018, Fundamentals of Materials Science and Engineering, 5th Edition, John Wiley & Sons.
2. Smith W. F., 2019, Foundation of Materials Science and Engineering, 6th Edition, Mcgraw Hill.
3. Askeland D. R., 2016, The Science and Engineering of Materials, 7th Edition, Cl-Engineering.
4. Serah, A. M., 2017, Engineering Materials for Engineering Technologist. Melaka: Universiti Teknikal Malaysia Melaka.

BMMP 2503
MEASUREMENT AND INSTRUMENTATION/
PENGUKURAN DAN INSTRUMENTASI

LEARNING OUTCOMES
At the end of this course, the students should be able to:
1. Analyse the basic elements of common measurement systems.
2. Perform suitable measurement methods for a given issue.
3. Measure the performance of a measurement system.

SYNOPSIS
Measurement and instrumentation course covers three main areas; dimensional metrology, measurement analysis, and surface/texture measurement. In the dimensional metrology, students will be expose to three types of measurements; linear, angle and geometrical. Besides that, measurement of screw thread also covered in this course. Students will be taught from basic measuring instruments and will be introduced to the usage of the high precision measuring instruments that are Coordinate Measuring Machine and CNC Roundness measuring. In the measurements analysis, students will be required to describe the standard Measurement, measurement process, process capability, measurement errors, limits, tolerances and fits. In surface/texture measurement, students will perform the measurement of surface texture.

REFERENCES
1. Lau Kok Tee, and Saiful Naim Sulaiman (2020) Dimensional Measurement and Instrumentation for Technologist, Penerbit Universiti, Universiti Teknikal Malaysia Melaka
2. Connie, D. (2015). Fundamentals of Dimensional Metrology, 6th Edition. Cengage Learning.
3. Kalpakjian, S., Schimd, S. R., (2014). Manufacturing Engineering and Technology, 7th Edition. Prentice Hall.
4. Bucher, J. L. (2012). The Metrology Handbook, 2nd Edition. SQ Quality Press.
5. Campbell, R. G., Roth, E. S. (2002). Integrated Product Design and Manufacturing Using Geometrical Dimensioning and Tolerancing. Marcel Dekker, Inc.

SEMESTER 3

BMMA 2343
MICROPROCESSOR TECHNOLOGY/
TEKNOLOGI MIKROPEMPROSES

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Describe the basic concepts of digital system, combinational and sequential logic circuit.
2. Explain the microprocessor fundamental, internal architecture of microprocessor and programming technique.
3. Follow the lab manual to complete tasks and assignment as individual or in group effectively.

SYNOPSIS
This course will essentially divide into two sections; digital electronics and microprocessor. The first section covers topics on digital electronic that include Introduction to Digital Concepts, Logic Gates, Combinational Logic and Data Control Devices Flip Flops and Sequential Logic Circuits. The next section will deal with topics such as Microprocessor Fundamentals, Introduction to Intel 8085 Microprocessor Hardware, Introduction to Intel 8085 Microprocessor Software and Programming Techniques with Additional Instructions.

REFERENCES
1. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, 6th Edition, Prentice Hall, 2013.
2. William Kleitz, Digital and Microprocessor Fundamental, 4th Edition, Prentice Hall, 2003.
3. Barry B. Brey, The Intel Microprocessor, 7th Edition, Prentice Hall, 2006.

BMMP 1323
MANUFACTURING PROCESS/
PROSES PEMBUATAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Explain the fundamental concepts of manufacturing processes.
2. Differentiate the application of various manufacturing processes.
3. Construct various skills of manufacturing techniques as an individual or a group.

SYNOPSIS

This course introduces the students to manufacturing and the aspects of manufacturing, metal-casting processes and equipment's, forming and shaping processes and equipment's, joining processes, manufacturing materials, and material-removal processes and machines.

REFERENCES

1. S. Kalpakjian, S.R. Schmid, Manufacturing Engineering and Technology SI Edition, Prentice Hall, 2014.
2. M.P. Groover, Fundamentals of Modern Manufacturing. Materials, Processes and Systems 4th Edition, John Wiley & Sons, Inc, 2010.
3. M. P. Groover, Introduction To Manufacturing Processes, 3rd Edition, Hoboken, NJ: Wiley, 2012.
4. P. N.Rao, Manufacturing Technology Foundry, Forming and Welding, 1st Edition, Mc Graw Hill, 2009.
5. P. N. Rao, Manufacturing Technology Metal Cutting and Machine Tools, 2nd Edition, Mc Graw Hill, 2009.
6. Amitabha Ghosh, Asok Kumar Mallik, Manufacturing Science, EWP New Dehli, 2009.

BMMH 2303
THERMODYNAMICS/
TERMODINAMIK

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply the basic concepts of thermodynamics, the First Law of Thermodynamics and the Second Law of Thermodynamics to closed and open systems.
2. Follow instructions in laboratory sheets when conducting thermodynamic experiments.
3. Complete individual or group assignments within the time given.

SYNOPSIS

This course covers the basic concepts and definitions of engineering thermodynamics, energy, work and heat, properties of pure substances (relationships of *P-v, T-v, P-T* and *T-s* diagrams), First Law of Thermodynamics, Second Law of thermodynamics and Entropy.

REFERENCES

1. Cengel, Y. A. and Boles, M. A..2014. Thermodynamics: An Engineering Approach, 8th Ed, McGraw Hill. Singapore.
2. S.C. Gupta, 2008. Thermodynamics, 1st Ed, Pearson Education (Singapore) Pte. Ltd.
3. Sonntag, R.E., Borgnakke. C, Van. and Gordon J., 2008. Fundamentals of Thermodynamics, 7th Edition, John Wiley & Sons, Inc.New York.
4. Eastop, T. D., And Mcconkey, A., 2011, Applied Thermodynamics for Engineering Technologists, 5th Ed, Pearson & Prentice Hall. New York.

BMMH 2313
FLUID MECHANICS/
MEKANIK BENDALIR

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply fluid mechanics concept in solving fluid statics and fluid dynamics problem.
2. Measure related parameter by using appropriate techniques in fluid mechanics application.
3. Demonstrate the ability to complete tasks and assignment as a leader or a member in group effectively.

SYNOPSIS

Introduction to this course is about the basic physical properties of fluids. Then it covers the definition of pressure and head. Next it followed by derivation of hydrostatic equation and its application in pressure measurement, static forces analysis on immersed surface and buoyancy analysis. For fluid dynamics, it started with introduction to fluid dynamics and fluid flow analysis. Then it is continued by derivation of flow equations, the application of energy equation and Bernoulli equation in the calculation of flow velocity, discharge, and head lost in piping systems. The last topic for this course is dimensional analysis and its application.

REFERENCES

1. Munson, B. R., Young D. F. and Okiishi, T. H., 2012, Fundamentals of Fluid Mechanics, 7th Ed., John Wiley & Sons, Inc, Asia.
2. Som, S. K. and Biswas, G., 2010, Introduction to Fluid Mechanics and Fluid Machines, Revised 2nd Ed., Tata McGraw-Hill, New Delhi.
3. Douglas, J. F., Gasiorek J. M. and Swaffield, J. A., 2011, Fluid Mechanics, 6th Ed., Prentice Hall, Spain.
4. Kundu, P. K., Cohen, I. M. and Dowling, D. R., 2011, Fluid Mechanics, 5th Ed., Academic Press, Waltham, USA.

SEMESTER 4

BMMA 2353
MODELING AND COMPUTER ANALYSIS/
PERMODELAN DAN ANALISIS BERKOMPUTER

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply fundamental of engineering and technical drawing in mechanical design using advance CAD tools.
2. Conduct computer modelling, design and analysis using advanced CAD tools.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams.

SYNOPSIS

This course will empower the students with fundamental knowledge and technical skills of 3D solid modeling skills using industry-proven 3d mechanical cad software. The students will learn about the different techniques for creating surface and solid models with emphasis on design intent. The course includes hands-on exercises and best practice methods for students to interpret common error messages during part, assembly and drafting stages.

REFERENCES

1. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. And Novak, J. E.,Lockhart S., 2016, Technical Drawing With Engineering Graphics, 15th Ed., Pearson & Prentice Hall, New Jersey.
2. Planchard, D. & M. Planchard, Engineering Design With Solidworks 2012, Schroff Development Corporation, 2012.
3. Kirstie Plantenberg (2011), Introduction To Catia V5 Release 19 (A Hands-On Tutorial Approach), Schroff Development.

PRE-REQUISITE

BMMA 1303
ENGINEERING GRAPHICS/
GRAFIK KEJURUTERAAN

BMMM 2303
SOLID MECHANICS/
MEKANIK PEPEJAL

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply the knowledge and principles of mechanics of materials in engineering design.
2. Identify appropriate experimental techniques in mechanics of material through laboratory experiments.
3. Demonstrate the ability to complete engineering project using the principle of mechanics of material in group effectively.

SYNOPSIS

The course contains topics of introduction, stress, strain, Hooke's law, bending, mechanical properties, transformation of stress, axial load, transformation of strain torsion, beam bending, transverse shear, combined loadings, deflection of beams and shafts and Mohr's circle.

REFERENCES

1. Hibbeler R.C., 2013, Statics and Mechanics of Materials, 3rd SI Ed., Prentice Hall, New York.
2. Beer. F.P. Et Al. 2012. Mechanics Of Materials, 6th Edition in SI Units. Mcgraw-Hill.
3. Beer. F.P. Et Al. 2011. Statics and Mechanics of Materials, 1st Edition. Mcgraw-Hill.
4. Beer, F. P. And Johnston Jr., E. R. and Eisenberg, E. R., 2010, Vector Mechanics For Engineers - Statics, 9th Ed. in SI Units, Mcgraw Hill, New York.
5. Roy Craig Jr., 2011, Mechanics of Materials, 3rd Ed., John Wiley & Sons, New York.

PRE-REQUISITE

BMMA 1333
STATICS / STATIK

BMMM 2313
DYNAMICS & MECHANICS OF MACHINE/
DINAMIK & MEKANIK MESIN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Describe the concept and principle of dynamics and mechanics of machine element.
2. Demonstrate the dynamics and mechanics of machine laboratory experiments.
3. Synthesize dynamics and mechanics of machine fundamentals into engineering practices.

SYNOPSIS

Introduction to basic principles based on kinematic and kinetic dynamics. The concept of displacement, distance, velocity, speed and acceleration. Application of newton's second law. The principle of work and energy, impulse and momentum of particles and rigid bodies. Transmission system based on the friction of motion, such as belts, brakes and dibble. Based delivery systems such as chains and gear teeth. Gear system. Balancing the dynamic system that includes balancing the body rotating plane and a parallel plane. Balancing of reciprocating motion as the body line of engines, radial engines and engine. Gyroscopic motion that includes a couple gyroscope. Gyro scope coupling effects. Simple harmonic motion and vibration consists of moving one degree of freedom. Free vibration. Damped free vibration. Forced damped vibration. Speed control of the cycle flywheel.

REFERENCES

1. Beer, F. P., Johnson, E.R., Clausen, W. E., (2013) Vector Mechanics For Engineers, Dynamics Si Units, 10th Edition. Mcgraw-Hill.
2. Hibbeler, R. C. (2013) Engineering Mechanics, Dynamics, 12th Edition. Prentice Hall.
3. Meriam, J. L. And Kraige, L. G. 2013. Engineering Mechanics, SI Version, 7th Edition. John Wiley.
4. Bedford, A. and Fowler, W. 2008. Engineering Mechanics: Dynamics (SI Units). 5th Edition.Prentice Hall.
5. Cleghorn, W. L., 2005, Mechanics of Machines, Oxford University Press.

PRE-REQUISITE
BMMA 1333
STATICS/ STATIK

**BMMH 3553
HEAT TRANSFER/
PEMINDAHAN HABA**

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Solve analytically and numerically problems related to performance evaluation and design of heat transfer equipment's.
2. Assemble laboratory equipment's according to the parameters investigated when conducting heat transfer equipment's.
3. Complete individual or group assignments within the time given.

SYNOPSIS
The introduction of the concept and definition of heat transfer engineering, energy, work, material thermal properties, mass transfer, the laws of the theory, empirical and analytical relationships. Numerical rules. Unsteady state conduction. Numerical analysis. Heat Transfer Simulation solution. Natural convection. Forced convection in laminar and turbulent flow in the plane and pipes. Phase change heat transfer. Thermal radiation on the body and a black surface. Low rate of heat transfer. Evaporation and condensation.

REFERENCES
1. Holman, J.P (2010). Heat Transfer. 10th SI Edition. McGraw Hill: Singapore.
2. Incopera, F.P. & Dewitt, D.P. (2014). Fundamental of Heat and Mass Transfer. 5th Edition, John Wiley and Sons: Toronto.
3. Cengel, Yunus A. (2011). Heat transfer: A Practical Approach. 4th Edition, McGraw Hill: New York.

**BMMM 2333
PNEUMATIC AND HYDRAULIC TECHNOLOGY/
TEKNOLOGI PNEUMATIK DAN HIDRAULIK**

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply knowledge of engineering fundamentals in order to analyse performance of hydraulic and pneumatic system.
2. Troubleshoot hydraulic and pneumatic system manually and using software.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams.

SYNOPSIS
This course covers the introduction of the hydraulic and pneumatic systems, types of pump, compressor and their working principles, types of valve, actuator and their usage, performance of the fluid power system, others fluid power system ancillaries and sensors, fluid power system circuit design and analysis with manual control and electrical control, fluid power symbols, the usage of computer software to design and simulate the fluid power system circuit, the usage of programmable logic controller in fluid power system circuit design and the application of fluid power in robotic and mobile hydraulic.

REFERENCES
1. Ilango S. 2007. Introduction to Hydraulics and Pneumatics. Prentice Hall-India. New Delhi.
2. Esposito A. 2003. Fluid Power with Applications .6th Ed. Prentice Hall. New Jersey.
3. Johnson, J.L. 2002. Introduction to Fluid Power. Delmar. New York.
4. Majumdar SR. 2002. Oil Hydarulic System Principles and Maintenance. Tata-McGraw Hill. New York.
5. Hehn A.H. 1993. Fluid Power Handbook.Vol 1. Gulf Publishing Company. Texas.

SEMESTER 5

BMMH 3323
CONTROL & INSTRUMENTATION/ KAWALAN & INSTRUMENTASI

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Construct experiments to determine the performance of controller and sensor elements or transducer.
2. Describe the dynamic behavior of the system through analysis of the system response.
3. Report the analysis of transient and steady state performance for first and second order control systems.

SYNOPSIS

At first, this course shall discuss the concept of instrumentation, the important of sensor, signal conditioning and data acquisition. Then it shall discuss the fundamental of control system; open and closed loop system; transfer function; block diagram reduction and signal flow graphs; modelling for electrical system, mechanical system and electromechanical system; transient and steady-state performance for first and second order systems; Routh Hurwitz criteria for stability and steady-state error analysis.

REFERENCES

1. Syed Najib and Maslan, 2nd Control Systems Engineering, Penerbit Utem, 2006.
2. Khalil Azha Mohd Annuar Et. Al., Control & Instrumentation, Penerbit Utem, 2015.
3. Alan S. Moris and Reza Langari, Measurement and Instrumentation: Theory and Application, Academic Press, 2011.
4. Norman S. Nise, Control Systems Engineering, 6th Edition, John Wiley & Sons Inc., 2011.
5. Richard C. Dort, Robert H. Bishop, Modern Control Systems, 12th Edition, Pearson, 2011.

BMMV 3033
PROJECT MANAGEMENT/ PENGURUSAN PROJEK

LEARNING OUTCOMES

At the end of the course, students should be able to:

1. Apply the core concepts and principles, functions, and process in project management.
2. Justify the important skills required and the necessary implementation methodology/ formulation in project management.
3. Develop a comprehensive & viable Project Proposal and deliver a presentation of the proposal.

SYNOPSIS

Project management is the systematic planning and co-ordination of people, activities and resources to ensure that a complex undertaking can be successfully achieved within a given time frame and budget. Classic project management has five main phases: initiation, planning, executing, controlling, and closing. The first phase is when the overall aim and enabling objectives are defined. It is the point at which a project manager can be identified along with the stakeholders in the project. The stakeholders include anyone likely to be affected by the execution and outcome of the project. The scope of the project then needs to be agreed, the resources checked, the team assembled and the risks assessed.

REFERENCES

1. Meredith, Mantel, Shafer and Sutton (2014). Core Concepts: Project Management in practice, 5th Edition, John Wiley & Sons.
2. Pinto, K. Jeffrey. (2016). Project Management, Achieving Competitive Advantage, 4th Edition. Pennsylvania State University, Prentice Hall.
3. Rosenau, M. (2005). Successful Project Management, 3 Ed., John Wiley & Sons.
4. Meredith, J., Mantel, S. and Mantel, S. Jr. (2009). Project Management: A Managerial Approach. New York, John Wiley & Sons Inc.

5. Gray, C.F and Larson, E.W, (2006). Project Management; A Managerial Perspective. McGrawHill
6. Russell, D., (2003). Managing High-Technology Programs and Projects, (3rd Edition). New York, John Wiley & Sons Inc.
7. Zaharna, R. S. (2001). Proposal Writing Handbook, Centre for Studies, Consultant and Technica Service. New York and Najah National University, Nablus.

BMMU 3803
INTEGRATED DESIGN PROJECT/
PROJEK REKABENTUK BERSEPADU

LEARNING OUTCOMES

At the end of the course, students should be able to:

1. Design solution by synthesizing manufacturing engineering technology knowledge that will solve broadly-defined engineering technology problems in accordance with relevant standards.
2. Utilize modern engineering technology and IT tools in facilitating solutions to broadly-defined engineering technology problems with an understanding of the limitations.
3. Evaluate the impact of the design product, component or processes in term of safety, environmental and sustainability factors.

SYNOPSIS

Integrated Design Project is a course where students have to design an engineering technology project to solve broadly defined problem. Broadly defined problem is engineering problems which cannot be pursued without a coherent and detailed knowledge of defined aspects of a professional discipline with a strong emphasis on the application of developed technology. The design project activities include project management, project planning, project management, design selection, design costing and sizing, analysis and evaluation. The course focuses on the implementation and integration of product/conceptual design development to produce a comprehensive final technical report, including engineering proposals and drawings, specifications and bills of material, cost estimates of development projects given to students, working in groups. Apart from basic engineering design, students are also required to integrate their knowledge of other engineering disciplines such as (but not limited to) structural analysis and design, including material selections, project scheduling techniques and sustainable development considerations into their overall project work. At the end of this course, the students will be able to comprehend the needs and requirements for product design procedures and are able to appreciate the importance of integration and synthesis of various disciplines of manufacturing, mechanical, etc and engineering knowledge.

REFERENCES

1. Ulrich, K. T. and Eppinger, Steven D., 2012, Product Design and Development, 5th Edition, McGraw Hill.
2. Chitale, A. K. and Gupta, R. C., 2006, Product Design and Manufacture, 3rd Edition, Prentice Hall, New Delhi, India.
3. Kalpakjian, S. and Schmid, S. R., 2001, Manufacturing Engineering & Technology, 4th Edition, Prentice Hall.
4. Cross, Nigel, (2010) Engineering Design Methods, Wiley.
5. W.Bolton, Mechatronics electronic control systems in mechanical and electrical engineering, 4th Ed., Prentice Hall, 2008.
6. Kutz, Myer, Mechanical Engineers Handbook-Manufacturing and Management, 3rd ed., John Wiley 2006.

BMMH 2503
FUNDAMENTAL OF HVAC & REFRIGERATION/
ASAS HVAC & PENYEJUKAN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Categorise the principle of vapour compression refrigeration cycle for air-conditioning and refrigeration.
2. Construct experiment on vapour compression cycle application.
3. Explain the important of recovering of recycling used refrigerants to prevent environmental damage.

SYNOPSIS
This course deals with an introduction to the refrigeration and air conditioning system. Carnot cycle and thermodynamics properties phase diagrams such as p-h, T- s and p-v. Vapour compression and absorption refrigeration system. Working media used in the heating, ventilating and air conditioning (HVAC) system.

REFERENCES
1. A. G.F. Hundy, A.R. Trott & T.C. Welch 2008 Refrigeration and Air-conditioning. 4th Ed. Amsterdam: Butterworth-heinemann
2. B. Mcquiston. F. C. And Parker J. D.2005. Heating Ventilation and Air Conditioning: Analysis and Design. 6th Ed. New York: John Wiley. C.
3. Yunus Cengel And Michael Boles. 2015. Thermodynamic: An Engineering Approach. 8th Ed. Singapore: Mc Graw Hill Inc.
4. D. Jones W.P. 1980. Air Conditioning Applications and Design. New York: Edward Arnold(publisher) Ltd.
5. E. Jones W.P. 1985. Air Conditioning Engineering. New York: Edward Arnold (Publisher) Ltd.
6. F. Johnson W.M. 1997. Practical Cooling technology. New York: Delmar Publisher Usa

BMMV 3043
MECHANICAL VIBRATION/
GETARAN MEKANIKAL

LEARNING OUTCOMES
At the end of the course, students should be able to:
1. Analyze vibration for one and two degree of freedom systems in a simple engineering practice.
2. Solve the natural frequencies and mode shapes of a vibrating system.
3. Explain basic techniques of vibration control.

SYNOPSIS
Fundamental of vibration. One-degree-of-freedom system: free vibration of an undamped and damped systems. Harmonically excited vibration: forced undamped and damped systems; unbalance rotating mass; base excitation. Two-degree-of-freedom system: natural frequencies and mode shapes. Continuous structures: beam, string and plates. Design of vibration suppression: vibration isolation and vibration absorber.

REFERENCES
1. S. S. Rao, Mechanical Vibrations, 5th edition: Prentice Hall, 2018.
2. S. G. Kelly, Mechanical Vibrations: Theory and Applications, Cengage Learning, 2011.
3. L. Meirovitch, Fundamental of Vibration, McGraw-Hill, 2010.
4. D.J. Inman, Engineering Vibrations, 3rd edition, Pearson Education Inc, 2008.
5. S. G. Kelly, Schaum's Mechanical Vibrations, McGraw- Hill, 2006.

SEMESTER 6

BMMU 3764
BACHELOR DEGREE PROJECT I/
PROJEK SARJANA MUDA I

LEARNING OUTCOMES

At the end of the course, students should be able to:

1. Apply knowledge to proposal preparation of industry-based or practice-oriented project.
2. Imitate appropriate existing concepts in engineering technology fields.
3. Adhere to project's dateline and related procedure.
4. Explain the project proposal in oral and written forms effectively.
5. Report literature review and preliminary findings in a scientific manner.

SYNOPSIS

The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES

1. Bachelor Degree Project Manual, Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan, Universiti Teknikal Malaysia Melaka.

BMMV 3053
COMPUTATIONAL SIMULATION/
SIMULASI BERKOMPUTER

LEARNING OUTCOMES

At the end of the course, students should be able to:

1. Develop an understanding for the theory and mathematical formulas used in solving a finite element analysis (FEA)
2. Perform the preprosessing, solving and post prosessing methods in CAE standard software.
3. Demonstrate verbally through presentation of simulation results based on mechanical engineering knowledge.

SYNOPSIS

This course provides students with an understanding of the numerical procedures in CFD and structure analysis through FEA. It will also deliver a proper background for the intelligent and appropriate use of commercial CFD and FEA software.

The course covers the basic concepts of fluid flow, introduction to CFD, solution of the Navier-Stokes Equations, turbulent flows, derivation of governing equations, discretization of governing equations using the finite difference and volume techniques, convergence acceleration, practical exercise using CFD software, introduction to finite elements method, formulation/variational methods including potential energy and Galerkin methods and practical exercise using FEA software.

REFERENCES

1. Andersson, B., Andersson, R., Hakansson, L., Mortensen, M., Sudiyo, R. & Wachem, B.V., 2012, Computational Fluid Dynamics for Engineers, Cambridge University Press.
2. Anderson, J.D., 2006, Computational Fluid Dynamics The Basic with Application, McGraw-Hill: Singapore.
3. Chandrupatla, T.R. and Belegundu, A.D., 2012, Introduction to Finite Elements in Engineering, 4th Edition, Prentice Hall, New Jersey.
4. Saeed, M, 2008, Finite Element Analysis: Theory and Application with ANSYS, 3rd Edition, Pearson, New Jersey.

BMMV 3063
ENVIRONMENT & SUSTAINABILITY/
KELESTARIAN & ALAM SEKITAR

LEARNING OUTCOMES

At the end of the course, students should be able to:

1. Explain the concept of environmental management and sustainability in according to needs of Environmental Quality Act 1974 and its regulations.
2. Demonstrate type of pollution control system and conduct performance monitoring based on the environmental pollution problem.
3. Apply the Cleaner Production Concept for adapting the sustainable consumption and protection to solve environmental problem.

SYNOPSIS

In moving towards developed country and high income nation in 2020, industrial activities contribute significant impact to the economic growth and environment. To ensure the growth able to meet the need of sustainable development, industries have to eliminate, mitigate and reduce pollution arises from their industrial activities according to existing guidelines, laws and regulations. Therefore, this course will introduce various types of pollution control methods ranging from industrial effluents treatment system, air pollution control system and hazardous waste management.

REFERENCES

1. Davis, Mackenzie L, and David A Cornwell. Introduction to Environmental Engineering. 5th Edition. Singapore: Mc Graw Hill, 2013.
2. Davis, Mackenzie L, and Susan J Masten . Principle of Environmental Engineering and Science. New York: McGraw-Hill, 2014.
3. Peavy, Howard S, Donald R Rowe, and George Tchobanoglous. Environmental Engineering. Singapore: Mc Graw Hill , 1895
4. ILBS. Environmental Quality Act 1974. International Law Book Services, 2015

SEMESTER 7

BMMU 4774
BACHELOR DEGREE PROJECT II/
PROJEK SARJANA MUDA II

LEARNING OUTCOMES

After completing the course, students will be able to:

1. Discuss solution to the proposed industry-based or practice- oriented project.
2. Demonstrate project findings using appropriate techniques with an understanding of its limitations.
3. Display self-reliance in working independently and cooperates in group activities.
4. Display the ability to present the project findings in oral and written forms effectively.
5. Report literature review and project potential in scientific manner with a recognition of the strengths, weaknesses and opportunity for improvement.

SYNOPSIS

This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES

1. Bachelor Degree Project Manual, Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan, Universiti Teknikal Malaysia Melaka.

PRE-REQUISITE

BMMU 3764
BACHELOR DEGREE PROJECT I/
PROJECT SARJANA MUDA I

SEMESTER 8

BMMU 4786
INDUSTRIAL TRAINING/
LATIHAN INDUSTRI

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Build technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the logbook systematically.
3. Develop effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor f Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES

1. UTeM Guideline Handbook for Industrial Training.

BMMU 4796
INDUSTRIAL TRAINING REPORT/
LAPORAN LATIHAN INDUSTRI

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Produce industrial training report.
2. Present report orally on working experience.

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE

Student required to pass Industrial Training BMMU 4786 in order to pass Industrial training report.

REFERENCES

1. UTeM Guideline Handbook for Industrial Training.

BMMV 4103
PRINCIPLES OF ENVIROMENTAL TECHNOLOGY/
PRINSIP TEKNOLOGI ALAM SEKITAR

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Analyse the impact of development to the environmental degradation.
2. Handle a project to manage effective environmental management plan.
3. Describe the philosophy of environmental engineering and technology.

SYNOPSIS

Population, economic growth, industrialization, urbanization and energy-use, as causes of environmental pollution. Mass and energy balance for environmental engineering systems under steady state and unsteady state conditions. Physical and transport properties of homogeneous and heterogeneous mixtures. Contaminant partitioning and transport in air, water and solids. Characteristics of particles, chemistry of solutions and gases, material balances, reaction kinetics, microbiology and ecology, as related to the environment. Application of environmental principles (technical and non-technical) to: water resource management, water and wastewater treatment, air pollution control, solid waste management, environmental impact assessment, and environmental ethics. Thermal pollution, noise pollution, greenhouse effect, acid precipitation, ozone depletion, air toxics, and ground-level ozone and fine particulates (photochemical smog). Sustainable development, life cycle analysis, and principles of environmental quality objectives, standards and guidelines.

REFERENCES

1. Master, G.M. & Ela, W.P., 2015, Introduction to Environmental Engineering, Pearson Education.
2. Davis, M.L. & Cornwell, D.A., 2012, Introduction to Environmental Engineering, 5th edition, McGraw-Hill.
3. Master, G.M. & Ela, W.P., 2008, Introduction to Environmental Engineering and Science, 3rd Edition, Pearson Education.
4. Harper, C.L., 2011, Environment and Society: Human Perspectives on Environmental Issues, 5th Edition. Routledge: Taylor & Francis Group.

BMMV 4113
WATER AND WASTE WATER TECHNOLOGY/
TEKNOLOGI AIR DAN AIR SISA

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Able to apply type of water and wastewater treatment technology to treat different type of pollution in water and wastewater.
2. Develop a performance monitoring plan for water treatment and industrial effluent treatment facility.
3. Explain the philosophy of water and wastewater treatment process on sustainable development.

SYNOPSIS

The course outlines the introduction water and wastewater treatment engineering and technology. The course covers the primary, secondary and tertiary water and wastewater treatment facility technology. The specific technology requires different performance monitoring to ensure its optimum efficiency.

REFERENCES

1. George Tchobanoglous, Franklin L. Burton, Metcalf & Eddy, H. David Stensel, 2003, Wastewater Engineering: Treatment and Reuse McGraw-Hill, ISBN 9780071241403.
2. Mark J. Hammer 2013, Water and Wastewater Technology, Pearson Education, ISBN 9781292021041
3. Nicholas P. Cheremisinoff, 2001, Handbook of Water and Wastewater Treatment Technologies Butterworth-Heinemann, ISBN 9780080523842

BMMV 4123
AIR QUALITY AND POLLUTION CONTROL TECHNOLOGY/
TEKNOLOGI KUALITI UDARA DAN KAWALAN PENCEMARAN

LEARNING OUTCOME
At the end of the course, students should be able to:
1. Apply specific air pollution control system to a specific process.
2. Develop a performance monitoring plan of air pollution control system.
3. Describe the philosophy of air quality management and air pollution control system.

SYNOPSIS
The course outlines the introduction water and wastewater treatment engineering and technology. The course covers the primary, secondary and tertiary water and wastewater treatment facility technology. The specific technology requires different performance monitoring to ensure its optimum efficiency.

REFERENCES
1. William Licht, 1988, Air Pollution Control Engineering: Basic Calculations for Particulate Collection CRC Press, Inc., ISBN 9780824778989.
2. Karl B. Schnelle, Jr., Charles A. Brown, 2016, Air Pollution Control Technology Handbook, CRC Press ISBN 9781420036435.
3. John C. Mycock, 1995, Handbook of Air Pollution Control Engineering and Technology CRC Press, ISBN 9781566701068.

BMMV 4133
SOLID WASTE MANAGEMENT TECHNOLOGY/
TEKNOLOGI PENGURUSAN SISA PEPEJAL

LEARNING OUTCOME
At the end of the course, students should be able to:
1. Examine the solid waste management practices.
2. Responds effectively to identify and reduce the types of solid waste apparent in a factory and domestic.
3. Propose plan for waste management system including recycling, landfilling, financing and life-cycle costing.

SYNOPSIS
Ecological action to protect the environment and conserve existing natural resources is an essential component of modern-day industrial societies. Environmental waste disposal and sustainable recycling of valuable resources from waste products are important fields requiring well trained disposal engineers with creativity and know-how. The course provides comprehensive training in this field and forms an interface between the wide range of specialist fields such as environmental sciences or process engineering to the planning, design, and management of efficient, economical and environmentally responsible solid waste disposal systems. Characterization of municipal solid waste; collection; transfer stations; waste minimisation and recycling; waste treatment, including size reduction, composing, incineration, emerging technologies; landfill disposal, including preparation of landfill management plans and operational aspects; introduction to planning of waste management systems.

REFERENCES
1. George Tchobanoglous, Frank Kreith. (2002). Handbook of Solid Waste Management (Mechanical Engineering), Second Edition, McGRAW-HILL: New York.
2. Ramesha Chandrappa, Jeff Brown. (2012). Solid Waste Management: Principles and Practice (Environmental Science and Engineering). Springer.
3. Christensen, Thomas H. (2011). Solid Waste Technology & Management. Chichester John Wiley & Sons.

4. Reddy, P. Jayarama. (2011). Municipal Solid Waste Management Processing, Energy Recovery, Global Examples. Hyderabad BS Pub.
5. Ludwig, Christian, Hellweg, Stefanie, Stucki, Samuel. (2003). Municipal solid waste management strategies and technologies for sustainable solutions. Springer Berlin.

BMMV 4143
ENVIRONMENTAL IMPACT ASSESSMENT/
PENILAIAN KESAN TERHADAP ALAM SEKITAR

LEARNING OUTCOME
At the end of the course, students should be able to:
1. Analyse the impact to the environment from the prescribed activities stipulated under Environmental Quality Act 1974.
2. Develop a mitigation plan to reduce the impact to the environment.
3. Describe the philosophy of environmental impact assessment.

SYNOPSIS
The course outlines the introduction of environmental impact assessment. The assessment report is important tool to analyse the impact to the environment from a project. The course covers the overview of environmental impact assessment, the tools to analyse the impact as well as a guidance to develop a mitigation plan.

REFERENCES
1. Peter Wathern, 2013, Environmental Impact Assessment: Theory and Practice Routledge, ISBN 9781134897711.
2. John Glasson, Riki Therivel, Andrew Chadwick 2013, Introduction to Environmental Impact Assessment, Routledge, ISBN 9781134303762.
3. Barbara Carroll, Trevor Turpin, 2002, Environmental Impact Assessment Handbook: A Practical Guide for Planners, Developers and Communities Thomas Telford, ISBN 9780727727817.

BMMV 4153
INDUSTRIAL AND HAZARDOUS WASTE MANAGEMENT/
PENGURUSAN SISA INDUSTRI DAN SISA BERJADUAL

LEARNING OUTCOME
At the end of the course, students should be able to:
1. Analyse the risk and hazards caused by the existence of hazardous waste.
2. Handle a project to manage the disposal and treatment of hazardous waste.
3. Describe the cradle-to-cradle philosophy and methods of hazardous waste handling and disposal.

SYNOPSIS
The course outlines the introduction of hazardous waste and it's disposal and treatment methods. The course will convey the information on toxicology and ecology effect of hazardous waste. Treatment methods which include physicochemical treatments, biological methods, thermal methods and land disposal will be explained extensively.

REFERENCES
1. Micheal D. La Grega, Phillip L. Buckingham, Jeffret C. Evans, 2010, Hazardous Waste Management Waveland Press, Inc., ISBN 978-1577666936.
2. Cliff VanGuilder, 2012, Hazardous Waste Management: An Introduction, Mercury Learning and Information, ISBN 978-1936420261.
3. Gayle Woodside, 2010, Hazardous Materials and Hazardous Waste Management Chapman & Hall, ISBN 978-0471174493.

BMMV 4203
SMALL CRAFT TECHNOLOGY/
TEKNOLOGI KAPAL KECIL

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Categorise the types of small craft and the means of their construction including their classification society involved.
2. Conduct assessment on stability, structural strength and performance of small craft vehicles.
3. Reports the project planning and execution of a small craft prototype construction.

SYNOPSIS

Introduction to small craft vehicles according to their types of supporting mode and operations, including the classification society which govern their structural design. The course will further explore the design, stability, engineering and control system associated with small craft vehicles. At the end of the lesson, the students will practically construct a prototype of small craft vehicle by using either steel/ aluminum or composite by applying standard construction practice.

REFERENCES

1. John Atkin (2011). Practical Small Boat Designs, International Marine Pub.
2. Ted Brewer (2012). Understanding Boat Design, International Marine Publishing
3. Introduction to Practical Marine Engineering I, Alan L. Rowen et al., The Society of Naval Architects and Marine Engineers, 2013
4. Introduction to Practical Marine Engineering II, Alan L. Rowen et al., The Society of Naval Architects and Marine Engineers, 2013
5. Hugo Du Plessis (2013). Fibreglass Boats: Construction, Gel Coat, Stressing, Blistering, Repair, Maintenance (5th ed), Adlard Coles Nautical

BMMV 4213
NAVAL ARCHITECTURE/
SENI BINA KAPAL

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Evaluate the standard assessment of various marine vehicles at various loading conditions.
2. Reproduce a set of marine vehicles design which fulfilling the basic standard design requirements.
3. Justifies the design produced based on certain standard guidelines.

SYNOPSIS

Introduction to type of marine vehicles which include ship principal dimension and terms, the form of vessel which include the conditions of equilibrium of floating body, the trim and change of trim, the small longitudinal inclination, the effect of free surface on initial stability and the strength of ships and ship vibration.

REFERENCES

1. Marine Engineer and Naval Architectures,
2. Naval Arrchitectures: Examples and Theory by Baxter, B.
3. Production Technology by Thomas G.G.
4. Material Science and Metallurgy by Pollack H.W

BMMV 4223
MARINE PRODUCTION AND MANAGEMENT/
PENGURUSAN DAN PENGELUARAN MARIN

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Examine the various types of shipyard layout in relation to process flow from material purchasing until ship launching.
2. Apply the project management concept in ship building production.
3. Incorporate the environmental or social impact the marine production planning.

SYNOPSIS

The course introduces students to the nature of ship production industry including layout design, process flow involves and impact of layout design towards the process flow. The course will also introduce the current global shipyard practice. On top of that, students will also be exposed to a classification society which governs the ship construction process. The final section will cover the ship production management practice.

REFERENCES

1. Anthony Molland (2008). The Maritime Engineering Reference Book, Butterworth-Heinemann
2. Gregory P. Tsinker (2014). Marine Structures Engineering – Specialized Applications, Springer-Science+Business Media.
3. Peter F.J. Broad (2012). Marine Classification Society Surveying, Witherby Seamanship International.
4. Huacan Fang and Menglan Duan (2014). Offsahore Operation Facilities – Equipment and Procedures, Petroluem Industry Press, China.

BMMV 4233
MARINE TECHNOLOGY SYSTEM/
SISTEM TEKNOLOGI MARIN

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Identify requirements for repair, installation, modification, redesign and maintenance of machines and systems of ships in accordance to maritime laws and regulations.
2. Measure appropriate activities coordination to ensure safe shipboard functions and effective marine power plant operations through laboratory experiments.
3. Describe impact of operations of power plant and ship system on sustainable development.

SYNOPSIS

This course incorporates theory and practical experience to prepare students for the fast-paced marine industry. Students will be exposed to the operation and application of power plants and ship systems. The course focuses on developing competencies required to function as part of an engineering team at the operational level. Students can expect to gain knowledge and skills around shipboard functions and effective marine power plant operations. In addition, they will also be exposed with maritime law and regulations.

REFERENCES

1. Hayt, William H.; Kemmerly, Jack E.; Durbin, Steven M. Engineering circuit analysis. 8th ed. New York: McGraw- Hill, 2012. ISBN 9780071317061.
2. Mohan, Ned; Undeland, Tore M.; Robbins, William P. Power electronics: converters, applications, and design. 3a ed. John Wiley & Sons, John Wiley & Sons, 2016. ISBN 0471226939.
3. Saarlas, Maido. Steam and gas turbines for marine propulsion. 2nd ed. Annapolis: Naval Institute Press, 2014. ISBN 0870216902
4. Bernstein, Martin D.; Yoder, Lloyd W. Power boilers: a guide to section I of the ASME boiler and pressure vessel code. New York: Asme Press, 2015. ISBN 0791800563.

5. Principles of naval architecture, vol. 2, Resistance, propulsion and vibration. 2nd revision. Jersey City, NJ: The Society of Naval Architects and Marine Engineers, 1988-1989. ISBN 0939773015 (V. 2).
6. ASHRAE handbook: Fundamentals. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, 2014. ISBN 0910110964.

BMMV 4243
MARINE OFFSHORE STRUCTURES/
STRUKTUR MARIN LAUT DALAM

LEARNING OUTCOME

At the end of the course, students should be able to:
1. Analyze the types of offshore structures and their characteristic.
2. Display appropriate techniques involving wave and offshore structures interaction through laboratory experiments.
3. Describe the impact of onshore, offshore, moving and floating structures on sustainable development.

SYNOPSIS

Introduction to function and design characteristic, Wave and structure interactions, Wave load on vertical wall, Shore structures, offshore structures.

REFERENCES

1. Young. B.and Wei, L., 2015, Marine Structural Design, 2nd Edition, Butterworth-Heinemann.
2. Sarpkaya, T. and Isaacson, M., 2013, Mechanics of Wave Forces on Offshore Structures, Van Nostrand Reinhold Co., NewYork.
3. Srinivasa C., 2015, Dynamic Analysis and Design of Offshore Structures, Springer India.
4. Chakrabarti, S. 2015, Handbook of Offshore Engineering, Elseviers.

BMMV 4253
MARINE INSPECTION & MAINTENANCE/
PEMERIKSAAN DAN PENYELENGGARAAN MARIN

LEARNING OUTCOME

At the end of the course, students should be able to:
1. Classify type of marine machinery, electrical and control and hull structure for inspection and maintenance.
2. Follows appropriate procedure to ensure marine machinery, electrical and control and hull structure comply with marine safety and regulation through laboratory experiments.
3. Explain the impact of shipboard maintenance activities based on the four types of maintenance philosophies on sustainable development.

SYNOPSIS

Introduction to marine inspection and maintenance of marine machinery, electrical and control, including ship structure. In addition, student will learn on marine components of refrigeration, steering gears and pumping systems. In the end of the course, students are required to produce a shipboard inspection and maintenance plan.

REFERENCES

1. The Running and Maintenance of Marine Machinery, J. Cowley, Institute of Marine Engineers, 2012
2. Introduction to Practical Marine Engineering I, Alan L. Rowen et al., The Society of Naval Architects and Marine Engineers, 2013
3. Introduction to Practical Marine Engineering II, Alan L. Rowen et al., The Society of Naval Architects and Marine Engineers, 2013
4. Marine Boilers, G. T. H. Flanagan, Newnes Publication, 2013
5. Pounder’s Marine Diesel Engines: and Gas Turbines, Doug Woodyard, Butterworth-Heinemann, 2013
6. Marine and Offshore Pumping and Piping Systems, J. Crawford, 2013

BMMV 4303
BUILDING SERVICES ENGINEERING/
KEJURUTERAAN PERKHIDMATAN BANGUNAN

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Associate principle in HVAC, lift, escalator and conveyor systems with building design.
2. Demonstrate technical skills in the data collection and analysis of HVAC, lift, escalator and conveyor systems.
3. Debate building services knowledge and skills to monitor the systems, energy and efficiency of buildings.

SYNOPSIS

The aim of the building engineering services is to give students the opportunity to demonstrate their ability to develop a building project, from its preliminary design phase to construction planning through integrated teamwork. Student will be able to demonstrate his/her capability of to apply the latest technology in water supply system, heating, ventilation and air conditioning systems, security and fire alarm system, fire-fighting systems, lifts, escalators and other mechanical transport systems.

REFERENCES

1. Chadderton D.V., 2013, Building Services Engineering, 6th Edition, Routledge.
2. Greeno R. & Hall F., 2015, Building Services Handbook, Routledge.
3. Portman, J., 2014, Building Services Design Management, John Wiley

BMMV 4313
BUILDING UTILITIES/
UTILITI BANGUNAN

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Associate principle and knowledge in building utilities with building design.
2. Demonstrate technical skills in the collection and analysis of building utilities data and propose solutions to implement in building utilities management policy.
3. Debate building utilities knowledge and skills to monitor the systems, energy and utilities efficiency of buildings.

SYNOPSIS

Principles and practices in water supply and sanitary systems. Pipe system of plumbing. Drainage in building. Electrical systems in buildings. Mechanical systems in buildings. Steam, air and gas distribution system in building; their measurement, analysis, design, installation, operation and maintenance in buildings in relation to the immediate surroundings or environment.

REFERENCES

1. Portman, Jackie (2014). Building Services Design Management. Oxford: UK: Wiley-Blackwell. ISBN 978- 1118528129.
2. Stipanuk, D. (2002), Hospitality Facilities Management and Design, (2nd ed.). New York: Cornell.
3. David V. Chadderton, (2007). Building Services Engineering, 5th ed. Taylor & Francis, Oxon.
4. G. J. Levermore (2000) Building Energy Management Systems, 2nd ed. E & FN Spon, (ISBN:9780419152903).
5. Keith Moss (2013) Heating and Water Services Design in Buildings, 2nd ed. Routledge ISBN 1134436009, 9781134436002

BMMV 4323
SMART BUILDING MANAGEMENT/
PENGURUSAN BANGUNAN PINTAR

LEARNING OUTCOME
At the end of the course, students should be able to:
1. Analyse building maintenance problem using Building Management System and Building Information Modelling.
2. Construct maintenance plan by applying Building Management System and Building Information Modelling.
3. Explain Building automation system and its use in monitoring the performance of the building.

SYNOPSIS
This course is designed to give student adequate information to run two well-known software in building services; Building Management System (BMS) and Building information modelling (BIM). BMS is a supervision way by a central computer system, managing many parameters and functions from data sent by sensors in large structures. It provides enhanced security infrastructure and economic management of energy. BIM is a process involving the generation and management of digital representations of physical and functional characteristics of places. BIM are files which can be extracted, exchanged or networked to support decision- making regarding a building or other built asset. Current BIM software is used by individuals, businesses and government agencies who plan, design, construct, operate and maintain diverse physical infrastructures, such as water, refuse, electricity, gas, communication utilities, roads, bridges, ports, tunnels.

REFERENCES
1. Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston. (2011) BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors, 2nd Edition. Canada, Hohn Wiley & Son
2. David V. Chadderton. (2012) Building Services Engineering. London, Routledge.

BMMV 4333
GREEN BUILDING AND SUSTAINABILITY/
KELESTARIAN DAN BANGUNAN HIJAU

LEARNING OUTCOME
At the end of the course, students should be able to:
1. Explain basic concepts related to sustainability & environmental concerns and describe major characteristics of sustainable buildings & infrastructures.
2. Demonstrate assessment techniques for green building delivery systems.
3. Share the philosophy of green building and sustainability.

SYNOPSIS
This course provides students with an understanding of the green building concept and assessment. The course covers the following topics:
- Ethics and sustainability; The green building concept; Environmental and resource concerns; Green building assessment; Conventional versus green building delivery systems; Green building process; Building materials and products; Construction operations; Building commissioning; Economic analysis of green buildings.

REFERENCES
1. Kibert, C.J., 2016, Sustainable Construction: Green Building Design Delivery, 4th Edition John Wiley.
2. Ching, F.D.K & Shapiro, I.M., 2014, Green Building Illustrated, John Wiley.
3. Chandrupatla, T.R. and Belegundu, A.D., 2012, Introduction to Finite Elements in Engineering, 4th Edition, Prentice Hall, New Jersey.
4. Reeder, L., 2010, Guide to Green Building Rating Systems: Understanding LEED, Green Globes, Energy Star, The National Green Building Standard and More, John Wiley.

BMMV 4343
BUILDING HSE/
HSE BANGUNAN

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Designate a plan for safe environment in buildings for all individuals.
2. Construct suitable building health and safety inspection policy, emergency plans, and other building safety issues.
3. Shares info regarding building safety issues.

SYNOPSIS

The aim of the building engineering services is to give students the opportunity to demonstrate their ability to plan for building HSE development. Student will be able to demonstrate his/her capability to conduct planning, commissioning and inspection of building facilities with regards to the National policy on HSE. This includes the understanding of the OSHA Act 1994 and FM Act 1967.

REFERENCES

1. Workplace Law Group, 2012, Health and Safety, Premises and Environment Handbook, Kogan Page Publishers.
2. Day A., Kelloway E.K. & Hurrell J.J., 2014, Workplace Well-being: How to Build Psychologically Healthy Workplaces, John Wiley
3. Dannenberg A.L., Frumkin H. & Jackson R.J., 2011, Making Healthy Places: Designing and Building for Health, Well-being and Sustainability, Island Press.

BMMV 4353
BUILDING MAINTENANCE TECHNIQUE/
TEKNIK PENYELENGGARAAN BANGUNAN

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Designate a structured and local approach to the formulation of an all embracing techniques for maintaining building.
2. Construct the most appropriate maintenance techniques based on the industry, configuration and operating context of the equipment.
3. Justify problem solving of real life condition regards to building maintenance issues.

SYNOPSIS

The students will be exposed to the various maintenance techniques from preventive maintenance, condition-based maintenance and run to fail maintenance technique for building. Principles of preventive maintenance; definition of a plant item; maintainability diagrams. Models for optimising the balance of preventive and corrective work. Definitions of operate to failure; fixed time maintenance; condition-based maintenance. Selection of the best maintenance procedure in the light of cost, safety factors and how the equipment fails. Assembling the maintenance tasks into a complete life plan for a unit or system. The top down and bottom-up approach to formulating a maintenance strategy. Using feedback to continuously improve the maintenance strategy. Industrial case studies.

REFERENCES

1. Tina Kanti Agustiady and Elizabeth A. Cudney,2015, Total Productive Maintenance: Strategies and Implementation Guide, CRC Press.
2. John D. Campbell and James V. Reyes-Picknell., 2015, Uptime: Strategies for Excellence in Maintenance Management, Productivity press.
3. Campbell, J. D., Jardine, A. K. S. and McGlynn, J., 2010, Asset Management Excellence: Optimizing Equipment Life-Cycle Decisions, 2nd Ed., CRC Press.

BMMD COURSE CORE COURSES (K)

SEMESTER 1

BMMA 1333
STATICS/
STATIK

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Describe the physical sciences of staticsconcepts.
2. Construct statics experiments to recognize the engineering mechanics of statics principles.
3. Explain effectively as an individual and assist group members for experimental and assignment works.

SYNOPSIS
An introduction to the basic concept of statics as physical sciences, system of units, scalars and vectors, free body diagram, forces system, force system resultants and moment, equilibrium of a particle, equilibrium of a rigid body, structural analysis (trusses analysis and simple frames and machines), friction and center of gravity and centroid.

REFERENCES
1. Hibbeler, R.C. (2016) Statics and Mechanics of Materials, 14th SI Edition, Prentice Hall, New York.
2. Beer, F. P., Johnston jr., E. R., Eisenberg, E. R., (2016) Vector Mechanics for Engineers - Statics, 11th Edition in si units, McGraw Hill, New York.
3. Meriam, J. L., Kraige L. G. (2008) Engineering Mechanics - Static SI Version, 6th Edition., John Wiley & Sons, New York.
4. Pytel, Kiusaalas. (2009). Engineering Mechanics-Static. 3rd Ed. Cengage Learning.
5. Michael P., Gary, G., Constanzo, F., (2009). Engineering Mechanics - Statics. Mcgraw-Hill Higher Education.

BMMD 1304
ENGINEERING DRAWINGS & CAD/
LUKISAN KEJURUTERAAN & CAD

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Explain the principles of engineering drawing and Computer Aided Design (CAD).
2. Generate 2D and 3D freehand sketching.
3. Construct engineering drawing using CAD software.

SYNOPSIS
The purpose of this course is to provide students with an understanding of the importance of engineering graphic communication to the design process and interpreting the engineering drawings. Student will gain hands-on experience creating freehand technical sketches, CAD technical drawings using orthographic projections, sections auxiliary views and isometric drawings. Emphasis is placed on creating drawings that are neat, correctly dimensioned using industry standards. Students will use freehand sketches methods and CAD software to develop visualization skills and create the engineering drawings. This course consists of lecture and practical session. A major part of the course consists of performing structured laboratory exercises. Classroom activities will complement and support the lab exercises with explanations and demonstrations of required activities.

REFERENCES
1. David L. Goetsch (2016) Technical drawing and engineering communication. 6th Edition Clifton Park, NY: Delmar Cengage Learning.
2. Giesecke, M., Spencer, H. & Dygdon, N. (2009) Technical Drawing, 14th Edition, Prentice Hall.
3. Riley, D. (2012) Discovering AutoCAD 2006, Pentice Hall.
4. McAdam, D. & Winn, R. (2003) Engineering Graphics, 2nd Edition, Pearson Education Canada Inc.
5. Marjom, Z. & Attan, H. (2008) Engineering Graphics & CADD, for Engineering Students, FKP, UTeM.

BMMP 1303
MANUFACTURING PRACTICE/
AMALAN PEMBUATAN

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Describe proper use of all equipment and requirement
2. Build product based on technical drawing that meet specific tolerance.
3. Perform the process according to the proper procedure.

SYNOPSIS
The practice consists of introduction to basic knowledge of using manual hand tools and equipment, machine tools, welding, fabrication, lathe, milling, and some manual work within manufacturing daily activities. It introduces common equipments for performing manufacturing works such as lathe and milling machine, arc welding, tig/mig welding, sheet metal forming etc. Due to its nature as introductory course, students are required to prepare at home before having the practice to acquire any knowledge concerning the practices.

REFERENCES
1. Kalpakjian, S. and Schmid R. (2014), Manufacturing Engineering and Technology, 7th Edition, Prentice Hall.
2. Mikell, P. G. (2010) Fundamental of Modern Manufacturing Materials, Processes, and Systems, 4th Edition, John Wiley & Sons.
3. Mikell P. G., (2013) Principles of Modern Manufacturing SI Version, 5th Edition, John Wiley & Sons.

BMMA 1313
PRINCIPLE OF ELECTRIC AND ELECTRONIC/
PRINSIP ELEKTRIK DAN ELEKTRONIK

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Explain the basic of electrical and electronics principles, circuit schematics and components.
2. Develop electrical circuit and justify the measured values using appropriates approach.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams.

SYNOPSIS
This course will cover on the topics of electrical and electronic components, emphasizing on electric circuit theory such as components and measurement instruments, circuit analysis. For electronic principle, it will cover on the topics of electronic devices such as operational amplifiers and digital electronics it will deals with topics such as system numbers, logic gates, boolean operation, combination logic circuits, and digital circuit application.

REFERENCES
1. Allan, R., H. (2014) Electrical Engineering, Pearson Education
2. Thomas L. Floyd (2010) Principles of Electric Circuits, 9th Edition, Prentice Hall.
3. Thomas L. Floyd (209) Digital Fundamental, 10th Edition, Pearson Education.
4. Alexander, C.K., (2008) Fundamental of Electric Circuit, Mcgraw Hill.
5. Nilsson, J. W., Riedel, S. A., (2008) Electric Circuit, Prentice Hall
6. Roger, T., (2008) Digital Electronics Principles & Applications, Mcgraw Hill.

SEMESTER 2

BMMM 2313
DYNAMICS & MECHANICS OF MACHINE/
DINAMIK & MEKANIK MESIN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Describe the concept and principle of dynamics and mechanics of machine element.
2. Demonstrates the dynamics and mechanics of machine laboratory experiments
3. Synthesize dynamics and mechanics of machine fundamentals into engineering practices.

SYNOPSIS
Introduction to basic principles based on kinematic and kinetic dynamics. The concept of displacement, distance, velocity, speed and acceleration. Application of newton's second law. The principle of work and energy, impulse and momentum of particles and rigid bodies. Transmission system based on the friction of motion, such as belts, brakes and dibble. Based delivery systems such as chains and gear teeth. Gear system. Balancing the dynamic system that includes balancing the body rotating plane and a parallel plane. Balancing of reciprocating motion as the body line of engines, radial engines and engine. Gyroscopic motion that includes a couple gyroscope. Gyro scope coupling effects. Simple harmonic motion and vibration consists of moving one degree of freedom. Free vibration. Damped free vibration. Forced damped vibration. Speed control of the cycle flywheel

REFERENCES
1. Beer, F. P., Johnson, E.R., Clausen, W. E., (2013) Vector Mechanics For Engineers, Dynamics Si Units, 10th Edition. Mcgraw-Hill.
2. Hibbeler, R. C. (2013) Engineering Mechanics, Dynamics, 12th Edition. Prentice Hall.
3. Meriam, J. L. And Kraige, L. G. (2013). Engineering Mechanics, SI Version, 6th Edition. John Wiley.
4. Bedford, A. And Fowler, W. (2008). Engineering Mechanics: Dynamics (SI units). 5th Edition.Prentice Hall.
5. Cleghorn, W. L., 2005, Mechanics of Machines, Oxford University Press.

PRE-REQUISITE
BMMA 1333
STATICS / STATIK

BMMP 1313
ENGINEERING MATERIALS/
BAHAN KEJURUTERAAN

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Explain the structures, properties and processing of engineering materials.
2. Display the ability to determine the microstructures and mechanical properties of various materials.
3. Construct the solution for engineering material problems.

SYNOPSIS
This course introduces basic concepts of engineering materials that covers introduction to engineering materials, inter-atomic bonding, crystalline structure and imperfections in solid. Explanation on different type of engineering materials (i.e. metal, polymer, ceramic, composite and semiconductor), its mechanical properties, basic application and processing are also included. Introduction to the binary phase diagrams (composition and microstructure correlation) is also given.

REFERENCES
1. Callister W.D. and Rethwisch D.G, 2011, Fundamentals of Materials Science and Engineering, 8th Edition, John Wiley & Sons.
2. Smith W. F., 2011, Foundation of Materials Science and Engineering, 5th Edition, Mcgraw Hill.
3. Askeland D. R., 2011, The Science and Engineering of Materials, 6th Edition, Cl-Engineering.
4. Serah, A. M., 2017, Engineering Materials for Engineering Technologist. Melaka: Universiti Teknikal Malaysia Melaka.

BEEA 1343
COMPUTER PROGRAMMING/
PENGATURCARAAN KOMPUTER

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Describe and convert the problems into the appropriate solutions.
2. Solve problems using software engineering principles.
3. Complete code by applying suitable programming structures in a group assignment.

SYNOPSIS

In this course, students will be exposed to the basic principles of computer and software development methodology. The course also includes basic principles of programming such as syntax, semantic, compiling, and linking. Students will also learn programming techniques using C++ such as data type, operator, selection, repetition, function, array, file, and pointer.

REFERENCES

1. Gaddis, T., (2015), Starting Out with C++: From Control Structures through Objects, 8th Edition, Global Edition, Pearson Education.
2. Daniel Liang, Y, (2014), Introduction to Programming with C++, 3RD Edition, Pearson Education.
3. Deitel, H.D., (2014), C++ How to Program,9th Edition, Pearson Education.
4. Nell, D., (2013), Programming and Problem Solving with C++: Comprehensive, 6th Edition, Jones & Bartlett Learning.
5. Gregoire, M., (2011), Professional C++, 2nd Edition, John Wiley & Son.

BMMP 1323
MANUFACTURING PROCESS/
PROSES PEMBUATAN

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Explain the fundamental concepts of manufacturing processes.
2. Differentiate the ability of various manufacturing processes.
3. Construct various skills of manufacturing techniques as an individual or a group.

SYNOPSIS

In this module, students will be introduced to various manufacturing processes that can be categorized into three major focus areas; metal removal processes, near-net shape and forming processes and joining processes. For the metal removal processes, the students will be exposed to turning, milling and abrasive machining. In the area of near-net shape and forming processes, wide range of processes will be introduced such as casting, rolling, forming, forging and extrusion. In addition to that near-net-shape processes for plastic, ceramic and metal powder will also be covered. And finally, the joining processes will familiarize the students to fusion and solid state welding.

REFERENCES

1. S. Kalpakjian, S.R. Schmid, Manufacturing Engineering and Technology SI Edition, Prentice Hall, 2014.
2. M.P. Groover, Fundamentals of Modern Manufacturing. Materials, Processes and Systems 4th Edition, John Wiley & Sons, Inc, 2010.
3. M. P. Groover, Introduction To Manufacturing Processes, 3rd Edition, Hoboken, NJ: Wiley, 2012.
4. P. N.Rao, Manufacturing Technology Foundry, Forming and Welding, 1st Edition, Mc Graw Hill, 2009.
5. P. N. Rao, Manufacturing Technology Metal Cutting and Machine Tools, 2nd Edition, Mc Graw Hill, 2009.
6. Amitabha Ghosh, Asok Kumar Mallik, Manufacturing Science, EWP New Dehli, 2009.

SEMESTER 3

**BMMD 2313
THERMO FLUID/
TERMO BENDALIR**

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Apply the thermodynamics First Law and Second law for common steady-flow device.
2. Solve various fluid flow problems using the Bernoulli Equation
3. Demonstrate the principles of thermodynamics and fluid mechanics through laboratory experiments.

SYNOPSIS
The course introduces the students to the basic engineering of thermodynamics that involved study on the energy transformation, working fluids, theory and application of first and second laws of thermodynamics. The course also covers explanation on the steam and gas power plant as a direct application of the thermodynamic theory. Students will be exposed on refrigeration system as an application on the thermodynamics principles. The second part of this course is to introduce the students to the basic of fluid mechanics. This consists of fluid's static and dynamic analysis, buoyancy and stability, Bernoulli equation, momentum principle, flow behavior in pipe and also covers the basic principle of dimensional analysis.

REFERENCES
1. Cengel, Y.A., Turner, R. H. & Cimbala, J. M. (2012) Fundamentals of Thermal-Fluid Sciences, 4rd Edition in SI Units, Mc Graw Hill.
2. Kaminsky, D. A. & Jensen, M.K. (2005) Introduction to Thermal and Fluid Engineering, John Wiley & Sons, Inc.
3. Cengel, Y.A. & Michael, A.B. (2002) Thermodynamics: An Engineering Approach, 4th Edition, Mc Graw Hill.
4. Eastop, T.D. & McConkey, A. (2004) Applied Thermodynamics for Engineering Technologist, 5th Edition, Longman.

**BMMM 2303
SOLID MECHANICS/
MEKANIK PEPEJAL**

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply the knowledge and principles of mechanics of materials in engineering design.
2. Identify appropriate experimental techniques in mechanics of material through laboratory experiments.
3. Demonstrate the ability to complete engineering project using the principle of mechanics of material in group effectively.

SYNOPSIS
Introduction to various types of structures and supports. Concepts of stress, strain, shear force and bending moment. Theory on beam deflection. Theory on torsion. Shear flow. Combination of loads. Deflection of beams

REFERENCES
1. Hibbeler R.C., 2013, Statics and Mechanics of Materials, 3rd SI Ed., Prentice Hall, New York.
2. Beer. F.P. Et Al. 2012. Mechanics Of Materials, 6th Edition in SI Units. Mcgraw-Hill.
3. Beer. F.P. Et Al. 2011. Statics and Mechanics of Materials, 1st Edition. Mcgraw-Hill.
4. Beer, F. P. And Johnston Jr., E. R. and Eisenberg, E. R., 2010, Vector Mechanics For Engineers - Statics, 9th Ed. in SI Units, Mcgraw Hill, New York.
5. Roy Craig Jr., 2011, Mechanics of Materials, 3rd Ed., John Wiley & Sons, New York.

BMMD 2504
ADVANCED ENGINEERING GRAPHICS & CAD/
GRAFIK KEJURUTERAAN LANJUTAN & CAD

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Explain the basic concepts of 3D modeling and its application in design process.
2. Construct assembly model.
3. Design parametric modelling using advance CAD tool.

SYNOPSIS
The purpose of this course is to provide students with an understanding of the importance of engineering graphic communication to the design process and interpreting the engineering drawings. Student will gain hands-on experience creating freehand technical sketches, CAD technical drawings using orthographic projections, sections auxiliary views and isometric drawings. Emphasis is placed on creating drawings that are neat, correctly dimensioned using industry standards. Students will use freehand sketches methods and CAD software to develop visualization skills and create the engineering drawings. This course consists of lecture and practical session. A major part of the course consists of performing structured laboratory exercises. Classroom activities will complement and support the lab exercises with explanations and demonstrations of required activities.

REFERENCES
1. Planchard, D.C., (2017), Engineering Design With Solidworks 2017, Sdc.
2. Bethune, J.D., (2016)Engineering Design And Graphics With Solidworks 2016 3.
3. Shih, R. (2018) Solidworks 2018 and Engineering Graphics : An Integrated Approach, Sdc.

PRE-REQUISITE
BMMD 1304
ENGINEERING DRAWINGS/
LUKISAN KEJURUTERAAN & CAD

SEMESTER 4

BMMP 2333
QUALITY CONTROL/
KAWALAN KUALITI

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Explain the basic quality principles and practices, quality solving techniques and product reliability related to manufacturing process.
2. Solve the manufacturing process quality problem using quality solving techniques.
3. Perform the ability to apply the quality solving techniques such as SPC, QFD, FMEA and Six Sigma in order to improve quality.

SYNOPSIS
There are four main sections consist in Quality and Reliability course: quality principles and practices; quality solving techniques; reliability and additional quality tools. In quality principle and practices, its covers quality basic, quality gurus, introduction to total quality management, and quality awards. Quality solving techniques will cover statistical process control (7 QC tools). In reliability, it explains life and reliability testing plans for product and process. Additional quality tools are Quality Function Deployment (QFD), Failure Mode Effect & Analysis (FMEA), Six Sigma and PDSA.

REFERENCES
1. Montgomery D. C., (2009) Introduction to Statistical Quality Control, 6th Edition, John Wiley and Sons, Inc.
2. Besterfield, D. H. (2014) Quality Improvement, 9th Edition, Pearson
3. Bass, I (2014) Six Sigma Statisctic with Excel and Minitab, Mc Graw Hill.
4. Besterfield, D.H., Besterfield-Minhna, C., Besterfield, G. H. and Besterfield-Sacre, M. (2011) Total Quality Management, 3rd Edition, Prentice Hall.

BMMP 2343
CONTROL SYSTEM/
SISTEM KAWALAN

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Apply appropriate techniques in describing the characteristics of control systems in time domain.
2. Construct experiments to distinguish system performances of open loop and closed loop systems.
3. Report the analysis of transient and steady state performance for first and second order control systems.

SYNOPSIS
This course focuses on the fundamental of control system theory. The system includes translational mechanical system, rotational mechanical system and electromechanical system, in linear and time invariant state. Student will also be exposed to solve stability and steady state problems in a system. Some of the methods used in solving these problems are dynamic system modelling, Laplace transform, block diagram and Routh-Huwirtz stability. Practical application on how to use commercially available mathematical software to solve control problem will also be introduced.

REFERENCES
1. Norman S. Nise, (2011). Control Systems Engineering, 6th Edition, John Wiley & Sons Inc.,
2. Katsuhiko Ogata, (2010). Modern Control Engineering, 5th Edition, Pearson.
3. Richard C. Dort, Robert H. Bishop (2011), Modern Control Systems, 12th Edition, Pearson.
4. Gopal, M. (2012) Control Systems: Principles and Design, 4th Edition, Mc Graw Hill.
5. Khalil Azha Mohd Annuar et. Al (2015)., Introduction to Control System, Penerbit UTeM.

BMMD 2324
PRODUCT DESIGN AND DEVELOPMENT/
REKA BENTUK DAN PEMBANGUNAN PRODUK

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Explain the principles of product design and development.
2. Organizes the product through the outcomes of analyzed problems.
3. Ability to work effectively in group for process of product design and development.

SYNOPSIS
This course blends the perspectives of marketing, design and manufacturing into a single approach to product development. This course provides the students with real industrial practices and essential roles played by various members of product development teams. Throughout this course, various attempts are used to strike a balance between theory and practical.

REFERENCES
1. H. Boejang, H. Attan, M.F. Basar, M.I Ramli, (2013) Module 4: Product Development for Engineering Technology, 1st Edition, Penerbit Universiti, UTeM, Melaka, Malaysia.
2. Ulrich, K.T. & Eppinger, S.D. (2016) Product Design and Development, 6th Edition, McGraw Hill Irwin.
3. Chitale, A.K. & Gupta, R.C. (2013) Product Design and Manufacture, 6th Prentice Hall, New Delhi, India.
4. Kalpakjian, S. & Schmid, S.R. (2014), Manufacturing Engineering & Technology, 7th Edition, Prentice Hall.

BMMD 3523
CNC TECHNOLOGY/
TEKNOLOGI CNC

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Explain the proper use of CNC types, CNC models, and CNC coordinate system.
2. Perform CNC ISO Programming method by using SinuTrain Sinumeric 840D simulator.
3. Construct CNC ISO Programming for Lathe two (2) axis and Milling three (3) axis.

SYNOPSIS

This course covers the knowledge of CNC technology and basics of CNC machining operations. Students will learn CAD/CAM and CNC machining using Mastercam software on PC based computers. The students will be exposed to the operation of CNC machines and methods of producing programming by using G-codes and M-codes.

REFERENCES

1. Alan Overby, (2011) CNC Machining Handbook, The McGraw-Hill Companies.
2. Michael Fitzpatrick, (2013) Machining and CNC Technology. 3rd Revision, McGraw-Hill Higher Education

SEMESTER 5

BMMP 3354
INDUSTRIAL ENGINEERING/
KEJURUTERAAN INDUSTRI

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Analyze the problems that are related to Industrial Engineering.
2. Solve manufacturing operation scenarios using Industrial Engineering tools and techniques.
3. Conduct experiments or laboratory tasks related to topics discussed in IE.

SYNOPSIS

This course is an introduction to Industrial Engineering (IE). The course introduces fundamental concepts and technique in IE covering two major areas that are production systems and optimization. In production system, student will be taught to productivity concept, work study and measurements, facility planning, forecasting, material requirement planning, inventory control and production scheduling. In optimization, students will be exposed to queueing theory, simulation and modeling, lean manufacturing and project management.

REFERENCES

1. Stevenson, W.J. (2015). Operations Management, 12th Edition. McGraw Hill.
2. Heizer, J., and Render, B. (2014) Operations Management, Pearson.
3. Abdullah, R, Mohamad, N.A, Kamat, S.R (2013). Modul: Industrial Engineering for Technologist Part 1 and Part 2. Penerbit UTeM.
4. Garcia-Diaz, Alberto and Smith, J. MacGregor (2008). Facilities Planning & Design. Prentice Hall
5. Arnold, J.R. Tony, Chapman, Stephen N. and Clive, Lloyd M. (2008). Introduction to Materials Management. Pearson International.
6. Kelton, David W., Sadowski, Randall P., Sturrock, David T. (2007). Simulation with Arena. McGraw Hill.

BMMD 2513
COMPUTER AIDED MANUFACTURING/
PEMBUATAN TERBANTU KOMPUTER

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Apply basic principal CAD/CAM methodology into 2D, 3D, surface modelling and CAM operation.
2. Plan machining strategies and tool path methods for milling and turning operations.
3. Simulate machining operations prior to the machining process.

SYNOPSIS
This course is an introducing to the CAD/CAM system and its application in industry. The students will be exposed to the application of high-end CAD/CAM software for generating geometric modelling and also part programming. The course covers generating 2D Graphic Elements, Geometric Modelling Systems, Generative/ Interactive Drafting, CAD and CAM Integration and CAD/ CAM Programming. By doing a group project, student will understand the link from CAD to CAM operation. Using CAD/CAM software, students will know how to simulate the part programming before start the machining operation.

REFERENCES
1. P N Rao, CAD/CAM Principles and Applications, 3rd Edition, McGraw-Hill, 2017.
2. Zhuming Bi, Xiaqin, Ccomputer Aided Design and Manufacturing, Wiley, 2020.
3. M.M.M. Sarcar, K. Mallikarjuna Rao, K.lalit Narayan, Computer Aided Design and Manufacturing, Prentice Hall, 2008.

BMMD 3533
DESIGN FOR MANUFACTURING AND ASSEMBLY/
REKA BENTUK PEMBUATAN DAN PEMASANGAN

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Explain the basic principles and methods of designing production tool in manufacturing field.
2. Apply the basic principles and methods of designing with current industrial practice.
3. Design efficient production tools for manufacturing, assembly and inspection processes.

SYNOPSIS
The Design for Manufacture and Assembly (DFMA) is an approach of a decision making in improving product design from the earliest concept design stages of a new product, based on concurrent engineering philosophy. The course structure exposes students to learn, understand and apply requirements of DFMA in ensuring the design of product that is ease and less expensive to manufacture and assemble, with retaining quality of product.

REFERENCES
1. Boothroyd, G., Dewhurst, P. & Knight, W. (2011) Product Design for Manufacture and Assembly, 3rd Edition Revised and Expanded, Marcel Dekker.
2. Boothroyd, G. (2005) Assembly Automation And Product Design, 2nd Edition Crc Press Taylor & Francis Group
3. Ulrich, K.T. & Eppinger, S.D. (2012) Product Design and Development, 5th Edition, McGraw Hill Irwin.
4. O. Molly, S.Tilley & E.A Warmah, (2015) Design For Manufacturing And Assembly,Springer Science.

BMMD 3543
RAPID MANUFACTURING/
PEMBUATAN PANTAS

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Explain the process of the concurrent product development process and the roles of its tools and technologies.
2. Manipulate the application of concurrent product development tools and technologies in a particular product design and development activities
3. Perform best practices during concurrent product development project activities in terms of planning, tools and technologies application, and management.

SYNOPSIS

This is a 3-credit Hour course offered to all third-year students of the Department of Manufacturing Engineering, Faculty of Mechanical and Manufacturing Engineering Technology. Product development requires the building and testing of prototype. A prototype is an approximation of the product on one or more dimensions of interest. Prototypes are used for learning, communication, i9ntegration and milestones. This course will provide the study of different concurrent product development tools and technologies known as time compression technologies adopted by product developers of manufacturers.

REFERENCES

1. H. Boejang, M.F. Basar (2013). Time Compression Technologies for Engineering Technology. 1 st Edition, Published by Penerbit UTeM, Universiti Teknikal Malaysia Melaka. Malaysia.
2. Hopkinson N. et al. (2014). Rapid manufacturing an Industrial Revolution for the Digital Age, Chicester: John Wiley & Sons.
3. Wright P.L. (2001). 21 st century Manufacturing Practice, Prentice-Hall.
4. Pham D.T, (2001). Rapid Manufacturing The Technologies and Applications of Rapid Prototyping and Rapidtooling, London: Springer.

BMMD 3553
ERGONOMICS DESIGN/
REKA BENTUK ERGONOMIK

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Apply ergonomics principles to create safe, healthy, efficient and effective activities in the workplace.
2. Analyze the effectiveness of the work system designed.
3. Constructs a design of work system by taken into consideration human capabilities and limitations.

SYNOPSIS

This course provides the students with the rationale for providing an occupationally safe and healthy work environment in industry. Three main elements of this course: human, equipment and work environment. These three elements are classified into different areas, however correlations of them are discussed and exemplified in each topic.

Through human study, students will be explained about the human anthropometric, physiology, psychology as well as capabilities and limitations of human. Meanwhile, through ergonomic design of equipment, students will learn on how to design the hand tools and workstations that are safe to the users.

Last but not least, the students also will be exposed on how to manage work environment such as thermal comfort, noise, etc. This will contribute better understanding to occupational health of industries.

REFERENCES

1. Karl H.E. Kroemer. Introduction to Ergonomics / Human Factors Engineering, 7th Edition. 2017.
2. Karwowski, W., (Editor), Applying Systemic- Structural Activity Theory to Design of Human- Computer Interaction Systems. Taylor & Francis, London, 2015.
3. MCCauley Bush, Pamela, Ergonomics Foundational Principles, Applications, and Technologies, Boca Raton, FLCRC Press, 2012.
4. Wickens, C.D., An Introduction to Human Factors Engineering, 2nd Edition, Pearson Education International, 2013.

SEMESTER 6

BMMU 3764
BACHELOR DEGREE PROJECT I/
PROJEK SARJANA MUDA I

LEARNING OUTCOMES

At the end of the course, students should be able to:

1. Apply knowledge to proposal preparation of industry-based or practice-oriented project.
2. Imitate appropriate existing concepts in engineering technology fields.
3. Adhere to project's dateline and related procedure.
4. Explain the project proposal in oral and written forms effectively.
5. Report literature review and preliminary findings in a scientific manner.

SYNOPSIS

The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES

1. Bachelor Degree Project Manual, Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan, Universiti Teknikal Malaysia Melaka.

BMMD 3563
PRODUCTION TOOL DESIGN/
REKA BENTUK ALAT PENGELUARAN

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Explain the basic principles and methods of designing production tool in manufacturing field.
2. Apply the basic principles and methods of designing with current industrial practice.
3. Design efficient production tools for manufacturing, assembly and inspection processes.

SYNOPSIS

This course is an introduction to the basic principles and methods of designing production tools such as jigs and fixtures for material removal processes, manual work operations, joining processes and inspection processes. The students will be exposed to the application of industrial work holding devices, drawings and designs. The working drawings will be aided by engineering drawing standards, company catalogues and handbooks. The jigs and fixtures focus on the locating elements such as; clamping elements, tool guiding and setting elements. In this course, students will also use CAD software.

REFERENCES

1. Hoffman, Peter J. (2013). Si Metric precision machining technology. Clifton Park, NY: Cengage Learning
2. Hoffman, E.G. (2002) Jig & Fixture Design, 5th Edition, Delmar Publisher.
3. Joshi, P.H. (2003) Jigs and Fixtures Design Manual, 2nd Edition, McGraw-Hill.
4. Orady, E. (2008) Jigs & Fixtures Design, Workshop Material, BATC UTM.

BMMD 3573
DESIGN OF MACHINE ELEMENT/
REKA BENTUK ELEMEN MESIN

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Apply the theory of common machine elements to design machine elements.
2. Analyze machine elements using finite element analysis.
3. Optimize the design of machine elements using finite element analysis.

SYNOPSIS
The course introduces students to the design and theory of common machine elements including clutches, brakes, bearings, springs and gears. It also gives students experience in solving design problems involving machine elements. Finite element analysis approach will also be introduced to analyze, evaluate and optimize the mechanical structure of machine elements.

REFERENCES
1. Wei Jiang, 2019, Analysis and Design of Machine Elements, John Wiley & Sons.
2. Ansel C. Ugural, 2018, Mechanical Design of Machine Components: Siversion, Taylor & Francis.
3. Budynas, R.G. & Nisbet J.K., 2014, Mechanical Engineering Design, 10th Edition, Mc Graw Hill, Singapore.
4. Juvinall, R.C. Andmarshek, K.M., (2012) Machine Component Design, 5th Edition.
5. Robert L. Norton (2014). Machine Design: An Integrated Approach, 5th Edition, Prentice Hall.

PRE-REQUISITE
BMMM 2313
DINAMICS & MACHANICS OF MACHINE/
DINAMIK & MEKANIK MESIN

BMMD 3583
COMPUTER AIDED ENGINEERING/
KEJURUTERAAN BERBANTU KOMPUTER (CAE)

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Explain the basic principles of finite element analysis in industrial practises.
2. Apply finite element modelling and equation to solve mechanical structure and fluid flow problem in design.
3. Demonstrate finite element analysis using CAD/CAE software.

SYNOPSIS
The course will introduce the students to the fundamental concepts of the finite element method and analysis in the context of practical application with emphasis on the engineering issues

REFERENCES
1. Chandrupatla T.R and Belgundu, A.D (1997), Introduction to the Finite Elements in Engineering, 2nd Edition, Prentice Hall, New Jersey
2. Huebner K.H and Dewhirst D.L(2001), The finite Element Method for Engineers, 4th Edition, John Wiley and Sons Inc, Toronto Canada
3. Cook R.D (1995), Finite Element Modeling for Stress Analysis, John Wiley and Son Inc
4. Logan D.L (2002), A First Course in the Finite Element Method, 3rd Edition Brooks/Cole, Pacific Grove, CA

PRE-REQUISITE
BMMM 2303
SOLID MECHANICS / MEKANIK PEPEJAL

BMMD 3804
INDUSTRIAL DESIGN/
REKABENTUK INDUSTRI

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Explain a systematic approach to the design process in studio projects.
2. Apply design and creative skills learned in one studio to problems encountered in the new context of a successive studio.
3. Demonstrate proficiency in model-making techniques using various materials.

SYNOPSIS
Industrial design deals with the planning and development for production of a variety of objects and interrelated systems. Consumer appliances, tools, safety equipment, business machines, furniture, medical equipment, architectural products, and transportation devices make up a partial list of those areas of specialization in industrial design.

Industrial design falls within a broader category of design, which is the professional area of activity concerned with planning and developing a wide variety of objects and spaces. Relationships among the users of the designed item, the efficient production of the designed item, and the aesthetic characteristics of the designed item are of particular importance.

REFERENCES
1. Chengalur, S.N., Rodgers, S.H. & Bernard, T.E. (2004) Kodak's Ergonomic Design for People at Work, 2nd Edition, Wiley.
2. Wickens, C.D. (2004) An Introduction to Human Factors Engineering, 2nd Edition, Pearson education International.
3. Cacciabue, P.C. (2004) Guide to Applying Human Factors Methods: Human Error and Accident Management in Safety-Critical Systems, Springer.
4. Radwin, R.S. (2007) Lecture Notes on IE 564 (Ergonomics and Occupational Safety), University of Wisconsin – Madison.
5. Smith, M. (2006) Lecture Notes on IE 342 (Introduction to Human Factors), University of Wisconsin – Madison.

BMMP 3814
MANUFACTURING SYSTEM/
SISTEM PEMBUATAN

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Solve manufacturing system problems using simulation approach.
2. Construct models of discrete event simulation for various manufacturing systems
3. Demonstrate manufacturing system simulation using simulation software

SYNOPSIS
Modelling and simulation introduces the students to principles and techniques of discrete event simulation. This is a powerful system tool for analyzing a wide variety of complex engineering and business problems. Students will learn to model a real system, use the main computational and programming instruments, and simulation language, to program the model. Student also will be exposed to design and evaluate simulation experiments.

REFERENCES
1. Harrington, H.J. and Kerim T. (2000) Simulation Modeling Methods: To Reduce Risks and Increasing Performance, McGraw Hill.
2. Severance, F. L. (2001) System Modeling and Simulation: An Introduction, John Wiley & Sons.
3. Averill, L. and Kelton, W.D., (1999) Simulation Modeling and Analysis (Industrial Engineering and Management Science Series), 3rd Edition, McGraw Hill Science/Engineering/Math.

SEMESTER 7

BMMU 4774
BACHELOR DEGREE PROJECT II/
PROJEK SARJANA MUDA II

LEARNING OUTCOMES
After completing the course, students will be able to:

1. Discuss solution to the proposed industry-based or practice-oriented project
2. Demonstrate project findings using appropriate techniques with an understanding of its limitations.
3. Display self-reliance in working independently and cooperates in group activities.
4. Display the ability to present the project findings in oral and written forms effectively.
5. Report literature review and project potential in scientific manner with a recognition of the strengths, weaknesses and opportunity for improvement.

SYNOPSIS
This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES
1. Bachelor Degree Project Manual, Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan, Universiti Teknikal Malaysia Melaka.

PRE-REQUISITE
BMMU 3764
BACHELOR DEGREE PROJECT I/
PROJECT SARJANA MUDA I

BMMD 4594
DESIGN PROJECT/
PROJEK REKA BENTUK

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Define problem, objectives and scope of the project.
2. Design the project and solution using appropriate tools.
3. Demonstrate the project management skills through design project findings

SYNOPSIS
This course develops the student's competence and self-confidence as designers. Design projects are drawn from manufacturing engineering problems. The aims of this course is to expose students with design and research methodology which consists of project background, literature review, project methodology, design, analysis and presentation. The design projects must incorporate engineering standards and realistic constraints that include economic, environmental, sustainability, manufacturability, ethical, health and safety.

REFERENCES
1. Ulrich, K. (2012) Product Design and Development, 5th Edition McGraw Hill.
2. Walker, D.J. (2000) Creative Techniques in Product and Engineering Design: A Practical Workbook, Woodhead Publication, Abington, Cambridge.
3. Matthews, C. (1998) Case Studies in Engineering Design, London: Arnold.

BMMD 4814
MOULD DESIGN/
REKA BENTUK ACUAN

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Classify requirements for a mould design and different types of moulds.
2. Design a mould layout and associate component.
3. Perform a runner and gating system selection for selected part

SYNOPSIS

This course is an introduction to the basic principles and method of designing mould components such as cavity, core, sprue, cooling system, gate and ejectors system. The students will be exposed to the application of industrial work holding devices, drawing engineering standard, design catalogs and mold design handbooks.

REFERENCES

1. Rainer Dangel (2016) Injection Moulds For Beginners, Hanser Publishers, Munich.
2. Kazmer D.O. (2016). Injection Mold Design 2nd Edition, Hanser Publishers, Munich.
3. Harry Pruner Wolfgang Nesch (2013). Understanding Injection Moulds, Hanser Publishers, Munich.
4. Rees. H (2011). Mold Engineering 2nd, Hanser Publishers, Munich.
5. Osswald. T.A., Turng L.S and Graman. P (2008) Injection Moulding Handbook, 2nd Edition Hanser Publishers, Munich

BMMD 4824
AUTOMOTIVE COMPONENT MANUFACTURING/
PEMBUATAN KOMPONEN AUTOMOTIF

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Explain the knowledge in automotive manufacturing technology.
2. Builds the automotive components at the final prototype stage by using software and machinery.
3. Apply the knowledge of design and material processing to produce automotive components for supporting the automotive ecosystem.

SYNOPSIS

This course provides strong fundamental concepts and techniques related to various type of finishing method that are applied in automotive industries. This course covers three major techniques used in finishing process such as machine process, joining process and surface treatment. The course is practical oriented where students apply their knowledge as well as capable to operate the relevant equipment.

REFERENCES

1. Serope Kalpakjian, (2014) Manufacturing Engineering & Technology, 7th edition, Prentice Hall
2. R.L. Timings, (1998) Manufacturing Technology, vol 1, 3rd edition, Wesley Longman
3. P.N RAO, (2000) Manufacturing Technology-Metal cutting & Machine Tools, McGraw Hill.
4. J.L.Stauffer, (1993) Finishing Systems design & Implementation, Published by association of Finishing process of the Society of Manufacturing Engineers. (SME)
5. H.S .Bawa, (2004) Manufacturing processes, McGraw Hill
6. Robert. GmBH, (2005) Automotive Handbook, 6th edition. Society of Automotive Engineer (SAE)

BMMD 4834
PACKAGING DESIGN & TECHNOLOGY/
REKABENTUK & TEKNOLOGI PEMBUNGKUSAN

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Explain the type, material and processes for packaging.
2. Analyze the packaging economics that abide packaging laws and regulations.
3. Design basics graphic and package base on material selection and marketing requirements.

SYNOPSIS
Packaging Design and Technology presents an overall of packaging and incorporates many disciplines to enable students to adequately convey and coordinate packaging activities. The course covers topics of introduction to packaging, fundamental components of packaging, essential elements of physical distribution, properties and sensitivity of different product, package system performance selection and packaging as marketing tool. The design aspects also covered.

REFERENCES
1. Luke, H. The Packaging and Design Templates Sourcebook (Graphic Design), RotoVision. 2007.
2. Kit L. Yam. The Wiley Encyclopedia of Packaging Technology, J. Wiley & Sons 2009.
3. Klimchuk, Marianne Rosner, Packaging Design: Successful Product Branding from Concept to Shelf. Hoboken, NJ: John Wiley 2006.
4. Steven D. and John S. Package Design Work Book: The Art and Science of Successful Packaging. Rockportu Publisher 2011.
5. Soroka, W. 4nd edition. Fundamental of Packaging Technology, DEStech Publication. Inc 2009.

BMMP 4XX4
IOT IN MANUFACTURING/
IOT PEMBUATAN

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Apply the knowledge of design and material processing to produce automotive components for supporting the automotive ecosystem.
2. Builds the automotive components at the final prototype stage by using software and machinery.
3. Shares the knowledge of automotive manufacturing new technology among students.

SYNOPSIS
This course provides strong fundamental concepts and techniques related to various type of finishing method that are applied in automotive industries. This course covers three major techniques used in finishing process such as machine process, joining process and surface treatment. The course is practical oriented where students apply their knowledge as well as capable to operate the relevant equipment.

REFERENCES
1. Serope Kalpakjian, (2014) Manufacturing Engineering & Technology, 7th edition, Prentice Hall
2. R.L. Timings, (1998) Manufacturing Technology, vol 1, 3rd edition, Wesley Longman
3. P.N RAO, (2000) Manufacturing Technology-Metal cutting & Machine Tools, McGraw Hill.
4. H.S .Bawa, (2004) Manufacturing processes, McGraw Hill
5. Robert. GmBH, (2005) Automotive Handbook, 6th edition. Society of Automotive Engineer (SAE) McGraw Hill, 2005

SEMESTER 8

BMMU 4786
INDUSTRIAL TRAINING/
LATIHAN INDUSTRI

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Show technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Communicate effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES

1. UTeM Guideline Handbook for Industrial Training.

BMMU 4796
INDUSTRIAL TRAINING REPORT/
LAPORAN LATIHAN INDUSTRI

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Produce industrial training report.
2. Present report orally on working experience.

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE

Student required to pass Industrial Training BMMU 4786 in order to pass Industrial training report.

REFERENCES

1. UTeM Guideline Handbook for Industrial Training.

COURSE DETAILS FOR JTKP PROGRAMMES

BMMP COURSE CORE COURSES (K)

SEMESTER 1

BMMA 1333
STATICS/
STATIK

LEARNING OUTCOMES

At the end of this course, students should be able to:
1. Describe the physical sciences of statics concepts
2. Construct statics experiments to recognize the engineering mechanics of statics principles.
3. Explain effectively as an individual and assist group members for experimental and assignment works.

SYNOPSIS

An introduction to the basic concept of statics as physical sciences, system of units, scalars and vectors, free body diagram, forces system, force system resultants and moment, equilibrium of a particle, equilibrium of a rigid body, structural analysis (trusses analysis and simple frames and machines), friction and center of gravity and centroid.

REFERENCES

1. Hibbeler, R.C. (2016) Statics and Mechanics of Materials, 14th SI Edition, Prentice Hall, New York.
2. Beer, F. P., Johnston jr., E. R., Eisenberg, E. R., (2016) Vector Mechanics for Engineers - Statics, 11th Edition in si units, McGraw Hill, New York.
3. Meriam, J. L., Kraige L. G. (2008) Engineering Mechanics - Static SI Version, 6th Edition., John Wiley & Sons, New York.
4. Pytel, Kiusaalas. (2009). Engineering Mechanics-Static. 3rd Ed. Cengage Learning.
5. Michael P., Gary, G., Constanzo, F., (2009). Engineering Mechanics - Statics. Mcgraw-Hill Higher Education.

BMMD 1304
ENGINEERING DRAWINGS & CAD/
LUKISAN KEJURUTERAAN & CAD

LEARNING OUTCOMES

At the end of this course, students should be able to:
1. Explain the principles of engineering drawing and Computer Aided Design (CAD).
2. Generate 2D and 3D freehand sketching.
3. Construct engineering drawing using CAD software.

SYNOPSIS

The purpose of this course is to provide students with an understanding of the importance of engineering graphic communication to the design process and interpreting the engineering drawings. Student will gain hands-on experience creating freehand technical sketches, CAD technical drawings using orthographic projections, sections auxiliary views and isometric drawings. Emphasis is placed on creating drawings that are neat, correctly dimensioned using industry standards. Students will use freehand sketches methods and CAD software to develop visualization skills and create the engineering drawings. This course consists of lecture and practical session. A major part of the course consists of performing structured laboratory exercises. Classroom activities will complement and support the lab exercises with explanations and demonstrations of required activities.

REFERENCES

1. Ashleigh Fuller, Antonio Ramirez, Douglas Smith. Technical Drawing 101 With Autocad 2017
2. David A. Madsen and David P. Madsen, Engineering Drawing And Design, 6th edition, 2016
3. Giesecke, Mitchell, Spencer, Hill, Dygdon, Novak, Technical Drawing With Engineering Graphics, 14th Edition, Prentice Hall, 2012.
4. Dix Riley, Discovering Autocad 2009, Pentice Hall, 2009.

BMMP 1303
MANUFACTURING PRACTICE/
AMALAN PEMBUATAN

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Describe proper use of basic engineering equipments and requirement
2. Build product based on technical drawing that meet specific tolerance.
3. Perform the process according to the proper procedure.

SYNOPSIS
The practice consists of introduction to basic knowledge of using manual hand tools and equipment, machine tools, welding, fabrication, lathe, milling, and some manual work within manufacturing daily activities. It introduces common equipments for performing manufacturing works such as lathe and milling machine, arc welding, tig/mig welding, sheet metal forming etc. Due to its nature as introductory course, students are required to prepare at home before having the practice to acquire any knowledge concerning the practices.

REFERENCES
1. Kalpakjian, S. and Schmid R. (2014), Manufacturing Engineering and Technology, 7th Edition, Prentice Hall.
2. Mikell, P. G. (2010) Fundamental of Modern Manufacturing Materials, Processes, and Systems, 4th Edition, John Wiley & Sons.
3. Mikell P. G., (2013) Principles of Modern Manufacturing SI Version, 5th Edition, John Wiley & Sons.

BMMA 1313
PRINCIPLE OF ELECTRIC AND ELECTRONIC/
PRINSIP ELEKTRIK DAN ELEKTRONIK

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Explain the basic of electrical and electronics principles, circuit schematics and components.
2. Develop electrical circuit and justify the measured values using appropriates approach.
3. Demonstrate ability to work effectively as individuals members, or leaders in technical teams.

SYNOPSIS
This course will cover on the topics of electrical and electronic components, emphasizing on electric circuit theory such as components and measurement instruments, circuit analysis. For electronic principle, it will cover on the topics of electronic devices such as operational amplifiers and digital electronics it will deals with topics such as system numbers, logic gates, boolean operation, combination logic circuits, and digital circuit application.

REFERENCES
1. Allan, R., H. (2014) Electrical Engineering, Pearson Education
2. Thomas L. Floyd (2010) Principles of Electric Circuits, 9th Edition, Prentice Hall.
3. Thomas L. Floyd (209) Digital Fundamental, 10th Edition, Pearson Education.
4. Alexander, C.K., (2008) Fundamental Of Electric Circuit, Mcgraw Hill.
5. Nilsson, J. W., Riedel, S. A., (2008) Electric Circuit, Prentice Hall
6. Roger, T., (2008) Digital Electronics Principles & Applications, Mcgraw Hill.

SEMESTER 2

BMMM 2313
DYNAMICS & MECHANICS OF MACHINE/
DINAMIK & MEKANIK MESIN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:
1. Describe the concept and principle of dynamics and mechanics of machine element.
2. Demonstrates the dynamics and mechanics of machine laboratory experiments
3. Convert dynamics and mechanics of machine into engineering practices.

SYNOPSIS

Introduction to basic principles based on kinematic and kinetic dynamics. The concept of displacement, distance, velocity, speed and acceleration. Application of newton's second law. The principle of work and energy, impulse and momentum of particles and rigid bodies. Transmission system based on the friction of motion, such as belts, brakes and dibble. Based delivery systems such as chains and gear teeth. Gear system. Balancing the dynamic system that includes balancing the body rotating plane and a parallel plane. Balancing of reciprocating motion as the body line of engines, radial engines and engine. Gyroscopic motion that includes a couple gyroscope. Gyro scope coupling effects. Simple harmonic motion and vibration consists of moving one degree of freedom. Free vibration. Damped free vibration. Forced damped vibration. Speed control of the cycle flywheel.

REFERENCES

1. Beer, F. P., Johnson, E.R., Clausen, W. E., (2013) Vector Mechanics For Engineers, Dynamics Si Units, 10th Edition. Mcgraw-Hill.
2. Hibbeler, R. C. (2013) Engineering Mechanics, Dynamics, 12th Edition. Prentice Hall.
3. Meriam, J. L. And Kraige, L. G. (2013). Engineering Mechanics, SI Version, 6th Edition. John Wiley.
4. Bedford, A. And Fowler, W. (2008). Engineering Mechanics: Dynamics (SI units). 5th Edition.Prentice Hall.
5. Cleghorn, W. L., 2005, Mechanics of Machines, Oxford University Press.

BMMP 1313
ENGINEERING MATERIALS/
BAHAN KEJURUTERAAN

LEARNING OUTCOMES

At the end of this course, students should be able to:
1. Explain the structures, properties and processing of engineering materials.
2. Display the ability to determine the microstructures and mechanical properties of various materials.
3. Construct the solution for engineering material problems.

SYNOPSIS

This course introduces basic concepts of engineering materials that covers introduction to engineering materials, inter-atomic bonding, crystalline structure and imperfections in solid. Explanation on different type of engineering materials (i.e. metal, polymer, ceramic, composite and semiconductor), its mechanical properties, basic application and processing are also included. Introduction to the binary phase diagrams (composition and microstructure correlation) is also given.

REFERENCES

1. Callister W.D. and Rethwisch D.G, 2011, Fundamentals of Materials Science and Engineering, 8th Edition, John Wiley & Sons.
2. Aludin Mohd Serah, 2017, Engineering Materials for Engineering Technologists Module 15, 3th Edition, Penerbit Universiti, Universiti Teknikal Malaysia Melaka.
3. Smith W. F., 2011, Foundation of Materials Science and Engineering, 5th Edition, Mcgraw Hill.
4. Askeland D. R., 2011, The Science and Engineering of Materials, 6th Edition, Cl-Engineering.

BEEA 1343
COMPUTER PROGRAMMING/
PENGATURCARAAN KOMPUTER

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Produce computer programming code based on principles, structures and techniques in C++.
2. Construct programming language code by applying suitable C++ programming techniques to solve a given problem.
3. Work in group effectively while performing group assignment.

SYNOPSIS
In this course, students will be exposed to the basic principles of computer and software development methodology. The course also includes basic principles of programming such as syntax, semantic, compiling, and linking. Students will also learn programming techniques using C++ such as data type, operator, selection, repetition, function, array, file, and pointer.

REFERENCES
1. Gaddis, T., (2015), Starting Out with C++: From Control Structures through Objects, 8th Edition, Global Edition, Pearson Education.
2. Daniel Liang, Y, (2014), Introduction to Programming with C++, 3RD Edition, Pearson Education.
3. Deitel, H.D., (2014), C++ How to Program,9th Edition, Pearson Education.
4. Nell, D., (2013), Programming and Problem Solving with C++: Comprehensive, 6th Edition, Jones & Bartlett Learning.
5. Gregoire, M., (2011), Professional C++, 2nd Edition, John Wiley & Son.

BMMP 1323
MANUFACTURING PROCESS/
PROSES PEMBUATAN

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Explain the fundamental concepts of manufacturing processes.
2. Differentiate the ability of various manufacturing processes.
3. Construct various skills of manufacturing techniques.

SYNOPSIS
In this module, students will be introduced to various manufacturing processes that can be categorized into three major focus areas; metal removal processes, near-net shape and forming processes and joining processes. For the metal removal processes, the students will be exposed to turning, milling and abrasive machining. In the area of near-net shape and forming processes, wide range of processes will be introduced such as casting, rolling, forming, forging and extrusion. In addition to that near-net-shape processes for plastic, ceramic and metal powder will also be covered. And finally, the joining processes will familiarize the students to fusion and solid state welding.

REFERENCES
1. Kalpakjian, S. and Schmid, R. (2014) Manufacturing Engineering and Technology, 7th Edition, Prentice Hall.
2. Timing, R. and Tooley, M. (2001) Basic Manufacturing, 2nd edition, Newnes.
3. Rao, P.N. (2000) Manufacturing Technology – Metal Cutting and Machine Tool, Mc Graw Hill.
4. Schey, J.A. (2000) Introduction to Manufacturing Processes, 3rd edition, Mc Graw Hill.

SEMESTER 3

BMMD 2313
THERMO FLUID/
TERMO BENDALIR

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Apply the thermodynamic Laws for common steady-flow device.
2. Solve various fluid flow problems using the fluid mechanics equations
3. Demonstrate the principles of thermodynamics and fluid mechanics through laboratory experiments.

SYNOPSIS

The course introduces the students to the basic engineering of thermodynamics that involved study on the energy transformation, working fluids, theory and application of first and second laws of thermodynamics. The course also covers explanation on the steam and gas power plant as a direct application of the thermodynamic theory. Students will be exposed on refrigeration system as an application on the thermodynamics principles. The second part of this course is to introduce the students to the basic of fluid mechanics. This consists of fluid's static and dynamic analysis, buoyancy and stability, Bernoulli equation, momentum principle, flow behavior in pipe and also covers the basic principle of dimensional analysis.

REFERENCES

1. Cengel, Y.A., Turner, R. H. & Cimbala, J. M. (2017) Fundamentals of Thermal-Fluid Sciences, 5th Edition in SI Units, Mc Graw Hill.
2. Kaminsky, D. A. & Jensen, M.K. (2005) Introduction to Thermal and Fluid Engineering, John Wiley & Sons, Inc.
3. Cengel, Y.A. & Michael, A.B. (2002) Thermodynamics: An Engineering Approach, 4^{th} Edition, Mc Graw Hill.
4. Eastop, T.D. & McConkey, A. (2004) Applied Thermodynamics for Engineering Technologist, 5^{th} Edition, Longman.

BMMM 2303
SOLID MECHANICS/
MEKANIK PEPEJAL

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply the knowledge and principles of mechanics of materials in engineering design.
2. Identify appropriate experimental techniques in mechanics of material through laboratory experiments.
3. Demonstrate the ability to work and communicate effectively in engineering project using the principle of mechanics of material.

SYNOPSIS

The course contains topics of introduction, stress, strain, hooke's law, bending, mechanical properties, transformation of stress, axial load, transformation of strain torsion, beam bending, transverse shear, combined loadings, deflection of beams and shafts and Mohr's circle.

REFERENCES

1. Hibbeler R.C., 2013, Statics and Mechanics of Materials, 3rd SI Ed., Prentice Hall, New York.
2. Beer. F.P. Et Al. 2012. Mechanics Of Materials, 6th Edition in SI Units. Mcgraw-Hill.
3. Beer. F.P. Et Al. 2011. Statics and Mechanics of Materials, 1st Edition. Mcgraw-Hill.
4. Beer, F. P. And Johnston Jr., E. R. and Eisenberg, E. R., 2010, Vector Mechanics For Engineers - Statics, 9th Ed. in SI Units, Mcgraw Hill, New York.
5. Roy Craig Jr., 2011, Mechanics of Materials, 3rd Ed., John Wiley & Sons, New York.

BMMP 2503
MEASUREMENT AND INSTRUMENTATION /
PENGUKURAN DAN INSTRUMENTASI

LEARNING OUTCOMES
At the end of this course, the students should be able to:
1. Analyse the basic elements of common measurement systems.
2. Perform suitable measurement methods for a given issue.
3. Measure the performance of a measurement system.

SYNOPSIS
Measurement and instrumentation course covers three main areas; dimensional metrology, measurement analysis, and surface/texture measurement. In the dimensional metrology, students will be expose to three types of measurements; linear, angle and geometrical. Besides that, measurement of screw thread also covered in this course. Students will be taught from basic measuring instruments and will be introduced to the usage of the high precision measuring instruments that are Coordinate Measuring Machine and CNC Roundness measuring. In the measurements analysis, students will be required to describe the standard Measurement, measurement process, process capability, measurement errors, limits, tolerances and fits. In surface/texture measurement, students will perform the measurement of surface texture.

REFERENCES
1. Lau Kok Tee, and Saiful Naim Sulaiman (2020) Dimensional Measurement and Instrumentation for Technologist, Penerbit Universiti, Universiti Teknikal Malaysia Melaka
2. Connie, D. (2015). Fundamentals of Dimensional Metrology, 6th Edition. Cengage Learning.
3. Kalpakjian, S., Schimd, S. R., (2014). Manufacturing Engineering and Technology, 7th Edition. Prentice Hall.
4. Bucher, J. L. (2012). The Metrology Handbook, 2nd Edition. SQ Quality Press.
5. Campbell, R. G., Roth, E. S. (2002). Integrated Product Design and Manufacturing Using Geometrical Dimensioning and Tolerancing. Marcel Dekker, Inc.

SEMESTER 4

BMMP 2333
QUALITY CONTROL/
KAWALAN KUALITI

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Explain the basic quality principles and practices, quality solving techniques and product reliability related to manufacturing process.
2. Solve the manufacturing process quality problem using quality solving techniques.
3. Performs the ability to apply the quality solving techniques such as SPC, QFD, FMEA and Six Sigma in order to improve quality.

SYNOPSIS
There are four main sections consist in Quality and Reliability course: quality principles and practices; quality solving techniques; reliability and additional quality tools. In quality principle and practices, its covers quality basic, quality gurus, introduction to total quality management, and quality awards. Quality solving techniques will cover statistical process control (7 QC tools). In reliability, it explains life and reliability testing plans for product and process. Additional quality tools are Quality Function Deployment (QFD), Failure Mode Effect & Analysis (FMEA), Six Sigma and PDSA.

REFERENCES
2. Montgomery D. C., (2009) Introduction to Statistical Quality Control, 6th Edition, John Wiley and Sons, Inc.
3. Besterfield, D. H. (2014) Quality Improvement, 9th Edition, Pearson
4. Bass, I (2014) Six Sigma Statisctic with Excel and Minitab, Mc Graw Hill.
5. Besterfield, D.H., Besterfield-Minhna, C., Besterfield, G. H. and Besterfield-Sacre, M. (2014) Total Quality Management, 9th Edition, Prentice Hall.
6. Yusuf, Y., Abdullah, R. And Abdul Rasib, A. H. (2019) Quality Control For Engineering Technologist, 2nd Edition.

BMMP 2343
CONTROL SYSTEM/
SISTEM KAWALAN

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Apply appropriate techniques in describing the characteristics of control systems in time domain.
2. Construct experiments to distinguish system performances of open loop and closed loop systems.
3. Report the analysis of transient and steady state performance for first and second order control systems.

SYNOPSIS
This course focuses on the fundamental of control system theory. The system includes translational mechanical system, rotational mechanical system and electromechanical system, in linear and time invariant state. Student will also be exposed to solve stability and steady state problems in a system. Some of the methods used in solving these problems are dynamic system modelling, Laplace transform, block diagram and Routh-Huwirtz stability. Practical application on how to use commercially available mathematical software to solve control problem will also be introduced.

REFERENCES
1. Norman S. Nise, (2019). Control Systems Engineering, 6th Edition, John Wiley & Sons Inc.,
2. Katsuhiko Ogata, (2010). Modern Control Engineering, 5th Edition, Pearson.
3. Richard C. Dort, Robert H. Bishop (2011), Modern Control Systems, 12th Edition, Pearson.
4. Gopal, M, (2012) Control Systems: Principles and Design, 4th Edition, Mc Graw Hill.
5. Khalil Azha Mohd Annuar et. Al (2015)., Introduction to Control System, Penerbit UTeM.

BMMD 2324
PRODUCT DESIGN AND DEVELOPMENT/
REKA BENTUK DAN PEMBANGUNAN PRODUK

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Explain the principles of product design and development.
2. Organizes the product through the outcomes of analyzed problems.
3. Ability to work effectively in group for process of product design and development.

SYNOPSIS
This course blends the perspectives of marketing, design and manufacturing into a single approach to product development. This course provides the students with real industrial practices and essential roles played by various members of product development teams. Throughout this course, various attempts are used to strike a balance between theory and practical.

REFERENCES
1. H. Boejang, H. Attan, M.F. Basar, M.I Ramli, (2013) Module 4: Product Development for Engineering Technology, 1st Edition, Penerbit Universiti, UTeM, Melaka, Malaysia.
2. Ulrich, K.T. & Eppinger, S.D. (2016) Product Design and Development, 6th Edition, McGraw Hill Irwin.
3. Chitale, A.K. & Gupta, R.C. (2013) Product Design and Manufacture, 6th Prentice Hall, New Delhi, India.
4. Kalpakjian, S. & Schmid, S.R. (2014), Manufacturing Engineering & Technology, 7th Edition, Prentice Hall.

BMMP 2514
CAD/
CAM

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Explain CAD/CAM systems and applications in industrial manufacturing.
2. Construct basic principles CAD/CAM methodology into 2D, 3D, surface modelling and CAM operation.
3. Manipulate machining strategies and toolpath methods for milling or turning operations for a given part.

SYNOPSIS

This course is an introducing to the CAD/CAM system and its application in industry. The students will be exposed to the application of high-end CAD/CAM software for generating geometric modelling and also part programming. The course covers generating 2D Graphic Elements, Geometric Modelling Systems, Generative/ Interactive Drafting, CAD and CAM Integration and CAD/ CAM Programming. By doing a group project, student will understand the link from CAD to CAM operation. Using CAD/CAM software, students will know how to simulate the part programming before start the machining operation.

REFERENCES

1. Michel Michaud, CATIA Core Tools: Computer Aided Three-Dimensional Interactive Application, 1st Edition, McGraw Hill, 2012.
2. Rao, P.N. (2017) CAD/CAM Principles and Applications, 3rd Edition, McGraw Hill.
3. Chang T.C., Wysk, R.A. & Wang, H.P. (2006) Computer-Aided Manufacturing, 2nd Edition, Prentice Hall.
4. McMahon, C. & Browne, J. (1998) CADCAM Principle, Practise and Manufacturing Management, 2nd Edition, Prentice Hall.

SEMESTER 5

BMMP 3354
INDUSTRIAL ENGINEERING/
KEJURUTERAAN INDUSTRI

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Analyze the problems that are related to Industrial Engineering.
2. Solve manufacturing operation scenarios using Industrial Engineering tools and techniques.
3. Perform experiments or laboratory tasks related to topics discussed in IE.

SYNOPSIS

This course is an introduction to Industrial Engineering (IE). The course introduces fundamental concepts and technique in IE covering two major areas that are production systems and optimization. In production system, student will be taught to productivity concept, work study and measurements, facility planning, forecasting, material requirement planning, inventory control and production scheduling. In optimization, students will be exposed to queueing theory, simulation and modelling, lean manufacturing and project management.

REFERENCES

1. Stevenson, W.J. (2015). Operations Management, 12th Edition. McGraw Hill.
2. Heizer, J., and Render, B. (2014) Operations Management, Pearson.
3. Abdullah, R, Mohamad, N.A, Kamat, S.R (2013). Modul: Industrial Engineering for Technologist Part 1 and Part 2. Penerbit UTeM.
4. Garcia-Diaz, Alberto and Smith, J. MacGregor (2008). Facilities Planning & Design. Prentice Hall
5. Arnold, J.R. Tony, Chapman, Stephen N. and Clive, Lloyd M. (2008). Introduction to Materials Management. Pearson International.
6. Kelton, David W., Sadowski, Randall P., Sturrock, David T. (2007). Simulation with Arena. McGraw Hill.

BMMP 3573
MATERIALS TESTING AND FRACTURE ANALYSIS/ PENGUJIAN BAHAN & ANALISIS PATAH

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Analyze various methods of material testing and non-destructive analysis in manufacturing.
2. Construct mechanical testing of materials in manufacturing and service.
3. Perform non-destructive analysis of materials in manufacturing and service

SYNOPSIS
The course will introduce the student on how Identify the various methods of materials testing and able to explain the effects of external forces on the behavior of materials, and the test methods employed in determining various mechanical properties. Among the scope of the course are fundamental and characteristics of different types of failures in materials to apply the fracture mechanics principles to identify the types of fracture surfaces of different materials and able to perform failure analysis, to differentiate the types of failure and fracture of materials in manufacturing and service.

REFERENCES
1. Norman E. Dowling (2013), Mechanical behavior of materials: engineering methods for deformation, fracture, and fatigue. 4th Edition. Boston, MA: Pearson
2. P. Field Foster (2007). The mechanical testing of metals and alloys, SIR ISAAC PITMAN & SONS, LTD., USA
3. Nicholas P Cheremisinoff, and Paul N Cheremisinoff (1995) Hand book of advanced materials testing, III SERIES, Materials engineering, MARECEL DEKKER INC., USA.1995

BMMP 3533
ADVANCED MANUFACTURING PROCESSES/ PROSES PEMBUATAN TERMAJU

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Choose the most appropriate processes for a given product design, application and cost.
2. Performs some experiments based on the advanced manufacturing process lab sheet requirements.
3. Demonstrates correct steps in executing tasks/ projects related to advanced manufacturing process.

SYNOPSIS
The course consists of non-traditional manufacturing processes and material removal methods, which include manufacturing processes using lasers technology, electron beam, abrasive water jet, electro discharge machining and electro chemical machining. Moreover, it will also include the introduction to aerospace material machining, automotive stamping, coating technology and electronic manufacturing processes.

REFERENCES
1. Serope Kalpakjian & Steve Schmid, (2014) Manufacturing Process and Technology, Prentice Hall
2. Mikell, P.G. (2007) Fundamental of Modern Manufacturing Process, 3rd Edition, Prentice hall.
3. Gregg, R. (2004) Modern Materials and Manufacturing Processes, Prentice Hall.
4. Degarmo, B.K. (1997) Materials and Processes in Manufacturing, 8th Edition, Prentice hall.

BMMP 2543
MATERIAL SELECTION/
PEMILIHAN BAHAN

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Solve materials and processing selection in product design and manufacturing.
2. Construct the suitability of a particular materials and processing method using data, chart and software.
3. Displays the right materials and processes to be used for products fabrication.

SYNOPSIS
This course integrates all types of engineering materials (metals, polymers, ceramics and composites) and its properties (modulus, strength, hardness and toughness etc) for materials selection in any engineering design. Various processing techniques (shaping, joining and finishing etc) are also summarized. Case study and project work are used to reinforce the concept and capabilities in applying selection of materials utilizing materials properties charts, data and software.

REFERENCES
1. Ashby, M.F. (2016) Materials Selection In Mechanical Design, 5rd Edition, Butterworth-Heinemann.
2. Mahmoud M.F. (2013) Selection of Materials and Manufacturing Processes for Engineering Design, 3rd Edition, Prentice Hall.
3. Ashby, M.F. (2009) The art and Science of Material selection in Product design, Butterworth-Heinemann.

PRE-REQUISITE
BMMP 1313
ENGINEERING MATERIALS/
BAHAN KEJURUTERAAN

BMMP 4553
SHEET METAL TECHNOLOGY/
TEKNOLOGI KEPINGAN LOGAM

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Solve problems in sheet metal technology design and application using correct tools and techniques.
2. Explain/Show sheet metal application / product to meet specified needs with appropriate consideration on technological aspect
3. Demonstrate sheet metal machines / equipment to produce complex sheet metal product.

SYNOPSIS
This course covers the introduction to safety, tools, machinery, materials, and fasteners used in the sheet metal trade. It covers processes such as cutting, forming and joining methods in fabrication of sheet metal and also including application of advanced machine such as CNC Tube Bending, CNC Laser Cutting, CNC Turret Punch and CNC Press Brake.

REFERENCES
1. Talyan Altan and A. Erman Tekkaya (2012). Sheet metal forming: processes and applications. Materials Park, Ohio: ASM
2. Vukota, Boljanovic, (2004) Sheet Metal Forming Processes and Die Design, Industrial Press Inc.
3. R.E Wakeford, (2002) Sheet Metal Work, Biddles Ltd.
4. Steve D. Benson, (1997) Press Brake Technology: A Guide to Precision Sheet Metal Bending, Society of Manufacturing Engineers.
5. Leo A. Mayer, (1995) Sheet Metal, American Technical Publishers Inc.

SEMESTER 6

BMMU 3764
BACHELOR DEGREE PROJECT I /
PROJEK SARJANA MUDA I

LEARNING OUTCOMES

At the end of the course, students should be able to:

1. Apply knowledge to proposal preparation of industry-based or practice- oriented project.
2. Imitate appropriate existing concepts in engineering technology fields.
3. Adhere to project's dateline and related procedure.
4. Explain the project proposal in oral and written forms effectively.
5. Report literature review and preliminary findings in a scientific manner.

SYNOPSIS

The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES

1. Bachelor Degree Project Manual, Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan, Universiti Teknikal Malaysia Melaka.

BMMP 3563
JIG & FIXTURES/
JIG & LEKAPAN

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Explain requirements for jigs and fixtures.
2. Design jigs and fixtures.
3. Implement locating and clamping principles.

SYNOPSIS

This course starts with an introduction of jigs and fixtures that is used to facilitate production works, making interchangeable pieces of work possible at a savings in cost production. Jigs and fixture are used to locate and hold the work that is to be machined. Also, the use of this device can result in such a degree of accuracy that workpieces can be assembled with a minimum amount of fitting. A jig and fixture can be designed for a particular job. The form to be used depends on the shape and requirement of the workpiece to be machined.

REFERENCES

1. Hoffman, Peter J. (2013). Si Metric precision machining technology. Clifton Park, NY: Cengage Learning
2. E.G. Hoffman (2004) Jig and Fixture Design 5th edition, Thomson Delmar Learning Publisher.
3. E.K. Henriksen (1973) Jig and Fixture Design Manual, Industrial Press, New York.

BMMP 3523
JOINING TECHNOLOGY/
TEKNOLOGI PENCANTUMAN

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Demonstrate the characteristics of joining in terms of process, equipment and setup.
2. Analyze the quality of joints using testing methods.
3. Construct the Non Destructive Testing (NDT) and Destructive Testing (DT) methods.

SYNOPSIS

Joining Process is another very important element in manufacturing and assembly processes. Nearly all products, from relatively simple to the most complex, are assembled from single parts or components. Therefore, this course shall cover each of related joining process and its equipment, inclusive welding, brazing, soldering, adhesive bonding and mechanical fastening. Furthermore, its also provides an engineering applications of using some of the equipment and tools of joining processes.

REFERENCES

1. Serope Kalpakjian & Steve Schmid, (2014) Manufacturing Process and Technology, Prentice Hall
2. Klas Weman & Gunnar Linden, (2006) MIG welding guide, Woodhead Publishing Limited.
3. Jeffus L, (2004) Welding Priciples and Aplication, Thomson.
4. Howard C., (2002) Modern Welding Technology, Prentice Hall.

PRE-REQUISITE

BMMP 1323
MANUFACTURING PROCESES/
PROSES PEMBUATAN

BMMP 3584
ADVANCED MACHINING/
PEMESINAN TERMAJU

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Distinguish the basic operation principles and control systems of CNC Three-Axis and Five-Axis machining.
2. Construct CNC Five-Axis program for milling operations inclusive of indexing and simultaneous motions.
3. Solve a complete CNC Program for any given actual industrial examples.

SYNOPSIS

This course provides concepts and techniques to prepare students with advanced computer numerical control (CNC) and computer-aided manufacturing (CAM) application. The course covers the following concepts and techniques: practice safety; apply mathematical concepts; interpret engineering drawings and control documents; recognize different manufacturing materials and processes; measure/ inspect; perform advanced machining; use verification and communication systems; and program using 5-axis CAM [computer-aided manufacturing] systems.

REFERENCES

1. Mattson, M. (2010) CNC Programming Principles and Applications, Delmar.
2. Krar, S., Gill, A., and Smid, P. (2000) Computer Numerical Control Simplified, Industrial Press Inc.
3. Madison, J. (1996) CNC Machining Handbook, Industrial Press Inc.
4. Mattson, M. (2002) CNC Programming Principles and Applications, Delmar.
5. McGeough, J.A., (2001) Advanced Methods of Machining, 1st Edition, Springer, New York.

PRE-REQUISITE

BMMP 2514
CAD/ CAM

BMMP 3804
LEAN MANUFACTURING/
PEMBUATAN LEAN

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Examine the lean practices for manufacturing.
2. Perform effectively to identify and eliminate the types of waste apparent in a manufacturing system.
3. Construct a value stream cell to fit a particular situation or specific problem by using lean manufacturing tool and techniques.

SYNOPSIS
Lean Manufacturing is based upon the principle of eliminating waste at all levels throughout the manufacturing system. This module reviews the skills and techniques required to analyse manufacturing systems and to design improved methods and layouts. It will use Value Stream Mapping to understand and appraise the current state; future state mapping will be used to develop a vision of value added flow. The focus of this module will be on the application of the technique through case studies and industrial experience, and will identify the benefits to be gained by their successful.

REFERENCES
1. William A. Levinson. (2013). Lean management system LMS: a framework for continual lean improvement. Boca Raton, FL: CRC Press
2. William, M.F. (2000), Lean Manufacturing: Tools, Techniques, and How to Use Them, St. Lucie Press
3. Tapping, D., Luyster,T. and Shuker, T (2002) Value Stream Management, Productivity Press.
4. Womack, J. P. and Jones, D.T., (2003) Lean Thinking, Simon & Schuster.
5. Shingo, S. (1989) A study of the Toyota Production System from an Industrial Engineering Viewpoint, Productivity Press

BMMP 3814
MANUFACTURING SYSTEM/
SISTEM PEMBUATAN

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Solve manufacturing system problems using simulation approach.
2. Construct models of discrete event simulation for manufacturing systems.
3. Perform manufacturing system simulation using simulation software.

SYNOPSIS
Modeling and simulation introduces the students to principles and techniques of discrete event simulation. This is a powerful system tool for analyzing a wide variety of complex engineering and business problems. Students will learn to model a real system, use the main computational and programming instruments, and simulation language, to program the model. Student also will be exposed to design and evaluate simulation experiments.

REFERENCES
1. Harrington, H.J. and Kerim T. (2000) Simulation Modeling Methods: To Reduce Risks and Increasing Performance, McGraw Hill.
2. Severance, F. L. (2001) System Modeling and Simulation: An Introduction, John Wiley & Sons.
3. Averill, L. and Kelton, W.D., (2014) Simulation Modeling and Analysis (Industrial Engineering and Management Science Series), 3rd Edition, McGraw Hill Science/Engineering/Math.
4. Banks, J., Carson Ii, J.S., Nelson, B.L. and Nicol, D.M. (2010). Discrete-Event System Simulation, 5th Edition. Peasron

SEMESTER 7

**BMMU 4774
BACHELOR DEGREE PROJECT II/
PROJEK SARJANA MUDA II**

LEARNING OUTCOMES

After completing the course, students will be able to:

1. Discuss solution to the proposed industry-based or practice- oriented project.
2. Demonstrate project findings using appropriate techniques with an understanding of its limitations.
3. Display self-reliance in working independently and cooperates in group activities.
4. Display the ability to present the project findings in oral and written forms effectively.
5. Report literature review and project potential in scientific manner with a recognition of the strengths, weaknesses and opportunity for improvement.

SYNOPSIS

This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES

1. Bachelor Degree Project Manual, Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan, Universiti Teknikal Malaysia Melaka.

PRE-REQUISITE

BMMU 3764
BACHELOR DEGREE PROJECT I/
PROJECT SARJANA MUDA I

**BMMP 3593
PLASTIC TECHNOLOGY/
TEKNOLOGI PLASTIK**

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Apply the fundamental principles of polymer properties, application and processing.
2. Analyze various plastic processing technology application.
3. Construct the ability to produce plastic finish product through various processes.

SYNOPSIS

This course provides an introduction to engineering polymers, which covers its classifications (thermoplastic, thermoset and elastomer), mechanical, rheological and physical properties as well as polymer product processing. Basic concept of polymer blends and raw materials formulation are also included. Emphasis is made on polymer based product manufacturing, relations between processing and final properties as well as environmental effects (disposal and recycling).

REFERENCES

1. Robert A. Malloy. (2010). Plastic part design for injection molding: an introduction. 2nd Edition. Cincinati OH: Handser Pub.
2. McCrum, N.G., Buckley, C.P. and Bucknall, C.B. (2004) Principles of Polymer Engineering, Oxford Science Publication.
3. Brent, S.A. (2006) Plastics Materials and Processing, 2nd Edition, Butterworth Heinemann.
4. Bahadur, P. and Sastry, N.V. (2005) Principles of Polymer Science, 2nd Edition, Alpha Science.
5. Fried, J.R. (2003) Polymer Science & Technology, 2nd Edition, Prentice Hall.

BMMD 4814
MOULD DESIGN/
REKABENTUK ACUAN

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Classify requirements for a mould.
2. Design mould layout.
3. Perform a runner and gating system selection.

SYNOPSIS
This course is an introduction to the basic principles and method of designing mould components such as cavity, core, sprue, cooling system, gate and ejectors system. The students will be exposed to the application of industrial work holding devices, drawing engineering standard, design catalogs and mold design handbooks.

REFERENCES
1. Herbert Rees, (2011) Mold Engineering 2nd Edition,
2. Hoffman, E.G. (2002) Jig & Fixture Design, 5th Edition, Delmar Publisher.
3. Joshi, P.H. (2003) Jigs and Fixtures Design Manual, 2nd Edition, McGraw-Hill.
4. Orady, E. (2008) Jigs & Fixtures Design, Workshop Material, BATC.

BMMD 4824
AUTOMOTIVE COMPONENT MANUFACTURING/
PEMBUATAN KOMPONEN AUTOMOTIF

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Apply the knowledge of design and material processing to produce automotive components for supporting the automotive ecosystem.
2. Builds the automotive components at the final prototype stage by using software and machinery.
3. Shares the knowledge of automotive manufacturing new technology among student.

SYNOPSIS
This course provides strong fundamental concepts and techniques related to various type of finishing method that are applied in automotive industries. This course covers three major techniques used in finishing process such as machine process, joining process and surface treatment. The course is practical oriented where students apply their knowledge as well as capable to operate the relevant equipment.

REFERENCES
1. Serope Kalpakjian, (2014) Manufacturing Engineering & Technology, 7th edition, Prentice Hall.
2. R.L. Timings, (1998) Manufacturing Technology, vol 1, 3rd edition, Wesley Longman.
3. P.N RAO, (2000) Manufacturing Technology-Metal cutting & Machine Tools, McGraw Hill.
4. H.S .Bawa, (2004) Manufacturing processes, McGraw Hill.
5. Robert. GmBH, (2005) Automotive Handbook, 6th edition. Society of Automotive Engineer (SAE) McGraw Hill, 2005.

BMMP 4834
IOT IN MANUFACTURING/
IOT DALAM PEMBUATAN

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Use the basic principle and technique of Internet of Things to solve problems in manufacturing application.
2. Design the IoT-based project and solution using appropriate techniques and modern tools in manufacturing application.
3. Demonstrate the project management skills as a member and leader in a team through project findings and solutions.

SYNOPSIS

Internet of Things is considered by many as the most disruptive revolution, primarily driven by the need of organizations and people to be able to follow objects and make them communicate. The Internet of Things has shown rapid evolution with widespread technical, social, and economic impact. This has resulted in a paradigm shift, machines taking over the role of human beings when it comes to data generation and usage. Industrial automation and smart manufacturing involves use of a myriad of technologies like big data, predictive analytics, and virtualized process modeling and simulation to create value from data by streamlining data and factory operations. This course aims to provide a general overview of implementing IoT especially in manufacturing domain. It emphases on practical issues and application of IoT on manufacturing challenges. The main focus will be placed on designing the IoT solution in manufacturing use cases using IoT hardware and software toward intelligent action. Topics of discussion include: Introduction to IoT technology; IoT architecture; communication technology for IoT; IoT and data analytics, IoT-enabled manufacturing system.

REFERENCES

1. Internet of Things Approach and Applicability in Manufacturing - Ravi Ramakrishnan - CRC Press, [2019]
2. IoT Concepts and Applications - Mansaf Alam, Springer, [2020]
3. Optimization of Manufacturing Systems Using the Internet of Things - Yingfeng Zhang, Academic Press, [2016].
4. Industrial Internet of Things Cybermanufacturing Systems - Sabina Jeschke, Springer [2017]

SEMESTER 8

BMMU 4786
INDUSTRIAL TRAINING/
LATIHAN INDUSTRI

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Show technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Communicate effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES

1. UTeM Guideline Handbook for Industrial Training.

BMMU 4796
INDUSTRIAL TRAINING REPORT/
LAPORAN LATIHAN INDUSTRI

LEARNING OUTCOME

At the end of the course, students should be able to:

1. Produce industrial training report.
2. Present report orally on working experience.

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE

Student required to pass Industrial Training BMMU 4786 in order to pass Industrial training report.

REFERENCES

1. UTeM Guideline Handbook for Industrial Training.

BMMW COURSE CORE COURSES (K)

SEMESTER 1

BEEA 1343
COMPUTER PROGRAMMING/
PENGATURCARAAN KOMPUTER

LEARNING OUTCOMES

Upon completion of this course, student should be able to:
1. Produce computer programming code based on principles, structures and techniques in C++.
2. Construct programming language code by applying suitable C++ programming techniques to solve a given problem.
3. Work in group effectively while performing group assignment.

SYNOPSIS

Throughout the course, students will be introduced to computer architecture and software development. The course consists of basic programming principles such as introduction to c++ programming syntax, variables, data types, operators, selection, repetition, function, array, pointer, structures and file processing.

REFERENCES

1. Abdul Kadir, (2016), C++ Programming A Practical Hands-on for Self Learning, 1st Edition, Penerbit Universiti, Universiti Teknikal Malaysia Melaka.
2. Gaddis, T., (2015), Starting Out with C++: From Control Structures through Objects, 8th Edition, Global Edition, Pearson Education.
3. Daniel Liang, Y, (2014), Introduction to Programming with C++, 3rd Edition, Pearson Education.
4. Deitel, H.D., (2014), C++ How to Program, 9th Edition, Pearson Education.
5. Nell, D., (2013), Programming and Problem Solving with C++: Comprehensive, 6th Edition, Jones & Bartlett Learning.

BMMD 1304
ENGINEERING DRAWINGS & CAD/
LUKISAN KEJURUTERAAN & CAD

LEARNING OUTCOMES

At the end of this course, students should be able to:
1. Explain the principles of engineering drawing and Computer Aided Design (CAD)
2. Generate 2D and 3D freehand sketching.
3. Construct engineering drawing using CAD software

SYNOPSIS

The purpose of this course is to provide students with an understanding of the importance of engineering graphic communication to the design process and interpreting the engineering drawings. Student will gain hands-on experience creating freehand technical sketches, CAD technical drawings using orthographic projections, sections auxiliary views and isometric drawings. Emphasis is placed on creating drawings that are neat, correctly dimensioned using industry standards. Students will use freehand sketches methods and CAD software to develop visualization skills and create the engineering drawings. This course consists of lecture and practical session. A major part of the course consists of performing structured laboratory exercises. Classroom activities will complement and support the lab exercises with explanations and demonstrations of required activities.

REFERENCES

1. Ashleigh Fuller, Antonio Ramirez, Douglas Smith. Technical Drawing 101 With Autocad 2017.
2. David A. Madsen and David P. Madsen, Engineering Drawing And Design, 6th edition, 2016.
3. Giesecke, Mitchell, Spencer, Hill, Dygdon, Novak, Technical Drawing With Engineering Graphics, 14th Edition, Prentice Hall, 2012.
4. Dix Riley, Discovering Autocad 2009, Pentice Hall, 2009.

BMMP 1323
MANUFACTURING PROCESSES/
PROSES PEMBUATAN

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Explain the fundamental concepts of manufacturing processes.
2. Display the ability of various manufacturing processes.
3. Integrate various skills of manufacturing techniques .

SYNOPSIS

In this module, students will be introduced to various manufacturing processes that can be categorized into three major focus areas; metal removal processes, near-net shape and forming processes and joining processes. For the metal removal processes, the students will be exposed to turning, milling and abrasive machining. In the area of near-net shape and forming processes, wide range of processes will be introduced such as casting, rolling, forming, forging and extrusion. In addition to that near-net-shape processes for plastic, ceramic and metal powder will also be covered. And finally, the joining processes will familiarize the students to fusion and solid state welding.

REFERENCES

1. S. Kalpakjian, S.R. Schmid, Manufacturing Engineering and Technology SI Edition, Prentice Hall, 2014.
2. M.P. Groover, Fundamentals of Modern Manufacturing. Materials, Processes and Systems 4th Edition, John Wiley & Sons, Inc, 2010.
3. M. P. Groover, Introduction To Manufacturing Processes, 3rd Edition, Hoboken, NJ: Wiley, 2012.
4. P. N.Rao, Manufacturing Technology Foundry, Forming and Welding, 1st Edition, Mc Graw Hill, 2009.
5. P. N. Rao, Manufacturing Technology Metal Cutting and Machine Tools, 2nd Edition, Mc Graw Hill, 2009.
6. Amitabha Ghosh, Asok Kumar Mallik, Manufacturing Science, EWP New Dehli, 2009.

BMMA 1313
PRINCIPLE OF ELECTRICAL & ELECTRONIC/
PRINSIP ELEKTRIK & ELEKTRONIK

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Explain the basic electrical and electronic concept in solving circuits problem.
2. Develop electrical circuits and measure voltage, current and resistance using appropriate instruments.
3. Demonstrate ability to work effectively as individuals, members, or leaders in technical teams.

SYNOPSIS

This course will cover on the topics of electrical and electronic components, emphasizing on electric circuit theory such as components and measurement instruments, circuit analysis. For electronic principle, it will cover on the topics of electronic devices such as operational amplifiers and digital electronics it will deals with topics such as system numbers, logic gates, boolean operation, combination logic circuits, and digital circuit application.

REFERENCES

1. Allan, R., H. (2014) Electrical Engineering, Pearson Education.
2. Thomas L. Floyd (2010) Principles of Electric Circuits, 9th Edition, Prentice Hall.
3. Thomas L. Floyd (209) Digital Fundamental, 10th Edition, Pearson Education.
4. Alexander, C.K., (2008) Fundamental Of Electric Circuit, Mcgraw Hill.
5. Nilsson, J. W., Riedel, S. A., (2008) Electric Circuit, Prentice Hall.
6. Roger, T., (2008) Digital Electronics Principles & Applications, Mcgraw Hill.

SEMESTER 2

BMMA 1333
STATICS/
STATIK

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Describe the physical sciences of statics concepts.
2. Construct statics experiments to recognize the engineering mechanics of statics principles.
3. Explain effectively as an individual and assist group members for experimental and assignment works.

SYNOPSIS

An introduction to the basic concept of statics as physical sciences, system of units, scalars and vectors, free body diagram, forces system, force system resultants and moment, equilibrium of a particle, equilibrium of a rigid body, structural analysis (trusses analysis and simple frames and machines), friction and center of gravity and centroid.

REFERENCES

1. Hibbeler, R.C. (2016) Statics and Mechanics of Materials, 14th SI Edition, Prentice Hall, New York.
2. Beer, F. P., Johnston jr., E. R., Eisenberg, E. R., (2016) Vector Mechanics for Engineers - Statics, 11th Edition in si units, McGraw Hill, New York.
3. Meriam, J. L., Kraige L. G. (2008) Engineering Mechanics - Static SI Version, 6th Edition., John Wiley & Sons, New York.
4. Pytel, Kiusaalas. (2009). Engineering Mechanics-Static. 3rd Ed. Cengage Learning.
5. Michael P., Gary, G., Constanzo, F., (2009). Engineering Mechanics - Statics. Mcgraw-Hill Higher Education.

BMMM 2303
SOLID MECHANICS/
MEKANIK PEPEJAL

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply the knowledge and principles of mechanics of materials in engineering design.
2. Display appropriate experimental techniques in mechanics of material through laboratory experiments.
3. Demonstrate the ability to complete engineering project using the principle of mechanics of material in group effectively

SYNOPSIS

Introduction to various types of structures and supports. Concepts of stress, strain, shear force and bending moment. Theory on beam deflection. Theory on torsion. Shear flow. Combination of loads. Deflection of beams

REFERENCES

1. Hibbeler R.C., 2013, Statics and Mechanics of Materials, 3rd SI Ed., Prentice Hall, New York.
2. Beer. F.P. Et Al. 2012. Mechanics Of Materials, 6th Edition in SI Units. Mcgraw-Hill.
3. Beer. F.P. Et Al. 2011. Statics and Mechanics of Materials, 1st Edition. Mcgraw-Hill.
4. Beer, F. P. And Johnston Jr., E. R. and Eisenberg, E. R., 2010, Vector Mechanics For Engineers - Statics, 9th Ed. in SI Units, Mcgraw Hill, New York.
5. Roy Craig Jr., 2011, Mechanics of Materials, 3rd Ed., John Wiley & Sons, New York.

BMMP 1313
ENGINEERING MATERIALS/
BAHAN KEJURUTERAAN

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Explain the structures, properties and processing of engineering materials.
2. Display the ability to determine the microstructures and mechanical properties of various materials.
3. Construct the solution for engineering material problems.

SYNOPSIS

This course introduces basic concepts of engineering materials that covers introduction to engineering materials, inter-atomic bonding, crystalline structure and imperfections in solid. Explanation on different type of engineering materials (i.e. metal, polymer, ceramic, composite and semiconductor), its mechanical properties, basic application and processing are also included. Introduction to the binary phase diagrams (composition and microstructure correlation) is also given.

REFERENCES

1. Callister W.D. and Rethwisch D.G, 2011, Fundamentals of Materials Science and Engineering, 8th Edition, John Wiley & Sons.
2. Smith W. F., 2011, Foundation of Materials Science and Engineering, 5th Edition, Mcgraw Hill.
3. Askeland D. R., 2011, The Science and Engineering of Materials, 6th Edition, Cl-Engineering.
4. Serah, A. M., 2017, Engineering Materials for Engineering Technologist. Melaka: Universiti Teknikal Malaysia Melaka.

BMMW 1303
CAD / CAM & CNC TECH/
CAD / CAM & TEKNOLOGI CNC

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Explain CAD/CAM & CNC systems and applications in manufacturing industries.
2. Demonstrate basic principal CAD methodology from 2D sketching to 3D modeling, dress-up features and 3-Axis CAM operations.
3. Manipulate machining operations and toolpath methods for 3-Axis CAM machining for any given industrial part.

SYNOPSIS

This course is an introducing to the CAD/CAM & CNC fundamental system and its application in industry. The students will be exposed to the application of high-end CAD/CAM software for generating geometric modeling and CAM programming. The course covers from 2D sketching to 3D modeling with basics dress-up features as well as CAM Programming up to 3-Axis machining. Introductory to CNC basic universal coding system also being taught to expose the students about the relationship between CAD/CAM and CNC.

REFERENCES

1. J. Srivinas (2016), CAD/CAM: Principles and Applications, Oxford University Press, India.
2. Michael Michaud (2012), CATIA Core Tools: Computer Aided Three-Dimensional Interactive Application, 1st Edition, McGraw-Hill Education.
3. P N Rao (2010) CAD/CAM: Principles and Applications, 3rd Edition, Tata McGraw Hill Education Private Limited.
4. Alan Overby, (2011) CNC Machining Handbook, the McGraw-Hill Companies.
5. Michael Fitzpatrick, (2013) Machining and CNC Technology, 3rd Revised Ed, McGraw-Hill Higher Education.
6. Nader G Zamani (2017), CAD Modeling Essentials in 3DEXPERIENCE 2016x Using CATIA Applications, SDC Publications.
7. Nanang Ali Sutisna (2019), CATIA V5 CAD CAM Exercise Manual, Lambert Academy Publication.

SEMESTER 3

BMMD 2313
THERMO FLUID/
TERMO BENDALIR

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Apply the thermodynamics First Law and Second law for common steady-flow device.
2. Solve various fluid flow problems using the Bernoulli Equation
3. Demonstrate the principles of thermodynamics and fluid mechanics through laboratory experiments

SYNOPSIS

The course introduces the students to the basic engineering of thermodynamics that involved study on the energy transformation, working fluids, theory and application of first and second laws of thermodynamics. The course also covers explanation on the steam and gas power plant as a direct application of the thermodynamic theory. Students will be exposed on refrigeration system as an application on the thermodynamics principles. The second part of this course is to introduce the students to the basic of fluid mechanics. This consists of fluid's static and dynamic analysis, buoyancy and stability, Bernoulli equation, momentum principle, flow behavior in pipe and also covers the basic principle of dimensional analysis.

REFERENCES

1. Cengel, Y.A., Turner, R. H. & Cimbala, J. M. (2012) Fundamentals of Thermal-Fluid Sciences, 4rd Edition in SI Units, Mc Graw Hill.
2. Kaminsky, D. A. & Jensen, M.K. (2005) Introduction to Thermal and Fluid Engineering, John Wiley & Sons, Inc.
3. Cengel, Y.A. & Michael, A.B. (2002) Thermodynamics: An Engineering Approach, 4th Edition, Mc Graw Hill.
4. Eastop, T.D. & McConkey, A. (2004) Applied Thermodynamics for Engineering Technologist, 5th Edition, Longman.

BMMP 2333
QUALITY CONTROL/
KAWALAN KUALITI

LEARNING OUTCOMES

1. At the end of this course, student should be able to:
2. Explain the basic quality principles and practices, quality solving techniques and product reliability related to manufacturing process.
3. Solve the manufacturing process quality problem using quality solving techniques.
4. Perform the ability to apply the quality solving techniques such as SPC, QFD, FMEA and Six Sigma in order to improve quality.

SYNOPSIS

There are four main sections consist in Quality and Reliability course: quality principles and practices; quality solving techniques; reliability and additional quality tools. In quality principle and practices, its covers quality basic, quality gurus, introduction to total quality management, and quality awards. Quality solving techniques will cover statistical process control (7 QC tools). In reliability, it explains life and reliability testing plans for product and process. Additional quality tools are Quality Function Deployment (QFD), Failure Mode Effect & Analysis (FMEA), Six Sigma and PDSA.

REFERENCES

1. Montgomery D. C., (2009) Introduction to Statistical Quality Control, 6th Edition, John Wiley and Sons, Inc.
2. Besterfield, D. H. (2014) Quality Improvement, 9th Edition, Pearson.
3. Bass, I (2014) Six Sigma Statisctic with Excel and Minitab, Mc Graw Hill.
4. Besterfield, D.H., Besterfield-Minhna, C., Besterfield, G. H. and Besterfield-Sacre, M. (2011) Total Quality Management, 3rd Edition, Prentice Hall.
5. Yusuf, Y., Abdullah, R. And Abdul Rasib, A. H. (2019) Quality Control For Engineering Technologist, 2nd Edition.

BMMW 2313
INDUSTRIAL ROBOTIC & AUTOMATION/
ROBOTIK DAN AUTOMASI INDUSTRI

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Explain concepts, principles and technologies related to robots and components of automation applied in manufacturing industry.
2. Solve problems related to the applications of robots and automation in manufacturing related activities.
3. Design automation systems or components using tools such as programmable logic controllers, drives systems, and industrial robots.

SYNOPSIS

The aim of this module is to provide knowledge on technology applied in industrial robotics and automation systems and components with focus on manufacturing. The first part of the module focus on elements of automation with emphasize on topics such as sensors, actuators, control and material handling. The second part of the module centers on robots' technology covering topics on robots' anatomy, robots' manipulators, transformation matrices, forward and inverse kinematics, and trajectory planning. Students are then equipped with skills on PLC automation programming, robots' motions, and simulation of automatic assembly process.

REFERENCES

1. Groover M. P., (2016) Automation, Production Systems, and Computer integrated Manufacturing, 4th Edition, Pearson.
2. Saeed, N, (2011) Introduction to Robotics – Analysis, Control, Applications, John Wiley and Sons.
3. Craig, J.J, (2017) Introduction to Robotics – Mechanics and Control, 3rd Edition, Pearson.

BMMW 2323
DATA MANAGEMENT & PROCESS OPTIMIZATION/
PENGURUSAN DATA DAN PENGOPTIMUMAN PROSES

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Explain model of manufacturing problems in linear programming, decision theory, transportation models, network models and waiting Lines.
2. Determine the alternative solutions in optimization problems.
3. Construct the solutions of optimization in manufacturing systems.

SYNOPSIS

Analyse, interpret and evaluate data. The goal of data analysis is to support the organization in decision-making. Optimization in manufacturing industry involves trying to make the most effective use of an organization's resources. Resources in organization such as machinery, money, energy, labor force are elements to make products. Linear programming is one of the tools, which is widely used, based mathematical technique to help plan and make decisions necessary to allocate resources. This course covers principles and practices, tools and techniques, fundamentals of data analysis and optimization problem in manufacturing. It discusses mathematical formulation of production or operational problems and solve them using linear programming and other optimization techniques. This course consists of two parts: data management and process optimisation.

REFERENCES

1. Montgomery, D. C. & Runger, G. C. (2020). Applied statistics and probability for engineers (7th ed.). John Wiley & Sons.
2. S. Christian Albright, Wayne L. Winston, Christopher J. Zappe (2019) Data Analysis and Decision Making, Seventh Edition, South-Western, Cengage Learning.
3. Ignizio J.P., Linear Programming in Single & Multiple Objective Systems, Prentice Hall 2009.

SEMESTER 4

BMMM 2313
DYNAMICS & MECHANICS OF MACHINE/ DINAMIK & MEKANIK MESIN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Describe the concept and principle of dynamics and mechanics of machine element.
2. Demonstrates the dynamics and mechanics of machine laboratory experiments.
3. Synthesize dynamics and mechanics of machine fundamentals into engineering practices

SYNOPSIS

Introduction to basic principles based on kinematic and kinetic dynamics. The concept of displacement, distance, velocity, speed and acceleration. Application of newton's second law. The principle of work and energy, impulse and momentum of particles and rigid bodies. Transmission system based on the friction of motion, such as belts, brakes and dibble. Based delivery systems such as chains and gear teeth. Gear system. Balancing the dynamic system that includes balancing the body rotating plane and a parallel plane. Balancing of reciprocating motion as the body line of engines, radial engines and enginev. Gyroscopic motion that includes a couple gyroscope. Gyro scope coupling effects. Simple harmonic motion and vibration consists of moving one degree of freedom. Free vibration. Damped free vibration. Forced damped vibration. Speed control of the cycle flywheel

REFERENCES

1. Beer, F. P., Johnson, E.R., Clausen, W. E., (2013) Vector Mechanics For Engineers, Dynamics Si Units, 10th Edition. Mcgraw-Hill.
2. Hibbeler, R. C. (2013) Engineering Mechanics, Dynamics, 12th Edition. Prentice Hall.
3. Meriam, J. L. And Kraige, L. G. (2013). Engineering Mechanics, SI Version, 6th Edition. John Wiley.
4. Bedford, A. And Fowler, W. (2008). Engineering Mechanics: Dynamics (SI units). 5th Edition.Prentice Hall.
5. Cleghorn, W. L., 2005, Mechanics of Machines, Oxford University Press.

BMMW 2333
ADDITIVE MANUFACTURING/ PEMBUATAN TAMBAHAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Explain the fundamental of additive manufacturing (AM) and understand why it has become one of the most important technology trends in decades for product development and innovation.
2. Demonstrate comprehensive knowledge of the broad range of AM processes, devices, capabilities and materials that are available.
3. Develop physical object from CAD using additive manufacturing.

SYNOPSIS

In this course student will learn the importance of additive manufacturing (AM) and its impact on global product development. Initially, historical development of AM will be discussed together with other related technologies. Then, student will able to explore the potential of AM technologies, devices, capabilities, materials and applications. Major AM processes which can be classified as solid based, liquid based and powder based will be discussed in detail. Later, the trade-offs between these various AM processes will be compared. This course will also explore the broad range of AM applications, including aerospace, consumer products, and creative artistry and others.

REFERENCES

1. Chee Kai Chua, Kah Fai Leong, 3D Printing and Additive Manufacturing: Principles and Applications, 5th Edition, World Scientific, 2016.
2. Gebhardt A., Understanding Additive Manufacturing, Hanser Publisher, 2014.
3. Thompson, R, Prototyping And Low Volume Production: The Manufacturing Guides, 2011.
4. Gibson, I., Rosen, D.W. and Stucker, B., Additive Manufacturing Technologies, Springer, 2010.
5. Noorani, R., 3D Printing: Technology, Applications And Selection, 4th Edi., CRC Press, 2018.
6. Redwood, B., Schoffer, F. and Garret, B., The 3D Printing Handbook: Technologies, Design And Applications, 3D Hubs B.V.,2018.

BMMW 2343
PRODUCT DESIGN & MANUFACTURING/
REKA BENTUK PRODUK & PEMBUATAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Describe the design principles and ease of manufacturing
2. Organize the product through the outcomes of analysed problems.
3. Ability to work effectively in group for process of product design and development.

SYNOPSIS

Product Design and Manufacturing unifies the perspectives of marketing, design and manufacturing into a single approach to product development. Students will be exposed to the concepts and principles of product design as well as the best processes to manufacture the product. As a result, this course provides the students with an appreciation for the realities of industrial practice and for the complex and essential roles played by various members of product development teams. Throughout this course, attempts are made to strike a balance between theory and practical.

REFERENCES

1. Boothroyd, Geoffrey & Dewhurst, Peter & Knight, W.A., (2020). Product design for Manufacturability and assembly.
2. Ulrich K. T., Eppinger S. D. (2016), product design and development, 6th edition, Mcgraw Hill Irwin.
3. Kalpakjian S., Steven R., Schmid, (2014) manufacturing engineering & technology, 7th edition, prentice hall.
4. Anderson, D.M., (2014). Design for Manufacturability: how to use concurrent engineering to rapidly develop low-cost, high-quality products for lean production.
5. Chitale A. K. and Gupta R. C. (2013), product design and manufacture, 6th prentice hall, new Delhi, India.

BMMD 3583
CAE/
CAE

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Explain the basic principles of finite element analysis in industrial practises.
2. Apply finite element modeling and equation to solve mechanical structure and fluid flow problem in design.
3. Demonstrate finite element analysis using CAD/CAE software.

SYNOPSIS

The course will introduce the students to the fundamental concepts of the finite element method and analysis in the context of practical application with emphasis on the engineering issues

REFERENCES

1. Chandrupatla T.R and Belgundu, A.D (1997), Introduction to the Finite Elements in Engineering, 2nd Edition, Prentice Hall, New Jersey.
2. Huebner K.H and Dewhirst D.L(2001), The finite Element Method for Engineers, 4th Edition, John Wiley and Sons Inc, Toronto Canada.
3. Cook R.D (1995), Finite Element Modeling for Stress Analysis, John Wiley and Son Inc.
4. Logan D.L (2002), A First Course in the Finite Element Method, 3rd Edition Brooks/Cole, Pacific Grove, CA.

SEMESTER 5

BMMW 3353
MANUFACTURING MANAGEMENT/
PENGURUSAN PEMBUATAN

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Analyze problems that are related to Industrial Engineering.
2. Solve manufacturing operation scenarios using Industrial Engineering tools and techniques.
3. Conduct experiments or laboratory tasks related to topics discussed in IE.

SYNOPSIS

This is a 3-credit hour course offered to all third year students of the Department of Manufacturing Engineering, Faculty of Engineering Technology. Students will be introduced to the concept of productivity and the various Industrial Engineering (IE) tools and techniques to improve productivity. Thus, during the first part of the course, emphasis will be on constructing activities on Forecasting, Work System Design, Strategic Capacity Planning, and Facility Layout in order to attain efficiency and effectiveness in manufacturing operations. In the second part, teaching and learning activities related to Material Requirement Planning, Inventory Control, Production Scheduling and Simulation Modeling. Lastly, the topic of Lean Manufacturing will also be included in order to introduce to the students on the recent focus by many companies to eliminate wastes in the operations.

REFERENCES

1. Tephen & Chapman, JR Tony Arnold, Ann K Gatewood, Lloyd M Clive (2017). *Introduction to materials management*, 8th edition, Pearson Education Limited.
2. Sushil Gupta, Martin star (2014). *Production and operations management systems*, CRC Press.
3. Stevenson, W.J., Chuong, S.C (2010). *Operations management: an Asian perspective*, 11th Edition Mcgraw Hill
4. Garcia-Diaz, Alberto and smith, J. Macgregor (2008). *Facilities planning & design*. Prentice hall, 2008.
5. Arnold, J.R. Tony, chapman, Stephen N. and Clive, Lloyd M. (2012). *Introduction to Materials Management*. Pearson International.

BMMU 3803
INTEGRATED DESIGN PROJECT/
PROJEK REKABENTUK BERSEPADU

LEARNING OUTCOMES
At the end of this course, students should be able to:

1. Design solution by synthesizing manufacturing engineering technology knowledge that will solve broadly-defined engineering technology problems in accordance with relevant standards.
2. Utilize modern engineering technology and IT tools in facilitating solutions to broadly-defined engineering technology problems with an understanding of the limitations.
3. Evaluate the impact of the design product, component or processes in term of safety, environmental and sustainability factors.

SYNOPSIS
Integrated Design Project is a course where students have to design an engineering technology project to solve broadly defined problem. Broadly defined problem is engineering problems which cannot be pursued without a coherent and detailed knowledge of defined aspects of a professional discipline with a strong emphasis on the application of developed technology. The design project activities include project management, project planning, project management, design selection, design costing and sizing, analysis and evaluation. The course focuses on the implementation and integration of product/conceptual design development to produce a comprehensive final technical report, including engineering proposals and drawings, specifications and bills of material, cost estimates of development projects given to students, working in groups. Apart from basic engineering design, students are also required to integrate their knowledge of other engineering disciplines such as (but not limited to) structural analysis and design, including material selections, project scheduling techniques and sustainable development considerations into their overall project work. At the end of this course, the students will be able to comprehend the needs and requirements for product design procedures and are able to appreciate the importance of integration and synthesis of various disciplines of manufacturing engineering knowledge.

REFERENCES
1. Ulrich, K. T. and Eppinger, Steven D., 2016, Product Design and Development, 5th Edition, McGraw Hill.
2. Chitale, A. K. and Gupta, R. C., 2013, Product Design and Manufacture, 6th Edition, Prentice Hall, New Delhi, India.
3. Kalpakjian, S. and Schmid, S. R., 2014, Manufacturing Engineering & Technology, 7th Edition, Prentice Hall.
4. Cross, Nigel, (2010) Engineering Design Methods, Wiley.
5. W. Bolton, Mechatronics electronic control systems in mechanical and electrical engineering, 4th Ed., Prentice Hall, 2008.
6. Kutz, Myer, Mechanical Engineers Handbook - Manufacturing and Management, 3rd ed., John Wiley 2006.

PRE-REQUISITE
BMMW 2343
PRODUCT DESIGN & MANUFACTURING/
REKA BENTUK PRODUK & PEMBUATAN

BMMD 3553
ERGONOMICS DESIGN/
REKA BENTUK ERGONOMIK

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Apply ergonomics principles to create safe, healthy, efficient and effective activities in the workplace.
2. Analyze the effectiveness of the work system designed.
3. Constructs a design of work system by taken into consideration human capabilities and limitations.

SYNOPSIS
This course provides the students with the rationale for providing an occupationally safe and healthy work environment in industry. Three main elements of this course: human, equipment and work environment. These three elements are classified into different areas, however correlations of them are discussed and exemplified in each topic.

Through human study, students will be explained about the human anthropometric, physiology, psychology as well as capabilities and limitations of human. Meanwhile, through ergonomic design of equipment, students will learn on how to design the hand tools and workstations that are safe to the users.

Last but not least, the students also will be exposed on how to manage work environment such as thermal comfort, noise, etc. This will contribute better understanding to occupational health of industries.

REFERENCES

1. Karl H.E. Kroemer. Introduction to Ergonomics/ Human Factors Engineering, 7th Edition. 2017.
2. Karwowski, W., (Editor), Applying Systemic- Structural Activity Theory to Design of Human- Computer Interaction Systems. Taylor & Francis, London, 2015.
3. MCCauley Bush, Pamela, Ergonomics Foundational Principles, Applications, and Technologies, Boca Raton, FLCRC Press, 2012.
4. Wickens, C.D., An Introduction to Human Factors Engineering, 2 nd Edition, Pearson Education International, 2013.

BMMW 3363
BUSINESS PROCESS INTEGRATION/
INTEGRASI PROSES PERNIAGAAN

LEARNING OUTCOMES
1. Describe the strategic importance of supply chain design, planning and operations.
2. Identify supply chain performance drivers and understand how they align with the functions in a company to improve competitive advantage.
3. Analyze supply chain management and design problems and apply relevant analytical tools to develop solutions.

SYNOPSIS
Supply chain management (SCM) deals with the management of materials, information, and financial flows in networks consisting of suppliers, manufacturers, distributors, end users and customers. Successful supply chains require decision making in the design, planning and operational phases. Facilities, inventory, transportation, sourcing, pricing and information are identified as key drivers for supply chain performance. This course provides a strategic framework to understand the importance of each of these drivers to ensure the successful implementation of the three phases. This course focuses on the inter-relationship of the strategic role of the supply chain and key drivers of supply chain performance. The course also provides exposure to use of primary analytical methodologies to solve supply chain problems.

REFERENCES

1. Chopra, S. & Meindl, P., 2013, Supply Chain Management. Strategy, Planning and Operations (6th edition), Pearson (Course textbook)
2. Simchi-Levi, D., Kaminsky, P. & Simchi-Levi, E., 2009, Designing and Managing the Supply Chain, (3e), McGraw-Hill.
3. Bowersox, D.J., Closs, D.J. & Cooper, M.B., 2010, Supply Chain Logistic Management (3e). McGraw Hill.
4. Ballou, R., 2003, Business Logistics Management, 5th Edition, Prentice Hall.
5. Chase, R & Jacobs, R., 2011, Operations and Supply Chain Management (13th edition). McGraw Hill.

BMMW 3803
STRUCTURAL COMPONENTS OF AIRCRAFT/
STRUKTUR KOMPONEN KAPAL TERBANG

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Describe the basic principles of aircraft structure.
2. Appreciate the roles that structures and structural materials play in aerospace vehicles.
3. Gain experience identifying, formulating, and solving aero structure problems.

SYNOPSIS

This course focus on aircraft structure concept. Students will be familiarized to the importance of customer requirements and airworthiness certification for aircraft structural development. Aircraft loads and major material for aircraft will be presented as the the significant factors for structural design. Various simple tools for supporting the analysis of structural integrity of the aircraft components will introduced, including simple structural analysis of fuselage, wings, tail, landing gear and engine.

REFERENCES

1. Saha, Pradip K. (2017) Aerospace Manufacturing Processes, Taylor & Francis Group, Boca Raton.
2. Soler, Manuel. (2014), Fundamentals of Aerospace Engineering, 1st Edition, Create Space, New Jersey.
3. Megson, T. (2007). Aircraft structures for engineering students, A Butterworth Heinemann Title.

BMMW 3813
JIGS & FIXTURES FOR AEROSPACE/
JIG DAN LENGKAPAN UNTUK AEROANGKASA

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Describe the basic principles of jig and fixture for aerospace manufacturing.
2. Identify the process engaged in fabricating the jig and fixture for aerospace.
3. Apply the principles of manufacturing the jig and fixture for aerospace.

SYNOPSIS

This subject consists of the design for manufacturing, principles of producibility design, tools and manufacturing of jigs and fixtures, jigs and fixtures for aerospace manufacturing, construction methods and materials of jigs and fixtures and the types of jigs and fixture.

REFERENCES

1. Hoffman, E.G. (2004) Jig and Fixture Design 5th edition, Thomson Delmar Learning Publisher, Florence.
2. Henriksen, E.K. (1973), Jig and Fixture Design Manual, Industrial Press, New York.

BMMW 3823
INDUSTRIAL DESIGN/
REKABENTUK INDUSTRI

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Explain systematic approach of basic design process.
2. Apply design and creative skills in to overcome design problems.
3. Demonstrate proficiency in sketching and basic model-making techniques using various materials.

SYNOPSIS

Industrial design is the professional service of creating and developing concepts and specifications that optimize the function, value, and appearance of products and systems for the mutual benefit of both user and manufacturer. It covers relationships among the users of the designed item through aesthetics and 'form follow function' criteria. Whereas for the manufacturer, it supports the ability of design towards mass manufacturability. Consumer appliances, tools, safety equipment, business machines, furniture, medical equipment, architectural products, and transportation devices make up a partial list of those areas of specialization in industrial design.

REFERENCES

1. Marzuki Ibrahim. (2013). Rekabentuk Produk, Dewan Bahasa dan Pustaka
2. Hassan. A, Ahmad Rizal. A.R. (2008). Rekabentuk Perindustrian, Dewan Bahasa dan Pustaka.
3. Idris I., Richard L. B. K. (2007) Introduction to Basic Sketching and Rendering Techniques, UTM, Johor.
4. http://www.education.edean.org/ (Retrieved on Feb. 2017)
5. http://www.dsource.in/course/product-drawing/index.html (Retrieved on Feb. 2014)
6. Cuffaro, D., & Zaksenberg, I. (2013). The Industrial Design Reference & Specification Book: Everything Industrial Designers Need to Know Every Day. Massachusets: Rockport.

BMMW 3833
VISUAL COMMUNICATION/
KOMUNIKASI VISUAL

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Able to use graphical software in various media to suit design purposes.
2. Apply design theory to create visual communications.
3. Develop a capacity to undertake ongoing design thinking while conceiving, communicating and presenting ideas

SYNOPSIS

The course will teach the student to understand Visual Communication theory. Students will master suitable graphical software for computer visualization and printing techniques. Students will be shown how to present design media at a professional level in an industrial situation. Students will also develop further understanding and application of the principles of design visualization and presentation. Students will learn to apply the theory in Digital Photography, video production, branding, web development, posters and printing design.

REFERENCES

1. Meredith Davis, Jamer Hunt, (2017), Visual Communication Design, Bloomsbury academic.
2. Guan Ming Soo et.al, (2013) 3D Visual Communication, Wiley.
3. Maura Keller, Michelle Taute, (2012) Design Matters, Rockport Publishers.
4. Ken Smith et.al, (2011) Handbook of Visual Communication, Taylor and Francis Group.

BMMW 3843
DATA STRUCTURE & ALGORITHM/
STRUKTUR DATA & ALGORITMA

LEARNING OUTCOMES
At the end of this course, student should be able to:

1. Illustrate the fundamental of data structures and algorithms including basic algorithm analysis.
2. Construct programs which implement various data structures and common searching and sorting algorithms.
3. Demonstrate the implementation of data structures and algorithms in problem solving.

SYNOPSIS
This course aims to develop students knowledge in data structures and algorithms. Students will be introduced to abstract data type (adt) concept and later apply the ADT concept in the implementation of data structures. Additionally, analysis of algorithm efficiency will be explained followed by discussion on various common searching and sorting algorithm. Students will then learn essential data structures like linked list, stack, queue, tree, graph and heap along with the operations for maintaining them. Throughout the semester, students will also be exposed on applying those various data structures in solving various challenges and problems.

REFERENCES
1. Malik, D. S., "C++ Programming: Program Design Including Data Structures", 8th edition, Cengage Learning, 2018.
2. Drozdek, A., "Data Structures and Algorithms in C++ 4th Edition", Cengage Learning, 2013.
3. Malik, D. S., "Data Structures Using C++", 2nd edition, Cengage Learning, 2010.
4. Y.Daniel Liang, "Introduction to Programming with C++",3rd Edition, Pearson, 2014.
5. Mark A. Weiss, "Data Structures and Algorithm Analysis in C++",4th edition, Pearson, 2014.

PRE-REQUISITE
Basic understanding of C programming language, text editor, and execution of programs.

BMMW 3853
DIGITAL FACTORY & SIMULATION/
PERKILANGAN DIGITAL & SIMULASI

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Explain the principles of digital factories and their relation to real factories by giving examples of digital verification and industrial relevance.
2. Demonstrate how a digital factory can be developed in modelling and simulation software for manufacturing concepts, factory layouts, production planning and manufacturing flow.
3. Model, simulate and analyze manufacturing systems with simulation technology.

SYNOPSIS
With the very high cost of investment in manufacturing industry, it is very important that good decisions are made about buying and operating manufacturing systems. At the same time the increasing complexity of manufacturing systems makes decision making more difficult. Simulation is often the only way to gather the necessary information. Besides, the ability to rapidly prepare and rebuild a factory for the manufacturing of new products has become an increasingly important issue. One way of speeding up such a change process is to model and simulate the manufacturing and the flow of products in the factory-to-be, even before the start of its construction. This course deals with models and software that can be used in such a simulation process, with a particular focus on the need for and benefit of standardized models. The teaching module deals with the simulation as a method to analyze and evaluate the operation or design of manufacturing processes and facilities. Students shall be enabled to efficiently use the discrete event simulation and graphical dynamic simulation technique. Complexity is managed by analyzing only relevant decision criteria. The module contains of - Theory of discrete event simulation - Process oriented and object oriented modelling techniques - Training in the simulation package - Steps to conduct simulation studies and projects - Classification of simulation packages - Project based on real production industrial situation - Statistical

analysis of simulation models - Newest developments in the field of simulation, distributed simulation, web-based simulation.

REFERENCES

1. Banks, J., Carson II, J.S., Nelson, B.L, Nicol, D.M. (2014). Discrete-Event System Simulation. Fifth Edition. Pearson Education Limited. Essex. England.
2. Fabre, R., Bensoussan, A., Colin, Lucille., Blanquart, M.(2018). The Digital Factory for Knowledge: Production and Validatio of Scientific Results. Wiley-ISTE.
3. Murray, N.G. (2017). Rational Process Design and Simulation Modeling with Lanner Witness Horizon. DEMS.

SEMESTER 6

BMMU 3764
BACHELOR DEGREE PROJECT I/
PROJEK SARJANA MUDA I

LEARNING OUTCOMES

At the end of the course, students should be able to:

1. Apply knowledge to proposal preparation of industry-based or practice-oriented project
2. Imitate appropriate existing concepts in engineering technology fields.
3. Adhere to project's dateline and related procedure.
4. Explain the project proposal in oral and written forms effectively.
5. Report literature review and preliminary findings in a scientific manner.

SYNOPSIS

This is the first part of the Bachelor Degree Project (BDP 1). Students are expected to prepare a BDP proposal and conducts preliminary investigation. At the end of the semester students are required to submit the Bachelor Degree Project Proposal and preliminary findings for assessment and defend its through Presentation and QnA session.

REFERENCES

1. Bachelor Degree Project Manual, Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan, Universiti Teknikal Malaysia Melaka.

BMMW 3373
VISUAL MANUFACTURING/
PEMBUATAN VISUAL

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Demonstrates understanding of the theory, principles, concepts and vocabulary of 3D Computer Graphics.
2. Demonstrates understanding on important issues in the use of 3D digital visualization towards environmental communication and design.
3. Integrate the use of 3D digital visualization into a scientific or design inquiry.

SYNOPSIS

This course introduces students to the theory, concepts, principles and techniques of 3D Computer Graphics, including modeling, texturing, lighting, rendering and animation which is essential in visual manufacturing. It will also provide the student with understanding and the ability to animate 3D models.

REFERENCES

1. The Art of 3D Computer Animation and Imaging, Kerlow, Isaac Victor, John Wiley & Sons, Inc., New York, New York., 3rd Edition / 2003, 0-471-43036-6.
2. Shroeder, Martin & Lorenson, 'The Visualization Toolkit', 2nd ed., Prentice Hall, 1998. (or 3rd Edition).
3. Kitware Inc. Edited by W.J. Shroeder, 'The Visualisation Toolkit User's Guide', Prentice Hall.
4. Spence 'Information Visualization', Addison-Wesley, 2001. Good for the topic of information visualisation.
5. Waguespack, C. (2013). Mastering Autodesk Inventor 2014 and Autodesk Inventor LT 2014: Autodesk Official Press. John Wiley & Sons.
6. Ayachit, U. (2015). The paraview guide: a parallel visualization application. Kitware, Inc.

BMMW 3383
INDUSTRIAL INTERNET OF THINGS/
INDUSTRI INTERNET OF THINGS

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Understand the basic principle and technique of Internet of Things.
2. Identify components in IoT architecture.
3. Apply the principle and technique of Internet of Things to real application.

SYNOPSIS

Internet of Things (IoT) aims to connect all important devices with people. The connected devices are purpose-built to improve human capability in decision-making and boost usage performance. Devices can range from connected coffee makers, cars, or sensors on cattle to connected machines in a production plant. These devices provide data that offers new insights, and as they talk to each other, they develop their own intelligence and can advise people about optimal ways to put them to use. This will revolutionize people habits and the way we do work. This course aims to provide a general overview of implementing IoT especially in manufacturing domain. It emphases on practical issues and application of IoT on manufacturing challenges. The main focus will be placed on designing the IoT in manufacturing use cases using IoT hardware and software toward intelligent action. Topics of discussion include: introduction to IoT technology; IoT architecture; sensors and actuator in IoT; communication technology for IoT; IoT-enabled manufacturing system; smart and intelligent IoT.

REFERENCES

1. Hwaiyu Geng. Internet of Things and Data Analytic Handbook. John Wiley and Sons, 2017.
2. Rajkumar Buyya and Amir Vahid Dastjerdi. Internet of Things: Principles and Paradigms. Elservier, 2016.
3. Timothy Chou. Precision: Principles, Practices and Solutions for the Internet of Things. Cloudbook Inc, 2016.
4. Andrian McEwen and Hakim Cassimally. Designing the Internet of Things. John Wiley and Sons, 2014.
5. Cuno Pfister. Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud (Make: Projects). O'Reilly Media, 2011.

BMMP 3533
ADVANCED MANUFACTURING PROCESSES/
PROSES PEMBUATAN TERMAJU

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Selects the most appropriate processes for a given product design, application and cost.
2. Conducts some experiments based on the advanced manufacturing process lab sheet requirements.
3. Demonstrates correct steps in executing tasks/ projects related to advanced manufacturing process.

SYNOPSIS

The course consists of non-traditional manufacturing processes and material removal methods, which include manufacturing processes using lasers technology, electron beam, abrasive water jet, electro discharge machining and electro chemical machining. Moreover, it will also include the introduction to aerospace material machining, automotive stamping, coating technology and electronic manufacturing processes.

REFERENCES

1. Serope Kalpakjian & Steve Schmid, (2014) Manufacturing Process and Technology, Prentice Hall
2. Mikell, P.G. (2007) Fundamental of Modern Manufacturing Process, 3rd Edition, Prentice hall.
3. Gregg, R. (2004) Modern Materials and Manufacturing Processes, Prentice Hall.
4. Degarmo, B.K. (1997) Materials and Processes in Manufacturing, 8th Edition, Prentice hall.

BMMW 3863
COMPOSITE COMPONENTS FOR AEROSPACE/
KOMPONENT KOMPOSIT UNTUK AEROANGKASA

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Describe the basic principles of composite components in aerospace manufacturing.
2. Identify processes that involved in producing composite components for aerospace.
3. Apply the principles of manufacturing composite component for aerospace.

SYNOPSIS

The course consists of introduction to composite materials for aerospace, components in composite material, fibers, fabrics, matrices, classification of composites, lamina, laminate, type of composites and manufacturing technology of input raw material for composite fabrication, role of composite in major aircraft components, manufacturing process of composite materials, prepreg layup, liquid composite molding, resin transfer molding, vacuum-assisted RTM, resin film infusion as well as pultrusion.

REFERENCES

1. Saha, P.K. (2017), Aerospace Manufacturing Processes, 1st Edition, CRC Press, Taylor & Francis Group, US.
2. Daniel,I.M. and Ishai, O. (2006), Engineering Mechanics of Composite Materials, 2nd Edition, Oxford University Press, UK.
3. Bersee, H.E.N. (2010), Composites aerospace manufacturing processes, encyclopaedia of aerospace engineering, John Wiley & Sons Ltd., NJ.

PRE-REQUISITE

FUNDAMENTAL OF AEROSPACE MANUFACTURING

BMMW 3873
MEASUREMENT & INSPECTION FOR AEROSPACE/ PENGUKURAN & PEMERIKSAAN UNTUK AEROANGKASA

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Describe the basic principles of measurement and inspection methods.
2. Select and propose suitable measurement techniques based on the analysis on engineering problems that fulfil the standard practice.
3. Evaluate the strength and limitations of NDT techniques and clearly recognize the parameters affecting the sensitivity and reliability of the NDT techniques.

SYNOPSIS
Precision and safety is important factor in Aircraft industry. This course will focus on the measurement and inspection in the manufacturing of aircraft part. Students will be introduced to the generalities of measurement, manual and computer assisted measurement of part dimension using conventional as well as using laser tracker. Destructive and Non-Destructive Testing (NDT) will also be familiarized including dye penetrant, Eddy current and Ultrasonic techniques.

REFERENCES
1. Saha, Pradip K.. (2017) Aerospace Manufacturing Processes, Taylor & Francis Group, Boca Raton.
2. Beckwith, T.G., Marangoni, R.D. and Lienhard V,J.H., (2007), Mechanical Measurement, 6th Edition, Prentice Hall.
3. Mix, P.E., 1987, Introduction to Nondestructive Testing: A Training Guide, 2nd Edition, John Wiley, New York.

BMMW 3883
PRODUCT ARCHITECHTURE & USERABILITY TESTING/
SENIBINA PRODUK & UJIAN KEBOLEHGUNAAN

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Explain the principles and functions of advanced industrial design product architecture.
2. Demonstrate proficiency in creating prototypes using various materials.
3. Apply usability testing principles in industrial design processes

SYNOPSIS
This course consisted of theoretical and practical components. The students will be introduced to advanced industrial design product architecture elements including its components, processes, and approaches. In addition, the students will be exposed to practical and hands-on design activities in developing product prototypes and evaluations through team collaborations. Students will also be exposed to product validation through usability testing.

REFERENCES
1. Hassan Alli dan Ahmad Rizal, A.R., (2008), Reka Bentuk PerIndustrian – Pengenalan, Dewan Bahasa dan Pustaka, K.L.
2. Marzuki Ibrahim. Rekabentuk Produk, Dewan Bahasa dan Pustaka, 2013
3. K.T Ulrich, S.D Eppinger, Product Design and Development, 5th Edition, McGraw Hill, 2012

PRE-REQUISITE
BMMW 3823
INDUSTRIAL DESIGN

BMMW 3893
CONSUMER PRODUCT DESIGN & DEVELOMENT/ REKABENTUK & PEMBANGUNAN PRODUK PENGGUNA

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Explain the basic concepts of designing and developing consumer product.
2. Design and simulation using advance CAD tool in 3D.
3. Produce a sample of 3D consumer product prototype.

SYNOPSIS
This course enriches the students about design and development of consumer product. The principle to any successful consumer product is good design. Good design drives innovation and produces meaningful and memorable products that enchant customers and enhance brand performance. The aim of this course is to provide students with an understanding of designing and developing consumer product with in appropriate way. Emphasis is on 3D modelling generation skills which can be simulated at early stages of the design process. Students will explore the creation and editing of 3D parts using solid modelling and surface design in the context of feature-based design. They also will learn to consider consumer product guarantees, human factors and sustainable design in consumer product. Classroom activities will complement and will be supported by lab exercises with explanations and demonstration of related activities.

REFERENCES
1. Karl T. Ulrich, Steven D. Eppinger (2016) Product Design & Development 6th edition.
2. Robin R. (2016), Consumer Product Innovation and Sustainable Design. Routhledge.
3. Elivio Bonollo (2016). Product Design: A Course in First Principles Upfront Publishing.
4. Marcelo M.S. and Francisco Rebelo, (2016) Ergonomics in Design: Method and Techniques (Human Factor Ergonomics). press.

BMMW 3903
CYBER SECURITY IN DIGITAL MANUFACTURING/ KESELAMATAN SIBER DALAM PEMBUATAN DIGITAL

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Distinguish the appropriate methods to safeguards the elements of information technology and network in digital manufacturing.
2. Build the elements in information technology and network with the appropriate methods and tools/ software in digital manufacturing.
3. Explain issues related to ethics and law in information technology and networks and relate it with cyber laws in Malaysia.

SYNOPSIS
This course covers background views of ICT threats and the needs to have theoretical security method on Information Security in Software, Operating System, Data Center, Computer Networks in digital manufacturing. The course will also cover the basic cryptographic elements and authentication, IP Security, Firewalls, Security Management, and the related issue in Computer Crimes and Cyber Laws. Security related computing namely Microsoft Excel and Windows 2012 will be introduced and used to help in understanding and applying the security mechanism and algorithms.

REFERENCES
1. Michael Negnevitsky (2005). Artificial Intelligence: A Guide to Intelligent Systems, 2th Edition, China: Addison Wesley.
2. Thomas Braunl (2008). Embedded Robotics: Mobile Robot Design and Applications with Embedded Systems, 3rd Edition, Springer.

BMMW 3913
ARTIFICIAL INTELLINGENCE/
KECERDASAN BUATAN

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Analyze problems and synthesis solutions using Artificial Intelligence (AI) components such as Knowledge-Based and Expert Systems, Fuzzy Logic, Artificial Neural Network, and Genetic Algorithm.
2. Analyze operational performance of different components of AI in manufacturing system environments.
3. Demonstrates Design complex intelligent system based on components of intelligent functions.

SYNOPSIS
This course introduces students to the theory and concepts of artificial intelligent in building, analyzing, and synthesizing intelligent components of a manufacturing system. It examines the structure of knowledge-based system, expert system, neural networks, fuzzy logic, and genetic algorithm. The implementation of artificial intelligent in manufacturing systems will be discussed and studied on actual practices. The concept of machine learning, vision system, and future prospects of intelligent system in manufacturing operations will also be discussed.

REFERENCES
1. Michael Negnevitsky (2005). Artificial Intelligence: A Guide to Intelligent Systems, 2th Edition, China: Addison Wesley.
2. Thomas Braunl (2008). Embedded Robotics: Mobile Robot Design and Applications with Embedded Systems, 3rd Edition, Springer.

SEMESTER 7

BMMU 4774
BACHELOR DEGREE PROJECT II/
PROJEK SARJANA MUDA II

LEARNING OUTCOMES
After completing the course, students will be able to:
1. Discuss solution to the proposed industry-based or practice-oriented project.
2. Demonstrate project findings using appropriate techniques with an understanding of its limitations.
3. Display self reliance in working independently and cooperates in group activities.
4. Display the ability to present the project findings in oral and written forms effectively.
5. Report literature review and project potential in scientific manner with a recognition of the strengths, weaknesses and opportunity for improvement.

SYNOPSIS
This is the second part of the Bachelor Degree Project (BDP 2). Students are expected to continue the project started in BDP 1 until to completion. At the end of the semester students are required to submit the Bachelor Degree Project Thesis and a FOUR PAGES Summary related to the thesis for assessment and defend them through Presentation and QnA session.

REFERENCES
1. Bachelor Degree Project Manual, Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan, Universiti Teknikal Malaysia Melaka.

PRE-REQUISITE
BMMU 3764
BACHELOR DEGREE PROJECT I/
PROJECT SARJANA MUDA I

BMMW 4393
ENGINEERING FINANCIAL, COSTING AND ECONOMICS/
KEWANGAN, KOS DAN EKONOMI KEJURUTERAAN

LEARNING OUTCOME

1. Describe the role of engineering financial, costing and economics in making financial decision.
2. Apply the concepts, principle and techniques in engineering financial, costing and economics.
3. Analyze cost effectiveness for making decision of alternative investment using; rate of return, single and multiple alternatives, benefit cost ration and project risk in engineering design project.

SYNOPSIS

The course covers engineering financial, cost and finance in making final decisions. Engineering financial is crucial as it can help to assess the financial state of business as well as to select the best decision making and also allocating capital. It also helps to understand the financial sensitivity of project decisions and the use of decision tools for integrating business requirements. Besides, cost management which consists of production cost relationship, elements of the production process, managerial and cost accounting, inventory management, cost estimating methodology and cost control alternatives will be discussed in details in this course. Apart from that, engineering economics will discuss about the time value of money and interest relationship, which are useful to define certain project criteria that are utilized by engineers and project managers to select the best economic choice among several alternative. Projects examined will include both product and service producing investments. The effects of escalation, inflation and taxes on the economic analysis of alternative are also discussed. Management of risk incorporates the concepts of probability and statistics in the evaluation of alternative. The evaluation allows management to determine the probability of success of failure of the project.

REFERENCES

1. Blank, L. and Tarquin, A. Engineering Economy, 8th Edition, McGraw Hill, 2017.
2. W.G Sullivan, E.M Wicks, C.P. Koelling “Engineeringh Economy”. Prentic Hall International 17th Ed., 2018.
3. Clifford F. Gray and Erik W. Larson, 2018, Project Management: The Managerial Process, 7th Edition, Mc Graw Hill.

BMMW 4923
METALLIC COMPONENTS FOR AEROSPACE/
KOMPONEN LOGAM UNTUK AEROANGKASA

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Describe the basic principles of metallic components in aerospace manufacturing.
2. Identify the process engaged in fabricating the metallic components for aerospace.
3. Apply the principles of manufacturing the metallic components for aerospace.

SYNOPSIS
This course consists of the Introduction to Major Manufacturing Process in Aerospace such as major forming and forging processes of metal products, welding and joining, metal cutting and machining, abrasive metal removal and cutting processes and chemical metal removal and chemical processing of metals; Introduction of Tribology in Manufacturing Processes such as surface topography, adhesion and friction models, lubrication, surface treatments and surface quality.

REFERENCES
1. Halling, J. (1989) Principles of Tribology, Macmillan Education Ltd, London.
2. Kalpakjian, S. (2014), Manufacturing Engineering and Technology, Addison Wesley, MA
3. Saha, P.K. (2017) Aerospace Manufacturing Processes, CRC Press, Boca Raton.

PRE-REQUISITE
FUNDAMENTAL OF AEROSPACE MANUFACTURING

BMMW 4933
AEROSPACE COMPONENT MACHINING/
PEMESINAN KOMPONEN AEROANGKASA

LEARNING OUTCOMES
At the end of this course, student should be able to:
1. Describe the principles and techniques of machining for Aerospace Components.
2. Construct CAD/CAM program from Three to Five-Axis machining for milling operations of Aerospace Components.
3. Create a complete CAD/ Program for any given actual industrial examples.

SYNOPSIS
This course provides concepts and techniques to prepare students with advanced computer numerical control (CNC), computer aided design (CAD) and computer aided manufacturing (CAM) application focusing on Aerospace Components. The course covers cutting planning & strategy as well as techniques in preparing the CAD / CAM program up to Five-Axis machining for metallic and composite Aerospace Components

REFERENCES
1. Pradip K. Saha (2017), Aerospace Manufacturing Processes, CRC Press, Taylor & Francis Group.
2. J. Srivinas (2016), CAD/CAM: Principles and Applications, Oxford University Press, India
3. Michael Michaud (2012), CATIA Core Tools: Computer Aided Three-Dimensional Interactive Application, 1st Edition, McGraw-Hill Education.
4. P N Rao (2010) CAD/CAM: Principles and Applications, 3rd Edition, Tata McGraw Hill Education Private Limited.

BMMW 4943
PACKAGING DESIGN & TECHNOLOGY/
REKABENTUK & TEKNOLOGI PEMBUNGKUSAN

LEARNING OUTCOMES

At the end of this course, student should be able to:
1. Explain the type, material, and processes for packaging.
2. Analyse the packaging economics that abide packaging laws and regulations.
3. To design basics graphic and package base on material selection and marketing requirements.

SYNOPSIS

Principles of packaging presents an overall of packaging and incorporates many disciplines to enable students to adequately convey and coordinate packaging activities. The course covers topics of introduction to packaging, fundamental components of packaging, essential elements of physical distribution, properties and sensitivity of different product, package system performance selection and packaging as marketing tool and design the basic graphics of packaging..

REFERENCES

1. Daniel Hellstr M Annika Olsson Fredrik Nilsson. Managing Packaging Design for Sustainable Development: A Compass For Strategic Direction, John Wileys. 2016.
2. Mostokowitz H.R. et al. Packaging Research in Food Product Design and Development, Wileys. 2009.
3. Luke, H. The Packaging and Design Templates Sourcebook (Graphic Design), RotoVision. 2007.
4. Kit L. Yam. The Wiley Encyclopedia of Packaging Technology, J. Wiley & Sons 2009
5. Klimchuk, Marianne Rosner, Packaging Design: Successful Product Branding from Concept to Shelf. Hoboken, NJ: John Wiley 2006.
6. Steven D. and John S. Package Design Work Book: The Art and Science of Successful Packaging. Rockportu Publisher. 2011.

BMMW 4953
VEHICLE DESIGN & DEVELOPMENT/
REKABENTUK & PEMBANGUNAN KENDERAAN

LEARNING OUTCOMES

At the end of this course, student should be able to:
1. Able to design modern type of sustainable vehicle.
2. Apply design and manufacturing skills and knowledge in developing new sustainable vehicles.
3. Develop ability to design and prototype for communicating and presenting ideas.

SYNOPSIS

The course will teach the student to understand evolutionary important elements in design and development of a modern sustainable vehicle. Students will learn the evolution of vehicle history and master suitable graphical software for vehicle design. Students will be shown how to present their concepts design at a professional level in an industrial situation. Students will also develop further understanding and application of the principles of vehicles design interior and exterior.

REFERENCES

1. Mehrdan Ehsani and Yimin Gao, Modern Electric, Hybrid Electric and Fuel Cell Vehicles-Fundamentals, Theories and Design 2nd Edition. CRC Press.
2. Stuart Macey and Geoff Wardle, (2014), H-Point 2nd Edition: The Fundamentals of Car Design and Packaging. Design Studio Press
3. Mike Tovey, (2012), Design for Transport: A User-Centred Approach to Vehicle Design and Travel. Gower Publishing.

BMMW 4963
IT COMMUNICATION IN DIGITAL MANUFACTURING/
KOMUNIKASI IT DALAM PEMBUATAN DIGITAL

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Analyse and solve industrial problems in manufacturing based on ICT solution.
2. Conducts some experiments based on the ICT applications and solution lab sheet requirements.
3. Demonstrates capabilities in designing and applying ICT solution in manufacturing.

SYNOPSIS

The use of information and communication technology (ICT) in the manufacturing has proven to have a positive impact in companies that have implemented it, since this enhances collaboration, improving the quality of information shared between suppliers and buyers. This course describes a vision of manufacturing in the 4th technology revolution that maximizes efficiencies and improvements by exploiting the capability of ICT. This course includes the role of ICT in manufacturing and why enterprise networking is essential such as modelling system and virtual factory, product data management (PDM) system, online analytical processing (OLAP), decision support system (DSS), customer relation management (CRM), computer integrated manufacturing (CIM), and enterprise resource planning (ERP).

REFERENCES

1. Dennis L. Brandl and Donald E. Brandl, (2012) Plant IT: Integrating Information Technology into Automated Manufacturing, Momentum Press.
2. Kusiak, A. (2000) Computational Intelligence in Design and Manufacturing, New York: John Wiley & Son.
3. Kevin A. (2004) Information Technology for Manufacturing, St. Lucie Press.
4. Mikell P. Groover, (2007) Automation, production systems, and computer-integrated manufacturing, Prentice Hall, 3rd Edition.

BMMW 4973
ADVANCE MANUFACTURING ENTERPRISE/
PERUSAHAAN PEMBUATAN TERMAJU

LEARNING OUTCOMES

At the end of this course, student should be able to:

1. Demonstrates understanding on the concepts of ubiquity, clouds, services systems and the global idea of ubiquitous and cloud manufacturing.
2. Identify architecture of ubiquitous and cloud manufacturing in manufacturing enterprise.
3. Apply Ubiquitous Cloud Manufacturing System robustness in terms of interoperability, re-configurability and agility, efficiency and effectiveness in Manufacturing System.

SYNOPSIS

This course introduces students to the development of advanced manufacturing systems and enterprises in response to the nowadays requirements for new industrialization and manufacturing revitalization. The concept of Ubiquitous and Cloud Manufacturing Systems (UCMS), is expected to deliver the next generation of methods and means for enabling modern manufacturing enterprises capable to respond to the above-mentioned requirements.

REFERENCES

1. Weidong Li, Jörn Mehnen (2013). Cloud Manufacturing: Distributed Computing Technologies for Global and Sustainable Manufacturing: Springer Link.
2. Marianne Bradford (2015). Modern ERP: Select, Implement, and Use Today's Advanced Business Systems: Microsoft.

SEMESTER 8

BMMU 4786
INDUSTRIAL TRAINING/
LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the course, students should be able to:
1. Build technical competencies, knowledges, skills and attitude for lifelong learning
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Develop effective communication with staff, colleagues and other personnel
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor f Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

BMMU 4796
INDUSTRIAL TRAINING REPORT/
LAPORAN LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the course, students should be able to:
1. Produce industrial training report.
2. Present report orally on working experience.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE
Student required to pass Industrial Training BMMU 4786 in order to pass Industrial training report.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

ACADEMIC HANDBOOK SESSION 2022/2023

FOR BACHELOR DEGREE PROGRAMMES

SUMMARY OF COURSES TECHNOLOGY PROGRAMMES

FTKMP

FACULTY OF MECHANICAL AND MANUFACTURING ENGINEERING TECHNOLOGY

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITY COMPULSORY COURSES (W)

**BKKX XXX1
CO-CURRICULUM I & CO-CURRICULUM II/
KOKURIKULUM I & KOKURIKULUM II**

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply the technique in the relevant field.
2. Demonstrate the ability to participate in a team in the relevant field.

***LIST OF FIELDS**

CODE	COURSE
BKKC 1061	Koir
BKKC 1141	Silat Gayong
BKKC 1601	Gamelan
BKKC 1611	Cak Lempong
BKKC 1631	Nasyid
BKKC 1641	Seni Khat
BKKC 1761	Kompang
BKKC 1791	Catur
BKKE 1451	Perniagaan Sukan
BKKE 1461	Agropreneur
BKKE 1551	Keusahawanan
BKKE 1561	Fiqh Muamalat
BKKI 1531	Reka Cipta
BKKI 1781	Seni Foto
BKKL 1391	Pengurusan Kendiri
BKKL 1411	Pengurusan Kesihatan
BKKL 1501	Aplikasi Falak Dalam Ibadah
BKKM 1501	Rakan Polis
BKKM 1561	Budi Penyayang
BKKM 1811	Fiqh Amali
BKKM 1821	Tahsin Al-Quran
BKKM 1831	Prs & Sahabat Khidmat
BKKM 1911	Kelestarian Amalan Hijau
BKKM 1921	Pengurusan Tenaga Elektrik
BKKM 1931	Teknologi Hijau Dan Alam Sekitar
BKKP 1741	Pengucapan Awam (Bahasa Melayu)
BKKS 1011	Bola Sepak
BKKS 1031	Bola Tampar
BKKS 1071	Sepak Takraw
BKKS 1091	Senamrobik
BKKS 1101	Badminton
BKKS 1141	Kembara
BKKS 1151	Berbasikal
BKKS 1281	Hoki
BKKS 1311	Sofbol
BKKS 1351	Bola Baling
BKKS 1361	Ragbi
BKKS 1501	Petanque
BKKV XXXX	Kor SUKSIS
BKKV XXXX	Kor SISPA
BKKV XXXX	Kelana Siswa
BKKV 1571	Bulan Sabit Merah
BKKV XXXX	PALAPES
BKKV 1851	Pertolongan Cemas

***Remark: Subject to change by IPTK**

BLLW 1222
MANDARIN LANGUAGE 1/
BAHASA MANDARIN 1

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Demonstrate the ability to converse in Mandarin with correct and accurate pronunciation and respond to it accordingly.
2. Construct sentences with correct grammar and demonstrate writing skills.
3. Interpret the information in the simple text.

SYNOPSIS

This course is designed for students who do not have prior knowledge in Mandarin. It provides students with the foundation of knowledge to enable them to understand and respond in the oral and written forms. This course encompasses the listening, speaking, reading and writing components. This course aims to help students to obtain enough exposure of the Mandarin phonetics (Han Yu Pin Yin). The basic grammar introduced is related to the language used daily by the Chinese. Particular care is also taken to ensure the development of verbal communication and written skills in Mandarin

REFERENCES

1. Cheong, K. M. (2015). Mari Belajar Mandarin. Penerbit: Universiti Teknikal Malaysia Melaka.
2. Ang, L.H. & Ooi, B.L. (2012). Basic Chinese For Everyone. Selangor: Pelanduk Publications.
3. Wu, J. & Bai, L. (2011). Chinese Grammar Step By Step. Singapore: Cengage Learning Asia Pte Ltd.
4. Soh W. N., Chia T.H., San, L. & Mok, S. S. (2009). Conversational Mandarin Chinese For Non-Native Speakers. Selangor: Xueer publisher.
5. Alison, L.M. (2006). The First 100 Chinese Characters. Hong Kong: Tuttle Publishing

BLLW 1142
ENGLISH FOR ACADEMIC PURPOSES/
BAHASA INGGERIS UNTUK AKADEMIK

LEARNING OUTCOMES

By the end of the course, students should be able to:

1. Apply correct grammar rules according to context.
2. Demonstrate knowledge of various reading skills in the reading tasks given.

SYNOPSIS

This course aims to develop students' reading skills and grammar. A variety of academic reading texts and reading skills are explored to facilitate students' comprehension of the texts. These reading skills are also necessary in assisting students to master study skills. Grammar elements are taught in context to develop students' accuracy in the use of the language. This course also includes elements of blended learning.

REFERENCES

1. Pattison, T. (2015). Critical Reading: English for Academic Purposes. Pearson Higher Education & Professional Group.
2. de Chazal, E., & Rogers, L. (2013). Oxford EAP: A Course in English for Academic Purposes. Oxford: Oxford University Press.
3. Paterson, K. & Wedge, R. (2013). Oxford Grammar for EAP. Oxford: Oxford University Press.

BLLW 2152
ACADEMIC WRITING/
PENULISAN AKADEMIK

LEARNING OUTCOMES
At the end of the course, students should be able to:
1. Prepare clear and detailed descriptions of a product related to fields of interest.
2. Express arguments systematically in a composition.
3. Prepare short reviews of technical materials.

SYNOPSIS
This course aims to equip the students with the skills to communicate clear and detailed viewpoints in writing. The students are expected to have a stand on topics of their fields by providing advantages and disadvantages to support their arguments. From time to time, consultations with the students will be conducted throughout the completion of their assignments. This serves as the formative evaluation in the course. Grammar components are embedded in the course to support the required writing skills. Blended learning is incorporated in this course.

REFERENCES

1. Blass, L & Vargo, M. (2018). Pathways: Reading, Writing, and Critical Thinking 3. Mason: Cengage Learning, Inc
2. De Chazal, E., & Rogers, L. (2012). Oxford EAP: A Course In English For Academic Purposes. Oxford: Oxford University Press.
3. Paterson, K. & Wedge, R. (2013). Oxford Grammar for EAP. UK: Oxford University Press.

PRE-REQUISITE
BLHW 1442
ENGLISH FOR ACADEMIC PURPOSES/
BAHASA INGGERIS UNTUK AKADEMIK

BLLW 3162
ENGLISH FOR PROFESSIONAL INTERACTION/
BAHASA INGGERIS UNTUK INTERAKSI PROFESIONAL

LEARNING OUTCOMES
At the end of the course, students should be able to:
1. Listen and infer based on situations in context.
2. Respond to standard spoken language using communication strategies.
3. Display detailed descriptions by expanding and supporting points of view using relevant examples.

SYNOPSIS
This course which is designed based on a blended and student-centred learning approach aims to develop students' listening skills as well as communication skills and strategies. Among the elements covered are professional interactions that include group discussion and public speaking. Students are also required to express ideas with relevant examples in public speaking and online assessments. They are also exposed to the rudiments of grammar implicitly via the communicative activities.

REFERENCES

1. Fry, R. (2016). 101 Smart Questions To Ask On Your Interview. U.K.: New Page Books.
2. Cooper, S. (2016). 100 Tricks To Appear Smart In Meetings: How To Get By Without Even Trying. Andrews McMeel Publishing.
3. Hood, J.H. (2013). How To Book Of Meetings: A Complete Guide For Every Business. South Australia: Magill.
4. Carmine, G. (2014). Talk like TED: The 9 Public-Speaking Secret Of The World's Top Minds. New York: St Martins Press.
5. Jason, S.W. (2013). Workplace Communication For The 21st Century: Tools And Strategies That Impact The Bottom Line. California: Praeger.

PRE-REQUISITE
BLHW 2452
ACADEMIC WRITING/
PENULISAN AKADEMIK

BTMW 1112
BASIC TECHNOPRENEUR/
ASAS TEKNOKEUSAHAWANAN

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Demonstrate essential knowledge on entrepreneurial process in starting their own businesses
2. Assess the feasibility and commercial potential on finding the right business opportunities through Michael Potter's five forces of industry structure, SWOT, 4Ps of marketing and marketing mix, value creation, branding, market segmentation, positioning, value creation and social media marketing and entrepreneurial finance tools and materials
3. Perform their own entrepreneurial passion, desire and capabilities which are crucial for successful venture

SYNOPSIS

The course introduces students to the concepts of entrepreneurship. The goal of the course is to provide students with essential information on the entrepreneurial process. The focuses of the course are on business concept development and feasibility analysis to assess the viability of the concept. The course includes concepts of entrepreneurship, creativity, innovation, and new venture creation process. Students will learn to generate ideas, identify opportunities and investigate whether it can be turned into a viable business through feasibility analysis.

Entrepreneurial marketing will be given emphasis in this module as it is one of the important factors in feasibility analysis. Concepts such as product positioning, market segmentation, Michael Potter's five forces of industry structure and SWOT (Strength, weakness, Opportunity and Threat) will be introduced. Students will also learn to select, develop, and evaluate new products/ services, set prices to maximize profitability and make the most efficient use of public relations, publicity during product launches and initial rollouts.

REFERENCES

1. NTU (2013). Entrepreneurship & Innovation Asia. Overview. Nanyang Technological University, Singapore: Nanyang Technopreneurship Center.
2. Kuratko, D. F. (2017). Entrepreneurship: Theory, Process, Practice, 10th edn. Boston, MA, USA: Cengage Learning.
3. Shane, S. A. (2007). Finding Fertile Ground: Identifying Extraordinary Opportunities for New Ventures, 2nd Print. Upper Saddle River, NJ: Pearson Education.
4. Lewis, M. (2012). The New Thing: A Silicon Valley Story. London, Great Britain: Hodder & Stoughton Ltd.
5. Porter, M. E. (2008). Competitive Strategy: Techniques for Analyzing Industries and Competitors. The Free Press.
6. Stross, R. E. (2001). eBoys: The First Inside Account of Venture Capitalists at Work. Crown Publishing Group.

BIPW 1132
PHILOSOPHY AND CURRENT ISSUES/
FALSAFAH DAN ISU SEMASA

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Explain current issues based on philosophy, National Education Philosophy and Rukun Negara.
2. Explain current issues based on major thought streams in various philosophical streams.
3. Explain current issues through the perspective of comparative philosophy as the basis for establishing inter-cultural dialogue.

SYNOPSIS
This course covers the relationship of philosophy with the Philosophy of National Education and Rukun Negara. The use of philosophy as a tool to purify the culture of thought in life through art and thinking methods as well as human concepts. The main topics in philosophy namely epistemology, metaphysics and ethics are discussed in the context of current issues. Emphasis is given to philosophy as the basis for inter-cultural dialogue and fostering common values. At the end of this course, students will be able to see the disciplines of knowledge as a comprehensive body of knowledge and related to each other.

REFERENCES
1. Dzulkifli, A. R. & Rosnani, H (2019). New Interpretation of National Education Philosophy and Its Implementation Post 2020. Kuala Lumpur: IIUM Press.
2. Rosnani Hashim (2017). Revitalization of Philosophy and Philosophical Inquiry in Muslim Education. Gombak: Kull of Education, IIUM.
3. Al-Attas, S. M. Naquib (1991). The Concept of Education in Islam. Kuala Lumpur: ISTAC.

BLHW 2772
APPRECIATION OF ETHICS AND CIVILIZATIONS/
PENGHAYATAN ETIKA DAN PERADABAN

LEARNING OUTCOMES
At the end of this course, students will be able to:
1. Explain the theory and concept of ethics from different perspectives of civilization.
2. Explain the importance of contemporary issues related to various fields according to the mold of ethics and civilization.
3. Discuss the system, level of development, social and cultural progress across cultures for Malaysia.

SYNOPSIS
This course discusses the theories and concepts of knowledge, ethics and civilization based on the comparison of systems, social and cultural progress across diverse cultures. In addition, this course also explains about contemporary issues related to various fields according to the mold of ethics and civilization. This course approach can build Malaysians who come from various cultural backgrounds across cultural values to produce human culture with good values.

REFERENCES
1. Puga, I. & Easthope R. (2017). An analysis of C. Wright Mills's The sociological imagination. London: Routledge.
2. MacKinnon, B. (2015). Ethics: Theory and Contemporary Issues (8th ed). Stamford CT : Cengage Learning.

BTMW 2124
CAPSTONE TECHNOPRENEURSHIP 1/ CAPSTONE TEKNOKEUSAHAWANAN 1

LEARNING OUTCOMES

Upon completion of this course, student should be able to:
1. Apply various financial indicators & tools to prepare for financial information for a new business venture.
2. Acquire skills to analyze financial statements.
3. Present financial information for new busines.
4. Display the art of negotiation with investors.

SYNOPSIS

Entrepreneurs need money to start and to grow their business. It is important to understand how revenue is generated, how to source for funds, how to control cash flow, how to assess the success of the company in monetary terms, and how to value a company for various purposes. The course exposes students to the various financial aspects relating to new ventures. These include approaches to secure start-up capital and venture financing. Students learn about the basic accounting, essential financial indicators, the types of funds available, the different categories of investors, the importance of intellectual property in securing finance, the financial details to be included in a business plan required for investment purpose, valuation of company and the art of negotiation with investors.

REFERENCES

1. NTU (2013). Entrepreneurship & Innovation Asia. Overview. Nanyang Technological University, Singapore: Nanyang Technopreneurship Center.
2. Cremades, A. (2016). The Art of Startup Fundraising. Pitching Investors, Negotiating the Deal, and Everything Else Entrepreneurs Need to Know. Hoboken, NJ: John Wiley & Sons.
3. McKinsey & Co., Koller, T., Goedhart, M. & Wessels, D. (2015). Valuation. Measuring and Managing the Value of Companies, 6th ed. Hoboken, NJ: John Wiley & Sons.

BTMW 3134
CAPSTONE TECHNOPRENEURSHIP 2/ CAPSTONE TEKNOKEUSAHAWANAN 2

LEARNING OUTCOMES

Upon completion of this course, student should be able to:
1. Apply the business model canvas incorporating human and financial elements.
2. Acquire skills to resolve organizational conflicts Present financial information for new business.
3. Write a convincing business plan.
4. Evaluate vital organizational behaviours necessary to grow a new venture.
5. Motivate all stakeholders and build a cohesive venture team.

SYNOPSIS

The start-up and growth of an enterprise invariably involves both human and financial capital. To manage the increasing pool of human resources and to convince venture capitalists to invest become two main issues especially for growing venture. This course consists of two parts: in the first part, organization and human resource management are introduced; in the second part, the focus is on writing a convincing business plan to attract venture capital investment. When enterprise starts to take shape and grow, more people will be hired, proper organization, team building and human resource management will become important issues. In this course, students will be exposed to the various organizational aspects relevant to new ventures and established companies. These include the pros and cons of the different organization structures, conflicts that may arise among employees, and approaches to building strong teams. Human resourse management techniques will also be introduced and discussed. In the second part of the course, the business model canvas will be described listing the connections among the different components of a business. The value of a business plan and the techniques of writing a business plan will be introduced.

REFERENCES
1. NTU (2013). Entrepreneurship & Innovation Asia. Overview. Nanyang Technological University, Singapore: Nanyang Technopreneurship Center.
2. Cremades, A. (2016). The Art of Startup Fundraising. Pitching Investors, Negotiating the Deal, and Everything Else Entrepreneurs Need to Know. Hoboken, NJ: John Wiley & Sons.

BMMU 3134
FINAL YEAR PROJECT 1/
PROJEK TAHUN AKHIR 1

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Explain the problem, objectives and scope of project associated to the industrial or community needs.
2. Use relevant theory to produce solution.
3. Present the preliminary findings in the oral and written forms effectively.

SYNOPSIS
The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES
1. Manual Projek Sarjana Muda (PSM).

BMMU 3186
FINAL YEAR PROJECT 2/
PROJEK TAHUN AKHIR 2

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Analyze data in a meaningful form using relevant tools.
2. Perform project implementation systematically.
3. Present the results in the oral and written forms effectively.

SYNOPSIS
This is the second part of the Bachelor Degree Project. Students are expected to continue the project performed in Bachelor Degree Project until completion. At the end of the semester, students are required to submit the Bachelor Degree Project report and present their projects for assessment.

REFERENCES
1. Manual Projek Sarjana Muda (PSM).
2. Faculty Student 's Log Book.
3. Faculty Final Year Project Guide Book.

BMMU 3186
INDUSTRIAL TRAINING/
LATIHAN INDUSTRI

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Solve technology related problems using methods, tools and techniques learnt throughout the training.
2. Explain effectively with the technical community and produce technical reports and presentations.
3. Demonstrate social ethique and professionalism in technology practice.

SYNOPSIS
Industrial training is a compulsory component for degree program students at Universiti Teknikal Malaysia Melaka (UTeM). The experience and skills acquired from a period of placement can be invaluable and provide the advantage to the students when applying for employment after graduation. During the training period with the relevant industry, students are expected to involve in the following areas of training in order to achieve the underlying objectives: Manufacturing, production process and / or its optimization process, mechanical design and product, maintenance and repair of equipments, product testing and quality control.

REFERENCES
1. Faculty Student 's Log Book.
2. Faculty Final Year Project Guide Book.

BMMI (TECHNOLOGY COURSES)

BMMI 1013
PRODUCT DRAFTING AND SPECIFICATION/
DRAF PRODUK DAN SPESIFIKASI

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Examine, analyse, interpret and assess the engineering drawing.
2. Deliver information via the set of drawings from engineering parts.
3. Draft the product to be machined according to the standard of engineering drawing.

SYNOPSIS

The course will provide students with an understanding of the importance of engineering graphics as a communication tool specially for machining applications. Students will be exposed to geometry drawing, orthographic drawing, section view, isometric drawing, assembly drawing, dimension, tolerance, machining symbol and standard codes using manual sketches and computer aided design (CAD) software. They also learn how to interpret drawings.

REFERENCES

1. Mechanical Drawing Board & CAD Techniques, Student Edition, McGraw-Hill Education, 2013.
2. Dix, M. & Riley, P., 2014, Discovering AutoCAD 2017 Prentice Hall, New York.
3. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. and Novak, J. E.,Lockhart S., 2016, Technical Drawing with Engineering Graphics, 15th Ed., Pearson & Prentice Hall, New Jersey.
4. Jensen, C., & Jay D. H., 2007, Engineering Drawing and Design, 7th Ed., Glencoe and McGraw Hill, New York.
5. James D. Bethune, 2018, Engineering Graphics with AutoCAD 2017, Prentice Hall.

BMMI 1023
STANDARD PRODUCT PRECISION/
KETEPATAN PIAWAI PRODUK

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Conduct the basic quality principles and practices, quality solving techniques and product reliability related to manufacturing process.
2. Perform suitable measurement methods for a given issue.
3. Solve the manufacturing process quality problem using quality solving techniques as individual or group work.

SYNOPSIS

This course covers three main areas: dimensional metrology, measurement analysis, and surface/texture measurement. In the dimensional metrology, students will be expose to three types of measurements: linear, angle and geometrical. In the measurements analysis, students will be required to describe the standard Measurement, measurement process, process capability, measurement errors, limits, tolerances and fits. In surface/texture measurement, students will perform the measurement of surface texture. This course equivalent to Geometric, Dimensioning and Tolerance in other technological fields.

REFERENCES

1. Bucher, J.L (2014). The Metrology Handbook. ASQ Quality Press.
2. Campbell, R.G and Roth, E.S (2012). Integrated Product Design and Manufacturing Using Geometrical Dimensioning and Tolerancing. Marcel Dekker, Inc.
3. Besterfield, D. H. (2014) Quality Control, 8th Edition, Pearson.
4. Montgomery D. C. (2005). Introduction to Statistical Quality Control, 5th Edition, John Wiley and Sons, Inc.
5. Bass, I (2014) Six Sigma Statistic with Excel and Minitab, Mc Graw Hill.
6. Pande, Sanjay S., Dixit, Uday Shanker (2016). Precision Product-Process Design and Optimization.

BMMI 1033
WORKPIECE AND CUTTIING TOOL PROPERTIES/ SIFAT BAHAN KERJA DAN PERKAKAS PEMOTONG

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Recognize the common cutting tools and workpiece material tha tbeing applied in the automotive, aerospace and medical industries.
2. Manufacture cutting tool and/or workpiece material from powder metaalurgy and casting process.
3. Relate the usage of cutting tools and workpiece materials in the specific application in industry.

SYNOPSIS

This course covers types, setup, applications and specifications of common cutting tools and workpiece materials that frequently applied in industry. The course also introduces why the selection of the appropriate cutting tools and cutting fluids are essential in metal cutting operations to reduce the heat and friction produced during material removal operations and how the selection, setup and applications affect the quality, accuracy, efficiency and productivity of the workpiece produced.

REFERENCES

1. Erik Oberg, Franklin Jones, Holbrook Horton, Henry Ryffel, Christopher McCauley, (2016) 30th Edition, Machinery's Handbook, Industrial Press.
2. Winston A. Knight, Geoffrey Boothroyd, (2005) 3rd Edition, Fundamentals of Metal Machining and Machine Tools. Taylor & Francis.
3. J. Paulo Davim, (2014) 1st Edition, Machinability of Advanced Materials, Wiley.
4. J. Paulo Davim, (2011) 1st Edition, Machining of Hard Materials, Springer.
5. A Mouritz, (2012) 1st Edition, Introduction to Aerospace Materials, Woodhead Publishing.

BMMI 1043
JIG AND FIXTURE/ JIG DAN LEKAPAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Recognize difference type of jigs and fixtures, materials used, actuation method, components of jigs and fixtures.
2. Perform to fabricate component for jig and fixture with the specific design and application in manufacturing process.
3. Coordinate a task to fabricate jig and fixture assembled by multi components application.

SYNOPSIS

This course introduces students to jig and fixture. It starts with types and functions of jig and fixture. In addition, students will be exposed to knowledge about classification of jig and fixture for selected operation. This course also will introduce students to identify the principles and analysis of a tool design in jig and fixture application. In this course, the tool drawing is important to students in order to design the jig and fixture therefore the guideline of tool and jig design are explained.

REFERENCES

1. P. H Joshi (2010). Jig and Fixtures, Third Edition. McGraw Hill Education.
2. Tool and Cutter Sharpening (Workshop Practice), Harold Hall, Special Interest Model Books; UK ed. Edition, 2012.
3. Grover, M.P. (2010). Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, 4th Edition. Wiley.

BMMI 1054
TOOL SETUP AND REFURBISHMENT/
PEMASANGAN DAN BAIKPULIH PERKAKAS

LEARNING OUTCOMES
Upon completion of this course, students should be able to:
1. Identify the importance specification of cutting tool design for turning, milling and drilling operations.
2. Perform the cutting tool setup for turning, milling and drilling operations.
3. Propose the usage of refurbished cutting tools in machining and other application.

SYNOPSIS
This course covers types, setup, applications and specifications of common cutting tools and workpiece materials that frequently applied in industry. The course also introduces why the selection of the appropriate cutting tools and cutting fluids are essential in metal cutting operations to reduce the heat and friction produced during material removal operations and how the selection, setup and applications affect the quality, accuracy, efficiency and productivity of the workpiece produced.

REFERENCES
1. Tool and Cutter Sharpening (Workshop Practice), Harold Hall, Special Interest Model Books; UK ed. Edition, 2012.
2. Kalpakjian, S. and Schmid R. (2014), Manufacturing Engineering and Technology, 7th Edition, Prentice Hall.
3. Mikell P. Groover, Fundamentals of Modern Manufacturing Materials, Processes, and Systems, 4th Edition, John Wiley & Sons, 2010.
4. Mikell P. Groover, Principles of Modern Manufacturing SI Version, 5th Edition, John Wiley & Sons, 2013.
5. Metal Cutting Theory and Practice-CRC Press (2016), Agapiou, John S. & Stephenson, David A.
6. Tool and Cutter Grinding, Crowood Press Ltd (2021) - Marcus Bowman.

BMMI 1063
SUSTAINABLE MACHINING/
KELESTARIAN PEMESINAN

LEARNING OUTCOMES
Upon completion of this course, students should be able to:
1. Recognize the concept of green manufacturing and sustainability in machining practices.
2. Evaluate the principles and sustainability of using minimum resources for cost and energy saving.
3. Relate the sustainable issues and acts in machining industry.

SYNOPSIS
This course provides an overview on current sustainable machining. Its topics cover the concept in cutting tool management, lubrication strategy, optimization, economic, environmental dimensions. The course also covers design of experiment in machining trials.

REFERENCES
1. J. Paulo Davim, Sustainable Machining, 2017, Springer.
2. Peralta Álvarez M, Marcos Bárcena M, Aguayo González F. A Review of Sustainable Machining Engineering. 2016.
3. Optimization Process Through Triple Bottom Line. ASME. J. Manuf. Sci. Eng. 2016. 138(10):100801-100801-16. doi:10.1115/1.4034277.

BMMI 1073
CONDITION MONITORING IN MACHINING/ PEMANTAUAN KEADAAN DALAM PEMESINAN

LEARNING OUTCOMES

Upon completion of this course, students should be able to:

1. Relate the application of design, maintenance, process and inspection in condition monitoring.
2. Elaborate the potential of machining experts in condition monitoring.
3. Develop on skills that required to be applied in condition monitoring.

SYNOPSIS

This course exposes the student in performing condition monitoring is the process of determining the condition of machinery while in operation. It can be categorized into three aspects: Knowing what to listen for; How to interpret it; when to put this knowledge to use. Understanding this course enables to repair of problem components prior to failure. Condition monitoring not only helps plant personnel reduce the possibility of catastrophic failure, but also allows them to order parts in advance, schedule manpower, and plan other repairs during the downtime.

REFERENCES

1. BS ISO 13372: "Condition monitoring and diagnostics of machines. Vocabulary" (2012).
2. ISO (2011). ISO 17359:2011, Condition monitoring and diagnostics of machines - General guidelines. The International Organization for Standardization (ISO).
3. Simon R. W. Mills (2010). Vibration Monitoring and Analysis Handbook - (INST397). The British Institute of Non-Destructive Testing. ISBN 978-0-903132-39-8.
4. Principles of Machine Operation and Maintenance By Dick Jeffrey Copyright Year 1991.

BMMI 1083
ASSESEMENT OF MACHINABILITY/ PENILAIAN KEBOLEHMESINAN

LEARNING OUTCOMES

Upon completion of this course, students should be able to:

1. Define factors that is governed or influenced on the machinability.
2. Measure the machinability of machining process.
3. Organizing various methods of improvement for machinability.

SYNOPSIS

This course provides the students on knowledge for machinability measurement of material. Machinability is an indicator on how material can be cut (machined) permitting the removal of the material to achieve acceptable performances. Materials with good machinability (free machining materials) require little power to cut, can be cut quickly, easily obtain a good finish, and do not wear the tooling much. The factors that typically improve a material's performance often degrade its machinability.

Therefore, to manufacture components economically, engineers are challenged to find ways to improve machinability without harming performance. Machinability can be difficult to predict because machining has so many variables. Two sets of factors are the condition of work materials and the physical properties of work materials. The condition of the work material includes eight factors: microstructure, grain size, heat treatment, chemical composition, fabrication, hardness, yield strength, and tensile strength. Physical properties are those of the individual material groups, such as the modulus of elasticity, thermal conductivity, thermal expansion, and work hardening. Other important factors are operating conditions, cutting tool material and geometry, and the machining process parameter.

REFERENCES

1. Erik Oberg, Franklin Jones, Holbrook Horton, Henry Ryffel, Christopher McCauley, (2016) 30th Edition, Machinery's Handbook, Industrial Press, 2014.
2. Winston A. Knight, Geoffrey Boothroyd, (2005) 3rd Edition, Fundamentals of Metal Machining and Machine Tools, Taylor & Francis, 2012.
3. J. Paulo Davim, (2014) 1st Edition, Machinability of Advanced Materials, Wiley.
4. B Mills and A H Redford, (1983) 1st Edition, Machinability of Engineering Materials, Springer.

BMMI 2094
PRECISION AND FINISING IN CNC TECHNOLOGIES/
KETEPATAN DAN KEMASAN DALAM TEKNOLOGI CNC

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Recognize the capabilities of 2, 3 axis CNC machining.
2. Develop programs by using a coordinate system for milling and turning by using an ISO coding system.
3. Manage production by using CNC machines to produce components.

SYNOPSIS

This course provides students with concepts and practices in CNC machining that are computer programming of CNC milling and turning with specific processes such as drilling, tapping, boring, grooving, facing, pocketing, radius forming, angular cutting, and threading. Emphasis is on programming and production of parts including investigation in 2 and 3-axis programming techniques.

REFERENCES

1. J.L. Stauffer, (1993) Finishing Systems design & Implementation, Published by association of Finishing process of the Society of Manufacturing Engineers (SME).
2. Practical CNC-Training for planning and shop-Hanser Publishers. 1998.
3. Introduction to Computer Numerical Control-Barry Leathem-Jon. 1986.

BMMI 2103
PRECISION AND FINISHING IN EDM AND GRINDING TECHNOLOGIES/ KETEPATAN DAN KEMASAN DALAM TEKNOLOGI EDM DAN PENGISARAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Recognize the capabilities of EDM and Grinding Process.
2. Develop programs by using a coordinate system for EDM and Grinding for machining solution.
3. Manage production by using EDM and Grinding machines to produce components.

SYNOPSIS

This course introduces students to EDM and grinding technologies. It starts with the introduction of EDM and grinding technologies. In addition, students will be exposed to knowledge about classification of EDM and grinding technologies for selected operation. This course also will introduce students to identify the principles and analysis of a tool design and tool manufactured in both machine applications. In this course, the tool drawing is important to students in order to operate and manage the machine in the laboratory. The content in this lesson plan will guide the lecturer on the presentation.

REFERENCES

1. J.L. Stauffer, (1993) Finishing Systems design & Implementation, Published by association of Finishing process of the Society of Manufacturing Engineers (SME).
2. Tool and Cutter Sharpening (Workshop Practice), Harold Hall, Special Interest Model Books; UK ed. Edition, 2012.
3. The electrical discharge machining (EDM) handbook. K. P. Rajurkar. B. Zhang, 2007.
4. Principles of Modern Grinding Technology Book, Second Edition. W. Brian Rowe. 2014.

BMMI 2114
PRISMATIC CADCAM PRODUCT/ PRODUK CADCAM PRISMATIK

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Design the product by using the CAD/CAM system.
2. Apply the method of converting CADCAM design to the CNC programs.
3. Manage the different procedures in NC programming.

SYNOPSIS

This course is an introducing to the CAD/CAM system and its application in industry. It covers complete integration of design and manufacturing simplifies the creation of manufacturing components and geometry. The topics involved feature-based and geometry-based programming, for easy adaptability to design changes. Students will practice predictable and reliable machining to accelerate delivery of products to customers. This course provides a complete solution, from design through NC code generation, NC program creation, process documentation, post-processing and toolpath verification and simulation.

REFERENCES

1. Fred Karam, Using CATIA V5, Tomson (Delma Learning), 2014.
2. P N Rao, CAD/CAM Principles and Applications, 2nd Edition, McGraw Hill, 2004.
3. Chang T.C., Richard A. Wysk, Wang H.P., Computer-Aided Manufacturing, 2nd Edition, Prentice Hall, 2006.

BMMI 2123
MULTI AXIS MACHINING/
PEMESINAN PELBAGAI PAKSI

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Create machining program for complex parts that require multi axis machining.
2. Differentiate different types of machine configuration and machine kinematics.
3. Present sources and possibility of machine collision during machining.

SYNOPSIS

This course gives in depth knowledge to students regarding multi axis machining. As compared to basic CNC machining which comprises of 3 linear axes namely X, Y and Z axis, multi axis machining gives further capability to machine complex parts with the additional rotary axis A, B and C as well as mill-turn and turn-mill capability. Understanding machines configuration will be key to avoid collision during machining. Students will be introduced to different types of machine configuration and machine kinematics to have better understanding of machine tools in order to create effective and safe CNC machining programs.

REFERENCES

1. CNC Machining Handbook: Building, Programming, and Implementation by Alan Overby, Publisher: McGraw-Hill Education TAB, Release Date: October 2010.
2. Secrets of 5-axis Machining, Karlo Apro, Industrial Press, Inc New York, 2008.

BMMI 2134
COMPLEX CADCAM PRODUCT/
PRODUK CADCAM KOMPLEKS

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Distinguish the different procedures in NC programming for complex product.
2. Apply the method of converting to the CNC programs.
3. Develop the geometric features and method to design complex CAD/CAM part.

SYNOPSIS

This course is the continuity from the course of Prismatic CADCAM Product. Complex CADCAM product will be produced by using either 3, 5 or 9 axis CNC machines. The topics involved with construction views; cross section surface construction; trim plane surface; extruded surface; surface of revolution; drive curve surface construction; surface fillet construction; extending surface; composite surface construction.

REFERENCES

1. Fred Karam, Using CATIA V5, Tomson (Delma Learning), 2014.
2. P N Rao, CAD/CAM Principles and Applications, 2nd Edition, McGraw Hill, 2004.
3. Chang T.C., Richard A. Wysk, Wang H.P., Computer-Aided Manufacturing, 2nd Edition, Prentice Hall, 2006.

BMMI 2143
HEAT TREATMENT OF THE MACHINED COMPONENTS/
RAWATAN HABA UNTUK KOMPONEN TERMESIN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Conduct heat treatment to alter the properties of selected steel.
2. Differentiate the heat treatment application to change the properties of material.
3. Present the capability heat treated steel to be apllied in other application.

SYNOPSIS
This course will discuss the concept and application of heat treatment on various types of metal. The topics involved with the types of heat treatment process, main alloying element that affected the hardenability of steel and the change of microstructure and mechanical properties. The students will be exposed to the common heat treatment practice in industry. Student will also practice the quality control evaluation after heat treatment. Several advanced heat treatment process also will be discussed.

REFERENCES
1. Totten, G.E., 2010. Steel heat treatment: metallurgy and technologies. crc Press.
2. Sharma, R.C., 2008. Principles of heat treatment of steels. New Age International.
3. O. Erik, 2017. Heat Treatment of Steel. Read Book Ltd

BMMI 3154
ASSEMBLY METHOD/
TEKNIK PEMASANGAN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Develop of product by assembly component manufacture various technique.
2. Present the possibility to assemble components by using various techniques.
3. Organize the components that can be assembled by design for manufacturing assembly (DMFA) approach.

SYNOPSIS
This course introduces students to assembly method. It starts with types and functions of joining techniques in metal and plastic part. In addition, students will be exposed to knowledge about process assembly for metal and plastic parts. This course also will introduce student to design for manufacturing and assembly application. In this course, the principle of assembly method is important to students in order to design effectively step by step of assembly.

REFERENCES
1. Geoffrey Boothroyd, Peter Dewhurst, Winston A. Knight. Product Design for Manufacture and Assembly (Manufacturing Engineering and Materials Processing) 3rd Edition, 2011. ISBN: 10.1420089277/ ISBN:13.9781420089271.
2. Lanxess, A Design Guide, Joining Techniques in Engineering Plastics, Joining Techniques. 2010.

BMMI 3214
REWORK AND REHABILITATION OF MACHINED COMPONENTS/
KERJA DAN PEMULIHAN KOMPONEN TERMESIN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Identify parts that can be reworked or rehabilitated.
2. Propose the methods and procedures that can be utilized for rework and rehabilitation process.
3. Verify whether reworked or rehabilitated parts are ready for use.

SYNOPSIS

This course gives an exposure on rework of machined part and rehabilitating machined components which are out of tolerance due to wear and tear. Rework are required when machined parts are under machined and still have unremoved materials due to tool wear during machining. Whereas rehabilitation of parts is required when a machined part is out of tolerance after servicing its purpose in the field. Students will gain understanding of rework and rehabilitation and be aware of its purposes in the field of manufacturing.

REFERENCES

1. Handbook of Mould, Tool and Die Repair Welding, 1st Edition, S Thompson, 2010.

BMMI 3224
SURFACE AESTHETICS OF MACHINED COMPONENT/
ESTETIKA PERMUKAAN UNTUK KOMPONEN TERMESIN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Propose the suitable surface treatment process for suitable application.
2. Organize process to be applied to treat the surface from machining to coating process.
3. Present the benefit of fine surface finish of machined component to reduce operational cost.

SYNOPSIS

This course covers various types of coating method for performance and aesthetics purposes of machined component. It covers the fundamental of coating technologies, testing and procedures of each coating method.

REFERENCES

1. Tracton, A.A. ed., 2010. Coating Technology: Fundamentals, Testing, and Processing Techniques. CRC Press.
2. Kalpakjian, S., Vijai Sekar, K.S. and Schmid, S.R., 2014. Manufacturing engineering and technology. Pearson.

BMMI 3234
MACHINE MAINTENANCE/ PENYELENGGARAAN MESIN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Present the different techniques in machine maintenance.
2. Propose preventive maintenance program with consideration of cost, manpower and time.
3. Demonstrate problem solving of real-life condition regards to machine maintenance issues.

SYNOPSIS

The student will be exposed to the maintenance technique, troubleshooting and fault diagnosis for mechanical equipment. Among the basic maintenance methods are condition-based monitoring, vibration analysis, alignment dynamic balancing and mechanical seals. Students also will also learn about troubleshooting and maintenance of various machines and components such as valve, pump, compressor, gear etc. The essential steps of disassemble, check, trouble-shoot, repair and reassemble of mechanical components will be stressed in this course.

REFERENCES

1. Daniel E., Whitney, 2012, Mechanical Assemblies: Their Design, Manufacture and Role in Product Development, Oxford University Press.
2. Joel Levitt, 2010, Tpm Reloaded: Total Productive Maintenance, 1st Edition, Industrial Press.
3. Smith, Ricky, And Bruce Hawkins. Lean Maintenance: Reduce Costs, Improve Quality, And Increase Market Share. Amsterdam: Elsevier Butterworth Heinemann, 2004.

BMMI 3244
PROJECT MANAGEMENT AND SUPERVISION / PENGURUSAN PROJEK DAN PENYELIAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Present the case study that exhibit excellent project manager.
2. Analyzing the main factors influencing project management outcome with consideration of professionalism and ethics.
3. Develop project management skills through theoretical understanding and practical application of the project management principles.

SYNOPSIS

This course provides a systematic and thorough introduction to all aspects of project management and supervision. Projects are an increasingly important aspect of modern business, so we begin with the relation between projects and the strategic goals of the organization. This course covers the technical, cultural, and interpersonal skills necessary to successfully manage projects from start to finish. The course emphasizes that manufacturing project management with its own tools, body of knowledge, and skills.

REFERENCES

1. Project Management Institute, A Guide to the Project Management Body of Knowledge: (PMBOK® Guide) Sixth edition, PMI, 2018, ISBN 9781628253825.
2. Frame, J. Davidson, Managing Projects in Organizations: How to Make the Best Use of Time, Techniques, and People, 3rd edition, Jossey-Bass, 2003, ISBN 0-787-96831-5.
3. Project Management Institute, The Standard for Program Management, Third Edition, Project Management Institute, 2013, ISBN 978-1935589686.
4. Stackpole, Cynthia Snyder, A Project Manager's Book of Forms: A Companion to the PMBOK® Guide, Wiley, 2009, ISBN 978-0470389843.
5. Weiss, Joseph and Wysocki, Robert, Five-phase Project Management: A Practical Planning and Implementation Guide, Basic Books, 1992, ISBN 0-201-56316-9.

BMMI 3254
ACTS AND RISKS ASSESSMENT IN MACHINING PRODUCTION/
AKTA DAN PENILAIAN RISIKO DALAM PENGELUARAN PEMESINAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Be able to assess, analyse and interpret risks to the health and safety.
2. Able to plan, organise, control, monitor and review the preventive and protective measures.
3. Implementing operational risk management (ORM).

SYNOPSIS

This course teaches students the about health and safety and work in safer and healthier ways. student will be exposed with the related act. Apart from that, the regulations set by the department of environment (DOE) and department of occupational safety & health (DOSH) are also being exposed to students.

REFERENCES

1. FAA System Safety Handbook, Health and safety in engineering workshops, 2010.
2. Serope Kalpakjian and Steven R Schmid, K. Manufacturing Engineering and Technology 7th Edition. Pearson Education, 2016. ISBN-13: 978-0133128741/ISBN-10: 0133128741.

ELECTIVE COURSES

BMMI 3184
AEROSPACE MACHINING/ PEMESINAN AEROANGKASA

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Relate the profession of design, maintenance, process and inspection in the aerospace industry.
2. Elaborate the potential of machining experts in the aerospace industry.
3. Develop on characteristics that can be adapted in the aerospace industry.

SYNOPSIS

This course provides students with advanced concepts and practices in CNC machining that are advanced computer programming of CNC milling and turning specific for aerospace machining processes such as profiling, drilling, boring, grooving, facing and threading. Emphasis is on programming and production of complex aerospace parts including investigation in 3, 4 and 5-axis programming techniques, utilizing canned cycles, macros (subroutines), looping and parametric programming. The uses of CAM in producing complex and efficient programming techniques are also covered.

REFERENCES

1. Erik Oberg, Franklin Jones, Holbrook Horton, Henry Ryffel, Christopher McCauley, (2016) 30th Edition, Machinery's Handbook, Industrial Press.
2. Winston A. Knight, Geoffrey Boothroyd, (2005) 3rd Edition, Fundamentals of Metal Machining and Machine Tools, Taylor & Francis J. Paulo Davim, (2014) 1st Edition, Machinability of Advanced Materials, Wiley.
3. J. Paulo Davim, (2011) 1st Edition, Machining of Hard Materials, Springer.
4. A Mouritz, (2012) 1st Edition, Introduction to Aerospace Materials, Woodhead Publishing.

BMMI 3194
HUMAN FACTOR TECHNOLOGY/ TEKNOLOGI FAKTOR KEMANUSIAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Relate the profession of design, maintenance, process and inspection in the human factor technology.
2. Elaborate the potential of machining experts in the human factor technology.
3. Develop on characteristics that can be adapted in the human factor technology.

SYNOPSIS

This course provides human factor technologies pertinent to machine building particularly on ergonomic issues. Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance. Ergonomists in machining contribute to the design and evaluation of tasks, jobs, products, environments and systems in order to make them compatible with the needs, abilities and limitations of a machinist.

REFERENCES

1. Tewari, P. C. (2017). Work study and ergonomics. Boca Raton: CRC Press.
2. Shorrock, S. T., & Williams, C. (2017). Human factors and ergonomics in practice: Improving system performance and human well-being in the real world. Boca Raton: CRC Press Taylor & Francis Group.
3. Bridger, R. S. (2018). Introduction to human factors and ergonomics. Boca Raton, FL: CRC Press, Taylor & Francis Group.

BMMI 3204
PRODUCTION PLANNING IN MACHINING/
PERANCANGAN PENGELUARAN DALAM PEMESINAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Relate the profession of design, maintenance, process and inspection in the production planning.
2. Elaborate the potential of machining experts in the production planning.
3. Develop on characteristics that can be adapted in the production planning.

SYNOPSIS

The process planning in machining is basically a plan of how the designed parts will be fabricated, machine and equipment selection, to achieve required specification. It involves proper and strategic decisions along with analysis in order to plan and adapt the production of every single component that will be built. This course intent to provide substantial knowledge on production planning in machining. The course covers from the philosophy of process and machining engineering, methods of production planning, and up until production planning practices.

REFERENCES

1. Manjuri Hazarika, Uday Shanker Dixit. (2014). Setup Planning for Machining: Springer.
2. LaRoux K. Gillespie. (2017). Design for Advanced Manufacturing: Technologies and Processes: McGraw Hill Professional.
3. Yousef Haik, Sangarappillai Sivaloganathan, Tamer M. Shahin. (2015). Engineering Design Process. Cengage Learning.

BMMI 3174
RAPID MACHINING/
PEMESINAN PANTAS

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Relate the profession of design, maintenance, process and inspection in the rapid machining.
2. Elaborate the potential of machining experts in the rapid machining.
3. Develop on characteristics that can be adapted in the rapid machining.

SYNOPSIS

The course will introduce the concepts of Rapid Machining (RM). It covers the knowledge on materials as workpiece, cutting tools, cutting conditions and machines used in the RM. Instead of that, students will learn to develop CNC programming for RM and also analyse the cutting performance of RM.

REFERENCES

1. King, R., 2013. Handbook of high-speed machining technology. Springer Science & Business Media.
2. El-Hofy, H.A.G., 2013. Fundamentals of machining processes: conventional and nonconventional processes. CRC press.

BMMI 3164
TOOL AND DIE MAKING/
PEMBUATAN PERKAKAS DAN DAI

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Relate the profession of design, maintenance, process and inspection in the tool and die making.
2. Elaborate the potential of machining experts in the tool and die making.
3. Develop on characteristics that can be adapted in the tool and die making.

SYNOPSIS

This course introduces students to tool and die making. It starts with introduction about press machine. Further, students will be exposed to the knowledge about elements of progressive combination and compound dies. This course also introduces to student how to identify the principles and analysis of a mould. Finally, student will be explained the design considerations in design tool, mould and die.

REFERENCES

1. Injection Moulding Machine-Parameters and Product Improvement Guideline, Abd. Kahar Nordin, Norfauzi Tamin, Mohd Hadzley Abu Bakar, Penerbit UTeM2019, ISBN: 978-967-2145-42-4.
2. Tool and Cutter Sharpening (Workshop Practice), Harold Hall, Special Interest Model Books; UK ed. Edition, 2006.

BMMK (TECHNOLOGY COURSES)

BMMK 1014
SAFETY IN WELDING/
KESELAMATAN DALAM KIMPALAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply the welding risk control based on procedures in the working environment.
2. Evaluate welding hazards that impact the safety, health, and environment at working area.
3. Create control method to minimize the impact of possible hazard in the working environment

SYNOPSIS

The aim of this course is to expose students on safety practices and procedures. The students are required to identify types of hazards that may incur in industries especially related to welding processes. The students are required to understand equipment,

REFERENCES

1. AWS, Welding Handbook Vol 1, 2 & 3, 9th Edition, 2001.
2. AWS, ANSI Z49.1:2012, Safety in Cutting, Welding, and Allied Process, 2012.
3. John Cadick et.all. Electrical safety handbook, 2012.

BMMK 1024
CAD AND WELDING GRAPHICS/
CAD DAN GRAFIK KIMPALAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Explain the engineering drawings include welding symbol and standard codes.
2. Construct technical drawing using manual sketching and computer aided design.
3. Communicate by using engineering drawings for welding application

SYNOPSIS

The course will provide students with an understanding of the importance of engineering graphics as a communication tool specially for welding application. Student will be exposed to geometry drawing, orthographic drawing, section view, isometric drawing, assembly drawing, dimension, tolerance, welding symbol and standard codes using manual sketches and computer aided design (CAD) software.

REFERENCES

1. Dix, M. & Riley, P., 2014, Discovering AutoCAD 2017 Prentice Hall, New York.
2. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. and Novak, J. E., 2016, Technical Drawing, 15th Ed., Prentice Hall, New York.
3. Jensen, C., & Jay D. H., 2007, Engineering Drawing and Design, 7th Ed., Glencoe and McGraw Hill, New York.
4. James D. Bethune, 2018, Engineering Graphics with AutoCAD 2017, Prentice Hall.
5. E. N. Gregory and A. A. Armstrong, 2005, Welding symbol on drawing, Woodhead Publishing Ltd and CRC Press LLC.

BMMK 1034
METAL FABRICATIONS TECHNOLOGY/
TEKNOLOGI FABRIKASI LOGAM

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Manipulating the basic principles and scientific processes and materials to produce products with reasonable judgment.
2. Demonstrate understanding of the concept and use of the terms contained in metal fabrication and welding technology.
3. Organizing themselves either its individuals or in groups during project generating process.

SYNOPSIS

This course is to equip students with the knowledge of metal fabrication and welding technology to improve manufacturing expertise in providing human capital development at par with global technological developments.

REFERENCES

1. Kalpakjian, Schmid, Steven R. (2018). Manufacturing Engineering and Technology - 7th ed. Pearson India.
2. Yogesh Jaluria (2018). Advanced Materials Processing and Manufacturing (Engineering Series) - 1st ed. Springer.
3. Larry Jeffus (2018) Welding: Principles and Applications - 8th ed. Cengage Learning.
4. T.S. Srivatsan, T.S. Sudarshan, K. Manigandan (2018) - Manufacturing Techniques for Materials: Engineering and Engineered- 1st ed. CRC Press.
5. Myer Kutz (2015). Mechanical Engineers' Handbook: Materials and Engineering Mechanics- 4th ed. Wiley.
6. Jerry P. Byers (2017). Metalworking Fluids (Manufacturing Engineering and Materials Processing) - 3rd ed. CRC Press.
7. Josef Dillinger & Falko Wieneke (2016). Metal Engineering Textbook. Europa Lehrmittel Verlag.

BMMK 1043
PRODUCT DESIGN IN WELDING/
REKABENTUK PRODUK DALAM KIMPALAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Describe and apply the principles of product design and development.
2. Organizes and develop a practical design solution through a systematic investigation of the product design problem.
3. Ability to work effectively in group to apply knowledge of entrepreneurships in the process of product design and development.

SYNOPSIS

Product Design in Welding blends the perspectives of marketing, design and manufacturing into a single approach to product development. As a result, this course provides the students with an appreciation for the realities of industrial practice and for the complex and essential roles played by various members of product development teams. Throughout this course, attempts are made to strike a balance between theory and practical.

REFERENCES

1. H. Boejang, H. Attan, M.F. Basar, M.I Ramli, (2013) Module 4: Product Development for Engineering Technology, 1st Edition, Penerbit Universiti, UTeM, Melaka, Malaysia.
2. K.T. Ulrich, S.D. Eppinger, (2016), Product Design and Development, 6th Edition, McGraw Hill Irwin.
3. A.K. Chitale and R.C. Gupta, (2013), Product Design and Manufacture, 6th Prentice Hall, New Delhi, India.
4. S. Kalpakjian, Steven R Schmid, (2014) Manufacturing Engineering & Technology, 7th Edition, Prentice Hall, 2014.

BMMK 1054
WELDING DOCUMENTATION/
DOKUMENTASI KIMPALAN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply knowledge on welding procedure qualification and welder qualification.
2. Construct PQR, WPS, WQR & Welding Symbol according to related standard.
3. Demonstrate type of welding drawing design and symbol in welding as required according to related standard.

SYNOPSIS
This course is to provide the students with understanding and practical approach in writing the essential documents in welding. The student will be exposed with ASME section IX code where the students will practice to write PQR, WPS, and WQR and interpreting all welding variables for procedure and welder qualification. Students also will be exposed with all welding symbols and welding geometry and all documents related with welding inspection.

REFERENCES
1. ASME (2015), Boiler and Pressure Vessel Code Section IX.
2. Standards: American Welding Society (AWS), D1.1 (2015).
3. David J Hoffman, Kevin R Dahle, David J Fisher (2016). Welding. New Jersey: Pearson Education David J Hoffman.

BMMK 1064
NON-CONVENTIONAL WELDING PROCESS/
PROSES KIMPALAN BUKAN KONVENSIONAL

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Identify types of joining processes applied in manufacturing sector.
2. Practice the joining processes using certain equipment to make variety of joints.
3. Explain the characteristics of joining in terms of process, equipment and setup.

SYNOPSIS
This course is to provide student with welding processes that are not commonly used in the current industries that can be categories as new or advanced welding technology. Students will be exposed all welding processes and required should be able to perform process selection when deal with the special and complex demand of welding work.

REFERENCES
1. Kapil Gutha (2017). Advanced Manufacturing Technologies: Modern Machining, Advanced Joining, Sustainable Manufacturing (Materials Forming, Machining and Tribology)- 1st ed. Springer.
2. Edward R.Bohnart (2017). Welding Principles and Practices - 1st ed. Ma-Graw-Hill Education.
3. David J. Hoffman, Kevin R.Dahle, David J.Fisher (2016). Welding - 2nd ed. Pearson.
4. Andrew D. Althouse (2018). Modern Welding - 12th ed. Goodheart-Willcox.

BMMK 2074
IMPERFECTION IN WELDING/
KECACATAN KIMPALAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply welding inspection method.
2. Implement the characteristics of metal properties and destructive testing.
3. Analyse the inspection and other NDE methods.

SYNOPSIS

The course will provide students with knowledge of identifying types of defects and the strategy of controlling the imperfection. The students will also require to perform mechanical destructive test that is tensile, bending, copy and hardness test. The competence required for checking fabrication materials, structural alignment & dimensions, checking welding quality (welding defect/distortion and weld repair).

REFERENCES

1. Amitava Mitra (2016). Fundamentals of Quality Control and Improvement. J. Paul Guyer (2017). An Introduction to Welding Inspection.
2. John C. Uppold (2015). Welding Metallurgy and Weldability.
3. Ram Babu Sao (2016). Perfect: Quality Assurance & Quality Control. New York: CreateSpace Independent Publishing Platform.
4. David J Hoffman, Kevin R Dahle, David J Fisher (2016). Welding. New Jersey: Pearson Education

BMMK 2084
MATERIALS BEHAVIOUR IN WELDING/
SIFAT BAHAN DALAM KIMPALAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Classify metals based on generic properties, structural relationships with properties, especially the emergence of microstructures by heat treatment methods for the metal class.
2. Explain the behaviour of structural in fusion welding and testing of materials welded joints.
3. Discuss the classification of composite and ceramic based on the testing and the microstructure.

SYNOPSIS

This course describes the materials used in engineering. Scope covers Materials introduction; latest developments in materials, introduction to metal, metal forging. Metal structure; scale relationship with nature, and phase diagram. This course also will provide the students with understanding of the Microstructure development with heat treatment and mechanical properties. The students will be exposed to light alloy processing and diffusion process with microstructural appearance on thermal and mechanical properties. This course also covers the knowledge of the ceramic classification, polymer classification and composite on microstructure relationship and mechanical properties.

REFERENCES

1. Neville, A. M. (2015). Concrete technology. Harlow, England ; New York :Prentice Hall. LC Call Number: TA439.N46.
2. Askeland, Donald R.; Pradeep P. Phulé (2016). The Science & Engineering of Materials.Thomson-Engineering. LC Call Number: TA403.D87 2010.
3. Callister, Jr., William D. (2014). Materials Science and Engineering – An Introduction. John Wiley and Sons. LC Call number: TA403 .C33 2011.
4. Lewis, P.R., Reynolds, K. & Gagg, C. (2003). Forensic Materials Engineering: Case Studies. Boca Raton: CRC Press. LC Call number: TA219 .L48 2004.
5. Mathews, F.L. & Rawlings, R.D. (1999). Composite Materials: Engineering and Science. Boca Raton: CRC Press. LC Call number: TA418.9.C6 .M37 1999.

BMMK 2094
SAFETY MANAGEMENT/
PENGURUSAN KESELAMATAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Explain the different requirements and regulations of Factory and Machinery Act, Occupational Safety and Health Act.
2. Conduct hazard identification and risk assessment in workplace.
3. Construct preventive and control technique according to the acts pertinent to the Occupational Safety and Health.

SYNOPSIS

Safety management is a course that design to provide knowledge for managing activities in the business workplace that apply comprehensive management system designed to manage safety elements in the workplace. It includes acts, policy, objectives, plans, risk assessment, procedures, organisation, responsibilities and other measures. This is important to prevent accidents, injuries and other impact to the organisation that shows the role of management that focus to deter such catastrophic.

REFERENCES

1. Taylor, J. B. (2012). Safety culture: assessing and changing the behaviour of organisations. Gower Publishing, Ltd.
2. Geller, E. S. (2017). Working safe: How to help people actively care for health and safety. CRC Press.
3. Bahari, I. (2002). Pengaturan sendiri di dalam pengurusan keselamatan dan kesihatan pekerjaan. Mc Graw Hill.
4. Griffith, A., & Howarth, T. (2014). Construction health and safety management. Routledge.

BMMK 2104
WELDING DESIGN ANALYSIS/
ANALISIS REKABENTUK KIMPALAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Describe basic concepts and fundamental principles of mechanical applications.
2. Apply basic concepts and fundamental principles to solve design for welding application.
3. Analyze basic problems in design considerations for welding.

SYNOPSIS

The course covers: Static: General principle, Force vector and Equilibrium of Particle; Mechanics: Principle of Stress & Strain, Torsion; Mechanics: Pure Bending and analysis and design of beams for bending; Welded design Program; Design Equations; Welded design Considerations; Design for welded join; Weld join design

REFERENCES

1. Hibbeler, R.C., 2016, Engineering Mechanics-Statics, 14th Editions, Pearson.
2. Beer, F.P., Johnston E.R, DeWolf J.T and Mazurek D.F, 2015, Mechanics of Materials 7th Editions in SI Units,McGraw-Hill.
3. Design for welding, Welding Handbook Chapter Committee on Design for Welding, 2003, American Welding society.
4. V.M. Radhakrishnan 2005, Welding Technology and Design.

BMMK 2124
ELECTRICAL WELDING EQUIPMENT/
PERKAKASAN ELEKTRIK KIMPALAN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Examine the physical phenomenon occurring in the arc and the types of forces and metal transfer in the arc based on measurements of power source characteristics.
2. Demonstrate the right choice of diode material, thyristors and inverters based on the understanding of the basic principles and methods for controlling the volt-ampere characteristics of the electric welding machines.
3. Integrate the welding current, voltage, temperature, load and displacement using equipment's such as clamp meter, LVDT, arc welding analyzer and resistance for welding quality monitoring.

SYNOPSIS
This course is aimed to provide the students with the understanding of static and dynamic characteristics of the electric arc and its associated power characteristics. Students will learn the basic principles, methods and circuit components that control operating power and the volt-ampere characteristics in electrical resistance and arc welding. Through that students will gain knowledge of the operating principles of Alternators, D.C. generators and motors used for welding.

REFERENCES

1. WATERS, T. F. (2017). Fundamentals of manufacturing for engineers. Place of publication not identified: CRC Press.
2. Abu Hassan Ismail. (1993). Kimpalan dan Potongan Gas : Manual Bengkel. IBS Buku. LC Call Number: TS227 .A38 1993.
3. Groover, M. P. (2015). Fundamentals of Modern Manufacturing. Wiley.
4. Kalpakjian, S., Schmid, S. R., & Sekar, K. S. (2016). Manufacturing: Engineering and technology. Melbourne, Victoria, Australia: Pearson Australia.
5. Crowson, Richard. (2006), The Handbook of Manufacturing Engineering. Taylor and Francis. LC Call Number: TS183 .H36 2006 v.1

BMMK 2134
NON DESTRUCTIVE TESTING/
UJIAN TANPA MUSNAH

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Explain the current basic and some advanced principles of Non-Destructive Testing (NDT) techniques to satisfy complex engineering problems.
2. Select and propose suitable NDT techniques based on their analysis on engineering problems that fulfil the standard practice.
3. Develop the ability to communicate effectively using available resources to disseminate knowledge of NDT techniques in relation with industrial problem.

SYNOPSIS
This course introduces the basic principles of non-destructive testing and the methods of non-destructive testing that are widely use in the industry, which are Visual Inspection, Penetrant Test, Magnetic Particle Testing, Eddy Current Testing, Ultrasonic Testing and Radiographic Testing. This course also covers the execution, evaluation and interpretation of each NDT techniques. The advantages, limitations and main application of each NDT techniques are also provided.

REFERENCES

1. Nathan Ida, Norbert Meyendorf (2019). Handbook of Advanced Non-Destructive Evaluation - 1st ed. Springer.
2. Gerardus Blokdyk (2018). Nondestructive Testing - 3rd ed. 5STARCooks.
3. R.S. Sharpe, J.West and D.S Dean (2017). Quality Tehcnology Handbook - 4th ed. Butterworth-Heinemann.
4. F.P.G. Marquez, M. Papaelias, Noor Zaman (2016). Non-Destructive Testing. InTech Open.
5. Wesley Davis (2015). Procedures and Applications of Nondestructive Testing. NY RESEARCH PRESS.

BMMK 2114
COMPUTER AIDED ANALYSIS/
ANALISIS BERPANDUKAN KOMPUTER

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Analyse basic stress analysis for welding connection.
2. Apply fundamental sketching and feature modelling, build feature based models of parts and assemblies for easy editing.
3. Produce document design intent of parts and assemblies (include weld design) in manufacturing drawings.

SYNOPSIS

This course will empower the students with fundamental knowledge and technical skills of 3D solid modelling skills using industry-proven 3D mechanical CAD software. The students will learn about the different techniques for creating solid models and surface with emphasis on design intent. The students also will expose to the introduction to FEA structure/stress analysis, FEA application for weld product (welding connection analysis). The course includes hands-on exercises and best practice methods for students during drafting stage, part, assembly (weld product) and Finite Element Analysis (weld product)

REFERENCES

1. Tickoo, P. , 2016, Catia V5-6R2015 For Designers, 13th Ed., CADCIM Technologies, USA.
2. Dassault Systeme, 2008, CATIA: Part Design Fundamental, Generative structure analysis, generative assembly structure analysis, France.
3. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. and Novak, J. E., 2016, Technical Drawing, 15th Ed., Prentice Hall, New York.
4. Jensen, C., and Helsel, J. D., Short, D.R., 2017, Engineering Drawing And Design, 7th Edition, Glencoe and McGraw Hill, India.

BMMK 3144
ECONOMIC OF WELDING AND PROCUREMENT/
EKONOMI KIMPALAN DAN PEROLEHAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Calculate welding costs that include machine, material and labour.
2. Suggest the effective costing and the factors influencing welding costs.
3. Record of transactions in jurnal and ledgers, trial-balance and preparation of final account.

SYNOPSIS

The aim of this course is to provide participants with a clear understanding of the principles of effective procurement by utilising the capabilities to plan, implement, and evaluate a sourcing process appropriate to the value/ risk of the joining technology, materials/ part/ equipment being procured, communication and negotiation skills, and capacity to manage strategic supply, services and consultancy contracts. Besides to acquire knowledge in welding economics in the selection of process, consumables and workpiece materials.

REFERENCES

1. L. P. Connor, (2016) Economics In Welding And Cutting, American Welding Society.
2. Peter Baily, David Farmer, varry Crocker, David Jessop, David Jones, (2015) Procurement Principles and management, Pearson.
3. R. panneerselvam, (2008), Engineering Economics, Eastern Economy Edition.

BMMK 3184
WELDING QUALITY ASSURANCE/ JAMINAN KUALITI KIMPALAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Design a plan for quality assurance and control in welding manufacturing process according specifications and standards.
2. Demonstrate the procedure and inspection techniques related to welding assurance and control.
3. Apply creative thinking in problem solving to solve the problems associated with welding assurance and control.

SYNOPSIS

This course provides students with knowledge related with welding quality assurance. They will be taught with various topics covering Introduction to Welding Quality Assurance, Quality System Management and Responsibilities, Quality Assurance Planning, Welding Quality Standards, Inspections and Tests, Statistical Process Control, Nonconformances and Corrective Actions, Preventive Actions, Quality Audits, Records and Documents Control.

REFERENCES

1. Jay Heizer, Bery Render, Chuck Munson (2016). Operations Management: Sustainability and Supply Chain Management -12th Edition. Pearson.
2. R.S. Sharpe, J.West and D.S Dean (2017). Quality Tehcnology Handbook - 4th ed. Butterworth-Heinemann.
3. Kalpakjian, Schmid, Steven R. (2018). Manufacturing Engineering and Technology - 7th ed. Pearson India.
4. William J Stevenson (2017). Operation Management - 13th ed. McGraw-Hill Education.

BMMK 3193
CYBER PHYSICAL SYSTEMS IN WELDING/ SISTEM FIZIKAL SIBER DALAM KIMPALAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Justify the added value that can be achieved through application of CPS in welding process.
2. Demonstrate effectively the appropriate CPS tools in acquiring process variables in real time.
3. Criticise the logged data acquired from conventional and non conventional welding techniques.

SYNOPSIS

The aim of this course is to provide participants with a clear understanding of the potential application of cyber-physical systems (CPS) in welding industry. Competency in applying CPS technology, both with standalone and built-in CPS in analysis of welding parameters (e.g. current, temperature) and welding outputs (e.g. fume composition, welding bead) is thought for improving the marketability of the graduates in the era industrial revolution 4.0.

REFERENCES

1. Alur, R. (2015). Principles of cyber-physical systems. MIT Press.
2. Jeschke, S., Brecher, C., Meisen, T., Özdemir, D., & Eschert, T. (2017). Industrial internet of things and cyber manufacturing systems. In Industrial Internet of Things (pp. 3-19). Springer, Cham.
3. Pires, J. N., Loureiro, A., & Bölmsjo, G. (2006). Welding robots: technology, system issues and application. Springer Science & Business Media.

BMMK 3214
MANAGING PRODUCTION AND SUPERVISION/
PEMANTAUAN DAN PENGURUSAN PENGELUARAN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Evaluate total welding process performance based on quality management system.
2. Perform planning, scheduling and control.
3. Propose solution for solving related supervision problem.

SYNOPSIS
Welding production planning is another very important element in manager's responsibility to allocate the resources required to achieve cost-effectiveness in welding processes. Furthermore, this subject shall cover manager's responsibility to maintain equipment and consistently meet throughput requirements with a level of quality that conforms to the required standards.

REFERENCES
1. J.R. Barckhoff (2005), Total Welding Management, American Welding Society.
2. Kerzner, H.R., (2017), Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 12th Ed. John Wiley & Sons Inc, USA.
3. Cartlidge, D., (2015), Construction Project Manager's Pocket Book, 1st Ed. Routledge, USA.
4. Fredrike Bannik, (2014), Handbook of Positive Supervision, Hogrefe Publishing.

BMMK 3204
RECLAMATION IN WELDING/
PEMULIHAN DALAM KIMPALAN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Extrapolate the repair welding skill and apply techno-economics for practical problems.
2. Demonstrate high quality of repair welding which will benefit the industry in term of productivity and savings.
3. Acquire the skills to carry out practical feasible repair techniques maintaining low cost.

SYNOPSIS
The aim of this course is to acquire knowledge and to solve problems associated with failure and to update personal on the latest technology to ensure welded course would be maintained in good operating condition and at low maintenance cost.

REFERENCES
1. Dobly R.E., Kent K.S., (1986) Repair and Reclamation", The Welding Institute.
2. Jeffus, L. F. (2017). Welding: Principles and applications. Australia: Cengage Learning.
3. Bowditch, W. A. (2018). Modern Welding. S.L.: Goodheart-Willcox.
4. Lippold, J. C. (2015). Welding metallurgy and weldability. Hoboken, NJ: John Wiley & Sons.
5. Welding inspection technology: Workbook. (2008). Miami, FL: American Welding Society, Education Services.

ELECTIVE COURSES

BMMK 3154
NON DESTRUCTIVE TEST FOR PROFESSIONAL/ UJIAN TANPA MUSNAH UNTUK PROFESIONAL

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Construct testing instruction and work planning.
2. Suggest the condition of welding based on the NDT signal.
3. Recommend the maintenance and calibration of the NDT equipment.

SYNOPSIS

This course covers the preparation for the certification in the selected NDT technology. Certification is important because NDT personnel need to make critical judgments that can have safety and/or significant financial consequences. Therefore, in this course elements of technology preparation, operation, planning, data collection and interpretation, and maintenance are being provided.

REFERENCES

1. International Standard ISO 9712.
2. New Technologies in Electromagnetic Non-destructive Testing, (2016), Songling Huang and Shen Wang.
3. National Occupational Skill Standard, Department of skills Development.
4. Non Destructive test, (2016), Fausto Pedro García Márquez, Mayorkinos Papaelias, Noor Zaman.
5. Ultrasonic Methods of Non-destructive Testing, (1996), Jack Blitz and Geoff Simpson.
6. Non-destructive Testing Techniques, (2009) Ravi Prakash.

BMMK 3164
WELDING TECHNOLOGY FOR PROFESSIONAL/ TEKNOLOGI KIMPALAN UNTUK PROFESSIONAL

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Design a WPS and WPQT using according specifications and standards.
2. Develop the welding procedure based on knowledge related to weld techniques and position.
3. Suggest solution to the problems associated with welding qualification.

SYNOPSIS

This course provides students with knowledges and skills related with welding technology. They will be taught with various topics covering Introduction to Welder Certification Scheme, Welding Processes and Procedures, Welding Codes and Standards, Welding Procedure specification (WPS), Welding Procedure Qualification Test (WPQT), Pre and Post-Weld Inspection, Reports and Documentations and Welder Qualification Training and Testing (WQT).

REFERENCES

1. Gower A. Kennedy, 2012, Welding Technology, 5th Ed. Howard W. Sams., Prentice Hall.
2. O.P. Khanna, 2015 A text Book of Welding Technology, 1st edition, Dhanpat Rai Publication.
3. Larry Jeffus, 2017, Welding Principles and Application, 8th edition, sense publication.

BMMK 3174
WELDING INSPECTION FOR PROFESIONAL/
PEMERIKSAAN KIMPALAN UNTUK PROFESSIONAL

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Explain the duties and responsibilities of a welding inspector including fusion welding processes, typical weld defects, types of steel (including carbon-manganese, low alloy and stainless steels), the hardening of steels, weldability, heat treatment, and parent metal defects.
2. Develop procedure for approval based on codes and standards, and an outline of safe working practice.
3. Justify the test requirement of visual inspection, the testing of parent metals and welds, and destructive and non-destructive test techniques.

SYNOPSIS

This course will teach the duties and responsibilities of a welding inspector including fusion welding processes, typical weld defects, types of steel (including carbon-manganese, low alloy and stainless steels), the hardening of steels, weldability, heat treatment, and parent metal defects. The course also includes visual inspection, the testing of parent metals and welds, and destructive and non-destructive test techniques. It is also learnt in the course about welder and procedure approval, codes and standards, and an outline of safe working practices.

REFERENCES

1. Hughes, S. E. (2009). A Quick Guide to Welding and Weld Inspection. Amer Society of Mechanical.
2. Welding inspection technology. (2008). Miami, FL: American Welding Society, Education Dept.
3. Gower A. Kennedy, 2012, Welding Technology, 5th Ed. Howard W. Sams., Prentice Hall.
4. O.P. Khanna, 2015 A text Book of Welding Technology, 1st edition, Dhanpat Rai Publication.
5. Larry Jeffus, 2017, Welding Principles and Application, 8th edition, sense publication.

BMMF (TECHNOLOGY COURSES)

BMMF 1014
AUTOMOTIVE INDUSTRY & TECHNNOLOGY/
INDUSTRI & TEKNOLOGI AUTOMOTIF

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Discover the smartness technology in automotive industry.
2. Build skills on various systems used and their role in automotive industrial world.
3. Explain the opportunities, and challenges brought about by Industry and how organisations and individuals should prepare to reap the benefits

SYNOPSIS
This course is relevant to expose knowledge about the automotive industry and technology revolutions globally & locally. It is important to give knowledge about elements industrial revolutions in automotive; additive manufacturing, knowledge on next-generation vehicles, supply chain, cloud computing, cybersecurity, internet of things, big data analytics, horizontal and vertical integration, and simulation and augmented reality.,

REFERENCES
1. MITI (2020). National Automotive Policy 2020, Revised Ed. Perpustakaan Negara Malaysia.
2. Ralf Landmann (2001). The future of the automotive industry : challenges and concepts for the 21st century. Warrendale, PA : SAE.
3. Paul Nieuwenhuis and Peter Wells (2003). The automotive industry and the environment : a technical, business and social future. CRC Press, Cambridge.
4. He (Herman) Tang (2017). Automotive vehicle assembly processes and operations management. Warrendale, USA : SAE International.

BMMF 1023
AUTOMOTIVE DRAFTING/
LUKISAN AUTOMOTIF

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply knowledge and comprehension in generating 2D drafting for technical communication purpose.
2. Consturct 2D view and generate 2D drafting with proper dimensions, tolerances and symbols.
3. Prepare automotive components drafting with the proper dimensions, tolerances and symbols

SYNOPSIS
The course introduced method that is used to generate the 2D drawing which usually applied by industries. The suitable view and method in generating dimension on the selected view will be applied. It is also introduced the geometric dimensioning and tolerancing together with manufacturing processes symbols in the drafting process which helps producing the correctly and efficiently in term of technical communication. Students will have a mini project to re-create the existing automotive component CAD data and propose the 2D drafting drawing in term of manufacturing aspect.

REFERENCES
1. Ryan, Daniel L. Computer-aided graphics and design. Routledge, 2018.
2. Chapman, WilliamL. Engineering modeling and design. Routledge, 2018.
3. Cogorno, Gene R. Geometric dimensioning and tolerancing for mechanical design. McGraw-Hill, 2017.

BMMF 1034
AUTOMOTIVE WORKSHOP PRACTICE/
AMALAN BENGKEL AUTOMOTIF

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Discover the functions of major automotive engine subsystems.
2. Display the correct automotive engine assembly and fix engine malfunctions.
3. Demonstrate good working relation with team members.

SYNOPSIS
This module aims to expose students to the operation of the general vehicle servicing internal combustion engine technology. The course also discusses how the service, repair, maintenance, design and test the performance of conventional internal combustion engines. In addition, students have to solve engineering problems in real time by leveraging their knowledge and learn new information to solve problems of related engines.

REFERENCES
1. Bonnick, A. W., & Newbold, D. (2017). A practical approach to motor vehicle engineering and maintenance. London: Routledge.
2. Thompson, R., & Erjavec, J. (2014). Tech manual to accompany Automotive technology, a systems approach, 6th edition. Stamford: Cengage learning.
3. Duffy, J. E. (2017). Modern automotive technology: Workbook. Tinley Park, IL: Goodheart-Willcox Company.
4. Gilles, T. (2014). Automotive service: Inspection maintenance repair. Boston, Ma: Cengage Learning.

BMMF 1043
SHOPFLOOR SUPERVISION /
PENYELIAAN TEMPAT KERJA

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply the philosophy and foundation of shopfloor supervision.
2. Reproduce the shopfloor operation using related tools.
3. Form a good leadership and teamwork in shopfloor supervision

SYNOPSIS
Shop Floor Supervision is the system by which standards for running day-to-day business are established, maintained, controlled and improved. This approach is to continuously improve daily operation to gain better achievement in safety, quality, cost, delivery and morale of the business operation, as well as for the workers. This contributes to waste elimination at all levels throughout the manufacturing system. This module reviews the skills and techniques required to analyze manufacturing system and to design improved methods and layouts. The focus of this module will be on the application of the technique through studies and industrial experience and will identify the benefits to be gained by their success.

REFERENCES
1. Gupta, Sushil | Starr, Martin. (2014). Production and operations management systems. FL Taylor & Francis.
2. Marksberry, Phillip. (2013). The modern theory of the Toyota production system a systems inquiry of the world's most emulated and profitable management system. FL CRC Press 2013.
3. William, M.F. (2000). Lean Manufacturing: Tools, Techniques, and How to Use Them. St. Lucie Press.
4. Shingo, S (1989). A Study of the Toyota Production System from an Industrial Engineering Viewpoint. Productivity Press.
5. Suzaki, K. (1993). The new shop floor management: Empowering people for continuous improvement. New York: Free Press.

BMMF 1054
AUTOMOTIVE COMPONENT FABRICATION/ PEMBUATAN KOMPONEN AUTOMOTIF

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Use the fundamental concepts of manufacturing processes in automotive.
2. Construct various skills of manufacturing techniques as an individual or a group.
3. Follow the manufacturing process according to detail drawing or Standard Operating Procedure (SOP).

SYNOPSIS

The automotive manufacturing processes play a major role in deciding on the vehicles' design characteristics and the overall cost. Thus it is important for technologist to identify suitable manufacturing process to fabricate automotive component. Technologist also should be able to pinpoint the manufacturing capabilities and limitations of each process in order to fabricate part according to the specified design tolerances.

REFERENCES

1. Kalpakjian, Serope | Schmid, Steven R | Sekar, K. S. Vijay.(2014). Manufacturing engineering and technology. Upper Saddle River, NJ Pearson.
2. M.P. Groover, Fundamentals of Modern Manufacturing. Materials, Processes and systems 4rd Edition, John Wiley & Sons, INC, 2010.
3. M. P. Groover, Introduction to Manufacturing Processes, 3rd Edition, Hoboken, NJ: Wiley, 2012.
4. P. N. Rao, Manufacturing Technology – Metal Cutting and Machine Tools, 2nd Edition, Mc Graw Hill, 2009.
5. Mazumdar, Sanjay K. Composite Manufacturing: Materials, Products and Process Engineering, Boca Raton, FL: CRC Press, 2002.

BMMF 1064
AUTOMOTIVE COMPONENT DESIGN & ASSEMBLY/ REKABENTUK & PEMASANGAN KOMPONEN AUTOMOTIF

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply knowledge and comprehension in constructing 3D CAD data for technical communication purpose.
2. Follow the proper features to use in constructing 3D CAD data based on the manufacturing process aspect.
3. Complete 3D CAD data of automotive components and report the complete assembly and exploded drawings.

SYNOPSIS

This course introduced method that is used to construct the 3D CAD data which usually applied in industrial field. The suitable features in constructing 3D CAD data will be applied which helps producing the correctly and efficiently 3D CAD data for technical communication purpose. Students will have a mini project to construct the 3D CAD data of automotive component which considering the related manufacturing process aspect.

REFERENCES

1. Tres, P. A. Designing Plastic Parts for Assembly. Carl Hanser Verlag GmbH & Company KG (2017).
2. Kutz, Myer, ed. Mechanical Engineers' Handbook, Volume 2: Design, Instrumentation, and Controls. John Wiley & Sons, 2015.
3. Chapman, WilliamL. Engineering modeling and design. Routledge, 2018.

BMMF 2073
PROJECT MANAGEMENT/
PENGURUSAN PROJEK

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Apply thecore concepts and principles, functions, and process in project management.
2. Follow the process of planning, preparing project proposal until commissioning and closing out the project.
3. Demonstrate effectively as members or group leader in achieving project goal.

SYNOPSIS

This course focuses on the principles of project management including the importance and interrelationship of all its components. Students will be familiarized with the Project Management process group functions (initiating, planning, executing, controlling and closing) and project knowledge areas (integration, scope, time, cost, quality, human resources, communications, risks and procurement). Various tools for supporting the analysis of works in engineering project management will be introduced. Topics including initiating and planning the project, working with the management, project appraisal & sensitivity, creating budget and work breakdown structure, managing uncertainty & risk, building project plan, implementing and revising project plan, completing the project and contract laws.

REFERENCES

1. Schwalbe, Kathy(2017) An introduction to project management with a brief guide to Microsoft Project Professional 2016. Minneapolis Schwalbe Publishing 2017.
2. Harold Kerzner (2013). Project management a systems approach to planning, scheduling, and controlling. NJ John Wiley & Sons, Inc. 2013.
3. Smith, Karl A. (2000). Project management and teamwork. MA McGraw-Hill 2000.
4. Barkley, Bruce T | Saylor, James H. (2001). Customer-driven project management building quality into project process. New York, NY McGraw-Hill 2001.

BMMF 2084
AUTOTRONIC SYSTEM SERVICE /
PENYENGGARAAN SISTEM ELEKTRONIK AUTOMOTIF

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Classify the components of the electrical and electronics in automotive.
2. Display the functions and operations of automotive electrical and electronic systems.
3. Identify automotive electrical and electronic system.

SYNOPSIS

This course focuses on theory, operation and application of automotive electrical and electronic systems. Topic covered include vehicle electrical wiring systems, sensors and actuators, charging system, ignition system, starting system, lighting system, chassis electrical system, auxiliary systems, mechatronics, automotive networking, bus systems.

REFERENCES

1. James D. Halderman, Chase D. Mitchell, "Diagnosis and Troubleshooting of Automotive Electrical, Electronic, and Computer Systems", Pearson/ Prentice Hall, 2006.
2. Tom Denton "Automobile electrical and electronic systems : automotive technology : vehicle maintenance and repair", Abingdon, Oxon : Routledge, 2012.
3. Young A.P. & Griffiths. L. “Automotive Electrical Equipment”, ELBS & New Press- 1999.
4. William B.Riddens “Understanding Automotive Electronics”, 5th edition - Butter worth Heinemann Woburn, 1998.
5. Crouse, W.H “Automobile Electrical Equipment”, McGraw-Hill Book Co., Inc., New York, 3rd edition, 1986.

BMMF 2134
POWERTRAIN SYSTEM SERVICE/
PENYENGGARAAN SISTEM KUASA KENDERAAN

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply the principles of general and specific design on vehicle powertrain system.
2. Complete powertrain repair and assembly with confidence.
3. Demonstrate teamwork effectively in accomplishing any assignment or experiment.

SYNOPSIS
This course focuses on powertrain system components, power efficiency and fuel consumption, transmission performance, as well as services for light/heavy vehicle and engine repair management.

REFERENCES
1. Robert Fischer, (2015) The automotive transmission book. Switzerland Springer International Publishing 2015.
2. Society of Automotive Engineers, (2004) Powertrain developments and power and energy management. PA Society of Automotive Engineers 2004.
3. A.J. Martyr, (2012) Engine testing the design, building, modification and use of powertrain test facilities. Oxford Butterworth-Heinemann 2012.

BMMF 3183
AUTOMOTIVE LEGISLATION/
PERUNDANGAN AUTOMOTIF

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Apply the knowledge and implement the theory for inspection process.
2. Evaluate technical specification for each component and identity the problems.
3. Analyze the technical aspects and qualified the checked components in automotive parts.

SYNOPSIS
This course provides the students with the basic knowledge and theory regarding legislative on every aspect related to automotive aspects. The students can apply the obtained theory to the practical activities involving inspection for many aspects in automotive parts. This course exposed the students to handle the project related to inspection for lamp, wheel, noise and emission level, the safety features and the automotive homologation. Every inspection activity required the students to present the technical report according to the universal standard.

REFERENCES
1. Stanley H , Vehicle compatibility in automotive crashes, Society of Automotive Engineers 2005.
2. SAE International. Safety Test Methodology and Structural Crashworthiness, SAE International, 2006.
3. Eduardo Galindo, David Blanco, Chris J. Brace, Edward Chappell, Richard Burke, Chassis Dynamometer Testing: Addressing the Challenges of New Global Legislation, SAE International, 2017.

BMMF 3183
VEHICLE MARKETING/ PEMASARAN KENDERAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Learn the knowledge of current technology utilisation that suits with current marketing environment.
2. Identify the range of technology devices in crafting marketing strategies.
3. Apply various marketing methods including presenting a marketing plan report.

SYNOPSIS

A shift of marketing is underway as customers spend more time on mobiles, tablets and laptops. The challenge for marketers is to connect with customers through all technology devices in real time and create awareness across social media, display advertising and e-commerce. This course will develop students understanding on real-time conversations theories and concept with customers as they interact with websites and technology devices. Topics discussed include the modern-day marketing strategies – a combination of creativity using powerful narratives to tap into customer's wants and needs, with the technical side of data, digital engineering and analytics. Students are also required to be actively involved in case study analysis by carrying out contemporary research on technology creativity for current business environment.

REFERENCES

1. Wright, T. And Snook, C.J. 2016. Digital Sense: The Common Sense Approach to Effectively Blending Social Business Strategy, Marketing Technology, and Customer Experience, Wiley Press, ISBN: 978-1-119-29170-1.
2. Wertime, K. and Fenwick, I. 2007. DigiMarketing: The Essential Guide to New Media and Digital Marketing, Wiley Press, ISBN: 978-0-470-82231-9.
3. Kotler, P., and Armstrong, G.M., (2017). Principles of Marketing. 17th Edition. New York, Pearson.
4. Noel Capon, (2016). Capon's Marketing Framework. 4th edition. Wessex Press, Inc.
5. Noel Capon, Shamza Khan, (2015). Capon's Marketing Principles. Asia Edition. SJ Learning.

BMMF 3243
ASSET AND INVENTORY MANAGEMENT/ PENGURUSAN ASET DAN BARANGAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Describe the role of warehousing.
2. Explain strategic framework for logistic and inventory management.
3. Present the best practices of maintenance and asset management.

SYNOPSIS

This course focuses on the role of warehouse and inventory management specifically for automotive industry. This module is run as Work Based Learning at the selected industry.

REFERENCES

1. Alain Bensoussan (2011) Dynamic programming and inventory control. Amsterdam: IOS Press.
2. C. Mercado (2008) Hands-on inventory management. Auerbach Publications.
3. Max Muller (2011) Essentials of Inventory Management. Second edition. AMACOM.

BMMF 3256
QUALITY MANAGEMENT/
PENGURUSAN KUALITI

LEARNING OUTCOMES

Upon completion of this course, student should be able to:Calibration Form.xls

1. Explain the basic quality principles and practices, quality solving techniques and product reliability related to manufacturing process.
2. Solve the manufacturing process quality problem using appropriate problem solving techniques.
3. Perform the ability to apply the quality control tools.

SYNOPSIS

This course provides a useful insight into concept, theories and application of quality management in an organization. Student will be introduced to tools and techniques of quality that are useful for practice, people and process improvement. This also includes approaches for planning, controlling and improving the quality management function of a system. Quality is a universal concept, its application and management encompasses a wide variety of field. Therefore, this course is suitable for individuals who aspire to be managers in their organizations in future regardless of their area of specialization.

REFERENCES

1. Roslina, A. W. (2012). Quality management: Principles, systems and tools. Shah Alam: UiTM Press.
2. Kadir, A. (2009). Sistem pengurusan kualiti: Proses dan pelaksanaan di Malaysia. Bangi, Selangor: Penerbit Universiti Kebangsaan Malaysia.
3. Goetsch, D. L., & Davis, S. B. (2016). Quality management for organizational excellence: Introduction to total quality.
4. Besterfield, D. H. (2014) Quality Improvement, 9th Edition, Pearson.

BMMF 3263
RISK ASSESSMENT/
PENILAIAN RISIKO

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Determine and apply knowledge of complex risk assessment theory to your professional practice and/or further study.
2. Apply logical, critical and creative thinking to analyse, synthesise and apply theoretical knowledge, and technical skills, to formulate evidenced based solutions to industry problems or issues.
3. Collaborate effectively with others and demonstrate intellectual independence and autonomy to solve problems and/or address industry issues and imperatives.

SYNOPSIS

Factors such as appropriate selection of personnel, adequate provision of training and thorough consideration of occupational safety and health issues all help to reduce the incidence of injury and illness resulting from inadequate examination of potential hazards, poor ergonomic design, equipment failure, defective products or hazardous materials. The working environment, suitability of equipment and the competencies of staff all have to be considered in the context of legislative requirements and good management of health and safety. This document presents a structured approach to good management of safety and describes a universal framework for task or activity planning. It defines steps and processes which, if used as a common reference, will simplify and unify our management of health and safety risk and streamline our approach to planning tasks and activities.

REFERENCES

1. Bahr, Nicholas J. System Safety Engineering and Risk Assessment: A Practical Approach. CRC Press, 2014.
2. Principles of Risk Management and Insurance by George E. Rejda, Pearson: 12th Ed (2014).
3. Risk Management Principles and Practices - 12th edition by Michael W. Elliot

ELECTIVE COURSES

BMMF 2094
COMMERCIAL VEHICLE SERVICING AND MAINTENANCE/
SERVIS DAN PENYELENGGARAAN KENDERAAN KOMERSIAL

LEARNING OUTCOMES

Upon completion of this course, student should be able to:
1. Verify the compliance with the rules, regulation of commercial vehicle.
2. Construct various skills of servicing and repair as an individual or a group.
3. Follow the Standard Operating Procedure (SOP) in servicing and maintenance of commercial vehicle.

SYNOPSIS

A commercial vehicle is any type of motor vehicle used for transporting goods or paying passengers. The European Union defines a "commercial motor vehicle" as any motorized road vehicle, that by its type of construction and equipment is designed for, and capable of transporting, whether for payment or not. In this course, student will learn the rules and regulations service, maintainence and repair or commercial vehicles system and the engine.

REFERENCES

1. Chris Hadfield (2017). Today's Technician: Automotive Engine Repair & Rebuilding, Classroom Manual and Shop Manual.
2. Haynes manual on engine management: Petrol and diesel systems cars and light commercial vehicles. (2014).
3. Randall, M. (2004). Automotive diesel manual. Somerset [England: Haynes Publishing.
4. Driver & Vehicle Standards Agency, “Guide to maintaining roadworthiness - Commercial goods and passenger carrying vehicles,” 2018.

BMMF 2104
SURFACE DESIGN/
REKABENTUK PERMUKAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:
1. Demonstrate knowledge and comprehension in constructing surfacing data for technical communication purpose.
2. Construct the surface proper features to use in constructing surfacing data which emphasize the quality aspect.
3. Prepare surfacing data from the scanning data of automotive vehicles or component.

SYNOPSIS

This course introduced surfacing method that is used to construct the 3D CAD data which usually applied in industrial field. The suitable features in constructing industrial design surfacing will be applied which helps producing the quality and efficiently surfaces data data for technical communication purpose. Students will have a mini project to construct the 3D CAD data of automotive vehicle or component using surfacing module with quality verification.

REFERENCES

1. Lieu, Dennis K., and Sheryl A. Sorby. Visualization, modeling, and graphics for engineering design. Nelson Education (2015).
2. Gulanová, Jana, Samo Lonek, and Ladislav Gulan. "Comparison of two different approaches of a class-A surface creation and quality verification." Computer-Aided Design and Applications 15.5, 757-763 (2018).
3. David A. Crolla, David E. Foster, Toshio Kobayashi, Nicholas Vaughan, John Wiley & Sons, Encyclopedia of Automotive Engineering: Engines - fundamentals, Volume 1, Part 1. John Wiley & Sons (2015).

BMMF 2114
DRIVE TRAIN MAINTENANCE/
PENYELENGGARAAN PEMACU KENDERAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Analyse kinematicsand dynamics principle to determine suspension forces due to chasis loads and tire contact forces.
2. Construct some basic tests for determining suspension parameters in the forms of force-velocity and force displacement characteristics.
3. Explain the concept and the working principles of some advanced suspension systems such as active and semi-active suspension system.

SYNOPSIS

Introduction to chassis load and tire contact forces, modelling of chassis dynamic in vertical, literal and longitudinal direction. Performance criteria in suspension design. The use of suspension test machine for investigating the suspension characteristics. Effect of suspension parameters to the chassis dynamics. Semi-active and active suspension system.

REFERENCES

1. Tim Gilles "Automotive chassis : brakes, suspension, and steering", Albany, NY: Delmar Thomson Learning, 2005.
2. John Fenton "Handbook of automotive powertrains and chassis design", London: Professional Engineering Pub., 1998.
3. James D. Halderman "Automotive chassis systems", Upper Saddle River : Pearson, 2014.
4. Heldt.P.M. “Automotive Chassis”, Chilton Co., New York, 1990.
5. Steed W - “Mechanics of Road Vehicles” - Illiffe Books Ltd., London, 1960.

BMMF 2124
AUTOMOTIVE MODELLING/
PERMODELAN AUTOMOTIF

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Analyse approprate technology for building bodywork.
2. Construct 3-Dimensional physical model based on 2-Dimensional data using suitable tools,equipments and materials.
3. Organize systematic workflow and process in completing the task that have been given.

SYNOPSIS

This course provides the knowledge and skills regarding modelling process in automotive design development. From this course, students enable to apply various method and technique in modelling scale vehicle model, automotive component and fabricate working parts for automotive purposes. The course outlines opportunities to value add to professional skills developed during the course.

REFERENCES

1. Kathryn Mc Elroy (2017). Prototyping for Designers. O'Really Media.
2. Eric Cook (2015). Prototyping. Cherry Lake Publishing.
3. Bjarki Hallgrimsson (2012) Prototyping and Model Making. Laurence King Publishing.

BMMF 2144
VEHICLE PERFORMANCE ANALYSIS/
ANALISA PRESTASI KENDERAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Analyse the historical development and future trend of engine.
2. Determine the design principle of engine.
3. Utilize the engine and chassis dynamometer for engine performance test.

SYNOPSIS

This course will cover the history of vehicle engines, engine geometry, performance parameters of gas exchange for 4-stroke and two stroke for spark ignition engine combustion. Furthermore, this course includes the market situation for the development of vehicles, gearboxes and components. The selection of the transmission ratio of the vehicle. Basic approach to the performance of automotive engines, power conversion, adjustment of the engine and transmission, transmission system design principles.

REFERENCES

1. James Balkwill "Performance vehicle dynamics: engineering and applications" Kidlington, Oxford, UK: Butterworth-Heinemann, 2018.
2. Rodney Jacques "Simple engine tuning: a straight foward guide to adjusting most vehicle to achieve best performance and economy" London: Gunson, 1987.

BMMF 2154
EXTERIOR DESIGN/
REKABENTUK LUARAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Sketch vehicle exterior design based on specification and requirement given.
2. Construct 2 Dimensional Drawing through digital and manual techniques.
3. Communicate and convey their idea to the audience by using various tools and method.

SYNOPSIS

This course provides the knowledge and skills regarding designing an exterior part of the vehicle. From this course, students enable to apply various method and technique in vehicle design and go through the process of designing a vehicle based on specification given. The course outlines opportunities to value add to professional skills developed during the course.

REFERENCES

1. Stuar Macey, Geoff Wardle (2014) H-Point 2nd Edition: The Fundamentals or Car Design & Packaging. Design Studio Press.
2. Adrian Newey (2017). How to Illustrate and Design Concept Cars. New Edition.Veloce Publishing.

BMMF 2164
VEHICLE FAULT DIAGNOSIS/ DIAGNOSIS MASALAH KENDERAAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Describe the various diagnostic tools and method used to check vehicle performance systems (drivetrain, powertrain and electrical components).
2. Demonstrate the proper method to diagnos vehicle system (drivetrain, powertrain and electrical components).
3. Present the precaution and methodology during diagnostic the vehicle system (drivetrain, powertrain and electrical components).

SYNOPSIS

This course introduces the diagnostic equipment, tools, engine diagnostic and general electrical system diagnostics.

REFERENCES

1. Erjavec, Jack, Automotive technology: a systems approach, Clifton Park, NY.: Delmar Cengage Learning, 2010.
2. VanGelder, Kirk T. Fundamentals of automotive technology: principles and practice, Burlington, Mass.: Jones & Bartlett Learning, 2014.
3. Halderman, James D. Automotive technology: principles, diagnosis, and service, Upper Saddle River, NJ: Pearson, 2009

BMMF 2174
COMPONENT REMANUFACTURING/ PEMBUATAN SEMULA KOMPONEN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Correlate the broad range of Additive Manufacturing process, parameters,devices,capabilities and materials that available in remanufacture quality automotive component.
2. Produce the parts and components by using selected additive manufacturing process and materials.
3. Organize systematic workflow and process in completing the task that have been given.

SYNOPSIS

This course aims to implement additive manufacturing and reverse engineering in retrofitting process. Student will be exposed with process in 3D Scanning until fabrication process by using Additive Manufacturing Technology. At the end of this course, student will be able to redesign and reconstruct automotive component by using selected tools and process.

REFERENCES

1. I.Gibson, D.w.Rosen, B.Stucker (2015). Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing. Springer.
2. Ben Redwood, Filemon Schoff (2018). The 3D Printing Handbook. 3D Hubs.
3. Chhe Kai Chua, Kah Fai Leong (2017) 3D Printing and Additive Manufacturing. World Scientific Publishing.

BMMF 3204
HYBRID SERVICING/
PENYENGGARAAN HIBRID

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Explain the functions and operations of hybrid powertrain system and components.
2. Construct various skills of servicing and repair as an individual or a group.
3. Perform the servicing and maintenance according to Standard Operating Procedure (SOP).

SYNOPSIS

Hybrid technology is an emerging technology. Development of high performance batteries and downsizing engines requires technologies to be familiar with this technology and manage to perform maintenance and servicing activities.

REFERENCES

1. Tim Gilles "Automotive Service: Inspection, Maintenance, Repair" 5th Edition: Cengage Learning, 2015.
2. Barry Hollembeak "Today's Technician: Automotive Electricity and Electronics" 6th Edition: Cengage Learning, 2015.
3. Society of Automotive Engineers "Advanced hybrid vehicle powertrains" Warrendale, Pa.: Society of Automotive Engineers, 2005.

BMMF 3214
INTERIOR DESIGN/
REKABENTUK DALAMAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Ability to describe the concept of interior components and system developed and manufactured components by various suppliers who work with OEM from beginning of design process.
2. Ability to demonstrate and establish the car interor components with consideration of design for safety.
3. Ability to communicate and convey their idea to the audience by using various tools and method.

SYNOPSIS

This course aims to introduce interior components. Important concept consideration of safe environment for the occupants. Active and passive safety system will be introduce. Location, shape, surface hardness and supporting structures have to be carefully designed to protect the occupants.

REFERENCES

1. S. Macey and G. Wardle, "H-Point: The fundamentals of car design and packaging", DesignStudio Press, (2014).

BMMF 3224
ELECTRIC VEHICLE SERVICING/
PENYELENGGARAAN KENDERAAN ELEKTRIK

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Analyse knowledge of EV vehicle technology.
2. Apply knowledge of EV vehicle safety and service procedure.
3. Apply knowledge of EV service management at 3S Centre.

SYNOPSIS

This course focuses on Electric Vehicle (EV) servicing and repair management

REFERENCES

1. Barry Hollembeak (2015). Today's Technician: Automotive Electricity and Electronics, Classroom and Shop Manual Pack. 6th Edition. Cengage Learning.

BMMF 3234
PAINTING/
MENGECAT

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Ability to concepts and methodologies of automotive painting process, technology and materials in industrials practice.
2. Ability to apply and produce surface preparation for painting, wrapping and water transfer on steel and plactic parts.
3. Ability to organize systematic workflow and process in computing the task that have been given.

SYNOPSIS

This course aims to introduce the process and technique of automotive painting. This course will help student to execute painting jobs for automotive steel and plastic parts. Sticker wrapping and water transfer will be introduced.

REFERENCES

1. M. Jones and I. Taylor, "Car Painting", Crowood Press, (2015).
2. T. Thacker and M. Jenkins, "How to Paint Muscles Cars like a pro", CARTECH, (2018).
3. M. Thaddeus, "How to paint classic cars", Veloce Publishing Ltd. (2017).

BMMS (TECHNOLOGY COURSES)

BMMS 1013
INDUSTRIAL REVOLUTIONS/
REVOLUSI INDUSTRI

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Able to elaborate the smartness in smart factories, smart cities, smart products and smart services.
2. Able to adapt knowledge on various systems used and their role in industrial world.
3. Able to classify the opportunities, challenges brought about by Industry and how organisations and individuals should prepare to reap the benefits.

SYNOPSIS
This course is relevant to expose about knowledge about industrial revolutions that happened in global. It is important to give knowledge about elements in industrial revolutions, describe about additive manufacturing, figure about autonomous robots, supply chain, cloud computing, cyber security, internet of things, big data analytics, horizontal and vertical integration, and simulation and augmented reality.

REFERENCES
1. Mukhopadhyay, Subhas Chandra (2014), Internet of things: challenges and opportunities, Cham.
2. El-Haggar, Salah M.(2015), Sustainability and innovation : the next global industrial revolution, Cairo.
3. Majumdar, Sumit Kumar (2012), India's late, late industrial revolution : democratizing entrepreneurship, Cambridge.
4. Akerkar, Rajendra (2014), Big data computing, Boca Raton, : CRC Press, Taylor and Francis Group.

BMMS 1026
ADVANCE CAD IN HVAC/
CAD HVAC TERMAJU

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Analyze 2D view and generate 2D drafting with proper dimensions, tolerances and symbols.
2. Draw and editing of engineering drawings in commercial HVAC system.
3. Prepare engineering drawing for new Installation and upgrading commercial HVAC system.

SYNOPSIS
This subject exposes student to use CAD for HVAC Piping, CAD for Air Handling Equipment and Accessories, CAD for Ductwork and Air Distribution Device and CAD for HVAC Control circuit.

REFERENCES
1. Boundy, A. W. (2016) Engineering drawing, Boston: McGraw-Hill.
2. Bates, Bob. (2001) Architectural drafting and design 3 supplemental plans - electrical/plumbing /HVAC/roof, Albany, NY.
3. Clois E. Kicklighter, Walter C. Brown (2008), Drafting & Design.
4. W. Larsen Angel (2012) HVAC Design Sourcebook, McGraw.
5. Gupta, B.V.R. (2016) Engineering drawing with auto cad.

BMMS 1034
SAFETY IN HVAC ENVIRONMENT/
KESELAMATAN DALAM PERSEKITARAN KERJA HVAC

LEARNING OUTCOMES

Upon completion of this course, student should be able to:
1. Able to adapt knowledge on various systems used and their role in industrial world.
2. Coordinate tasks based on recent and relevant types and safety in HVAC.
3. Adhere to standard of procedure in managing safety in HVAC environment.

SYNOPSIS

This course exposes knowledge and skills related to occupational safety and health (OSH) that related to HVAC industry. Scope of the course encompass health, safety and environment management, emergency medical first aid, common hazards, activities in the oil and gas industry and their control measures, maintenance HVAC job hazard assessment and types of safety in HVAC.

REFERENCES

1. El-Sharkawi, Mohamed (2014), Electric safety.
2. Smith, Gregory William (2014), Contractor safety management.
3. Channing, John (2014), Safety at work, Abingdon, Oxon.
4. Della-Giustina, Daniel (2014), Fire safety management handbook.
5. Schaufelberger, John (2014), Construction project safety, Hoboken.

BMMS 1044
APPLICATION OF HVAC STANDARD FOR COMMERCIAL BUILDINGS/
APLIKASI PIAWAIAN HVAC BANGUNAN KOMERSIAL

LEARNING OUTCOMES

Upon completion of this course, student should be able to:
1. Identify the correct of air conditioning and refrigeration system standard for commercial buildings.
2. Organize for air conditioning and refrigeration system standard for commercial buildings based on its application.
3. Propose the suitable air conditioning and refrigeration system standard for commercial buildings.

SYNOPSIS

This course provides students with an overview of codes and standard for HVAC design in commercial buildings. It addresses only major requirements that are common to most code and standard. The course is also discussing on the used of ASHRAE standard in commercial buildings.

REFERENCES

1. Haines, Roger W. (2010), HVAC systems design handbook, New York.
2. Mull, Thomas E. (1998), HVAC principles and applications manual, New York.
3. Mitchell, John W. (2013), Principles of heating, ventilation, and air conditioning in buildings, Hoboken.
4. Nicol, F. (1995), Standards for thermal comfort: indoor air temperature standards for the 21st century.
5. Whitman, William C. (2012), Refrigeration and air conditioning technology 7th Ed., Boston, MA: Cengage Learning.

BMMS 1056
BUSINESS IN HVAC/
PERNIAGAAN DALAM HVAC

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Able to classify of contract specialisation in HVAC.
2. Organizes business planning, project purchasing, service management and company management.
3. Arrange servis after sale, customer demand and project purchasing.

SYNOPSIS
This course is relevant in business HVAC industry. To success in HVAC business, some topic should be attention. Ini this syllabus they have five components to manage business. The advice given in this course may also be applicable to monitor business in HVAC industry and guidance to achieve best service to sustain flow cash in business.

REFERENCES
1. Galai, Dan (2016) How to create a successful business plan: for entrepreneurs, scientists, managers and students.
2. Ferrell, O. C. (2015) Business, New York : McGraw-Hill 4th edition.
3. Boylan, Michael (2014) Business ethics, Chichester, West Sussex.
4. Schiller, Bradley R. (2013) The micro economy today.
5. Kelly, David (2011) Business law.

BMMS 2063
INDUSTRIAL PSYCHOLOGY/
PSIKOLOGI INDUSTRI

LEARNING OUTCOMES
Upon completion of this course, student should be able to:
1. Able to adapt knowledge the role of organization dealing with employee behavior and attitudes.
2. Able to describe job analysis in managing employee recruitment process.
3. Able to analyse the factor creating healthy workplace to enhance employee performance.

SYNOPSIS
This course is concerned of understanding of psychology in workplace. The learning content focus on organizational background, attitudes, behaviour, recruitment, issues, motivation, stress management, conflict, employee performance and healthy workplace.

REFERENCES
1. Azlina Abu Bakar (2013). Psikologi Industri dan Pengurusan Sumber Manusia. Kuala Terengganu.
2. Donald M Truxillo, Tayla N Bauer, Berin Erdogan (2016). Psychology and Work.London: Taylor & Francis.
3. Micheal G.Aamodt (2015). Industrial/Organizational Psychology: An Applied and Approach.
4. Paul Levy (2015). Industrial/Organizational Psychology: Understanding the Workplace.
5. Paul E Spector (2016). Industrial and Organizational Psychology.

BMMS 2076
APPLIED OF INDUSTRIAL REFRIGERATION/
APLIKASI PENYEJUKAN INDUSTRI

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Classify safety in potentially harmful situation.
2. Display the skills and knowledge required for the installation and maintenance of industrial refrigeration systems with respect to various codes and standards.
3. Integrate environment quality act in industrial installation and maintenance of industrial refrigeration systems.

SYNOPSIS

This course in refrigeration systems requires the use of tools and equipment, measuring instruments and materials and supplies. It involves sizing, installing, troubleshooting and repairing industrial refrigeration systems. It includes information on types and operation of industrial refrigeration systems and component parts.

REFERENCES

1. Rodolfo H. Mascheroni (2016) Operations in Food Refrigeration.
2. Andrew D Althouse (2016) Modern Refrigeration and Air Conditioning.
3. John Tomczyk (2016) Refrigeration and Air Conditioning Technology.
4. Stephen L. Herman (2013) Electricity and Controls for HVAC-R.
5. Russell E.Smith (2014) Electricity for Refrigeration, Heating and Air conditioning.
6. A C Bryant (1997) Refrigeration Equipment.
7. Wilbert F. Stoeker (1998) Industrial Refrigeration Handbook.

BMMS 2086
HVAC COMMERCIAL BUILDING PROJECT MANAGEMENT/
PENGURUSAN PROJEK HVAC BANGUNAN KOMERSIAL

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Plan the suitable method to optimized HVAC equipment and system efficiency.
2. Coordinate HVAC services documentation and financial commercial buildings.
3. Adhere to standard of procedure in managing HVAC services to commercial building.

SYNOPSIS

This course is relevant to typical Heating Ventilation and Air Conditioning (HVAC) Systems that are installed in commercial office type buildings. It is applicable to existing buildings – both old and new, small to large and different grades from premium city to rural. The advice given in this course may also be applicable to buildings other than commercial office type buildings. The course is also applicable to future buildings that are being designed – it addresses important topics to consider during the design and documentation stages of new projects.

REFERENCES

1. Silberstein, Eugene,(2005) Residential construction academy: HVAC, Clifton Park, NY.
2. Schaufelberger, John (2014), Construction project safety, Hoboken, NJ: John Wiley.
3. Zajac, Alan J. (1997) Building environments: HVAC systems, Milwaukee, WI : Johnson Controls Inc.
4. Rose, K. H. (2013) Guide to the Project Management Body of Knowledge (PMBOK® Guide)–Fifth Edition,Project Management Institute.
5. Kerzner, H., & Kerzner, H. R. (2017). Project management: a systems approach to planning, scheduling, and controlling, John Wiley & Sons.

BMMS 2096
HVAC WATER TREATMENT MANAGEMENT/
PENGURUSAN RAWATAN AIR SISTEM HVAC

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Plan water treatment based on treatment program.
2. Coordinate water treatment process to maintain water quality in HVAC system.
3. Perform to manage water treatment problem in closed loop system through the procedure.

SYNOPSIS

This subject provides students with knowledge how to maintain water quality for hvac systems, provide supervision of the water treatment program, chemical treatment requirements, biological control, system cleaning for coil products, chemical water treatment and physical water treatment, procedure testing & type equipment, water filtration for chilled water system and water analysis.

REFERENCES

1. Kleinert, Eric (2015) HVAC and refrigeration preventive maintenance New York : McGraw-Hill.
2. Loucks, D. P., Van Beek, E., Stedinger, J. R., Dijkman, J. P., & Villars, M. T. (2005). Water resources systems planning and management: an introduction to methods, models and applications. Paris: Unesco.
3. Stanford III, H. W. (2016). HVAC water chillers and cooling towers: fundamentals, application, and operation. CRC Press.
4. Blake, R. T. (1980). Water treatment for hvac and potable water systems. McGraw-Hill.
5. Kreith, F., Wang, S. K., & Norton, P. (2018). Air conditioning and refrigeration engineering. CRC Press.

BMMS 2106
CHILLER PLANT MONITORING/
PEMANTAUAN LOJI PENYEJUKAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Choose the best procedure for effectiveness and operate chiller plant.
2. Organizes the chiller plant monitoring system maintenance, treatment and troubleshooting.
3. Prepare report analysis of the componen performance in chiller plant.

SYNOPSIS

This course is relevant to typical Heating Ventilation and Air Conditioning (HVAC) Systems. One of the system in HVAC is chiller plant. Chiller plant was preferred to install in commercial office type buildings. It is applicable to existing buildings – both old and new, small to large and different grades from premium city to rural. The advice given in this course may also be applicable to monitor chiller plant and standard operational procedure for the maintenance to get full effectiveness of this system and prepare to be competence technologies.

REFERENCES

1. Cheah Wren Hwai (2016) Evaluation of cooling tower drift eliminators performance, Batu Pahat: Universiti Tun Hussein Onn Malaysia: (2015).
2. HVAC and refrigeration preventive maintenance McGraw-Hill.
3. Sugarman, Samuel C (2014) Testing and balancing HVAC air and water systems.
4. Auvil, Ronnie J (2007) HVAC control systems.
5. Jones, William Peter (2001) Air Conditioning Engineering.
6. Delmar Thomson Learning (2000) Commercial refrigeration service.
7. Zajac, Alan J. (1997) Building environments: HVAC systems, Milwaukee, WI: Johnson Controls.

BMMS 3116
INDOOR AIR QUALITY CONTROL/ KAWALAN KUALITI UDARA DALAMAN

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Plan air quality problem based on IAQ prosedure.
2. Create solution to improving of IAQ control and recommendations.
3. Arranges process for investigating IAQ complaints and methodology for monitoring.

SYNOPSIS

This subject provides students with a dynamic understanding of indoor air quality and the effects of health, comfort and productivity. Student will learn about IAQ regulations ASHRAE guidelines, common indoor air quality problems and solutions, indoor air quality assessment of commercial buildings and how to achieve effective air quality in the workplace for optimum working conditions.

REFERENCES

1. Dudzinska, Marzenna R Management (2011) Management of of indoor air quality.
2. Robert Jennings Heinsohn, John M. Cimbala (2013), Environmental health : indoor air quality.
3. Hess-Kosa, K. (2016). Indoor air quality: the latest sampling and analytical methods.
4. Haines, R. W., & Myers, M. E. (2010). HVAC systems design handbook. McGraw-Hill.
5. Enteria, N., Awbi, H., & Yoshino, H. (Eds.). (2017). Desiccant Heating, Ventilating, and Air-Conditioning Systems. Springer Singapore.

BMMS 3126
HVAC INSPECTION/ PEMERIKSAAN SISTEM HVAC

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Classify of HVAC inspection task.
2. Arranges of inspection work on the HVAC system accordance with established procedures.
3. Prepare reports before, during and after the inspection task.

SYNOPSIS

The purpose of this course focus to learn the HVAC inspection requirements that preserve a system's ability to achieve acceptable thermal comfort, energy efficiency, and indoor air quality in commercial buildings. This course consists Introduction to Hvac Inspections, Required Inspection Tasks, Risk Management, Hvac Systems and Components, Types of Equipment and Systems for Inspection, Hvac Systems & Indoor Air Quality, Pre-Inspection Tasks, Inspection Tasks and Post-Inspection Tasks.

REFERENCES

1. Grigg, Peter (2007). AIR CONDITIONING INSPECTION.: Chartered Inst. of Building Services Engineers.
2. Langley, Billy C. (2003). Air conditioning and refrigeration troubleshooting handbook. 2nd Ed.
3. Coastal Training Technologies Corp. (1999). Cooling towers maintenance and trouble shooting. Virginia Beach, VA: Coastal Skills Training.
4. Kleinert, Eric. (2015). HVAC and refrigeration preventive maintenance. New York: McGraw-Hill.
5. Delmar Thomson Learning. (2009). Heating, ventilation, air conditioning and refrigeration. Albany, NY: Delmar Thomson Learning.
6. Miller, Rex. (2009). HVAC troubleshooting guide. New York: McGraw Hill.
7. Grigg, Peter. (2007). Inspection of air conditioning systems. London: Chartered Inst. of Building Services Engineers.

BMMS 3146
HVAC PROJECT PLANNING AND DEVELOPMENT/
PERANCANGAN DAN PEMBANGUNAN PROJEK HVAC

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Decide Supervision management to monitor HVAC project progress.
2. Organize HVAC supervision project based on schudule planning using sofware.
3. Arrange HVAC Project planing based on necessary resources for the project.

SYNOPSIS

This subject provides students with knowledge of planning, supervise and monitoring project. Student also learn how to handle HVAC project preplanning, project construction kick-off, project construction and project commissioning.

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1. Silberstein, Eugene, (2005) Residential construction academy: HVAC, Clifton Park, NY.
2. Schaufelberger, John (2014), Construction project safety, Hoboken, NJ.
3. Zajac, Alan J. (1997) Building environments : HVAC systems, Milwaukee, WI: Johnson Controls Inc.
4. Rose, K. H. (2013) Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition, Project Management Institute.
5. Kerzner, H., & Kerzner, H. R. (2017). Project management: a systems approach to planning, scheduling, and controlling, John Wiley & Sons.

BMMS 3156
TESTING AND COMMISIONING COMMERCIAL HVAC/
PENGUJIAN DAN PERTAULIAHAN KOMERSIAL HVAC

LEARNING OUTCOMES

Upon completion of this course, student should be able to:

1. Justify the importance of testing & commisioning works.
2. Carry out inspection work on the HVAC system accordance with established procedures.
3. Make reports before, during and after the inspection task.

SYNOPSIS

This Testing and Commissioning (T & C) Procedure aims to lay down the minimum testing and commissioning requirements to be carried out on air-conditioning, refrigeration, ventilation and central monitoring and control system installation. Such requirements are applicable to both new installations upon completion and existing ones after major alteration. This course had four main chapter included.

Scope of The Testing & Commissioning Works, Tests and Inspections during Construction, Functional Performance Tests and Commissioning and Statutory Inspections.

REFERENCES

1. Coastal Training Technologies Corp. (1999). Condensers maintenance & troubleshooting.
2. International Training Corporation. (1999). Air conditioning and refrigeration system operation checks.
3. Gupta, N.C. (2016). Comprehensive HVAC System Design: A Handbook on Practical Approach to Air Conditioning, Heating and Ventilation Systems.
4. Sugarman, Samuel C. (2014). Testing and balancing HVAC air and water systems.
5. Stanfield, Carter. (2013). Fundamentals of HVACR.
6. Mitchell, John W. (2013). Principles of heating, ventilation, and air conditioning in buildings.

ACADEMIC HANDBOOK SESSION 2022/2023

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ACADEMIC HANDBOOK SESSION 2022/2023

FOR BACHELOR DEGREE PROGRAMMES

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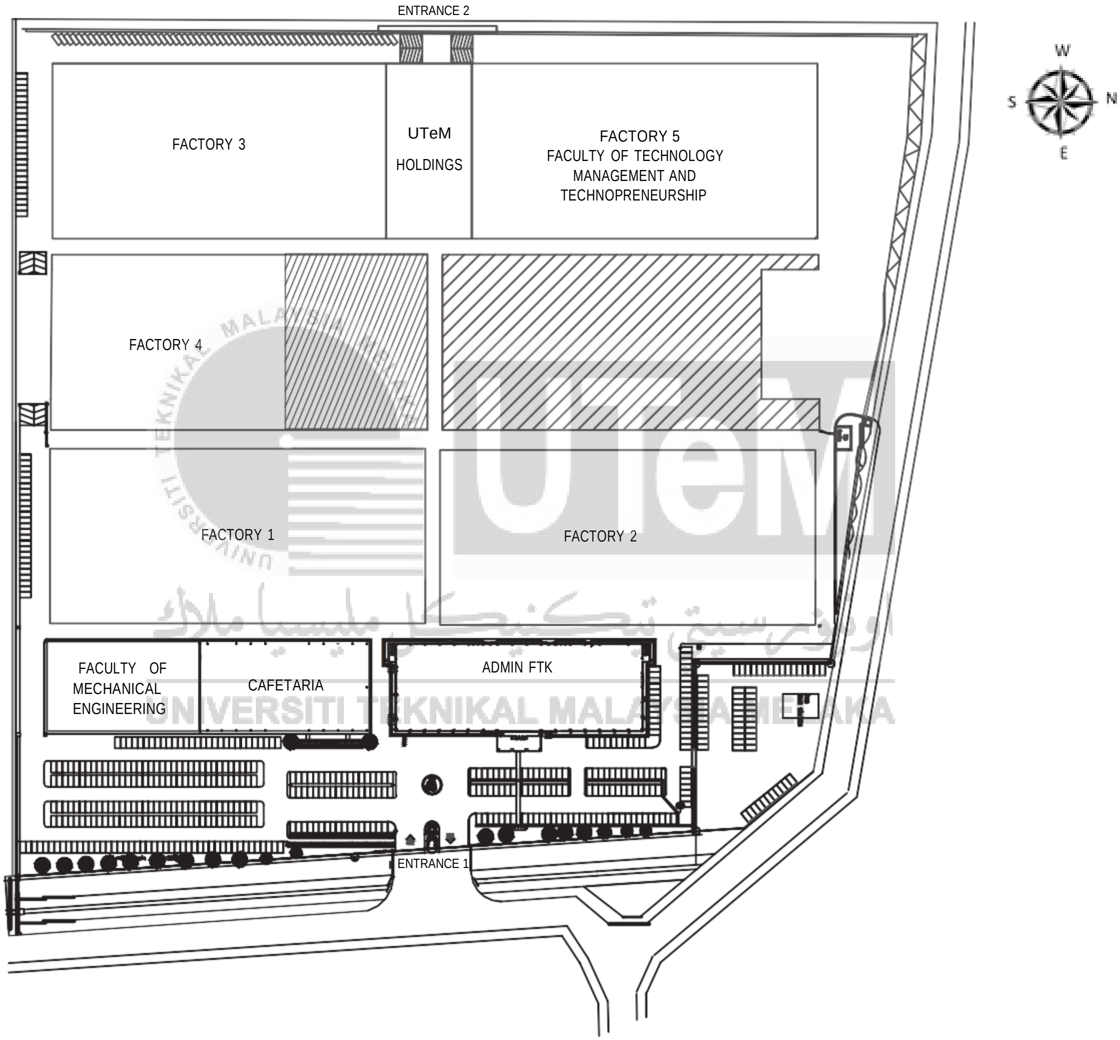
UNIVERSITI TEKNIKAL MALAYSIA MELAKA


ENTRANCE 2
FACTORY 3
UTeM HOLDINGS
FACTORY 5
FACULTY OF TECHNOLOGY MANAGEMENT AND TECHNOPRENEURSHIP
W
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N
E
FACTORY 4
FACTORY 1
FACTORY 2
FACULTY OF MECHANICAL ENGINEERING
CAFETARIA
ADMIN FTK
UNIVERSITI TEKNIKAL MALAYSIA MELAKA
ENTRANCE 1

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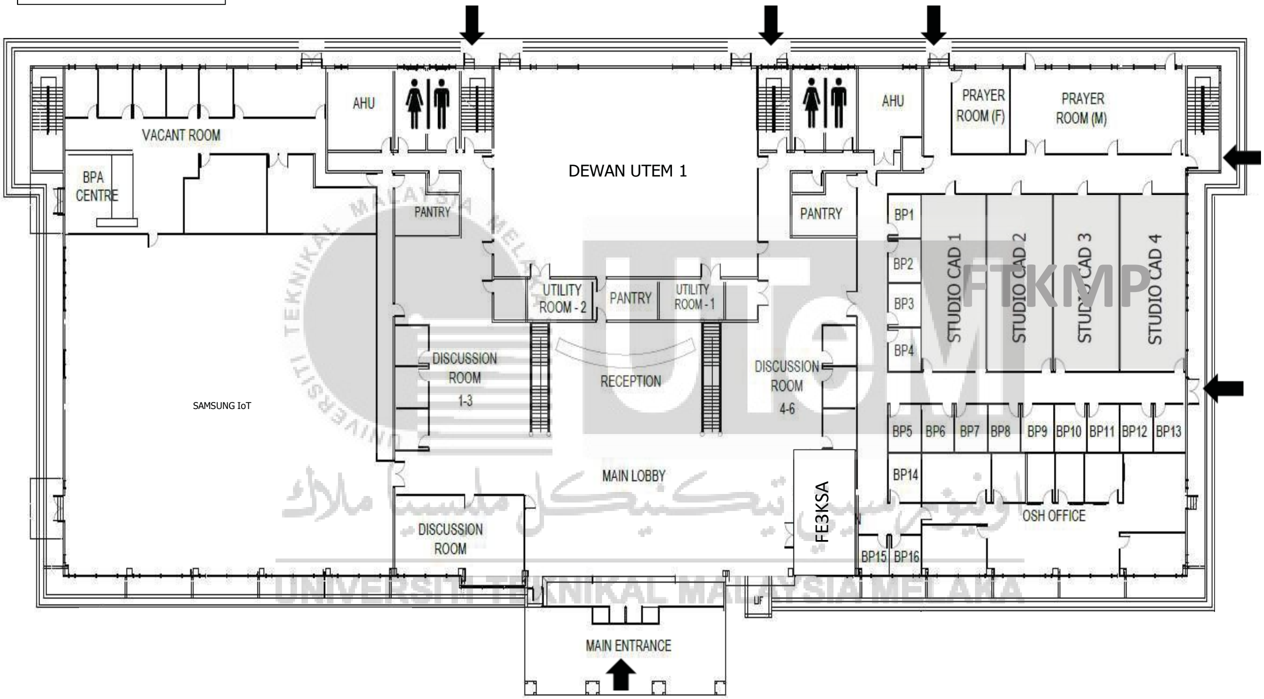

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BP - LECTURER ROOM
BPA - ACADEMIC ADMINISTRATION DEPARTMENT
OSH - OCCUPATIONAL SAFETY AND HEALTH

ENTRANCE TO BUILDING

ADMIN-FTK (ARAS 2)

LEGEND

BP - LECTURER ROOM
DC - PRINTING ROOM
DISC.R - DISCUSSION ROOM

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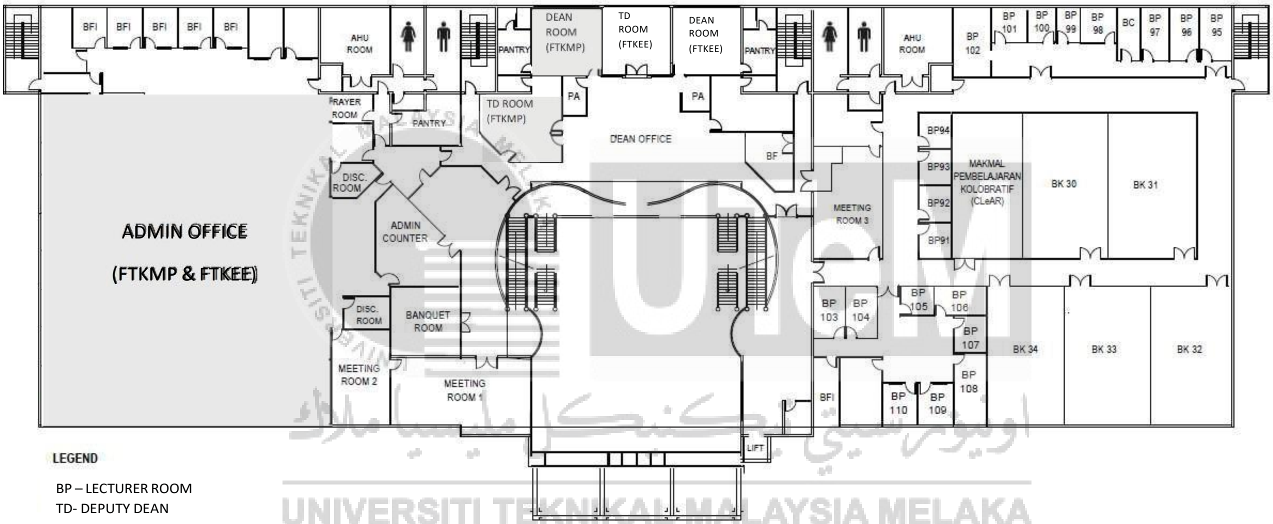

LEGEND

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TD- DEPUTY DEAN

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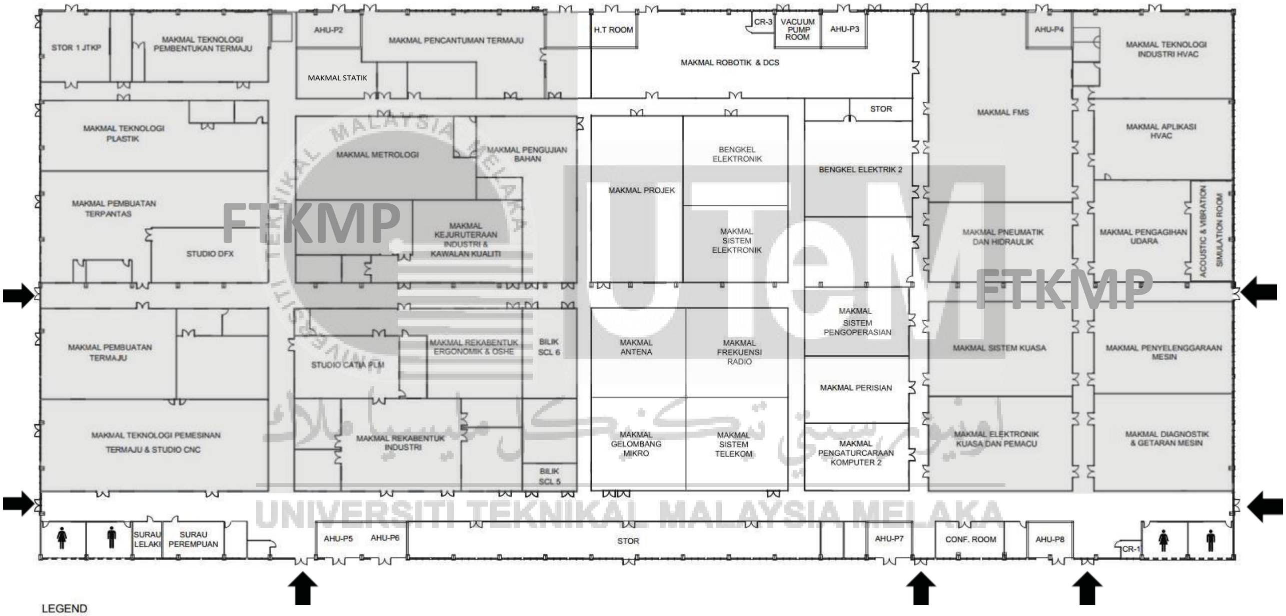
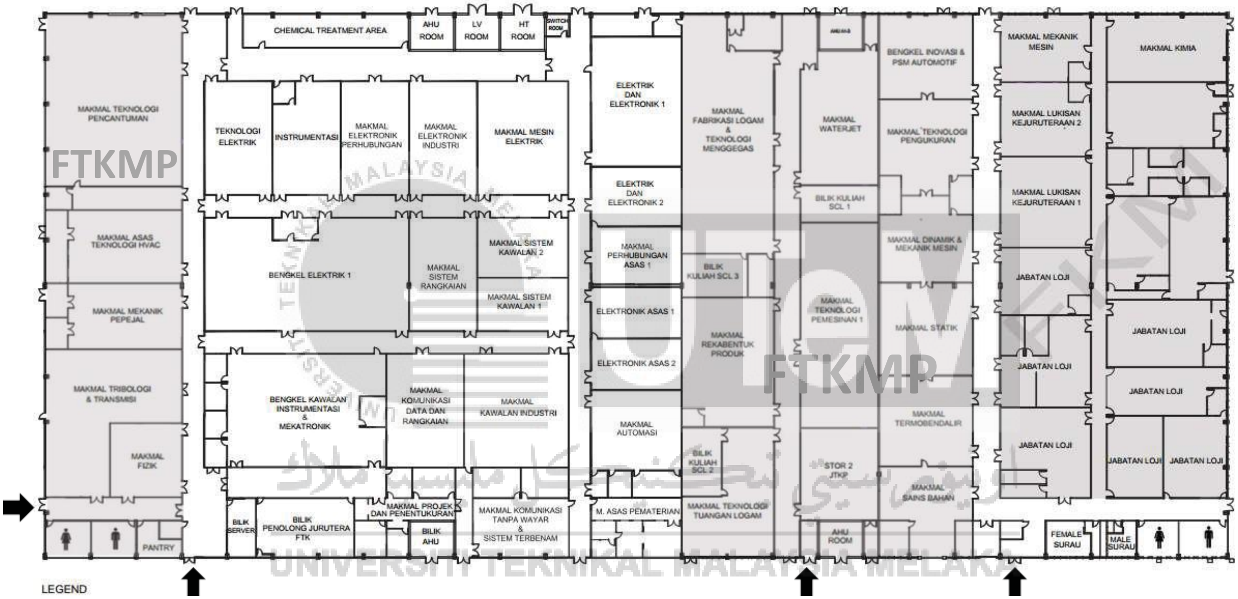


LEGEND

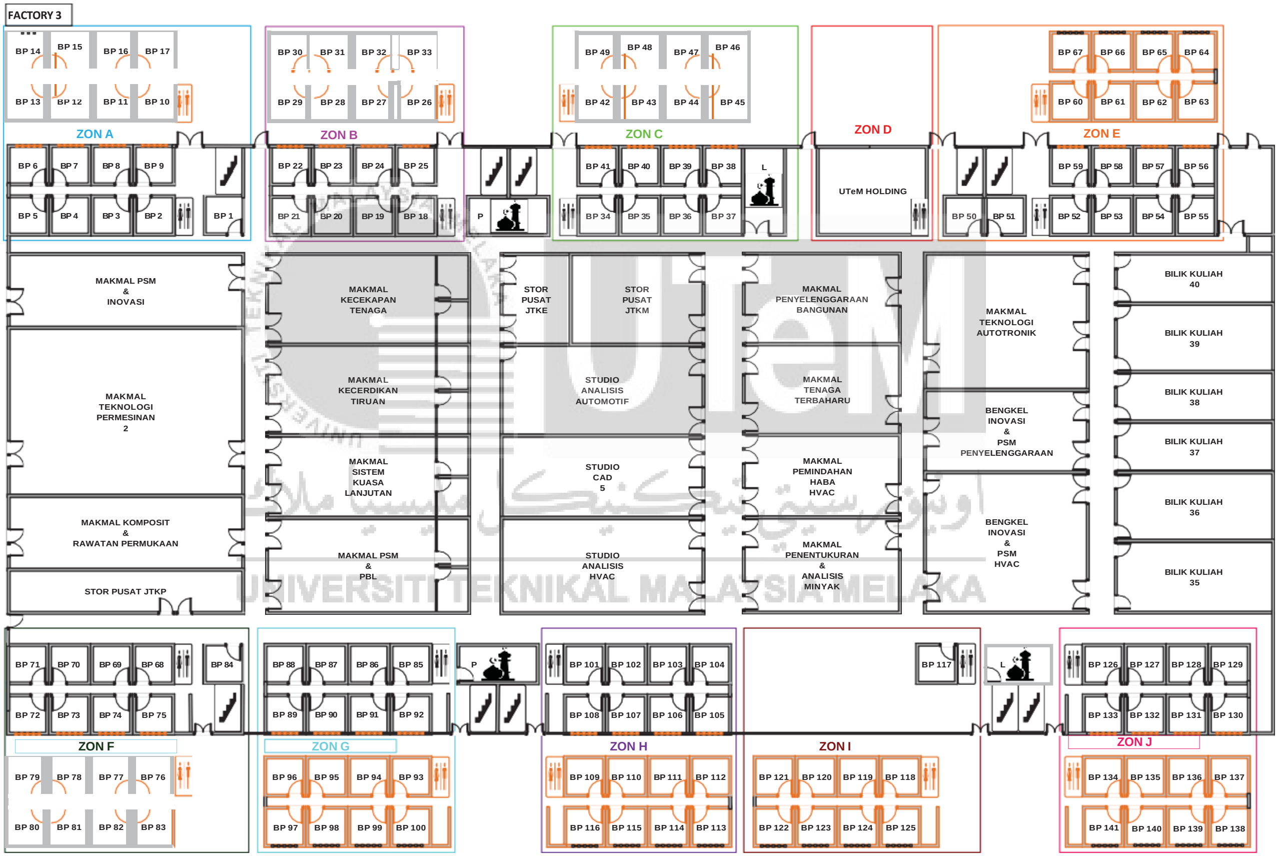
AHU - AIR HANDLING UNIT
SCL - STUDENT CENTRED LEARNING
HT - HIGH TENSION

FACTORY 2



LEGEND

AHU - AIR HANDLING UNIT
SCL - STUDENT CENTRED LEARNING
HT - HIGH TENSION
LV - LIGHT VOLTAGE


FACTORY 3
ZON A
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MAKMAL KOMPOSIT & RAWATAN PERMUKAAN
STOR PUSAT JTKP
MAKMAL KECEKAPAN TENAGA
MAKMAL KECERDIKAN TIRUAN
MAKMAL SISTEM KUASA LANJUTAN
MAKMAL PSM & PBL
STOR PUSAT JTKE
STOR PUSAT JTKM
STUDIO ANALISIS AUTOMOTIF
STUDIO CAD 5
STUDIO ANALISIS HVAC
MAKMAL PENYELENGGARAAN BANGUNAN
MAKMAL TENAGA TERBAHARU
MAKMAL PEMINDAHAN HABA HVAC
MAKMAL PENENTUKURAN & ANALISIS MINYAK
MAKMAL TEKNOLOGI AUTOTRONIK
BENGKEL INOVASI & PSM PENYELENGGARAAN
BENGKEL INOVASI & PSM HVAC
BILIK KULIAH 40
BILIK KULIAH 39
BILIK KULIAH 38
BILIK KULIAH 37
BILIK KULIAH 36
BILIK KULIAH 35
BP 71
BP 70
BP 69
BP 68
BP 84
BP 72
BP 73
BP 74
BP 75
ZON F
BP 79
BP 78
BP 77
BP 76
BP 80
BP 81
BP 82
BP 83
BP 88
BP 87
BP 86
BP 85
BP 89
BP 90
BP 91
BP 92
ZON G
BP 96
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BP 94
BP 93
BP 97
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BP 101
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BP 106
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ZON H
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ZON I
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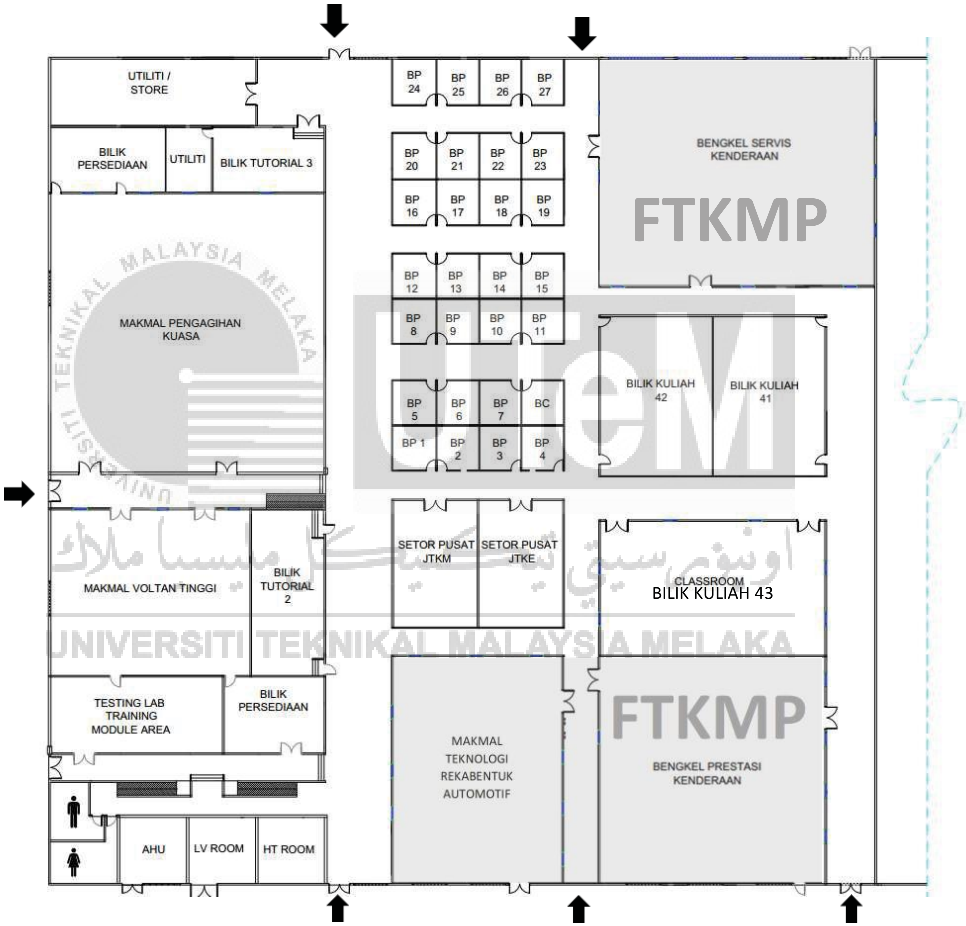
BP 127
BP 128
BP 129
BP 133
BP 132
BP 131
BP 130
ZON J
BP 134
BP 135
BP 136
BP 137
BP 141
BP 140
BP 139
BP 138

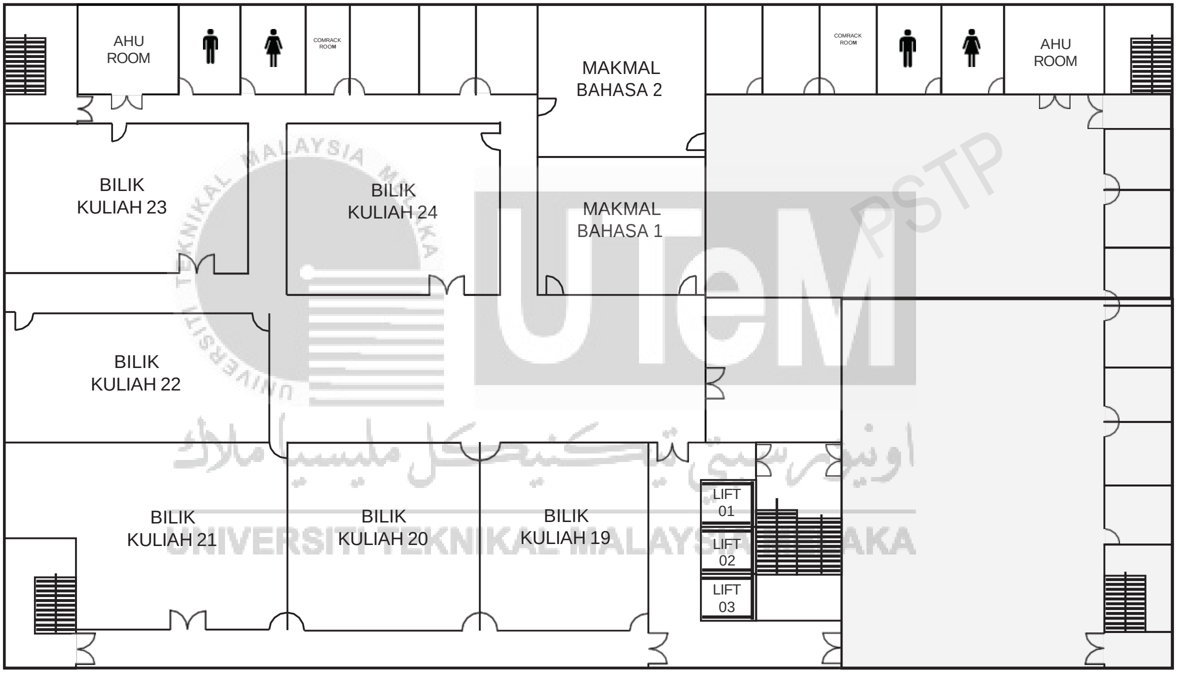
FACTORY 4



LEGEND :

HT - HIGH TENSION
LV - LIGHT VOLTAGE
BC - BILIK COMRACK
BP - BILIK PENGAJAR

ARAS 5 (FKM BUILDING)



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