ACADEMIC HANDBOOK
FOR BACHELOR DEGREE AND DIPLOMA PROGRAMMES
FACULTY OF MECHANICAL ENGINEERING
ACADEMIC SESSION 2017/2018

All information in this academic handbook is correct at the time of print and is course to change without prior notice.

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FOREWORD BY THE DEAN

Assalamualaikum and Salam Sejahtera,

First and foremost, I would like to welcome all new students of Faculty of Mechanical Engineering (FKM) to Universiti Teknikal Malaysia Melaka (UTeM). Congratulations for being selected to be a part of our engineering programmes. You have indeed made the right decision which will prepare you to be skilled and competent engineers with commendable leadership qualities.

The main objective of this academic handbook is to be a point of reference for students to understand and get to know both the faculty and the programmes offered at the university, especially in FKM. Students are exposed to the world of knowledge, competency and skills which are blended together to develop their self-esteem in philosophy, creativity and critical thinking, as well as to strengthen their commitments in serving the country. It is also to equip students to be well-prepared in facing challenges and survive in future.

In the context of professional graduates, the faculty has provided various facilities for students to assist in developing their skills and self-competence. 'Research Power House', which aims to educate and instill research practices is estimated to produce students who have the capacity to pursue their studies at Masters level. The establishment of the Accreditation Laboratory has also makes it easier for research focus and development, in line with the expectations of the industry. In addition, FKM also provides courses and vocational competency certificates to prepare students as work-ready graduates who are the expert human capital at workplace.

It is my hope that this academic handbook can be fully benefitted by students as a useful guide throughout their study period.

Lastly, I would like to wish all the best to all students embarking their journey in this faculty.

Thank you.

Dr. Ruztamreen Bin Jenal
Dean
Faculty of Mechanical Engineering

1 BACKGROUND OF UTeM

1.1 HISTORY

On December 1st, 2000, the Ministry of Education of Malaysia has officially approved the establishment of a new public university in the name of Kolej Universiti Teknikal Kebangsaan Malaysia (KUTKM). The establishment of KUTKM is to fulfil the needs of prospective industries on professional manpower in technical areas that not only have sound academic ability, but also competent and highly technical skilled. As the 14th public higher learning institution established in Malaysia, KUTKM has experienced many challenges and impediments in order to be a renowned university. KUTKM supports application-oriented approach and practice.

On February 1st, 2007, KUTKM has been renamed the Universiti Teknikal Malaysia Melaka (UTeM). From the beginning of the establishment, UTeM has upheld and maintained technical education programmes which fulfil the needs of current industries. The students of UTeM come from diverse backgrounds which include science, technical and vocational streams.

1.2 LOCATION

From 2001 to 2005, UTeM, which was then known as KUTKM, was located in renovated shophouses in Taman Tasik Utama, Ayer Keroh. These renovated shophouses consist of the university administrative offices, lecture halls, laboratories, staff rooms along with student accommodation.

On June 10th, 2001, KUTKM began offering academic programmes with pioneer student intake of 348 students. At present, UTeM has seven Faculties that offer programmes in Diploma and Degree levels. The faculties are:

a. Faculty of Mechanical Engineering (FKM)
b. Faculty of Electronics & Computer Engineering (FKEKK)
c. Faculty of Electrical Engineering (FKE)
d. Faculty of Manufacturing Engineering (FKP)

e. Faculty of Information & Communication Technology (FTMK)
f. Faculty of Technology Management and Technopreneurship (FPTT)
g. Faculty of Engineering Technology (FTK)

UTeM has 3 campuses; which are the Main Campus at Durian Tunggal, Technology Campus at Ayer Keroh and the City Campus at Bandar Melaka.

1.2.1 MAIN CAMPUS

The Main Campus is located at the Mukim Durian Tunggal, Melaka on a piece of land that has been developed since 2001. The Faculty of Electronics & Computer Engineering and the Faculty of Electrical Engineering have commenced their operations at the Main Campus since 2005. In 2009 another three faculties, namely the Faculty of Mechanical Engineering, the Faculty of Manufacturing Engineering and the Faculty of Information & Communication Technology, started operating in the main campus. However, in 2011, Faculty of Mechanical Engineering was relocated at the Technology Campus, Ayer Keroh. In addition, Institute of Technology Management and Entrepreneurship (IPTK), Centre for Languages and Human Development (PBPI), the Sports Complex, the Student Activity Centre and students' cafeteria are completed and utilized. Sports grounds such as fields for football, hockey, tennis and various other sports facilities have been completed. The university administrative office has been fully operating at the Main Campus; such as the Chancellery, Registrar, Bursary, Computer Centre, Quality Assurance and Accreditation Centre, Development Office, Grand Hall and the Mosque.

1.2.2 TECHNOLOGY CAMPUS

The Technology Campus is located in Kawasan Perindustrian Tasik Utama, Ayer Keroh which houses the Faculty of Mechanical Engineering and Faculty of Engineering Technology. Most of FKM's laboratories are located at the Mechanical Engineering Laboratory Complex, Taman Tasik Utama, Ayer Keroh.

1.2.3 CITY CAMPUS

The City Campus is located in Bandar Melaka which houses the Faculty of Technology Management and Technopreneurship (FPTT). The faculty conducts programmes for undergraduate and postgraduate students. Centre for Teaching and Learning (PPP) and the University Press, are also operating at this campus.

1.3 UNIVERSITY ORGANIZATION

In 2004, UTeM revamped its structure of organization. New departments were established including the Centre for Teaching and Learning (PPP), Centre for Graduate Studies (PPS), and Centre for Quality Assurance and Accreditation (PJKA) which is now known as Centre for Strategic, Quality and Risk (PPSKR). In 2008, several other centres were opened including Centre for Languages and Human Development (PBPI), Sports Centre, and Islamic Centre.

The university's organization consists of the University's Senate and the University Executive Council. In 2010, there are improvements on the university's structure of organization. The lists of departments are listed below:

a. Administration :
   i. Development Office
   ii. Knowledge and Communication Services Centre (formerly known as Computer Center)
   iii. Centre for Teaching & Learning
   iv. Centre for Strategic, Quality and Risk Management
   v. University Publication
   vi. Islamic Centre
   vii. Sports Centre
   viii. Centre for Resources & Instructional Technology
b. Academic :
   i. Centre for Graduate Studies
   ii. Faculty of Electronics and Computer Engineering
   iii. Faculty of Electrical Engineering

iv. Faculty of Mechanical Engineering
v. University Publication
vi. Faculty of Manufacturing Engineering
vii. Faculty of Information & Communication Technology
viii. Faculty of Technology Management and Technopreneurship
ix. Faculty of Engineering Technology
x. Centre for Languages & Human Development
xi. Institute of Technology Management and Entrepreneurship

1.4 ACADEMIC CALENDAR

The Academic Calendar for each session can be assessed from UTeM website.

2 BACKGROUND OF FKM

2.1 INTRODUCTION

The Faculty of Mechanical Engineering (FKM), UTeM was established after the approval was granted by the Ministry of Education Malaysia on the 22nd June 2001. The faculty administration office and lecture rooms are located in Technology Campus, Taman Tasik Utama, Ayer Keroh. A laboratory complex nearby was built to host the laboratories, workshops and lecture rooms. For a complete locations of facilities, refer to section 7.1 Currently, the faculty offers both undergraduate and post graduate programmes. The undergraduate programmes offered are Diploma in Mechanical Engineering Programme and Bachelor of Mechanical Engineering whilst the post graduate programmes are Master of Science by research, Master of Mechanical Engineering (Taught Courses and Mixed Modes), Doctor of Philosophy and Doctor of Engineering programmes.

2.2 VISION, MISSION AND OBJECTIVES

In order to achieve the objectives of the Faculty, a framework of policy implementation is developed. The followings are the vision, mission and objectives of programmes offered by the Faculty:

2.2.1 VISION

To be an ideal, dynamic and innovative faculty.

2.2.2 MISSION

To produce highly competent mechanical engineering graduate having good moral and ethical values.

2.2.3 OBJECTIVES

a. To offer high quality academic programmes with emphasis on practice and application oriented mechanical engineering discipline in line with the current industrial requirement and be recognized by professional bodies.
b. To produce competent mechanical engineering graduate with critical thinking, innovative and have the ability to solve problem either in group or individual in the process of fulfilling the national human capital requirement.
c. To upgrade expertise and competency of the staff by conducting various quality and well organized human resource development programmes based on good ethical and moral values.
d. To perform the research and development activities based on industrial problems in the process to develop post-graduate programmes and to produce prototypes that could be patented and commercialized.
e. To conduct teaching and learning based on writing and publication activities as well as research and consultancy activities.
f. To promote smart partnership between university and industry at faculty level.
g. To offer services in consultancy and life long learning with practical and application oriented in the field of mechanical engineering and in other strategic field or specialization to meet the requirement of domestic and global market.

2.3 ORGANISATIONAL STRUCTURE

The faculty administration is headed by a Dean and assisted by three Deputy Deans who are responsible in academic, research & post graduate studies and student development. Each of undergraduate programmes is managed by respective Head of Department. Currently FKM has six departments, namely Department of Thermal-Fluids, Department of Structure & Materials, Department of Design & Innovation, Department of Automotive, Department of Plant and Maintanance and Department of Diploma Studies. Each Head of Department is entrusted and responsible for the academic activities and physical development of infrastructure and facilities. The research activities are coordinated by the Centre of Excellence (CoE) Manager. FKM CoE is known as Center for Advance Research on Energy (CARe).

The Administrative Office of FKM is located at Level 3 FKM Building, Technology Campus, where the office of Dean, Deputy Deans, Head of Departments, Chief Assistant Registrar, Assistant Registrar and administrative support staff are located. The routine operation and management of laboratories at FKM is handled by Heads of Laboratory and Assistant Engineer.

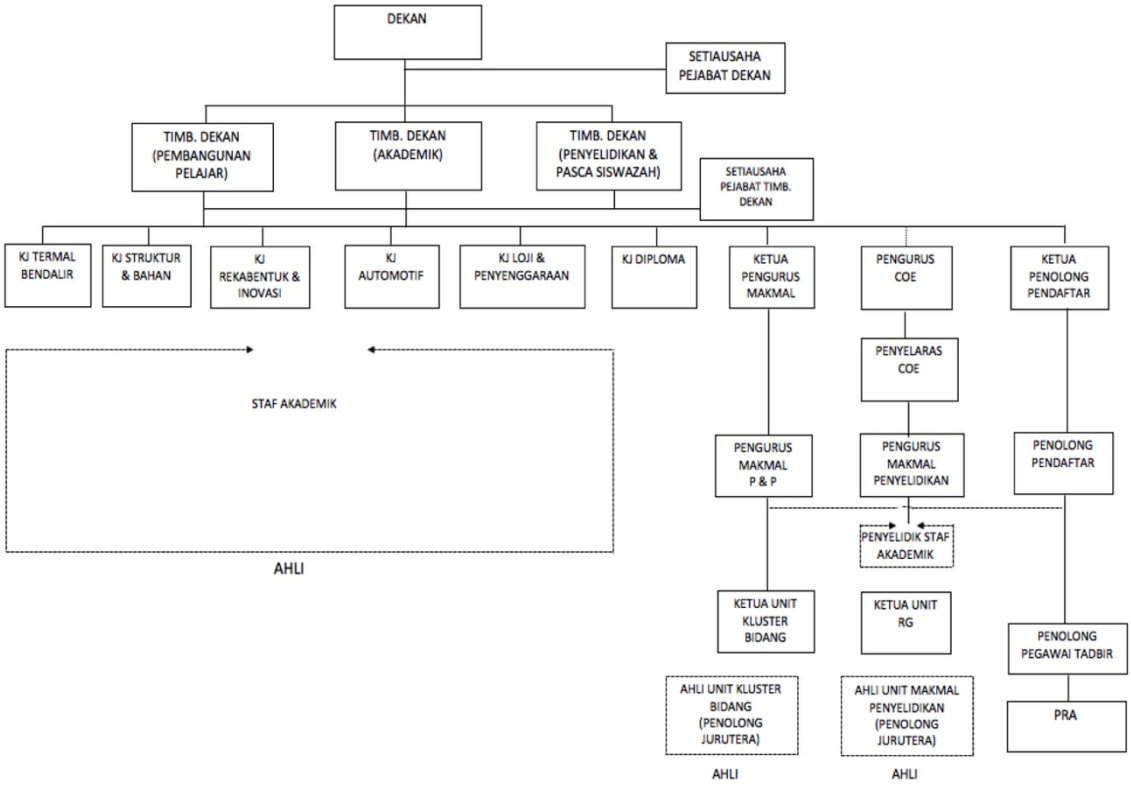


Figure 2.1 Faculty's Organizational Structure

3 ACADEMIC PROGRAMMES

3.1 INTRODUCTION

The Faculty of Mechanical Engineering offers academic programmes at both undergraduate and postgraduate levels. This handbook focuses on information pertaining to the undergraduate programmes. The programmes offered at undergraduate level are the Bachelor of Mechanical Engineering (BMCG) and the Diploma in Mechanical Engineering (DMC). The normal study periods for BMCG and DMC programmes are four and three years respectively. The curriculum structures of BMCG and DMC programmes are explained in sections 3.6 and 3.8, respectively.

Starting from Semester 1 Session 2014/2015, the faculty offers only one bachelor degree programme (BMCG). The purpose of offering a single programme is to produce graduates with broad engineering skills and therefore, highly adaptable to the job market. The specialization of students into various engineering fields will be accomplished through the offering of elective courses in Year 4.

The faculty's commitment in providing quality education programme continues by adhering to the guidelines set by the Engineering Accreditation Council of Malaysia (EAC). In addition, the faculty also continues the implementation of Outcome-Based Education (OBE) which has also been used by a large number of leading universities around the world. Using OBE system, the teaching and learning process is tailored to develop balanced graduates based on the objectives set in Programme Educational Objectives (PEO). Every taught course carries a set of learning outcomes (LOs), which students need to achieve upon completion of the course. These LOs are mapped to Programme Outcomes (POs) for assessment purposes.

3.2 PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEOs are specific goals consistent with the mission and vision of the University, that are responsive to the expressed interest of programme stakeholders, describing the expected achievements of graduates in their career and professional life, few years after graduation.

The graduates from this programme are expected to become:

PEO1 Graduates who are competent and adaptable in multi industries by practicing the knowledge in mechanical engineering that relevant to professional engineering practice.

PEO2 Graduates who will pursue study in graduate works and others professional education.

PEO3 Graduates who will be leader at note-worthy level and provide solutions that benefited the respective organization, society and nation.

3.3 PROGRAMME OUTCOMES (PO)

POs are statements that describe what students are expected to know and able to perform or attain by the time of graduation. These relate to the skills, knowledge, and behaviour that students acquire through the programme.

3.3.1 PROGRAMME OUTCOMES (PO) FOR DEGREE PROGRAMME

The graduate from this programme is expected to be able to:

PO1 Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex mechanical engineering problems. (**Engineering Knowledge)**

PO2 Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principle of mechanical engineering knowledge. (**Problem Analysis)**

PO3 Utilize a systematic approach to design solution for complex engineering problem that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental consideration. (**Design/Development of Solutions)**

PO4 Conduct investigations of complex problem using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. (**Investigation)**

PO5 Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations. (**Modern Tool Usage)**

PO6 Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and consequent responsibilities relevant to professional engineering practice. (**The Engineer and Society)**

PO7 Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development. (**Environment and Sustainability)**

PO8 Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. (**Ethics)**

PO9 Communicate effectively on complex engineering activities with engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions. (**Communication)**

PO10 Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings. (**Individual and Team Work)**

PO11 Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. (**Life Long Learning)**

PO12 Demonstrate knowledge and understanding of engineering, management and entrepreneurship principles; and apply them effectively as a member and leader in a team to manage projects and in multidisciplinary environments.(**Project Management and Finance**)

3.3.2 PROGRAMME OUTCOMES (PO) FOR DIPLOMA PROGRAMME

The graduate from this programme is expected to be able to:

PO1 Apply knowledge of applied mathematics, applied science, engineering fundamentals and an engineering specialization to wide practical procedures and practices.

PO2 Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity.

PO3 Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO4 Conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements.

PO5 Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations.

PO6 Demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well-defined engineering problems.

PO7 Understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts.

PO8 Understand and commit to professional ethics and responsibilities and norms of technician practice.

PO9 Communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions.

PO10 Function effectively as an individual, and as a member in diverse technical teams.

PO11 Recognise the need for, and have the ability to engage in independent updating in the context of specialised technical knowledge.

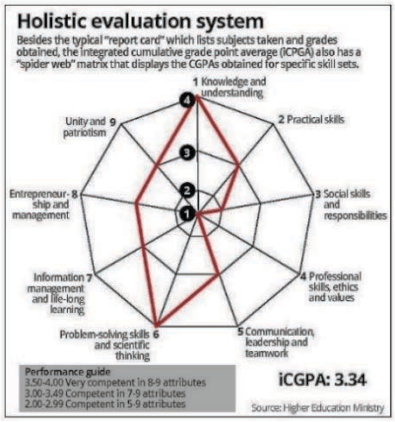
PO12 Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a technical team and to manage projects in multidisciplinary environments.

3.4 INTEGRATED CUMULATIVE GRADE POINT AVERAGE (iCGPA)

The 1st shift of the Malaysia Education Blueprint 2015-2025 (Higher Education) is "Producing holistic, entrepreneurial and balanced graduates". In order to achive this goal, it is essential for UTeM to develop a constructively aligned, holistic and integrated curriculum that embeds High Impact Educational Practices (HIEP), which encompasses cognitive and conceptual clarity, entrepreneurial skills, experiential learning and innovation.

In line with the policy of the nation, a new instrument, which is termed as Integrated Cumulative Grade Point Average (iCGPA) is introduced by the Ministry of Higher Education to assess student achievement based on this holistic, entrepreneurial and balanced graduates criteria. This new instrument will be fully implemented starting from semester 1 session 2016/2017 in all public universities.

Under the new system, upon graduation students have a comprehensive "report card". Apart from the conventional numerical CGPA and academic transcript, the report card is also consists of the detailed soft skills that students have gained during their study at the university. These skills include leadership, communication, entrepreneurial, social and critical thinking skills, which is displayed in a spider web form as shown below.



3.5 CAREER IN MECHANICAL ENGINEERING

Career as a mechanical engineer or assistant mechanical engineer (technical assistant) is highly renumerated, however it demands great responsibilities. Engineers and assistant engineers are problem solvers who provide solutions to any engineering problem that arises. In other words, they are knowledgeable people with the ability to solve problems. Hence, mechanical engineer must be of very skilled person and comfortable with his or her knowledge in mechanical engineering.

Mechanical engineering typically exists together with electrical and civil engineering in terms of its historical development. Due to highly ethical and challenging nature of the engineers and assistant engineers' job scope, it gained a professional and semi professional recognition. Therefore it is the aim of every mechanical engineer to be recognised professionally in terms of their ability and competency. There are avenues where mechanical engineer can be registered as a Professional Engineer.

Engineers or assistant engineers must possess good ethical values. Virtues are universal, irrespective of his or her position, place of work or race. Engineer and assistant engineer must heed those virtues which include sincerity, transparency and consistency. Other qualities

needed by engineers are computer-literate, good in interpersonal skills, creative and critical thinking skills.

Upon the completion of mechanical engineering programmes at Bachelor' Degree or Diploma level, graduates have vast career opportunities. Mechanical Engineer and Assistant Mechanical Engineer are mostly employed in the manufacturing, automotive, marine, aerospace, oil & gas, robotic, mining and food and beverage (F&B) industries.

The job scope of a Mechanical Engineer and an Assistant Mechanical Engineer among others are design, material selections and analysis of manufactured products. Some examples of the product include home appliances, health care and sport equipment, instrumentation and crafts. Other fields of work include integration of mechanical, electronic engineering and computer control in the field of mechatronics.
Mechanical engineering graduates are employed in many industrial sectors which encompass the following work environments:-

a. Design and manufacturing of automotive components and engine
b. Defence industries, power generation and environmental protection
c. Marine industries and sea transport
d. Automation, control and robotic industries
e. Heavy machinery industries that use hydraulic and pneumatic system, electronic and digital driven machines
f. Agricultural and food production industries
g. Petrochemical, gas and mineral industries
h. Biotechnology and biomedical industries
i. Research and development, engineering management and service industries
j. Construction of building mechanical system

In the industry, graduates of mechanical engineering are highly marketable and hold a wide range of positions either in public agencies or private companies which include:

a. Mechanical Engineer

b. Sale & Service Engineer
c. Project Engineer
d. Technical Engineer
e. Production Engineer
f. Industrial Engineer
g. Plant Engineer
h. Design Engineer
i. Maintenance Engineer
j. Assistant Lecturer
k. Research Officer
l. Technical Officer

On the other hand, mechanical engineering diploma holders are highly sought after and often hired to hold positions such as:

a. Assistant Mechanical Engineer
b. Assistant Service Engineer
c. Assistant Project Engineer
d. Assistant Technical Engineer
e. Assistant Product Engineer
f. Assistant Industrial Engineer
g. Assistant Plant Engineer
h. Assistant Design Engineer
i. Assistant Maintenance Engineer
j. Assistant Research Officer
k. Assistant Technical Officer

3.6 BACHELOR OF MECHANICAL ENGINEERING (BMCG)

The curriculum structure for the first two years of Bachelor of Mechanical Engineering (BMCG) is to enhance the students' basic Mechanical Engineering knowledge before engaging in more advance programme courses. These courses include Engineering Mathematics, Engineering Materials, Engineering Graphics and CAD, Statics, Differential

Equations, Computer Programming, Principle of Electric and Electronics, Principle of Measurements and Instrumentation, Microprocessor Technology, and Statistics. The practical work and workshops are designed to enhance students' knowledge and skills. In addition, students will also study courses such as Third Language, Ethnic Relations, Technical English Language, Islamic and Asian Civilizations (TITAS) and Co-Curriculums.

In Year 3, students will undergo core curriculum programmes which cover advanced courses as well as compulsory university courses. Students are then required to undergo industrial training for at least 10 weeks, during the short semester (after semester 6) in selected industries. The objectives are to strengthen the engineering knowledge and theory as well as their hands-on skills. It is expected that this training will provide our graduates with enough technical knowledge before advancing into a real career in industry.

Fourth year students (final year), who are in their 7th and 8th semester, shall carry out Final Year Project (FYP), programme core and elective courses which are focused on advanced knowledge of Mechanical Engineering. In addition, students will also sit a number of important courses such as Critical & Creative Thinking, Engineers & Society, Sustainability & Environment, Engineering Seminar, Entrepreneurship Technology, and Engineering Management & Economy. The courses are designed to provide students with soft skills such as engineering management, entrepreneurship, communication English, and moral development programme. The intended outcome is to produce mechanical engineering graduates with knowledge in their specialised field, as well as in non-technical fields.

The minimum number of credits required for an award of Bachelor of Mechanical Engineering is **131**. The breakdown of course categories and credits required are as follows: university compulsories (W) -18 credits, common cores (P)-48 credits, programme cores (K) -53 credits, and electives (E)-12 credits.

3.7 CURRICULUM STRUCTURE FOR BMCG PROGRAMME

YEAR 1 (SEMESTER I)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
BLHL 1XX2	THIRD LANGUAGE*	W	2	-
BLHW 1702	ISLAMIC AND ASIAN CIVILIZATIONS**	W	2	-
BLHW1742	MALAYSIAN STUDIES***	W	2	-
BMFG 1213	ENGINEERING MATERIALS	P	3	-
BMCG 1523	ENGINEERING GRAPHICS AND CAD	P	3	-
BMCG 1113	STATICS	P	3	-
BMFG 1113	ENGINEERING MATHEMATICS I	P	3	-
TOTAL			16	

*Refer to Third Language Courses Table offered by Centre for Languages and Human Development. International students are required to take BLHL1012 Bahasa Melayu Komunikasi.
** Only for Malaysian students
*** For International student only

YEAR 1 (SEMESTER 2)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
BKKX XXX1	CO-CURRICULUM I*	W	1	-
BMCG 1013	DIFFERENTIAL EQUATIONS	P	3	-
BITG 1233	COMPUTER PROGRAMMING	P	3	-
BEKG 1123	PRINCIPLES OF ELECTRIC AND ELECTRONICS	P	3	-
BEKG 1233	PRINCIPLES OF MEASUREMENTS AND INSTRUMENTATION	P	3	-
BMCG 1011	MECHANICAL ENGINEERING LABORATORY I	K	1	-
BMCG 1213	DYNAMICS	K	3	-
TOTAL			17	

*Refer to Co-Curriculum Courses offered by Centre for Languages and Human Development.

YEAR 2 (SEMESTER 3)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
BLHW 2712	ETHNIC RELATIONS**	W	2	-
BKKX XXXX	CO-CURRICULUM II*	W	1	-
BLHW2752	MALAYSIAN CULTURE***	W	2	-
BMCG 2113	SOLID MECHANICS I	K	3	-
BMCG 2713	THERMODYNAMICS I	K	3	-
BMCG 2613	FLUID MECHANICS I	K	3	-
BMCG 2011	MECHANICAL ENGINEERING LABORATORY II	K	1	-
BEKG 2433	ELECTRICAL SYSTEM	P	3	-
TOTAL			16	

*Refer to Co-Curriculum Courses offered by Centre for Languages and Human Development.
** Only for Malaysian students
*** For International student only

YEAR 2 (SEMESTER 4)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
BLHW 2403	TECHNICAL ENGLISH	W	3	-
BENG 2143	ENGINEERING STATISTICS	P	3	-
BEKG 2453	ENGINEERING MATHEMATICS II	P	3	-
BMCG 2513	COMPUTER AIDED DESIGN AND MANUFACTURING	K	3	-
BMCG 2312	MANUFACTURING PROCESS	K	2	-
BMCG 2021	MECHANICAL ENGINEERING WORKSHOP	K	1	-
BMCG 2212	MICROPROCESSOR TECHNOLOGY	K	2	-
TOTAL			17	

YEAR 3 (SEMESTER 5)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
BMCG 3113	SOLID MECHANICS II	K	3	BMCG 2113
BMCG 3313	ENGINEERING DESIGN	K	3	-
BMCG 3713	THERMODYNAMICS II	K	3	BMCG 2713
BMCG 3613	FLUID MECHANICS II	K	3	BMCG 2613
BMCG 3333	MECHANICAL DESIGN	K	3	-
TOTAL			15	

YEAR 3 (SEMESTER 6)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
BLHW 3403	ENGLISH FOR PROFESSIONAL COMMUNICATION	W	3	-
BMCG 3223	CONTROL ENGINEERING	K	3	-
BMCU 3013	INTEGRATED DESIGN PROJECT	P	3	-
BMCG 3723	HEAT AND MASS TRANSFER	K	3	-
BMCG 3233	MECHANICAL VIBRATION	K	3	-
TOTAL			15	

YEAR 3 (SHORT SEMESTER)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
BMCU 3935	INDUSTRIAL TRAINING	P	5	-
TOTAL			5	

YEAR 4 (SEMESTER 7)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
BLHC 4032	CRITICAL AND CREATIVE THINKING	W	2	-
BMCU 4972	FINAL YEAR PROJECT I	P	2	-
BENG 4322	ENGINEER AND SOCIETY	P	2	-
BMCG 4812	SUSTAINABILITY AND ENVIRONMENT	K	2	-
BMCU 4011	ENGINEERING SEMINAR	P	1	-
BMCG 4XX3	ELECTIVE I	E	3	-
BMCG 4XX3	ELECTIVE II	E	3	-
TOTAL			15	

YEAR 4 (SEMESTER 8)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
BTMW 4012	ENTREPRENEURSHIP TECHNOLOGY	W	2	-
BMCU 4984	FINAL YEAR PROJECT II	P	4	BMCU 4972
BMFG 4623	ENGINEERING MANAGEMENT AND ECONOMY	P	3	-
BMCG 4XX3	ELECTIVE III	E	3	-
BMCG 4XX3	ELECTIVE IV	E	3	-
TOTAL			15	
TOTAL OVERALL CREDIT			131	

ELECTIVE COURSES

FIELD	CODE	COURSE	CREDIT
THERMAL-FLUID	BMCG 4713	RENEWABLE ENERGY SYSTEM	3
	BMCG 4723	REFIRGERATION AND AIR CONDITIONING SYSTEM	3
	BMCG 4733	POWERPLANT SYSTEM	3
	BMCG 4613	COMPUTATIONAL FLUID DYNAMICS	3
	BMCG 4623	FLUID POWER AND TURBOMACHINERY	3
STRUCTURE AND MATERIALS	BMCG 4113	FINITE ELEMENT ANALYSIS	3
	BMCG 4123	ADVANCED SOLID MECHANICS	3
	BMCG 4413	NON DESTRUCTIVE TESTING	3
	BMCG 4423	COMPOSITES AND ADVANCED MATERIALS	3
	BMCG 4433	METALLURGY	3
DESIGN AND INNOVATION	BMCG 4313	MECHANISM DESIGN	3
	BMCG 4323	PROTOTYPE DEVELOPMENT TECHNOLOGY	3
	BMCG 4333	DESIGN QUALITY AND RELIABILITY	3
	BMCG 4343	DESIGN OPTIMIZATION	3
	BMCG 4513	ADVANCED COMPUTER AIDED	3
AUTOMOTIVE	BMCG 4913	VEHICLE DYNAMICS	3
	BMCG 4923	AUTOMOTIVE TECHNOLOGY	3
	BMCG 4933	VEHICLE POWERTRAIN SYSTEMS	3
	BMCG 4943	INTERNAL COMBUSTION ENGINE	3
	BMCG 4953	VEHICLE SYSTEM MODELING AND SIMULATION	3

MAINTENANCE	BMCG 4213	VIBRATION MONITORING OF ROTATING MACHINERY	3
	BMCG 4813	CONDITION BASED MAINTENANCE	3
	BMCG 4823	RELIABILITY, MAINTAINABILITY AND RISKS	3
	BMCG 4833	WEAR DEBRIS AND OIL ANALYSIS	3
	BMCG 4843	STRUCTURAL HEALTH MONITORING	3

*Students are required to complete four (4) courses (total of 12 credits) with at least three (3) of the courses must be from the same field.

CATEGORY	DESCRIPTION
KD	CREDIT EARNED (*KREDIT DAPAT*)
W	UNIVERSITY COMPULSORY COURSE
P	COMMON CORE COURSE
K	PROGRAMME CORE COURSE
E	ELECTIVE COURSE

3.8 DIPLOMA IN MECHANICAL ENGINEERING (DMC)

The curriculum structure for Year 1 is the strengthening of the knowledge for SPM school leavers from technical, vocational and government aided. Courses offered by the Faculty are Fundamental Mathematics, Physics, Chemistry, Calculus, Engineering Graphic, Statics, Computer Programming and Computer-Aided Drawing (CAD), Principle of Electric and Electronics, Manufacturing Process and Technology & Engineering Workshop Practice that provide students with opportunities to improve their knowledge and skills in mechanical field. Apart from the engineering courses, students are also offered English courses, TITAS, etc.

In Year 2 and Year 3, students will begin their studies in the programme courses such as Dynamics, Thermodynamics, Solid Mechanics, Fluid Mechanics, Material Science, Mechanics of Machine, Engineering Design, Principle of Electronic & Microprocessor, Engineering Mathematic, Statistics, and Differential Equation. At the end of Year 2 (special semester), students are required to undergo an industrial training for a minimum of 10 weeks in various related industries. The students will be exposed to the real industrial working environment during this industrial training. Students will also have the opportunity to learn third language as an additional course that will be offered by the Faculty in Year 2. In Year 3, students must also conduct Diploma Projects during final semester before graduation.

Apart from the engineering courses, students are also offered several university compulsory courses such as English courses, TITAS, management, entrepreneurship and communication. With this curriculum, the diploma engineering graduates are expected to acquire high technical knowledge and skills as well as good attitude in-line with *Malaysia Education Blueprint 2015-2025 (Higher Education)*. It aims to equip the future graduates with technical knowledge/skills and the preparation through the actual working environment in the industrial sector.

The minimum credit hours required for the award of Diploma in Mechanical Engineering is **94 credits**.

3.9 CURRICULUM STRUCTURE FOR DMC PROGRAMME

PRELIMINARY SPECIAL SEMESTER

CODE	COURSE	CATEGORY	CREDIT	PRE - REQUISITE
DLHW 1012	FOUNDATION ENGLISH	W	2	-
DLHW 1742	KEPIMPINAN	W	2	-
DLHW 1722	FALSAFAH SAINS DAN TEKNOLOGI	W	2	-
TOTAL			6	

YEAR 1 (SEMESTER I)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
DMCU 1012	EXPERIMENTAL METHOD	P	2	-
DMCU 1233	CHEMISTRY	P	3	-
DMCU 1032	FUNDAMENTAL MATHEMATICS	P	2	-
DACS 1263	FUNDAMENTAL PHYSICS	P	3	-
DEKG 2113	ELECTRICAL & ELECTRONIC PRINCIPLES	P	3	-
DMCU 1912	TECHNOLOGY AND ENGINEERING WORKSHOP PRACTICE I	P	2	-
DLHW 1032	PENGAJIAN MALAYSIA	W	2	-
TOTAL			17	

YEAR 1 (SEMESTER 2)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
DMCS 1313	STATICS	P	3	DACS 1263 DMCU 1032
DITG 1113	COMPUTER PROGRAMMING	P	3	-
DMCU 1323	MANUFACTURING PROCESS	P	3	-
DMCD 1543	ENGINEERING GRAPHICS	P	3	-
DMCU 1042	CALCULUS	P	2	DMCU 1032
DMCU 2922	TECHNOLOGY AND ENGINEERING WORKSHOP PRACTICE II	P	2	DMCU 1912
DXXX XXX1	CO-CURRICULUM I*	W	1	-
TOTAL			17	

*Refer to Co-Curriculum courses offered by Centre for Language and Human Development(PBPI).

YEAR 2 (SEMESTER 3)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
DMCT 2123	THERMODYNAMICS I	P	3	-
DMCS 2323	SOLID MECHANICS I	P	3	DMCS 1313
DMCB 2423	MATERIALS SCIENCE	P	3	DMCU 1233
DMCM 2713	DYNAMICS	P	3	DMCS 1313
DMCU 2052	ENGINEERING MATHEMATICS	P	2	-
DLHW 2422	ENGLISH FOR EFFECTIVE COMMUNICATION	W	2	-
DXXX XXX1	CO-CURRICULUM II*	W	1	-
TOTAL			17	

*Refer to Co-Curriculum courses offered by Centre for Language and Human Development.

YEAR 2 (SEMESTER 4)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
DMCF 2213	FLUID MECHANICS I	P	3	-
DMCS 3333	SOLID MECHANICS II	P	3	DMCS 2323
DMCU 3082	STATISTICS	P	2	-
DENG 2223	FUNDAMENTAL ELECTRIC AND MICROPROCESSOR	P	3	DEKG 2113
DTKW 1012	ASAS PEMBUDAYAAN KEUSAHAWANAN	W	2	-
DMCU 2062	DIFFERENTIAL EQUATIONS	P	2	-
DLHW 3432	ENGLISH FOR MARKETABILITY	W	2	-
TOTAL			17	

YEAR 2 (SPECIAL SEMESTER)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
DMCU 2963	INDUSTRIAL TRAINING	P	3	KD 51
DMCU 2972	INDUSTRIAL TRAINING REPORT	P	2	-
TOTAL			5	

YEAR 3(SEMESTER 5)

CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
DMCT 3133	THERMODYNAMICS II	P	3	DMCT 2123
DMCF 3233	FLUID MECHANICS II	P	3	DMCF 2213
DMCM 3723	MECHANICS OF MACHINES	P	3	DMCM 2713
DMCD 3523	ENGINEERING DESIGN	P	3	DMCS 3333
DMCU 3973	DIPLOMA PROJECT	P	3	KD 62
TOTAL			15	
OVERALL TOTAL CREDIT			94	

NOTE:

CATEGORY	**DESCRIPTION**
KD	CREDIT EARNED (*KREDIT DAPAT*)
W	UNIVERSITY COMPULSORY COURSE
P	FACULTY CORE COURSE

4 SYLLABUS SYNOPSIS

4.1 BACHELOR DEGREE PROGRAMME

YEAR 1 COURSES - UNIVERSITY COMPULSORY

BLHW 1702 ISLAMIC AND ASIAN CIVILIZATION (TITAS)*

* Only for Malaysian students

LEARNING OUTCOMES

Pada akhir mata pelajaran ini, pelajar akan dapat:

LO1 Menjelaskan konsep asas ketamadunan melalui perbincangan kumpulan.

LO2 Menghubungkait sejarah dengan kemajuan tamadun bangsa di dunia melalui tugasan berkumpulan.

LO3 Merumus isu dan cabaran peradaban dunia melalui pembentangan kumpulan.

SYNOPSIS

Mata pelajaran ini menjelaskan tentang ilmu ketamadunan yang mencakupi definisi, pandangan semesta dan sumber ketamadunan. Mata pelajaran ini turut membincangkan persamaan dan perbezaan tamadun-tamadun dunia dengan mencari titik pertemuan melalui dialog peradaban. Selain itu, mata pelajaran ini juga turut mengupas isu dan cabaran semasa serta kesannya dalam perkembangan peradaban masa kini.

REFERENCES

a. Bakar, O., 2009, *Modul Pengajian Tamadun Islam dan Tamadun Asia*, Penerbit Universiti Malaya, Kuala Lumpur.

b. Arif, S., Noor, A. R. M., Hassan, M. A., Sulaiman, N. & Rawi, A. H. M., 2007, *Tamadun Islam dan Tamadun Asia*, Mc Graw-Hill (Malaysia) Sdn. Bhd., Kuala Lumpur.

c. Musa, H., 2005, *Pemerkasaan Tamadun Melayu Malaysia Menghadapi Globalisasi Barat*, Penerbit Universiti Malaya, Kuala Lumpur.

BLHL 1XX2 THIRD LANGUAGE

The following are examples of third language as offered by Centre for Language and Human Development (PBPI): Arab Language, Mandarin Language, Japanese Language and Bahasa Melayu Komunikasi**.

** Only for International students

BKKX XXX1 CO-CURRICULUM I

LEARNING OUTCOMES

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

LO1 Recognise a balanced and comprehensive education

LO2 Develop leadership aspects stressing on diciplines and cooperation within a group or organisaton.

LO3 Build personality and character guided by rules of conduct.

LO4 Foster cooperation and unity in multi-racial society.

SYNOPSIS

a. Cultural
   Choir, *Gamelan, Cak Lempung, Nasyid, Seni Khat*, Seni Lakon, Art, English Elocution, Bahasa Melayu Elocution, and *Kompang*.
b. Entrepreneurship
   Video, Film and Photography, Publishing & Journalism, Computer and Technopreneurship.
c. Society
   Fiqh Muamalat, *Fiqh Amali, Tahsin Al-Quran & Yaasin* and Peer Program.
d. Recreation
   Go-Kart, Adventure and Cycling.
e. Sports
   Swimming, Volley Ball, Golf, *Takraw*, Aerobic, Badminton, Football and Net ball.
f. Martial Arts
   Silat Gayong, Karate-Do and Taekwando.

YEAR 1 COURSES - COMMON CORE

BMFG 1113 ENGINEERING MATHEMATICS

LEARNING OUTCOMES

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

LO1 Describe the basic concept of partial derivatives, multiple integrals and vector-valued functions.
LO2 Select an appropriate technique to solve problems that involved partial derivatives, multiple integrals and vector-valued functions.
LO3 Apply the concept of partial derivatives, multiple integrals and vector-valued functions in solving engineering problems.
LO4 Perform the given tasks that pertain to the engineering problems by using the knowledge of engineering mathematics.

SYNOPSIS

This course consists of three chapters: Functions of Several Variables, Multiple Integrals and Vector-valued Functions. The syllabus is developed by introducing the concepts of the functions with severable variables, integration and also vector-valued function, followed by learning various techniques in solving the problems and its application in physical and engineering fields.

REFERENCES

a. Anton, H., & Bivens, I., Davis, S., 2010, *Calculus Multivariable*, 8th edition, John Wiley.
b. Kreyszig, E., 2009, *Advanced Engineering Mathematics*, 9th edition, John Wiley.
c. Trim, D., 2008, *Calculus for Engineers*, 4th edition, Prentice Hall.
d. James, G., 2007, *Modern Engineering Mathematics*, 4th edition, Prentice Hall.
e. Stroud, K. A, 2007, *Engineering Mathematics*, 5th Edition, Palgrave Macmillan.

BMFG 1213 ENGINEERING MATERIALS

LEARNING OUTCOMES

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

LO1 Explain the basic concepts of engineering materials in terms of interatomic bonding and crystal structure.
LO2 Analyze the properties of engineering materials based on its structure.

LO3 Apply the basic understanding of engineering materials properties to determine their processing method.

SYNOPSIS

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

REFERENCES

a. Callister, W.D. Jr., 2010, *Materials Science and Engineering - An Introduction*, 8th Edition. John Wiley & Sons Inc.
b. Smith, W.F., 1998, *Principle of Materials Science & Engineering*, 4th Edition, Mc. Graw Hill.
c. Shackelford, J.F., 2000, *Materials Science and Engineering - An Introduction*, 5th Edition, Prentice Hall.
d. Bolton, W., 2001, *Engineering Materials Technology*, 3rd Edition, BH Publisher.
e. Vernon, J. (2001) *Introduction to Engineering Materials*, 4th Edition, Palgrave MacMilan.

BMCG 1523 ENGINEERING GRAPHICS AND CAD

LEARNING OUTCOMES

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

LO1 Explain the engineering graphics fundamentals.
LO2 Construct technical drawing using manual sketching and computer aided design.
LO3 Communicate by using engineering drawings.

SYNOPSIS

The course will provide students with an understanding of the importance of engineering graphics as a communication tool among engineers. Student will be exposed to the engineering graphics fundamentals of manual sketching, geometric dimensioning and tolerancing, graphic projections, sectioning and engineering drawings. Students will develop visualization skills by constructing technical drawings using manual sketches and computer aided design (CAD) software. The course consists of both lecture and practical session where students will be guided in presenting and interpreting engineering drawings correctly.

REFERENCES

a. Rizal, M. A. et al., 2009, *Modul Lukisan Berbantu Komputer*, Penerbit Universiti Teknikal Malaysia Melaka, Melaka.
b. Dix, M. & Riley, P., 2014, *Discovering AutoCAD 2014*, Prentice Hall, New York.
c. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. and Novak, J. E., 2011, *Technical Drawing*, 14th Ed., Prentice Hall, New York.
d. Jensen, C., & Jay D. H., 2007, *Engineering Drawing and Design*, 7th Ed., Glencoe and McGraw Hill, New York.
e. Frederick, E. G. & Mitchell, A., 2008, *Technical Drawing and Engineering Drawing*, 14th Ed., Prentice Hall.

BMCG 1113 STATICS

LEARNING OUTCOMES

On successful completion of this course, student should be able to:

LO1 Describe and apply the basic concepts and fundamental principles of engineering mechanics (statics).

LO2 Analyze and solve equilibrium problems of particle and rigid body.
LO3 Work as an effective member of a team to solve engineering mechanics (statics) problems.

SYNOPSIS

The engineering mechanics of statics provides an introduction and 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

a. Hibbeler, R.C., 2013, *Engineering Mechanics – Statics*, 13th Ed., Prentice Hall.
b. Beer, F.P., and Johnston, E.R., 2011, *Statics and mechanics of materials*, McGraw-Hill.
c. Morrow, H.W., 2011, *Statics and Strength of Materials*, Prentice Hall.
d. Mott, R.L., 2010, *Statics and strength of materials*, Prentice Hall.

BMCG 1013 DIFFERENTIAL EQUATIONS

LEARNING OUTCOMES

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

LO1 Describe the basic concept and solution of second order differential equations, Laplace transform and Fourier series.
LO2 Select an appropriate technique to solve problems involving differential equations.
LO3 Apply the concept of differential equations in solving engineering problems.

SYNOPSIS

This course is intended to introduce the concept and theories of differential equations. Second order linear differential equations with constant coefficients will be solved by using the methods of undetermined coefficient, variation of parameters and Laplace transform. Fourier series in relation to periodic functions will be discussed. An introduction to the solution and application of partial differential equations with boundary value problems using the method of separation of variables and Fourier series will also be discussed.

REFERENCES

a. Muzalna, M. J., Irmawani, J., Rahifa, R., Nurilyana, A. A., 2010, *Module 2: Differential Equations*, Penerbit UTeM.
b. Cengel, Y. A., & Palm, W. J., 2013, *Differential Equations for Engineers and Scientists*, 1st Ed. McGraw-Hill., U.S.A.
c. Nagle, R. K., Saff, E. B., & Snider, A. D., 2011, *Fundamentals of Differential Equations and*
d. *Boundary Value Problems*, 6 th Ed. Pearson Education Inc., U.S.A.
e. Kohler, W., & Johnson, L., 2011. *Elementary Differential Equations with Boundary Value Problems*. Pearson Education Inc., U.S.A.
f. Edwards, C. H., & Penny, D. E., 2008. *Differential Equations and Boundary Value Problems*, 4 th Ed. Pearson Education Inc., New Jersey, U.S.A.

BITG 1233 COMPUTER PROGRAMMING

LEARNING OUTCOMES

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

LO1 Describe the fundamental principles of problem solving, programming techniques and structures in program development.
LO2 Explain problems and their solutions based on the principles of problem solving and programming techniques.

LO3 Trace and debug in troubleshooting program applications.
LO4 Construct computer program codes by applying suitable programming structures and techniques.

SYNOPSIS

This course covers the introductory topics in programming using C++ language. It includes the introduction to computers and programming, the fundamentals of programming, problem solving and software development. Data types and operators, selection, repetition, function, array, file, structured data and pointer are among the topics covered in the course.

REFERENCES

a. Gaddis, T., 2011, *Starting Out with C++ Brief Version: From Control Structures Through Objects*, 7th. Edition, Pearson Education.
b. Abdullah, N. et. al, 2006, *Lab Module Computer Programming BITG 1113*, FTMK, UTeM
c. Friedman, Koffman, 2010, *Problem Solving, Abstraction and Design using C++*, Pearson Education.
d. Etter, D.M., Ingber, J.A., 2008, *Engineering Problem Solving with C++*, 2nd Edition, Pearson Education.
e. Hanly, J.R, 2002, *Essential C++ for Engineers and Scientists*, Addison Wesley.

BEKG 1233 PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT

LEARNING OUTCOMES

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

LO1 Describe the principle, various terms and standards in measurement.
LO2 Explain the principles of measurement devices.
LO3 Apply the suitable bridge techniques to measure component values such as resistance, inductance and capacitance.
LO4 Explain the operation, function and applications of transducers/sensors.

SYNOPSIS

This course discusses about units and dimensions, standards, errors, static characteristic, noise and calibration in measurement devices such as galvanometers, ammeters, voltmeters, wattmeter, temperature, force and torque and pressure measurement as well as accelerometer. It also introduces oscilloscope and sensors for instrumentation application.

REFERENCES

a. Kalsi, H.S., 2010, *Electronic Instrumentation*, 3rd Ed., Tata McGraw Hill.
b. Bakshi, U.A., Bakshi, A.V., and Bakshi, K.A., 2009, *Electronic Measurements and Instrumentation*, Technical Publications Pune.
c. Wolf. S., Smith, R.F.M., 2004, *Reference Manual for Electronic Instrumentation Laboratories*, 2nd Ed., Prentice-Hall.
d. Vaisala, V.O., 2006, *Calibration Book*

BEKG 1123 PRINCIPLES OF ELECTRIC AND ELECTRONICS

LEARNING OUTCOMES

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

LO1 Explain the basic electrical and electronics principles, circuit schematics and components.
LO2 Demonstrate the electrical and electronic knowledge to solve the series and parallel

circuits in DC and phasor approach for AC circuit.

LO3 Explain the principle knowledge of semiconductor devices for Diode, BJT and Op Amp.

LO4 Apply the electronic knowledge to solve the Diode, BJT and Op Amp circuits.

SYNOPSIS

This course will discuss about the basic principles of electrical and electronics; Introduction to electric element, symbol and components. KCL, KVL, Node and Mesh in solving DC series and parallel circuit. Introduction in magnetism, electromagnetism and AC characteristic. Introduction to semiconductors, atomic structures, energy band, P-type and N-type. Study on structure, principle and application of diode, BJT and Op-Amp circuits.

REFERENCES

a. Floyd, T.L., 2010, *Principles of Electric Circuits*, Pearson, 9th Ed.

b. Floyd, T.L., and Buchala, D.M., 2010, *Electric Circuits Fundamentals*, Pearson, 8th Ed. (2010)

c. Boylestad, R.L., Nasheslsky, L., 2010, *Electronic Devices and Circuit Theory*, Pearson Prentice Hall.

YEAR 1 COURSES - PROGRAMME CORE

BMCG 1011 MECHANICAL ENGINEERING LABORATORY I

LEARNING OUTCOMES

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

LO1 Observe discipline in attending laboratory sessions, applied safety precautions before, during and after conducting experiments in terms of experimental procedures and aware of the general experimental ethics.

LO2 Use basic mechanical engineering instruments to measure engineering variables pertinent to the conducted experiments

LO3 Write a well organised, sensible and readable technical reports which describe the experiment in a standard writing format

SYNOPSIS

Introduction to Science, Engineering and Technology. Introduction to safety. Ethics in laboratory. Use of scientific method. Mechanical measurement concept. Introduction to measuring devices. Basic engineering instruments. Use of instrument to measure engineering variables. Experimental report writing. The experiments will be conducted in mechanical engineering laboratories that study fundamental engineering concepts in statics, dynamics, material sciences, measurements and instrumentation as well as engineering drawing.

REFERENCES

a. Wheeler, A.J. and Ganji, A.R., 2010. Introduction to Engineering Experimentation, 3rd Edition, International Edition, Pearson.

b. Alan, S.M., 2001. Measurement and Instrumentation Principles, 1st Edition, Butterworth-Heinemann

c. Holman, J.P. 2001. Experimental Methods for Engineers. 7th Ed., McGraw Hill.

BMCG 1213 DYNAMICS

LEARNING OUTCOMES

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

LO1 Describe the fundamentals of dynamics.

LO2 Apply the dynamics of particles and rigid bodies using principle of force and acceleration, work and energy, and impulse and momentum.

LO3 Apply the laws of dynamics to analyze and interpret the dynamics of particles and rigid bodies.

SYNOPSIS

This course introduces the principle of kinematics and kinetics of particles and rigid bodies. The lessons cover the concept of position, velocity and acceleration of particles; and application of Newton's second law, Principle of Work and Energy, Principle of Impulse and Momentum for both particles and rigid bodies.

REFERENCES

a. Hibbeler, R. C., 2012, *Engineering Mechanics, Dynamics*, 13th Edition, Prentice Hall.

b. Beer, F. P., Johnston, E. R. and Flori, R., 2008, *Mechanics for Engineers, Dynamics*, 5th Edition, McGraw-Hill.

c. Beer, F. P., Johnston, E. R., Clausen, W. E., Eisenberg, E. R. and Cornwell, P. J., , 2010, *Vector Mechanics for Engineers: Dynamics*, 9th Edition, McGraw Hill.

YEAR 2 COURSES - UNIVERSITY COMPULSORY

BLHW 2712 ETHNIC RELATIONS

LEARNING OUTCOMES

Pada akhir mata pelajaran ini, pelajar akan dapat:

LO1 Menganalisis peranan hubungan etnik dan kepentingannya dalam proses pembangunan Malaysia melalui perbincangan kumpulan.

LO2 Memberi respons tentang isu dan cabaran etnik budaya di Malaysia melalui pembentangan kumpulan.

LO3 Merumus isu-isu perpaduan dan cadangan untuk memperkasakannya di Malaysia melalui penulisan artikel.

SYNOPSIS

Mata pelajaran ini membincangkan konsep-konsep asas budaya, peranan etnik dan pengaruhnya terhadap sosiopolitik dan sosioekonomi negara khususnya dalam merealisasikan agenda perpaduan. Mata pelajaran ini juga memberi pendedahan tentang isu-isu dan cabaran dalam konteks perpaduan di Malaysia. Selain itu, mata pelajaran ini turut mengupas perkembangan globalisasi dan kesannya ke atas jati diri dan proses pembangunan di peringkat Malaysia. Selain itu mata pelajaran ini akan merumuskan isu-isu perpaduan dan cadangan penambahbaikannya di Malaysia.

REFERENCES

a. Baharuddin, S.A., 2012, *Modul Hubungan Etnik Edisi Kedua.Bangi: Institut Kajian Etnik*, Universiti Kebangsaan Malaysia.

BKKX XXXX CO-CURRICULUM II

LEARNING OUTCOMES

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

LO1 Recognise a balanced and comprehensive education

LO2 Develop leadership aspects stressing on diciplines and cooperation within a group or organisaton.

LO3 Build personality and character guided by rules of conduct.

LO4 Foster cooperation and unity in multi-racial society.

SYNOPSIS

a. Cultural
   Choir, Gamelan, Cak Lempung, Nasyid, Seni Khat, Seni Lakon, Art, English Elocution, Bahasa Melayu Elocution, and Kompang.
b. Entrepreneurship
   Video, Film and Photography, Publishing & Journalism, Computer and Technopreneurship.
c. Society
   Fiqh Muamalat, Fiqh Amali, Tahsin Al-Quran & Yaasin and Peer Program.
d. Recreation
   Go-Kart, Adventure and Cycling.
e. Sports
   Swimming, Volley Ball, Golf, Takraw, Aerobic, Badminton, Football and Net ball.
f. Martial Arts
   Silat Gayong, Karate-Do and Taekwando.

BLHW 2403 TECHNICAL ENGLISH

LEARNING OUTCOMES

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

LO1 Distinguish the use of tenses, run-ons, fragments, modifiers and parallelism.

LO2 Summarise and paraphrase main ideas.

LO3 Write a proposal as well as progress and project reports in a group.

LO4 Organise and present project report in groups.

SYNOPSIS

This course is content-based in nature and aims to equip students with the necessary language skills required to write various reports. As this course prepares students for the mechanics of the different genres of writing, the emphasis is on proposal, progress and project reports by employing Student-Centred Learning approach. It also introduces students to the elements of presentation as well as provides them with the necessary grammar skills in writing.

REFERENCES

a. Devi, S. I., Khamis, N., Suradi, N., Zainal Abidin, N., Abdullah, F., Hamdzah, N. L. A., Ahmad Ahsan, N.I., Rajendraan, E.,& Teh Zanariah Mohd Raus, T.Z., 2008, *Technical English*. Melaka: Pusat Bahasa dan Pembangunan Insan, UTeM.
b. Anderson, P. V., 2007, *Technical communication: A reader-centred approach* , 6th ed, California: Wadsworth Publishing.
c. Finkelstein, L. J., 2007, *Pocket book of technical writing for engineers and scientists*, 3rd ed., New York: McGraw Hill.
d. Hart, H., 2008, *Introduction to engineering communication,* 2nd ed., London: Prentice Hall.
e. Indra Devi, S. & Jano, Z., 2008, *Technical report writing*, Kuala Lumpur: Pearson Prentice Hall.

YEAR 2 COURSES - COMMON CORE

BEKG 2433 ELECTRICAL SYSTEM

LEARNING OUTCOMES

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

LO1 Explain the basic principle of electromagnetism, power concepts & equations, power factor corrections (single and three-phase system) and per-unit calculation.

LO2 Analyze the characteristics for static and rotation electric machine principles, including AC, DC, Synchronous and induction motor and transformer.

LO3 Apply the concepts of the electric power system network (generation, transmission and distribution) and various power generation system and energy sources.

LO4 Apply the characteristics and performance of electrical transmission line and distribution system.

SYNOPSIS

This is an introductory course for students on the fundamental knowledge of electrical power system. The students will be taught on the physics of electrical power system, which includes the theory and analysis of electromagnetism, followed bypower concepts &equations (single and three phase), power factor &power factor corrections, single and three-phase system and per-unit calculation. There will also topics on characteristics for static and rotating electric machine principles, including AC, DC, synchronous, induction motor and transformer. Furthermore, students will be introduced to the concepts on the electric power system network (generation, transmission and distribution) and various power generation system and energy sources.The students will also learn on basic characteristics and performance of electrical transmission line and distribution system.

REFERENCES

a. Glover, S. & Overbye, 2012, *Power System Analysis and Design*, 5th ed., Cengage Learning.

b. Saadat, H., 2004, *Power System Analysis*, 2nd ed., Mc-Graw Hill.

c. Hughes, *Electrical and Electronic Technology*, 10th ed., UK: Pearson Edu. Ltd.

BENG 2142 STATISTICS

LEARNING OUTCOMES

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

LO1 Identify clearly the concept of probability for a range of discrete and continuous random phenomena.

LO2 Apply the concept of sampling distribution, estimation and hypothesis testing to draw valid conclusion in solving engineering problems.

LO3 Analyze and interpret data by using simple linear and multiple linear regression techniques to forecast and produce statistical information.

LO4 Perform the given tasks that pertain to the engineering problems by using the knowledge of statistics.

SYNOPSIS

Topics covered: data description, measurement, probability, discrete random variable, continuous random variable, sampling distribution, estimation, hypothesis testing, simple linear regression and

multiple linear regression. The students are required to use SPSS and Minitab software to analyze and interprete the real engineering data. Applications of statistics in engineering are also explained in this course.

REFERENCES

a. Walpole, R.E, et al, 2011, *Probability & Statistics for Engineers & Scientists*, 9th Edition, Pearson Prentice Hall.
b. Sara, S., et al, 2008, *Introduction to Statistics & probability A Study Guide*, Pearson Prentice Hall.
c. Hayter, A. J., 2012, *Probability and Statistics for Engineers and Scientists*, 4th Edition, Thomson Brooks/Cole.
d. Montgomery, D.C., 2011, *Design & Analysis of Experiments*, 7th Edition, John Wiley & Sons, Inc.
e. Ledolter, J., & Hogg, R.V., 2010, *Applied Statistics for\engineer and Physical Scientists*, 3rd Edition. Pearson Prentice Hall.

BEKG 2452 NUMERICAL METHODS

LEARNING OUTCOMES

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

LO1 Identify the errors exist in numerical computations.
LO2 Solve the mathematical problems by using the numerical methods.
LO3 Perform the given tasks that pertain to the engineering problems by using the knowledge of numerical methods.
LO4 Develop computational code for numerical methods.

SYNOPSIS

Topics covered: Errors; Solution of Nonlinear Equations; Solution of Linear Systems; Interpolation and Curve Fitting; Eigenvalues and Eigenvectors; Numerical Differentiation; Numerical Integration; Solution of Ordinary Differential Equations; Solution of Partial Differential Equation; Introduction to SCILAB and its application in the numerical computations.

REFERENCES

a. Burden, R., Faires, J.D., 2011, *Numerical Analysis*, 9th ed., USA: Brooks/Cole, Cengage Learning.
b. Khoo, C.F., 2011, *Using SCILAB for Numerical Methods*, Module in preparation.
c. Chapra, S.C., Canale R.P., 2010, *Numerical Methods for Engineers*, 6th ed., New York: McGraw-Hill.
d. Khoo, C.F., SharifahSakinah, S.A, Zuraini, O., Lok Y. Y., 2009, *Numerical Methods*, 3rd ed., Petaling Jaya: Pearson Prentice Hall.
e. Chapra S.C., 2008, *Applied Numerical Methods with Matlab for Engineers and Scientists*, 2nd ed., New York: McGraw-Hill

YEAR 2 COURSES - PROGRAMME CORE

BMCG 2113 SOLID MECHANICS I

LEARNING OUTCOMES

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

LO1 Describe and apply the basic concepts and fundamental principles of solid mechanics.

LO2 Analyse and solve the state of stress and strain in elastic structural members under various loading conditions.

LO3 Analyze and determine the principle stresses for plane stress problem due to combine loading.

SYNOPSIS

Introduction to various types of structures and type of supports. Concepts of stress, strain, shear force and bending moment. Theory on torsion. Pure bending on a structure. Combination of loads. Transformation of stress.

REFERENCES

a. Beer, F.P., Johnston E.R., Jr, John, T., Dewolf, Kazurek, D. F., 2012, *Mechanics of Materials*, 6th Edition (Global Edition) , McGraw-Hill.

b. Hibbeler, R.C., 2011, *Mechanics of Materials*, 8th Edition in SI Unit, Prentice Hall.

c. Gere, J.M., 2004, *Mechanics of Materials*, Thomson.

d. Vable, M., 2002, *Mechanics of Materials*, Oxford University Press.

e. Shames, I.H., 2000, *Introduction to Solid Mechanics*, Prentice Hall.

BMCG 2713 THERMODYNAMICS I

LEARNING OUTCOMES

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

LO1 Define the First and Second Law of Thermodynamics.

LO2 Apply the thermodynamic principles using property tables.

LO3 Solve the thermodynamics processes relating to ideal gas and pure substances.

SYNOPSIS

The aim of this course is to provide students a basic understanding of the thermodynamics fundamental laws and the ability to implement them in solving a range of simple engineering problems. The course covers the following topics:

- Introduction to thermodynamics: relevance in the context of energy and the environment.
- Basic concepts: microscopic and macroscopic points of view, system and control volume approaches, properties, state, equilibrium, processes and cycles.
- Energy, heat, work and the First Law: kinetic, potential and internal energy; heat transfer; displacement work and shaft work; the first law of thermodynamics for a system.
- Properties of substances: pure substances; the two-property rule, state diagrams; intensive and extensive properties; internal energy, enthalpy and specific heats; ideal and perfect gases; phase change, vapour and liquid properties, steam and water.
- The First Law for flow processes: the steady-flow energy equation and application to e.g. throttling processes, nozzles, turbines, pumps, compressors.
- Consequences of the Second law: Clausius inequality, definition of entropy, state diagrams using entropy; T dS relationships; isentropic processes for perfect gases; isentropic

efficiency; simple ideas of work potential in the presence of the environment.

REFERENCES

a. Cengel, Y.A., & Boles, M.A., 2014, *Thermodynamics: An Engineering Approach*, 8th Edition, McGraw-Hill, Singapore.
b. Moran, M.J., Shapiro, H.N., Boettner, D.D. & Bailey, M.B., 2014, *Fundamental of Engineering Thermodynamics*, 8th Edition, John Wiley & Sons, Inc.
c. Borgnakke, C. & Sonntag, R. E., 2012, *Fundamentals of Thermodynamics*, 8th Edition, John Wiley & Sons, Inc.

BMCG 2613 FLUID MECHANICS I

LEARNING OUTCOMES

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

LO1 Define and describe the basic concepts and fundamental principles of fluid mechanics

LO2 Apply fluid mechanics equations in solving fluid mechanics problem.

LO3 Analyse the fluid mechanics concepts in solving fluid mechanics problem

SYNOPSIS

The introduction to the basic physical properties of fluids. Definition of pressure and head. Derivation of hydrostatic equation and its application in pressure measurement, static forces analysis on immersed surface and buoyancy analysis. The introduction to fluid dynamics and fluid flow analysis. 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. Dimensional analysis and its application.

REFERENCES

a. Cengel, Y. A. and Cimbala, J. M., 2009, *Fluid Mechanics: Fundamentals and Applications*, 2nd International Ed., McGraw-Hill, Singapore.
b. Munson, B.R., Young D.F. and Okiishi, T.H., 2009, *Fundamentals of Fluid Mechanics*, 6th Ed., John Wiley & Sons, Inc, Asia.
c. Douglas, J. F., Gasiorek J. M. and Swaffield, J. A., 2006, *Fluid Mechanics*, 5th Ed., Prentice Hall, Spain.

BMCG 2011 MECHANICAL ENGINEERING LABORATORY II

LEARNING OUTCOMES

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

LO1 Observe discipline in attending laboratory sessions, applied safety precautions before, during and after conducting experiments in terms of experimental procedures and aware of the general experimental ethics.

LO2 Plan, design and conduct experiments to prove a proposed hypothesis out of a given real and practical engineering problem.

LO3 Analyse experimental results that include graphical data presentation and error analysis.

LO4 Write a well organised, sensible and readable technical reports which describe the experiment in a standard writing format.

SYNOPSIS

Introduction to safety procedures in a laboratory. Hypothesis formulation. Design of experiments. Data Analysis. Use of graphical presentation techniques for experimental data. Error and uncertainty. Measurement Accuracy and Precision. Statistical analysis. Good laboratory report writing.

The experiments will be conducted in mechanical engineering laboratories that study fundamental engineering concepts in thermodynamics, fluid mechanics, solid mechanics and mechanical design.

REFERENCES

a. Wheeler, A.J. and Ganji, A.R., 2010. *Introduction to Engineering Experimentation*, 3rd Ed., International Edition, Pearson.
b. Alan, S.M., 2001. *Measurement and Instrumentation Principles*, 1st Ed., Butterworth-Heinemann
c. Holman, J.P. 2001. *Experimental Methods for Engineers*. 7th Ed., McGraw Hill.

BMCG 2513 COMPUTER AIDED DESIGN AND MANUFACTURING

LEARNING OUTCOMES

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

LO1 Acquire and apply fundamental sketching and feature modeling, build feature based models of parts and assemblies for easy editing.
LO2 Produce document design intent of parts and assemblies in manufacturing drawings.
LO3 Design and develop products effectively through the applications of engineering design methodology.

SYNOPSIS

This course will empower the students with fundamental knowledge and technical skills of 3D solid modeling skills using industry-proven 3D mechanical CAD/CAM software. The students will learn about theory of CAD/CAM systems, the different techniques for creating sketches, solid models, assemblies and CAM operations 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, drafting stages and machining stages.

REFERENCES

a. Dassault Systeme, 2012, *Solidworks 2012 Essential Part Assembly and Drawing*, France.
b. Dassault Systeme, 2006, *CATIA R16: Part Design Fundamental* and CATIA machining, France.
c. Rao, P.N., 2004, *CAD/CAM Principles and Applications*, 2nd Edition, McGraw Hill.

BMCG 2312 MANUFACTURING PROCESS

LEARNING OUTCOMES

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

LO1 Explain the result of manufacturing processes by applying knowledge of material science and engineering fundamentals.
LO2 Analyse the issues and aspects of manufacturing in order to select the most suitable manufacturing processes for a particular component.
LO3 Demonstrate knowledge of understanding on the impact of manufacturing solutions to societal and environmental contexts.

SYNOPSIS

This course covers theoretical issues of manufacturing and the quality aspects of manufacturing such as quality assurance and tolerance. The type and fundamental principle of joining processes, metal casting processes, forming processes, shaping processes, material removal processes, modern machining processes and their equipments are also covered. The quantitative problem analysis of certain manufacturing processes is included as well. Societal and environment issue in manufacturing processes are also included. Finally the need to engage in life-long learning processes is emphasised as to ensure students alert on the manufacturing technological changes.

REFERENCES

a. Groover, M.P., 2007, *Fundamentals of Modern Manufacturing*, 3rd Edition, John Wiley & Sons Inc.

b. Kalpakjian, S., and Schmid, S. R., 2001, *Manufacturing Engineering and Technology*, 5th Edition,Prentice Hall International.
c. Schey, J.A., 1999, *Introduction to Manufacturing Processes,* McGraw Hill.

BMCG 2021 MECHANICAL ENGINEERING WORKSHOP

LEARNING OUTCOMES

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

LO1 Identify common shop hazards and use common shop safety equipments.
LO2 Use various kinds of hand tools, measuring tools and equipments for workshop practice.
LO3 Work as an effective member of a team to produce engineering products.

SYNOPSIS

This course covers the fundamentals of cutting, forming, joining and machining processes. The processes include sheet metal forming, welding, conventional milling and CNC Lathe. Other aspects such as handling, safety regulations, and main functions of the machining are introduced. The students will be exposed with practical use of the machine.

REFERENCES

a. Kalpakjian, S. & Schmid, S.R., 2013, *Manufacturing Engineering and Technology*, 7th Ed., Pearson.
b. Groover, M.P., 2007, *Fundamentals of Modern Manufacturing*, 5th Ed., John Wiley & Son Inc.
c. Mike, T., 2000, *Basic Manufacturing*, Butterworth-Heinemann.

BMCG 2212 MICROPROCESSOR TECHNOLOGY

LEARNING OUTCOMES

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

LO1 Explain the architectures of microprocessor technology and its components.
LO2 Characterize functions of microprocessor and the peripheral devices.
LO3 Design applications for the simple problems in the field of control of processes and machines using microprocessor technology.

SYNOPSIS

Introduction and examples of practical utilizations in the field of control systems, data acquisition and communication using the microprocessor technology. Explanation of basic terms (memory, bit, byte, word, address, bus, microprocessor, microcomputer, register, instruction, instruction set, program, stack, arithmetical/logical unit) and basic principles of the program execution (interrupt and timer/counter) . Principles of the function and utilization of the input/output ports as general digital inputs and outputs for switches, sensors, LED indicators, alphanumeric LCD, DC and stepper motors. Utilization of the A/D converter and serial communication interface for application on mechanical sensors.

REFERENCES

a. Martin, P. B., 2013, *PIC Microcontrollers*, 3rd Edition, Newnes.
b. Borowik, B., 2011, *Interfacing Microcontroller to Peripheral Devices*, Springer.
c. Wilmshurst, T., 2010, *Designing Embedded Systems with PIC Microcontrollers*, 2nd Edition, Newnes.
d. Osborn, G., 2010, *Embedded Microcontrollers and Processor Design*, 1st Edition, Prentice Hall.
e. Mazidi, M.A., *AVR Microcontroller and Embedded Systems*, 1st Edition, Pearson.

YEAR 3 COURSES - UNIVERSITY COMPULSORY

BLHW 3403 ENGLISH FOR PROFESSIONAL COMMUNICATION

LEARNING OUTCOMES

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

LO1 Produce a recommendation report based on a given scenario using appropriate tenses, parallel structures, and modifiers.

LO2 Demonstrate professional communication skills in oral presentation and job interview.

LO3 Role-play and conduct meetings in groups.

LO4 Compose a resume and an application letter relevant to the respective job.

LO5 Differentiate between facts and opinions, and use vocabulary relevant to its context.

SYNOPSIS

This course is designed to develop students' written and oral communication skills, as well as to enhance their level of English literacy which will be beneficial to their professional careers. Students are taught to write application letter and resume according to the format required by the workplace. In addition, they are also taught to produce a recommendation report. Students also acquire effective presentation skills as well as gain experience in mock interviews and meetings prior to seeking employment. Grammar is taught implicitly. The Student-Centred Learning approach is employed in the teaching and learning process.

REFERENCES

a. Azar, B.S., 2010, *Understanding and using English grammar*, New York: Longman.

b. Casher, C.C. & Weldon, J., 2010, *Presentation excellence: 25 tricks, tips and techniques for professional speakers and trainers*, USA: CLB Publishing House.

c. Chin, F.C.J., Soo, K.S.E., & Manjuladevi, R., 2010, *English for professional communication: Science and engineering*, Singapore: Cengage Learning Asia Pte Ltd.

d. Khoo, M.S.L, Abdul Rahim, R., & Rajendraan, E., 2006, *Communication at the work place*, Melaka: Jabatan Bahasa dan Komunikasi, UTeM.

YEAR 3 COURSES - COMMON CORE

BMCU 3935 INDUSTRIAL TRAINING

LEARNING OUTCOMES

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

LO1 Acquire on-job training or in-plant training in a working environment relevant to the field of mechanical engineering.

LO2 Develop appropriate soft skills and professional engineering environment exposure throughout the duration of industrial training.

LO3 Apply all knowledge in order to solve common industrial problems as an individual and as a leader in a group or a member of a team.

LO4 Practice the ethics of social, environmental and cultural responsibilities appropriately during industrial training.

SYNOPSIS

Students in third year are required to undergo industrial training for a minimum of 10 weeks at the designated organisation. During the industrial training, students are given continuous supervision by an industrial supervisor as well as supervisor appointed by the faculty. Daily activities throughout the industrial training must be recorded in a log book provided by the faculty, which will be evaluated by the supervisors. Five credit-hours are given for this industrial training. Students must show satisfactory attendance and discipline in order to pass this course. The faculty' supervisor may visit the students during the training period.

YEAR 3 COURSES - PROGRAMME CORE

BMCG 3113 MECHANICS OF SOLIDS II

LEARNING OUTCOMES

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

LO1 Analyse plane-strain problems, strain measurements, stress-strain for pressure vessels and finally apply yield criteria to avoid elastic failure or yielding.

LO2 Analyse and solve the deformation of structural members based on double integration and energy methods.

LO3 Evaluate and solve buckling problem of structural members under compressive axial load and plastic collapse of mechanical members due to various loading conditions.

SYNOPSIS

Transformation of plane-strain and measurements of strain. Pressure vessels: thin, thick and compound cylinders. Yield criteria for ductile and brittle materials. Deflection of beams. Strain energy: Energy concept and Castigliano's theorem. Column: Euler's buckling stress and Secant Formula. Plastic deformation due to axial, bending and torsional loadings and residual stresses.

REFERENCES

a. Beer, F.P, Johnston, E.R., Dewolf, J.T., and Mazurek, D.F., 2012, *Mechanics of Materials*, 6th edition. McGraw-Hill.

b. Hibbeler, R.C., 2011, *Mechanics of Materials*, SI Ed., Prentice Hall.

c. Gere, J.M., 2012, *Mechanics of Materials*, CL Engineering.

BMCG 3313 ENGINEERING DESIGN

LEARNING OUTCOMES

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

LO1 Explain and apply an appropriate design method at the particular design phase in the course of developing a practical solution of an engineering design problem.

LO2 Develop a practical design solution through a systematic investigation of the engineering design problem.

LO3 Communicate effectively in written, oral and visual means in a technical setting.

SYNOPSIS

This course covers Engineering Design process started from problems analysis, Formulating Design problems, Concept Design, Configuration Design, Parametric Design, Detail Design and Prototypes Development. Suitable methods such as QFD, Weighted Objective Method will be used at the particular design stage. Engineering Economics aspect of product, human factor, ethic and safety in

design is included. Design for Manufacture and Assembly (DFMA) is a part of this course. In addition students are required to carry out teamwork project and communicate effectively in written and oral in the technical setting.

REFERENCES

a. Dieter, G.E., Schmidt, L.C, 2009, *Engineering Design*, 4th Edition, McGraw- Hill/Higher Education, Singapore.
b. Ulrich, K.T. and Eppinger, S.D., 2009, *Product Design and Development*, McGraw-Hill
c. Ullman, D.G., 2004, *The Mechanical Design Process*, McGraw-Hill Education (Asia), Singapore.

BMCG 3713 THERMODYNAMICS II

LEARNING OUTCOMES

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

LO1 Apply the principles of thermodynamics (the first and the second laws of thermodynamics) to the optimal design of the basic energy conversion systems: power generation, refrigeration and air-condition.

LO2 Analyze energy conversion systems in the course of their operation, engineering design quantities and their effects on the basic performance characteristics.

LO3 Design the basic energy conversion systems, select working fluids and estimate the system efficiency.

SYNOPSIS

Thermodynamics II is a continuation of Thermodynamics I (BMCG 2713). Thermodynamics principles are applied to the analysis of power generation, refrigeration and air-conditioning systems. Energy and availability analysis (exergy), moist air properties and psychrometric chart and analysis are discussed in this course.

REFERENCES

a. Cengel, Y.A., & Boles, M.A., 2014, *Thermodynamics: An Engineering Approach*, 8th Edition, McGraw-Hill, Singapore.
b. Moran, M.J., Shapiro, H.N., Boettner, D.D. & Bailey, M.B., 2014, *Fundamental of Engineering Thermodynamics*, 8th Edition, John Wiley & Sons, Inc.
c. Borgnakke, C., & Sonntag, R.E., 2012, *Fundamentals of Thermodynamics*, 8th Edition, John Wiley & Sons, Inc.

BMCG 3613 FLUID MECHANICS II

LEARNING OUTCOMES

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

LO1 Understand and apply the principles of fluid mechanics (Fluid kinematics and fluid dynamics, boundary layer theory, turbomachinery and similitude) to engineering problems

LO2 Analyze and evaluate the flow system (wall bounded, internal and external flow and turbomachinery) for discerning its characteristic and/or performance

LO3 Evaluate the flow system (wall bounded, internal and external flow and turbomachinery) for engineering application

SYNOPSIS

Introduction to the concept of fluid flow. Two dimensional ideal fluid flows. Viscous flow field and differential analysis of fluid motion. Vortex and Drag. Boundary layer theory, Von Karman Equation, Prandtl-Blasius solution. Dimensiona Analysis and similarity. Working concepts and performance prediction of some fluid machineries such as pumps

and turbines. Fundamental introduction of Computational Fluid Dynamics (CFD).

REFERENCES

a. Cengel, Y.A. & Cimbala, J.M., 2009, *Fluid Mechanics: Fundamentals and Applications*, 2nd Ed., McGraw-Hill, Singapore.
b. Munson, B.R., Young, D.F., & Okiishi, T.H., 2009, *Fundamentals of Fluid Mechanics*, 6th Ed., Wiley,
c. Crowe, C.T., Elger, D.F., Roberson, J.A. & Williams, B.C., 2008, *Engineering Fluid Mechanics*, 9th Ed, Wiley.

BMCG 3333 MECHANICAL DESIGN

LEARNING OUTCOMES

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

LO1 Apply the formulation for optimized and safe design based on engineering standard.
LO2 Analyze the statics and dynamics of mechanical systems design
LO3 Evaluate mechanical design system in solving complex engineering problem.

SYNOPSIS

This course covers a brief review of the Engineering Design Process, Design for Static Strength, Design for Fatigue Strength, Linkage Mechanisms and the Applications of Springs and Brakes, Design of Threaded and Welded Joints, Bearings and Shafts Design and Balancing, the Basics of Gyroscopes, Gear Strength for Power Transmission,as well as the Belt and Chain for Flexible Power Transmission.

REFERENCES

a. J. K. Nisbett & R. G. Budinas, 2014 Shigley's Mechanical Engineering Design, Ninth Edition in SI Units, McGraw-Hill Companies, Inc., New York.
b. Peter R. N. Childs BSc. And D.Phil , 2013, Mechanical Design Engineering Handbook Butterworth-Heinemann; 1 edition (November 18, 2013).
c. Michael F. Ashby., 2010, Materials Selection in Mechanical
d. Design, Fourth Edition 4th Edition, Butterworth-Heinemann; 4
e. edition (October 5, 2010).

BMCG 3223 CONTROL ENGINEERING

LEARNING OUTCOMES

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

LO1 Derive mathematical model and obtain transfer function of dynamic systems.
LO2 Explain stability of control system using standard techniques in times domain and analyze the time response of the system.
LO3 Utilize frequency response techniques and its relative stability to control the dynamic systems.

SYNOPSIS

Introduction to open loop and closed-loop control systems. Modeling of real system using differential equations to obtain the transfer function of dynamic systems and utilization of block diagrams for the closed-loop control system. Analysis of system for stability in time and frequency domains, final value, steady-state error, overshoot and settling time. Application of controller such as, P, PI and PID algorithms to achieve the desired system response.

REFERENCES

a. Ogata, K., 2010, *Modern Control Engineering*, 5th Edition, Pearson Education Inc.
b. Franklin, G.F., 2009, *Feedback Control of Dynamics Systems*, 6th Edition, Pearson Education Inc.
c. Ogata, K., 2004, *System Dynamics*, 4th Edition, Pearson Education Inc.

BMCU 3013 INTEGRATED DESIGN PROJECT

LEARNING OUTCOMES

LO1 Design solution by synthesizing mechanical engineering knowledge that will solve complex mechanical engineering problem in accordance withrelevant standards.

LO2 Utilize modern engineering and IT tools in facilitatingsolutions to complex mechanical engineering problems with an understanding of the limitations.

LO3 Evaluate the impact of the design product, component or processes in term of safety, environmental and sustainability factors.

LO4 Demonstrate effectively teamwork skill in completing the IDP.

LO5 Apply project management and financial knowledge effectively in completing the IDP.

SYNOPSIS

Integrated Design Project is a course where students have to design a mechanical engineering project, including project management, project planning, project feasibility study, 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 quantities, cost estimates of development projects given to students, working in groups. Apart from basic mechanical 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 mechanical engineering knowledge.

REFERENCES

a. International Engineering Alliance, Graduates attributes and professional competencies, version 3, June 2013.

b. Richard G. Budynas and J. Keith Nisbett, Shigley's Mechanical Engineering Design (McGraw-Hill Series in Mechanical Engineering) 10th Edition, January 27, 2014

c. Peter R. N. Childs BSc. And D.Phil , 2013, Mechanical Design Engineering Handbook Butterworth-Heinemann; 1 edition (November 18, 2013).

d. Michael F. Ashby., 2010, Materials Selection in Mechanical Design, Fourth Edition 4th Edition, Butterworth-Heinemann; 4 edition (October 5, 2010).

BMCG 3723 HEAT AND MASS TRANSFER

LEARNING OUTCOMES

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

LO1 Solve problems on steady state and unsteady state on one dimension and multiple dimension heat transfer.

LO2 Determine the heat transfer coefficient for natural or forced convection in dimensionless parameter in thermal system.

LO3 Determine of energy exchanges between black and grey surfaces at different temperatures.

SYNOPSIS

Introduction to heat transfer, steady state conduction-one dimension and multiple dimensions, unsteady state conduction. Numerical analysis for solving heat transfer problems, forced convection in laminar and turbulent flow on plate and pipe, natural convection, phase changes of heat transfer,

thermal radiation on black body and surface, and boiling and condensation

REFERENCES

a. Chengel, Y.A., & Ghajar, A., 2014, *Heat and Mass Transfer: Fundamentals & Applications*, 5th Ed., McGraw-Hill.
b. Incropera, F.P. & Dewit, D.P., 2011, *Fundamentals of Heat and Mass Transfer*, 7th Ed., John Wiley & Sons.
c. Holman, J., 2009, *Heat Transfer*, 10th Ed., McGraw-Hill.

BMCG 3233 MECHANICAL VIBRATION

LEARNING OUTCOMES

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

LO1 Apply the fundamental principles of vibration of one-and two-degree-of-freedom systems in engineering practice.
LO2 Identify the vibration characteristics of a vibrating system
LO3 Design 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

a. Rao, S.S., 2011, *Mechanical Vibrations*, 5th edition: Prentice Hall.
b. Kelly, S.G., 2011, *Mechanical Vibrations*: *Theory and Applications*, Cengage Learning.
c. Meirovitch, L., 2010, *Fundamental of Vibration,* McGraw-Hill.
d. Inman, D.J., 2008, *Engineering Vibrations*, 3rd edition, Pearson Education Inc.
e. Kelly, S.G., 2006, *Schaum's Mechanical Vibrations*, McGraw-Hill.
f. Putra, A., Ramlan, R., and Ismail, A.Y., 2014, *Mechanical Vibrations*: Teaching Modul and Learning Series, UTeM.

YEAR 4 COURSES - UNIVERSITY COMPULSORY

BLHC 4032 CRITICAL AND CREATIVE THINKING

LEARNING OUTCOMES

Pada akhir mata pelajaran ini, pelajar akan dapat:

LO1 Membincangkan prinsip asas kemahiran pemikiran kritis & kreatif dalam menyelesaikan masalah harian.
LO2 Memberi maklum balas dalam perbincangan kumpulan terhadap isu berkaitan perkembangan kemahiran pemikiran kritis & kreatif.
LO3 Menyelesaikan masalah melalui kajian kes terhadap isu semasa yang berkaitan bidang pengajian mereka.
LO4 Menganalisis kehendak pasaran akan datang dan mencadangkan penyelesaian berasaskan produk.

SYNOPSIS

Mata pelajaran ini direka untuk memberi pendedahan kepada pelajar tentang prinsip-prinsip asas dalam pemikiran kritis & kreatif. Pelajar akan mengaplikasikan kaedah pemikiran kritis & kreatif dalam penyelesaian masalah. Pelajar akan dipandu di dalam projek akhir di mana penganalisaan keperluan produk dari pelbagai perspektif dan pemikiran di luar batasan akan diaplikasikan.

REFERENCES

a. Yahya, A., Abdullah, A.N., Hasan, H., & Rahman, R.R.R.A., 2011, *Critical and Creative Thinking Module* 2, Melaka, Penerbit UTeM.
b. Buzan, T., & Buzan, B., 2006, *The Mind Map Book*, Essex: BBC Active, Pearson Education.
c. Claxton, G., & Lucas, B., 2007, *The Creative Thinking Plan*, London: BBC Books.
d. Fisher, A., 2011, *Critical Thinking: An Introduction*, London: Cambridge University Press.

BTMW 4012 ENTREPRENEURSHIP TECHNOLOGY

LEARNING OUTCOMES

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

LO1 Recognize the importance of entrepreneurship, the role of entrepreneurship in today's society, and the technical knowledge of the entrepreneurial process.

LO2 Explain the basic concepts of interdisciplinary competences in management, and create technology-based businesses.

LO3 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

a. Barringer, B.R., and Ireland, R.D., 2012, *Entrepreneurship, 4*th Edition, Pearson.
b. Scarborough, N.M., 2011, *Essentials of Entrepreneurship and Small Business Management*, 6th. Edition, Pearson.
c. UiTM Entrepreneurship Study, 2010, *Fundamentals of Entrepreneurship*, Pearson.

YEAR 4 COURSES - COMMON CORE

BMCU 4972 FINAL YEAR PROJECT I

LEARNING OUTCOMES

After completing the course, students should be able to:

LO1 Formulate a problem statement and design a project methodology to fulfill objecives of the project.

LO2 Conduct initial measurements and/or predictive studies to meet objectives of the project.

LO3 Present a project report in written and oral forms.

SYNOPSIS

The student needs to plan and implement the project individually that related to the mechanical engineering field. It 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.

BMCU 4984 FINAL YEAR PROJECT II

LEARNING OUTCOMES

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

LO1 Carry out project management based on the principle of engineering.

LO2 Conduct initial measurements and/or predictive studies to meet objectives of the project.

LO3 Analyze data and interpret results.

LO4 Present a full project report in written and oral forms.

SYNOPSIS

The student needs to plan and implement the project individually that related to the mechanical engineering field. It 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.

BENG 4322 ENGINEER AND SOCIETY

LEARNING OUTCOMES

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

LO1 Relate the effect and impact of technology on society, culture and environment.

LO2 Demonstrate as a responsible professional, abiding to the code of professional ethics.

LO3 Demonstrate effectively the assignment given in a group or individual.

LO4 Response critically and handle social, cultural and global issues as well as environment, occupational health & safety issues.

SYNOPSIS

Role of engineer in Nation Building, evaluation of engineering, National development Role of engineers in society, laws related to public safety, health & welfare, future engineers, professionalism and codes of ethics, definition of professionalism, understanding engineering as a profession, ethical theories, IEM and BEM code of ethics. Ethical problem solving techniques analysis of issues in ethical problems, line drawing, flow charting, learn to handle conflicting problems, application in bribery and accepting gifts situation. Ethics practice in Occupational Safety and Health at work. Rights and responsibilities of engineers. Quality from engineering perspective. Carrier guidance and project management.

REFERENCES

a. The Institution Of Engineer, Engineering Professionalism and Ethics, 4th Ed, 1995.
b. Fleddermann, C.B., 2008, *Engineering Ethics*, 3rd Ed, Prentice Hall.
c. Martin, M.W., & Schinzinger, R., 2005, *Ethics in Engineering*, 4th Ed, McGraw-Hill.
d. Harris JR, C.E., Pritchard, M.S., Rabin, M.J., 2003, *Engineering Ethics*, 2nd Ed, Thomson and Wadsworth.
e. Canning, J., 2007, Workplace Safety for Occupational Health and Safety (Safety at Work Series V4).
f. Safe Work in 21st Centuries (Educational and Training for the Next Decade Occupational Health and Safety Personnel) National Academy Press, 2006
g. Idrus, A., Sulaiman, S.A., Khamidi, M.F., 2010, *Engineers in Society*, Mc Graw Hill Education.

BMFG 4623 ENGINEERING ECONOMY AND MANAGEMENT

1.0 LEARNING OUTCOMES

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

LO1 Explain the core concepts and principles in project management and engineering economics.
LO2 Construct critical decision-making tools in an engineering project by analysing project management and financial elements.
LO3 Generate a comprehensive & viable Project Proposal and justify by a presentation in group discussion session.

SYNOPSIS

This course covers engineering economics and managing risk in an organization. Engineering economics discusses about the time value of money and interest relationships, which are useful to define certain project criteria that are utilised by engineers and project managers to select the best economic choice among several alternatives. Projects examined will include both product and service-producing investments. The effects of escalation, inflation, and taxes on the economic analysis of alternatives are also discussed. Management of risk incorporates the concepts of probability and statistics in the evaluation of alternatives. This allows management to determine the probability of success or failure of the project.

REFERENCES

a. Blank, L., and Tarquin, A., 2012, *Engineering Economy*, 7th Edition, McGraw Hill.
b. Sullivan, W.G., Wicks, E.M., and Koelling, C.P., 2012, *Engineering Economy*, 15th Edition, Pearson.
c. Park C.S., 2011, *Contemporary Engineering Economics*, 5th Edition, Pearson.
d. Whitman, D., and Terry, R., 2012, *Fundamentals of Engineering Economics and Decision Analysis*, Morgan & Claypool Publishers.

BMCU 4011 ENGINEERING SEMINAR

LEARNING OUTCOMES

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

LO1 Identify the professional engineering knowledge, practices and responsibilities.
LO2 Gather and sort relevant information with regard to the given technical talk.
LO3 Discuss current engineering issues and practices in small group and present the reflection in a forum or short report.

SYNOPSIS

A series of technical talks will be organised and the attendance is compulsory. The technical talks will dwell on engineering profession that relates to the technology advancement, economy issues, technopreneurship, environment, sustainability and safety aspects. Reflection of the seminar will be discussed in a forum and short report will be produced by the students.

YEAR 4 COURSES - PROGRAMME CORE

BMCG 4812 SUSTAINABILITY AND ENVIRONMENT

LEARNING OUTCOMES:

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

LO1 Explain the impact of pollution and climate changes towards the environment.

LO2 Apply the concept of sustainable development in engineering design, manufacturing and technologies abide with the current national laws, regulations and policies.

LO3 Analyse using sustainability assessment tools in engineering design, manufacturing and technologies.

SYPNOPSIS:

This course is an introductory course on sustainability and environment. It focuses on five main elements for sustainability; Water, Energy, Health, Agriculture and Biodiversity. Sustainable development and its application in Malaysia in relation to the National Environmental Policy and Green Technology Policy are highlighted. Assessment tools such as Life Cycle Assessment, Carbon Footprint and Cleaner Production abide with the latest guideline, policies, laws and regulation. The application of engineering design, manufacturing and technologies towards sustainability and environment will be discussed.

REFERENCES

a. Robertson, M., 2014, *Sustainability Principles and Practice,* Routledge.

b. De Vries, B.J.M., 2012, *Sustainability Science.* Cambridge University Press.

c. Davis, M.L., and Masten, S.J., 2014, *Principle of Environmental Engineering and Science.* New York: McGraw-Hill.

d. Snedden, R., 2014, *Environmental Engineering and the Science of Sustainability*. New York: Crabtree Publishing.

YEAR 4 COURSES - ELECTIVE

BMCG 4713 RENEWABLE ENERGY SYSTEM

1.0 LEARNING OUTCOMES

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

LO1 Calculate the potential output for the renewable energy applications.

LO2 Design the technoeconomics of stand-alone renewable energy system based on consumption data, local weather and current technology.

LO3 Evaluate the scenario of renewable energy application and energy policy in Malaysia.

SYNOPSIS

Introduction to renewable energy. Solar photovoltaics, solar thermal systems, wind power, wave and tidal power, hydroelectric, biofuels, biomass, geothermal and ground-source heat pump, hydrogen and fuel cells.

REFERENCES

a. Boyle, G., 2012, *Renewable Energy: Power for a Sustainable Future*, 3rd Edition Oxford, University Press.

b. Kaltschmitt, M., Streicher, W., Wiese, A., 2010, *Renewable Energy: Technology, Economics and Environment*, 1st Edition, Springer.

c. Da Rosa, A.V., 2012, *Fundamentals of Renewable Energy Processes*, 3rd Edition, Academic Press.

BMCG 4723 REFIRGERATION AND AIR CONDITIONING SYSTEM

LEARNING OUTCOMES

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

LO1 Design the vapour compression and vapour absorption refrigeration systems by estimating the corresponding system performance.

LO2 List and discuss the relevancy of the working fluids such as steam and refrigerants (natural or otherwise) that are available and applicable to the industries especially in terms of the global warming, carbon emission and environmental sustainability.

LO3 Formulate and discuss the basic psychrometric theory and use the theory to design thermal systems related to the air conditioning processes.

LO4 Design an air conditioning system that meet the heat gain load and thermal comfort requirements by establishing the building cooling load and designing of ducting system.

SYNOPSIS

Introduction to the underlying thermodynamics principles, refrigeration system 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 systems. Types and use of refrigerants in the heating, ventilating and air conditioning (HVAC) system. Effect of green-house gases to the environmental sustainability. Psychrometric principles and thermal processes related to the HVAC. Interior design and thermal comfort configuration for domestic and industrial buildings. Cooling load estimation and ducting design for ventilation.

REFERENCES

a. McQuiston, F.C., 2011, *Heating, Ventilating and Air Conditioning Analysis and Design*, Wiley.
b. Arora, C.P., 2009, *Refirgeration and Air Conditioning*, 3rd Edition, Tata-McGrawHill, New Delhi.
c. Jones, W.P., 2001, *Air Conditioning*, 5th Edition, Butterwort Heinemann, Oxford.
d. Wang, S.K., 2009, *Handbook of Air Conditioning and Refrigeration*, 2nd Edition, MCGraw-Hill, New York.

BMCG 4733 POWERPLANT SYSTEM

LEARNING OUTCOMES

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

LO1 Determine the performance of different cycles and component for power generation plant.
LO2 Calculate the performance of different combustion system using different fuel source.
LO3 Analyze the cooling tower performance.
LO4 Appraise the performance of Nuclear energy power generation system.

SYNOPSIS

The course will involve the studies on the Thermodynamics review, Rankine Cycles, Fossil-Fuel Steam Generator, Fuels and Combustion, Turbines, Condensate Feedwater System, Circulating Water System, Gas Turbines, Nuclear Energy, Reactors, Powerplant and Power Generation Influence on the Environment.

REFERENCES

a. Kiameh, P., 2011, Power Plant Equipment Operation and Maintenance Guide, McGraw Hill.
b. Woodruff, E., Lammers, H., and Lammers, T., 2011, *Steam Plant Operation*, 9th Ed., McGraw-Hill.
c. El-Wakil, M.M., 2002, *Powerplant Technology*, McGraw Hill.

BMCG 4613 COMPUTATIONAL FLUID DYNAMICS

LEARNING OUTCOMES

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

LO1 To explain the concept of major theories, approaches and methodologies used in CFD.
LO2 To conduct the actual implementation of CFD methods in using commercial CFD codes.
LO3 To be able to interpret and present the results in an appropriate professional context.

SYNOPSIS

The fundamental principles of fluid mechanics are conservation of mass, momentum and energy. Engineering students must understand and be able to apply these basic principles before designing fluids engineering systems. Hence, this course is designed for undergraduate students tend to pursue industrial employment after graduation. The course is focused on two areas: the fundamental of the method and the correct way of conducting the analysis using readily available software, i.e. ANSYS Version 14.

REFERENCES

a. Anderson, J.D., 2006, Computational Fluid Dynamics The Basic with Application, McGraw-Hill: Singapore.
b. Chung,T.J., 2010, Computational Fluid Dynamics, Second Edition, Cambridge University Press: United States of America.
c. Tannehill, J.C., Anderson, D.A., and Pletcher, R.H., 1997, Computational Fluid Mechanics and Heat Transfer, Second Edition, Taylor and Francis: USA.

BMCG 4623 FLUID POWER AND TURBOMACHINERY

LEARNING OUTCOMES

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

LO1 Apply fluid power and turbomachinery knowledge to solve engineering problems

LO2 Analyze the performance of fluid power and turbomachinery system

LO3 Gain and latest advanced knowledge of fluid power and turbomachinery technology

SYNOPSIS

This course involves the concept of static and dynamic in fluid machinery. Static of fluid machinery covers types of pumps, compressors, valves, actuators and their working principles, the performance of the fluid power system, the fluid power circuit design and the circuit control analysis. Dynamic of fluid machinery covers the classification of different types of turbomachines, basic relations of velocity diagrams, mass flow rates, energy equations, momentum equation, axial and radial flow compressor and turbines.

REFERENCES

a. Esposito, A., 2003, Fluid Power with Applications, 6th Ed., Prentice Hall. New Jersey.

b. Johnson, J.L., 2002, Introduction to Fluid Power, Delmar, New York.

c. Dixon, S.L., 2005, Fluid Mechanics and Thermodynamics of Turbomachinery, Elsevier Butterworth-Heinemann, USA.

d. Rangwala, A.S., 2005, Turbo-Machinery Dynamics Design and Operation, McGraw-Hill, USA.

BMCG 4113 FINITE ELEMENT ANALYSIS

LEARNING OUTCOMES

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

LO1 Apply the principle of finite element method in solving engineering problem.

LO2 Develop finite element model using finite element software.

LO3 Analyse and evaluate structure integrity of complex engineering problem using finite element software.

SYNOPSIS

The purpose of this course is to expose the practice of structural analysis in engineering using finite element analysis. Introduction to finite elements method and understanding of direct method for 1-D elements including bar and beam elements. Understanding of formulation method including Potential Energy and Galerkin methods. Hands-training of PATRAN-NASTRAN software in order to build finite element model in 1-D, 2-D and 3-D to solve the linear statics problems.

REFERENCES

a. Logan, D. L., 2012, *A First Course in the Finite Element Method*, 5th Edition, PWS Publishing Company, Boston.

b. Chandrupatla, T. R., and Belegundu, A. D., 2012, *Introduction to Finite Elements in Engineering*, 4th Edition, Prentice Hall, New Jersey.

c. Saeed, M., 2008, Finite Element analysis: Theory and Application with ANSYS, 3rd Edition, Pearson, New Jersey.

d. Huebner, K.H., Dewhirst, D.L., Smith, D.E. and Byron, T.G., 2001, *The Finite Element Method For Engineers*, 4th Edition, John Wiley & Son Inc., New York.

e. Reddy, J. N., 2005, *An Introduction to Finite Element Method*, 3rd Edition, McGraw-Hill, Inc., New York.

BMCG 4123 ADVANCED SOLID MECHANICS

LEARNING OUTCOMES

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

LO1 Analyse and determine shear centre and stresses of structures due to unsymmetrical bending and torsional load.

LO2 Analyse and determine principal stresses by using imaging technique.

LO3 Analyse and evaluate the contact stresses due to contact between curved surfaces.

SYNOPSIS

Unsymmetrical bending theory, stresses in curved beams, shear centre and stress, torsion for open and closed cells thin-walled, photoelasticity, stresses in circular and square plate, and contact stresses.

REFERENCES

a. Beer, F.P., and Johnston, E.R, 2013, *Mechanics of Materials,* 4th Ed., McGraw-Hill.

b. Budynas, R.G., 1999, *Advanced Strength and Applied Stress Analysis*, McGraw-hill.

c. Hearn, E. J., 1997, *Mechanics of Materials Vol. I &II.*, Butterworth-Heinemann.

d. Benham, P.P., Crawford, R.J., and Armstrong, C.G, 1996, *Mechanics of Engineering Materials*, Longman Group, Ltd., UK.

e. Vable, M., 2004, *Mechanics of Materials*. Oxford University Press.

f. Solecki, R., and Conant, R.J., 2003, *Advanced Mechanics of Materials*. Oxford University Press.

BMCG 4413 NON DESTRUCTIVE TESTING

LEARNING OUTCOMES

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

LO1 Explain the current basic and some advanced principles of Non-Destructive Testing (NDT) techniques to satisfy complex engineering problems.

LO2 Select and propose suitable NDT techniques based on their analysis on engineering problems that fulfil the standard practice.

LO3 Develop the ability to communicate effectively using available resources to disseminate knowledge of NDT techniques in relation with industrial problem.

SYNOPSIS

This course introduce the basic principles of Non-Destructive Testing (NDT) 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. Introduction to Advanced NDT methods are also included.

REFERENCES

a. Mix, P.E., 1987, *Introduction to Nondestructive Testing: A Training Guide*, 2nd Edition, John Wiley, New York. (Textbook)

b. Raj, B., Jayakumar, T., and Thavasimuthu, M., 1996, *Practical Non-Destructive Testing*, 2nd Edition, Woodhead Publishing Limited, Cambridge.

c. Boving, K.G., 2000, *NDE Handbook: Non-Destructive Examination Methods for Conditioning Monitoring*, 2nd Edition, Woodhead Publishing Limited, Cambridge

BMCG 4423 COMPOSITES AND ADVANCED MATERIALS

LEARNING OUTCOMES

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

LO1 Explain the characteristics of materials that determine their properties.

LO2 Identify various classes of composites and advanced materials and their processing, properties and applications.

LO3 Apply the information provided in the course to properly identify, characterize, and select materials that satisfy a set of requirements.

SYNOPSIS

This course introduces students to composites and advanced materials in general, with the focus on their classifications, basic constituents, processing and applications. In addition, knowledge on the mechanical testing of fibre-reinforced composites is included. This course also emphasis on specific advanced materials including nanomaterials, natural fibre-reinforced plastic and powder metallurgy. The course also introduces some of the fundamental concepts in selecting and designing with composites and advanced materials in various engineering applications.

REFERENCES

a. Chawla, K.K., 2012, *Composite materials: Science and Engineering*, Springer.

b. Budinski, K.G., and Budinski, M.K., 2010, *Engineering Materials*, Ninth Edition, Pearson Prentince Hall.

c. Matthew, F.L., and Rawling, R.D., 2003, *Composite Materials: Engineering and Science*, Woodhead Publishing Limited.

d. Hodgkinson, John, 2000, *Mechanical testing of advanced fibre composites*, Woodhead Publishing.

e. Edelstein, Alan, S., and Cammaratra, R.C., 1998, *Nanomaterials: synthesis, properties and applications*. CRC Press.

BMCG 4433 METALLURGY

LEARNING OUTCOMES

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

LO1 Explain clearly the structure, physical and mechanical behaviour of the metallic materials.

LO2 Describe properly the solidifications process, plastic deformation, strengthening mechanism, principle of recovery, recrystallization and grain growth.

LO3 Correlate the composition, microstructure and heat treatment processes by interpretation of Ferum-Carbide phase diagrams and transformation diagrams system appropriately and corrosion and prevention of metallic materials.

LO4 Develop the ability to communicate effectively using available resources to disseminate knowledge of metallurhy various enginnering application.

SYNOPSIS

Physical metallurgy: crystal structure and properties of pure metals, solidification; strengthening mechanisms; recovery, recrystallization and grain growth; ferum-carbide phase diagram; TTT diagrams; heat treatment of steel; non-ferrous metals and its alloy; heat treatment of non-ferrous metals; properties of metallic materials and its alloy, corrosion and prevention of metallic materials .

Mechanical metallurgy: stress and strain; elastic behavior; theory of elasticity; true stress and true strain; effect of heat/temperature on strain rate and stress flow; metallurgy structure; mechanic testing for

metallic materials for stress, hardness, impact and creep; fundamental of mechanical working for metallic materials.

REFERENCES

a. George, E.D., 2013, *Mechanical Metallurgys*, 3th Ed. in SI Units, Tata McGraw-Hill.

b. V. Raghavan, 2006, *Physical Metallurgy Principles And Practice* 2nd Ed.. Prentice Hall.

c. Smith, W.F., 2010, *Principles of Materials Science and Engineerings*, 5th Ed., McGraw Hill.

d. Hertzberg, R.W., 1996, *Deformation and Fraxture Mechanics of Engineering Materials,* 4th Ed., Willey.

BMCG 4313 MECHANISM DESIGN

LEARNING OUTCOMES

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

LO1 Describe the concept and the process of designing a mechanism system.

LO2 Analyze the motion characteristics of the machine analytically, graphically or computationally.

LO3 Synthesize mechanisms according to motion requirement.

SYNOPSIS

This course is to introduce the principles of designing mechanisms, aided by the use of computer applications. Students will investigate the kinematics and dynamics of machineries. Topics include cam and cam follower design, gear kinematic analysis, and linkage synthesis.

REFERENCES

a. Myszka, Dave, 2012, *Machines & Mechanisms: Applied Kinematic Analysis*, 4th ed., Prentice Hall, Upper Saddle River, New Jersey.

b. Norton, Robert, 2012, *Design of Machinery*, 5th ed., McGraw-Hill, New York.

c. Uicker Jr., J.J., Pennock, G.R., and Shigley, J.E., 2003, *Theory of Machines and Mechanisms*, 3rd ed., Oxford University Press, New York.

BMCG 4323 PROTOTYPE DEVELOPMENT TECHNOLOGY

LEARNING OUTCOMES

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

LO1 Explain the fundamental issues in concurrent product and process development in terms of concurrent engineering tools and technologies such as rapid prototyping, reverse engineering, computer aided design, and high speed machining.

LO2 Discuss the main design issues issues with relation to rapid prototyping, reverse engineering and high speed machining.

LO3 Analyze and recognize the appropriate time compression technologies based on its application, engineering requirements and lead-time.

SYNOPSIS

This course introduces essential tools and techniques in concurrent product and process development. It explains and discusses the functions and roles of time compression technologies such as rapid prototyping, CAD, and reverse engineering within product development. Comparison between additive and subtractive layer manufacturing is included. An overview of several RP, RE, and CAD systems current application and future trends are also discussed. The application of solid modeling and surface modeling, together with STL file generation in component design is analyzed. Reverse engineering systems, rapid tooling and rapid manufacturing techniques are compared and discussed.

3.0 REFERENCES

a. Thompson, R., 2011, *Prototyping and Low-Volume Production: The Manufacturing Guides*, Thames and Hudson.
b. Bartolo, P.J., 2011, *Stereolithography: Material, Processes and Applications*, Springer.
c. Gibson, I., Rosen, D.W., & Stucker B., 2009, *Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing*, Springer.

BMCG 4333 DESIGN QUALITY AND RELIABILITY

LEARNING OUTCOMES

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

LO1 Apply technique of benchmarking, quality function deployment and design of experiment to improve product quality for customer's satisfaction.
LO2 Develops mathematical models useful in analyzing components and system reliability as well as develop the common failure laws based upon its distributions to predict reliability.
LO3 Demonstrate the ability of quality and reliability methodology in developing products in a technical setting.

SYNOPSIS

This course introduces essential techniques in quality and reliability issues in design. The students will be exposed to the Total Quality Management concept, application of quality function deployment, design of experiment (Taguchi method) for product and process design. It also covers topics such as product reliability, application of fault tree analysis, failure distribution method and reliability prediction analysis.

REFERENCES

a. Krajewski, L.J., Ritzman, L.P., & Malhotra, M.K., 2007, *Opeartion Management: Process and Value Chains*, Prentice Hall.
b. Smith, D.J., 2011, *Reliability, Maintainability and Risk*, Elsevier Ltd.
c. Ebeling, C.E., 2010, *An Introduction to Reliability and Maintainability Engineering*, The McGraw-Hill Companies, INC.

BMCG 4343 DESIGN OPTIMIZATION

LEARNING OUTCOMES

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

LO1 Understand and formulate of optimization problems in engineering design.
LO2 Analyze design constraint and variables to solve optimization problem.
LO3 Apply an engineering package to optimize the design. Modern Tool Usage.
LO4 Explore optimization cases in industry.

SYNOPSIS

This course covers Mathematical modeling of engineering design problems for optimization. Boundedness and monotonicity analysis of models. Differential optimization theory for unconstrained and constrained problems, and selected numerical algorithms for continuous nonlinear models. Emphasis on the interaction between proper modeling and computation. Students propose design term projects from various disciplines and apply course methodology to optimize designs.

REFERENCES

a. Papalambros, P.Y., and Wilde, D.J., 2000, *Principles of Optimal Design: Modelling and Computation*, Cambridge University Press.
b. Arora, J., 2011, *Introduction to Optimum Design* (Third Edition), Academic Press.
c. Venkataraman, P., 2009, *Applied Optimization with MATLAB Programming* (2nd

Edition), Wiley.

d. Rao, S.S., 2009, Engineering Optimization: Theory and Practice, Wiley.

BMCG 4513 ADVANCED COMPUTER AIDED DESIGN

LEARNING OUTCOMES

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

LO1 Understand and apply the fundamentals of surface modeling in CAD using the tools and workbenches studied in the class in relation to the design and automotive industries.

LO2 Develop 3D surface models in the process of concept design generation and also for the engineering design detail data development.

LO3 Analyze the surface modeling data using the surface analysis tools for further engineering design and development process.

SYNOPSIS

This course will empower the students with fundamental knowledge and technical skills of 3D surface modeling skills using industry-proven 3D mechanical CAD software. The students will learn about the different techniques for creating surface models with emphasis on design intent. Other topics include surface analysis, A-class surface, generation of complex shape, surface requirement in mechanical applications.

REFERENCES

a. Dassault Systeme, 2006, *CATIA: Generative Shape Design Fundamentals*; Lecture

b. Guide CATIA V5R16, France.

c. Dassault Systeme, 2006, *CATIA: FreeStyle Fundamentals; Lecture Guide CATIA V5R16*, France.

d. Dassault Systeme, 2006, *CATIA: FreeStyle Sketch Tracer; Lecture Guide CATIA V5R16*, France.

e. Dassault Systeme, 2006, *CATIA: Digital Shape Editor; Lecture Guide CATIA V5R16*, France.

BMCG 4913 VEHICLE DYNAMICS

LEARNING OUTCOMES

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

LO1 Explain some basic vehicle dynamics requirements.

LO2 Explain the basics of vehicle handling/ride and primary factors that affect it.

LO3 Develop physical and mathematical model to predict the dynamic response of a vehicle.

LO4 Employ the computer software in modeling vehicle dynamics.

SYNOPSIS

This course is intended to discuss an introduction and the basic concept of vehicle dynamics, fundamental approach towards vehicle dynamics modeling, vehicle response to various driver and ambient inputs, road loads, mechanics of tyre, relation between ride and handling, steering and suspension system.

REFERENCES

a. Dukkipati, R.V., Pang, J., Qatu, M.S., Sheng, G., & Shuguang, Z., 2008, *Road Vehicle Dynamics*, 1st Ed., SAE International, Warrendale, PA, USA.

b. Wong, J.Y., 2008, *Theory of Ground Vehicles*, 4th Ed., John Wiley & Sons.

c. Rajamani, R., 2012, *Vehicle Dynamics and Control*, 2nd Ed., Springer, New York, USA.

BMCG 4923 AUTOMOTIVE TECHNOLOGY

LEARNING OUTCOMES

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

LO1 Describe the classifications and fundamental concept of automotive system.

LO2 Analysis the assembly and disassembly process of automotive system or components.
LO3 Review the technological advances in any automotive system in modern vehicle supporting Energy Efficient Vehicle (EEV).

SYNOPSIS

This course covers automotive configurations, basic operation of automotive system and components such as engine and power train system, electric and electronic system, suspension, brake, steering, fuel and lubricants.

REFERENCES

a. Halderman, J.D., 2009, *Automotive Technology: Principles, Diagnosis and Services*, 3rd Edition, Prentice Hall.
b. Erjavec, J., 2010, *Automotive Technology 5e: A Systems Approach*, 5th Edition, Thomson Delmar Learning, New York.
c. Duffy, J.E., 2009, *Modern Automotive Technology*, 7th Edition, Goodheart-Willcox Publisher.

BMCG 4933 VEHICLE POWERTRAIN SYSTEMS

LEARNING OUTCOMES

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

LO1 Explain the principles behind the design of vehicle powertrain components and systems.
LO2 Use mathematical programming for examination of performance and energy usage.
LO3 Solve the design challenge that involves a compromise between vehicle performance and energy usage.
LO4 Analyse on the overall vehicle performance using a system approach that focuses on the integration and interaction of all powertrain components.

SYNOPSIS

Transmission design engineering has been enriched by numerous variants such as automatic transmission, continuous variable transmission, torque converter, clutch transmission and transmission for all-wheel drive. The purpose of this course is to describe the development of motor vehicle transmission as an ongoing part of the vehicle development system. The contents including discussing and introducing the basic concept of automotive power train, fundamental approach towards automotive engine performance, power conversion, engine and transmission matching, principle design of transmission system, vehicle response to various engine and transmission configurations, automatic and manual transmission, brakes and wheel, and power train technology. New era of power train technology will also be analyzed.

REFERENCES

a. Mashadi, B., and Crolla, D., 2012, *AutomotiveVehicle Powertrain Systems*, John Wiley & Sons Ltd.
b. Naunheimer, H., Bertsche, B., Ryborz, J., and Novak, W., 2011, *Automotive of Vehicle Dynamics*, Society of Automotive Engineers: USA.
c. Nam, K.H., 2010, *AC Motor Control and Electric Vehicle Applications*, CRC Press.

BMCG 4943 INTERNAL COMBUSTION ENGINE

LEARNING OUTCOMES

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

LO1 Explain the fundamental concepts of the internal combustion engine.
LO2 Explain the combustion process, engine cycles, operating parameters and emissions produced by internal combustion engine.

LO3 Use analytical and computational approaches for analyzing internal combustion engine.

SYNOPSIS

The course introduces students to the fundamentals of internal combustion engines (ICEs). Thermodynamic operating principles are used to solve problems on spark ignition and compression ignition engines that operate on four-stroke or two-stroke cycles. The scope of the course includes all ICEs with an emphasis on reciprocating engines used in automobiles and similar applications. Topics include operating characteristics, engine cycles, thermochemistry and fuels, air and fuel induction, fluid motion within combustion chamber, combustion, exhaust flow, emissions and air pollution, heat transfer in engines, and friction and lubrication. The latest automotive technologies are also discussed in relevant topics such as hybrid vehicles, higher voltage electrical systems, and electronic valve actuation.

REFERENCES

a. Ganesan, V., 2010, *Internal Combustion Engines*, 3rd Edition, Tata-McGraw Hill, New Delhi.
b. Bosch, R., 2006, *Gasoline-Engine Management: Systems and Components*, 3rd Ed., Professional Engineering publishing.
c. Pulkrabek, W.W., 2004, *Engineering Fundamental of the Internal Combustion Engine*, 2nd Ed., Prentice Hall, New Jersey.

BMCG 4953 VEHICLE SYSTEM MODELING AND SIMULATION

LEARNING OUTCOMES

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

LO1 Develop mathematical models for a given vehicle application or analysis.

LO2 Verify the models using vehicle dynamics simulation software.

LO3 Simulate and evaluate the performance of vehicle system.

SYNOPSIS

This course is intended to introduce vehicle dynamics modeling and simulation. Mathematical models will be developed in order to predict the vehicle behaviour in longitudinal, lateral and vertical directions. Tire modeling will cover both linear and non-linear tire models. Validation and limitations of vehicle models will be discussed. These models will be used to evaluate the performance of tire, ride and handling. For vehicle handling assessment, steady-state and transient tests will be described. Modeling and simulation of vehicle systems in MATLAB/SIMULINK environment will be used extensively in class notes and assignments.

REFERENCES

a. Wong, J.Y., 2008, *Theory of Ground Vehicles*, 4th Ed., John Wiley and Sons Inc, USA.
b. Rajamani, R., 2012, *Vehicle Dynamics and Control*, 2nd Ed., Springer, New York, USA.
c. Dukkipati, R.V., Pang, J., Qatu, M.S., Sheng, G., & Shuguang, Z., 2008, *Road Vehicle Dynamics*, 1st Ed., SAE International, Warrendale, PA, USA.

BMCG 4213 VIBRATION MONITORING OF ROTATING MACHINERY

LEARNING OUTCOMES

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

LO1 Describe the principle of vibration measurement, signal processing and the standards used in rotating machineries fault diagnosis.

LO2 Classify the fault criteria in rotating machineries.

LO3 Diagnose and justify the type of faults.

SYNOPSIS

The course emphasizes on the basic vibration measurement involving rotating machineries. It covers the basic signal processing especially relating to the time domain and frequency domain analyses. Several fault diagnosis involving unbalance, alignment, looseness, rolling element bearing analysis, gearbox analysis, pumps, fans and compressors are covered in the course. The course also highlights the right way to the vibration analysis process and the setting of alarm limits. Several related ISO standards are also briefly introduced.

REFERENCES

a. Vance, J., Zeidan, F., & Murphy, B., 2010, *Machinery Vibration and Rotordynamics*, 1st Ed., John Wiley & Sons, USA.
b. Adams, M.L., 2009, *Rotating Machinery Vibration: From Analysis to Troubleshooting*, 2nd Ed., CRC Press, USA.
c. Muszynska, A., 2005, *Rotordynamics (MECHANICAL ENGINEERING)*, CRC Press, USA.
d. Bently, D.E. & Hatch, C.T., 2003, *Fundamentals of Rotating Machinery Diagnostics (Design and Manufacturing)*, 1st Ed., American Society of Mechanical Engineers, USA.
e. Randall, R.B., 2011, *Vibration-based Condition Monitoring: Industrial, Aerospace and Automotive Applications*, 1st Ed., John Wiley & Sons, USA.

BMCG 4813 CONDITION BASED MAINTENANCE

LEARNING OUTCOMES

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

LO1 Differentiate different maintenance strategies.

LO2 Debate suitable diagnostic methods for a given condition of the machine/structure.

LO3 Apply the common techniques to monitor the condition of a machine/structure.

SYNOPSIS

This course introduces the maintenance philosophy in general and focuses more on the philosophy of the condition based maintenance. It also covers the basic techniques used in condition monitoring such as vibration analysis, oil and wear debris analysis, thermography and ultrasonic techniques. By introducing these common techniques, students are exposed on how to decide the best diagnosis method to determine the faults. Sometime, one technique may not be able to determine the faults and requires integrated condition monitoring which involves various techniques.

REFERENCES

a. Williams, J.H., Davies, A., & Drake, P.R., 1994, *Condition-based Maintenance and Machine Diagnostics*, 1st Ed., Chapman and Hall, USA.
b. Chang, F.K., 2011, *Structural Health Monitoring 2011: Condition Based Maintenance and Intelligent Structures*, 1st Ed., Destech Pubns Inc, USA.
c. Rao, B.K.N., 1996, *Handbook of Condition Monitoring*, 1st Ed., Elsevier Advanced Technology, UK.
d. Davies, A., 1998, *Handbook of Condition Monitoring: Techniques and Methodology*, Chapman & Hall, UK.
e. Yardley, E.D., 2002, *Condition Monitoring: Engineering the Practice*, John Wiley & Sons, USA

BMCG 4823 RELIABILITY, MAINTAINABILITY AND RISKS

LEARNING OUTCOMES

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

LO1 Apply the analysis of failure and reliabilty of equipment or component by using statistical method.

LO2 Conduct the maintainability analysis of machine or component.

LO3 Predict the failure risk and safety of the machine or component.

SYNOPSIS

The course provides knowledges in analyzing the reliability of machine and component. Generate failure statistic of machine or components. . Decision making analysis (Pareto and trend analysis). Analysis and assessment of component reliability (Weibull distribution and graphic analysis). Maintainability analysis and Fault tree analysis, for safety risk assessment which include : (a) symbols and construction, (b) minimum cut sets, (c) top event quantification, (d) importance measures. The Reliability Block Diagram (RDB): representation and assessment of the reliability of simple configurations. Maintainability analysis. Estimating system repair times.

REFERENCES

a. Smith, D.J., 2011, *Reliability, Maintainability and Risk: Practical Methods for Engineers Including Reliability Centred Maintenance and Safety-Related Systems*, 8th Ed., Butterworth-Heinemann.

b. Stapelberg, R.F., 2009, *Handbook of Reliability, Availability, Maintainability and Safety in Engineering Design*, 1st Ed., Springer.

c. Plucknette, D., 2009, *Reliability Centered Maintenance using RCM Blitz*, Reliabilityweb.com.

d. Dhillon, B.S., 2006, *Maintainability, Maintenance, and Reliability for Engineers*, CRC Press.

BMCG 4833 WEAR DEBRIS AND OIL ANALYSIS

LEARNING OUTCOMES

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

LO1 Apply the wear debris and oil analysis on machine lubricated component.

LO2 Predict onset of failures using wear debris and oil analysis for further maintenance action.

LO3 Decide on maintenance action of the analyzed machine and component.

SYNOPSIS

The course provides knowledge in lubrication fundamentals, lubricant additive properties, lubricant perfomance properties, and deteriotation condition due to the process. It focuses on condition monitoring techniques using wear debris and oil analysis. The technique enables the prediction of machine deterioration through wear particle counts, particle shape analysis, quantity analysis and surface condition of particles. In addition, oil analysis is capable of giving the condition of lubricants being used in the machine and components such as gearboxes and bearing. The status of the additives of the lubricants can also be determined in order to know the deterioration performance of the lubricants. Through contamination analysis, the source of the contaminants can be detected in order to ensure the rate of contamination can be controlled and eliminated. Through the combined analysis, decision can be made on the next course of actions to be taken on the analyzed machine component. This course will extend to cover the best practice technique of lubricant management.

REFERENCES

a. Hunt, T. M., 1992, *Handbook of wear debris analysis and particle detection in liquids*, Elsevier Science Publisher..
b. Hunt, T. M., 2004, *Oil Analysis*, Coxmoor Publishing Company's.
c. Yardley, E. D., 2002, *Condition monitoring: Engineering the practice*,Wiley
d. M.J.Neale (2001),"lubrication and reliability handbook", Butterworth-Heneimman
e. Davies, A.,1996, *Handbook of condition monitoring*, Thomson science.

BMCG 4843 STRUCTURAL HEALTH MONITORING

LEARNING OUTCOMES

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

LO1 Apply the structural monitoring systems to ensure structural integrity.
LO2 Use the SHM system and tools to access the structural defect or loss.
LO3 Develop sustainable maintenance programs and schemes by using SHM system.

SYNOPSIS

This course is intended to introduce the Structural Health Monitoring (SHM) Systems and Technologies. It covers the system methodology that including system components, data collection and acquisition; the sensor technology; the SHM testing categories such as static field test, dynamic field test and etc; the SHM system design; vibration-based techniques for SHM; and case studies.

REFERENCES

a. Balageas, D., Fritzen, C., Guemes, A., 2010, Structural Health Monitoring, 2nd Ed., ISTE Ltd, London, UK.
b. Farrar, C.R., Worden, K., 2013, Structural Health Monitoring: A Machine Learning Perspective, 1st Ed., John Wiley & Sons Ltd, UK.
c. Giurgiutiu, V., 2014, Structural Health Monitoring with Piezoelectric Wafer Active Sensor, Academic Press.

4.2 DIPLOMA PROGRAMME

PRELIMINARY SPECIAL SEMESTER - UNIVERSITY COMPULSORY

DLHW 1012 FOUNDATION ENGLISH

LEARNING OUTCOMES

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

LO1 Interpret information from various types of oral texts.

LO2 Express ideas and thoughts orally in group discussions.

LO3 Distinguish different types of reading texts of varying length and complexity.

LO4 Produce an article based on non-linear texts in pair.

LO5 Apply appropriate grammar elements in quizzes.

SYNOPSIS

This course is designed to help students improve their proficiency in the English language and to communicate effectively in both spoken and written forms. Five main aspects: listening, speaking, reading, writing and grammar are taught in an integrated approach so as to build confidence among the learners to become efficient speakers of English in their tertiary education.

REFERENCES

a. Azar, B., & Hagen, S., 2003, Fundamentals of English Grammar, 3rd Ed. Workbook, Longman, USA.

b. Dobiecka, K., & Wiederholt, K., 2008, Well Read: Skills and Strategies for Reading, Oxford University Press, China.

c. Freira, R., & Jones, T., 2011, Q: Skills for success Listening and Speaking, Oxford University Press, China.

d. Ling, K. S., 2011, Effective Text MUET, Penerbit Ilmu Bakti, Subang Jaya.

DLHW 1702 TAMADUN ISLAM & TAMADUN ASIA (TITAS)

LEARNING OUTCOMES

Di akhir kursus ini pelajar akan dapat:

LO1 Menjelaskan konsep asas ketamadunan melalui perbincangan kumpulan.

LO2 Menghubungkait sejarah dengan kemajuan tamadun bangsa di dunia melalui tugasan berkumpulan.

LO3 Membincangkan isu-isu ketamadunan dan peradaban melalui pembentangan kerja kumpulan.

SYNOPSIS

Mata pelajaran ini menjelaskan tentang ilmu ketamadunan mencakupi definisi, pandangan semesta dan sumber ketamadunan. Mata pelajaran ini turut membincangkan persamaan dan perbezaan tamadun-tamadun dunia dengan mencari titik pertemuan melalui dialog peradaban. Selain itu, mata pelajaran ini juga turut mengupas isu dan cabaran semasa serta kesannya dalam perkembangan peradaban masa kini.

REFERENCES

a. Bakar, O., 2009, Modul Pengajian Tamadun Islam dan Tamadun Asia, Penerbit Universiti Malaya, Kuala Lumpur.

b. Arif, S., Noor, A.R.M., Hassan, M.A., Sulaiman, N., & Rawi, A.H.M., 2007,

Tamadun Islam dan Tamadun Asia, Mc Graw-Hill (Malaysia), Kuala Lumpur.
c. Musa, H., 2005, Pemerkasaan Tamadun Melayu Malaysia Menghadapi Globalisasi Barat, Penerbit Universiti Malaya, Kuala Lumpur.

DLHW 1722 FALSAFAH SAINS DAN TEKNOLOGI

LEARNING OUTCOMES

Di akhir kursus ini pelajar akan dapat:

LO1 Menyatakan konsep ilmu, falsafah sains dan teknologi dalam perspektif Islam melalui perbincangan.

LO2 Menerangkan perkaitan antara prinsip falsafah sains dan teknologi dengan proses pembangunan masa kini melalui tugasan berkumpulan.

LO3 Membincangkan isu dan cabaran semasa sains dan teknologi serta kesannya terhadap permasalahan sosial melalui pembentangan berkumpulan.

SYNOPSIS

Mata pelajaran ini membincangkan tentang konsep ilmu, konsep falsafah, sains dan teknologi yang berunsurkan inovasi menurut sarjana Islam dan barat. Selain itu, mata pelajaran ini juga menekankan tentang metodologi dalam sains Islam, konsep dan pencapaian tamadun Islam dalam bidang matematik, astronomi, fizik, kimia, perubatan, konsep penciptaan alam dan kosmologi dalam Islam, pencapaian dalam bidang telekomunikasi terkini dan isu-isu sains semasa.

REFERENCES

a. Nordin, R., Noor, A.R.M., Kudus, N., Ahmad, N.A., Hassan, M.A., Mohamed, S., Rawi, A.H.M., & Ibrahim, I., 2008, Modul Falsafah Sains dan Teknologi, Cetakan Dalaman Universiti Teknikal Malaysia Melaka.
b. Fakhry, M., 2005, A History of Islamic Philosophy, Columbia University Press, Columbia.
c. Jusoh, Y., & Muhammad, A., 2007, Pendidikan Falsafah Sains Al-Quran, Penerbit Universiti Teknologi Malaysia, Johor.
d. Abdullah, A.R., 2010, Wacana Falsafah Sains Sejarah Dan Pemikiran, Pusat Kajian Pengurusan Pembangunan Islam Universiti Sains Malaysia, Pulau Pinang.
e. Bakar, O., 2008, Tauhid dan Sains: Perspektif Islam Tentang Agama dan Sains, Pustaka Hidayah, Bandung.

YEAR 1 COURSES - UNIVERSITY COMPULSORY

DLHW 2712 HUBUNGAN ETNIK

LEARNING OUTCOMES

Di akhir kursus ini, pelajar akan dapat:

LO1 Menganalisis peranan hubungan etnik dan kepentingannya dalam proses pembangunan Malaysia melalui perbincangan kumpulan.

LO2 Memberi respons tentang isu dan cabaran etnik budaya di Malaysia melalui pembentangan kumpulan.

LO3 Berkongsi pengalaman pembelajaran mengenai isu dan cabaran etnik serta budaya masyarakat melalui penulisan artikel.

SYNOPSIS

Mata pelajaran ini membincangkan konsep-konsep asas budaya, peranan etnik dan pengaruhnya terhadap sosio-politik dan ekonomi negara khususnya dalam merealisasikan agenda perpaduan. Mata pelajaran ini juga memberi pendedahan tentang isu-isu dan cabaran dalam konteks perpaduan di Malaysia. Selain itu, mata pelajaran ini turut mengupas perkembangan globalisasi dan kesannya ke atas jati diri dan proses pembangunan di peringkat Malaysia. Selain itu mata pelajaran ini akan merumuskan isu-isu perpaduan dan cadangan penambahbaikannya di Malaysia.

REFERENCES

a. Baharuddin, S.A., 2007, *Modul Hubungan Etnik*, Shah Alam: Pusat Penerbitan Universiti, Universiti Teknologi Mara.

b. Dora, M.T., 2005, *Liberalisasi Komuniti*, Melaka: Penerbit Universiti Teknikal Malaysia Melaka.

c. Bari, A.A., 2008, *Perlembagaan Malaysia*, Shah Alam: Arah Publication Sdn. Bhd.

DKKX XXX1 CO-CURRICULUM I

LEARNING OUTCOMES

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

LO1 Understand a balanced and comprehensive education hence generating a more mature student.

LO2 Develop leadership aspects stressing on diciplines and cooperation within a group or organisaton.

LO3 Build personality and character guided by rules of conduct.

LO4 Foster cooperation and unity in multi-racial society.

SYNOPSIS

a. Culture
Choir, *Gamelan*, *Cak Lempung, Nasyid*, *Khat*, Acting, Art, Debate (*Bahasa Malaysia*), Debate, Interior Design and *Kompang*.

b. Entrepreneurship
Video, Film & Photography, Journalism and Publication, e-computer and Technopreneurship.

c. Community
Fiqh Muamalat, Fiqh Amali, Translation of *Al-Quran & Recitation of Yaasin* and Peer Group Programmes (PRS) & *Sahabat Khidmat*.

d. Sports
Swimming (Male), Volleyball, Golf, Kayak, Sepak *Takraw*, Swimming (Female), Aerobics, Badminton, Football and Netball.

e. Martial Arts
Silat Gayong, Karate-Do and Taekwando.

YEAR 1 COURSES - PROGRAMME CORE

DMCU 1012 EXPERIMENTAL METHOD

LEARNING OUTCOMES

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

LO1 Describe clearly basic mechanical quantity, measurement techniques, procedures and devices.

LO2 Apply the mechanical measurement knowledge through the problem given.

LO3 Analyze collected experimental data, thus recognizing the important point of the data through discussion.

LO4 Communicate in writing and produce proper laboratory report that meets the requirement format.

SYNOPSIS

Introduction to the experiment and measurement concept. Experimental data properties and graphical presentation of the data. Dealing with hysteresis and uncertainty. This course also covers experiment data processing which consists of using statistical method for irregular data, regression line, and using spreadsheet in data analysis. Introduction to the basic knowledge about measurement devices.

REFERENCES

a. Beckwith, T.G., Marangoni, R.D., & Lienhard, V.J.H., 2007, *Mechanical Measurement*, 6th Edition, Prentice Hall.

b. Holman, J.P., 2001, *Experimental Methods for Engineers*, 7th Edition, McGraw Hill.

c. Bolton, W., 1996, *Experimental Method*, Newness, Butterworth-Heinemann.

d. Doeblin, O.E., 1995, *Engineering Experimentation: Planning, Executing and Reporting*, McGraw Hill.

e. Kirkup, L., 1994, *Experimental Methods: An Introduction to the Analysis and Presentation of Data*, John Wiley and Sons.

DMCU 1233 CHEMISTRY

LEARNING OUTCOMES

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

LO1 Recall the relevant chemistry principle studied.

LO2 Explain verbally and in writing the different chemical reactions, the differences in the reactivity of various elements, the nature of various chemical properties and chemical reactions and the factors affecting chemical properties and chemical reaction.

LO3 Solve chemistry related problem by applying the relevant chemical principles.

LO4 Demonstrate the relevant chemistry laboratory skills.

LO5 Apply the various chemical properties learned to discuss the solution for relevant mechanical engineering problems.

SYNOPSIS

This course will discuss about the concepts in Chemistry: The Study of Change; Atoms, Molecules and Ions; Chemical Reaction; Structure of Atoms; The Periodic Table; Chemical Bonding; Properties of Matter; and Thermochemistry.

REFERENCES

a. Chang, R., 2013, Chemistry, 12th Ed., McGraw Hill, USA.

b. Petrucci, R.H., & Hill, J.W., 2002, General Chemistry: An Integrated Approach, Prentice Hall, USA.

c. Halimaton H., et al., 2001, Kimia Asas Sains dan Kejuruteraan, Johor Bahru.

DMCU 1032 FUNDAMENTAL MATHEMATICS

LEARNING OUTCOMES

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

LO1 Explain fundamental knowledge of mathematics that is used in engineering field.

LO2 Solve simple engineering problem by providing a suitable formulation.

LO3 Apply knowledge acquired in advanced mathematic courses: e.g. Calculus, Engineering Mathematics and Differential Equation.

SYNOPSIS

This course discuss about Real Number System; Complex Numbers; Matrices; Geometric Coordinates; Functions and Graph;Trigonometry; and Polynomials.

REFERENCES

a. Larson, R., 2006, Pre-Calculus, 27th ed. Houghton Mifflin College..
b. James, G., 2010, Modern Engineering Mathematics, 4th Ed. With MyMathLab, Prentice Hall.
c. Sullivan, M., 2004, Brief Calculus An Applied Approach, Johan Wiley & Sons.
d. Sullivan, M., & Sullivan III, M., 2007, Precalculus, Prentice Hall.
e. Blitzer, R., 2005, Algebra & Trigonometry, Prentice Hall.
f. Othman, Z., & Ahmad, S.S.S., 2008, Module of Fundamental Mathematics, UTeM.

DACS 1263 FUNDAMENTAL PHYSICS

LEARNING OUTCOMES

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

LO1 Define the basic laws and comprehend the basic concepts in physics.

LO2 Apply the laws and the concepts systemtically in problem solving.

LO3 Relate between the various topics covered and their application in the field of engineering.

LO4 Make accurate measurement and present result in a proper scientific report.

SYNOPSIS

The topics cover 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, heats, temperature, electric forces and fields, capacitor, electric current and circuits, reflection and refraction of light.

REFERENCES

a. Giambatista A., Richardson, B.M., & Richardson, R.C., 2007, College Physics, 2nd Edition, Mc-Graw Hill.
b. Walker, J.S., 2007, Physics, 3rd Edition Addison Wesley.
c. Cutnell, J.D., & Johnson, K.W., Physics, 7th Edition, Wiley, 2006.
d. Bueche, F. J., & Hecht, E., 2005, Sachaum's Outline of College Physics, 10th Edition, Mc-Grw Hill.

DEKG 2113 ELECTRICAL & ELECTRONIC PRINCIPLES

LEARNING OUTCOMES

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

LO1 Understand the fundamental concepts of electricity (DC and AC).

LO2 Understand the uses of electrical and electronics circuits.

LO3 Familiarize with integrated and digital circuits.

SYNOPSIS

This module provides knowledge relating to electrical units and parameters, direct and alternating current sources, Ohm's Law, passives components like resistor and capacitors in parallel and series connections, sine wave characteristic, transformers, actives components (integrated circuit) like diode, transistor, operational amplifier, digital circuits and their application.

REFERENCES

a. Hughes, E., 2002, Electric and Electronic Technology, Prentice Hall.

b. Robbins, H., and Miller, W.C., 2004, Circuits Analysis: Theory and Practice, 3rd Edition, Thomson Delmar Learning.

c. Boylstead R., Nashelsky L., 2002, Electronics Devices and Circuit Theory, 8th Edition, Prentice Hall.

d. Codgell, J.R., 1999, Foundation of Electrical Engineering, 2nd Edition, Prentice Hall.

e. Irwin, J.D., Kerns, JR., D.V., 1995, Introduction to Electrical Engineering, Prentice Hall.

DMCU 1912 TECHNOLOGY AND ENGINEERING WORKSHOP PRACTICE I

LEARNING OUTCOMES

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

LO1 Identify common shop hazards and common workshop safety equipments.

LO2 Demonstrate the proper and correct tools and safety equipments usage for a given job.

LO3 Produce products during welding, fabrication and fitting projects.

LO4 Prepare reports on all projects

SYNOPSIS

a. Welding

This course is designed to provide students with a fundamental understanding of gas welding, arc welding (SMAW) and MIG welding (GMAW), welding safety, welding machines (gas, arc, MIG), electrode classifications and electrode selection. Training to develop the basic welding skills in basic joint configurations such as butt joint and tee joint.

b. Fabrication

Covers layout, cutting, forming and joining of basic sheet metal and use of hand tools and equipment to develop and fabricate basic sheet metal project based on drawing of the project.

c. Fitting

This course is designed to give students a good appreciation on the various types of hand tools commonly used for measurement, marking out, and metal removal. This course also let the students understand the uses of common hand tools and appreciate the important of fitting work in the finishing product. Through the hands-on practice given, the students will acquire some of the basic skills and technique involved with these hand processes.

REFERENCES

a. Mike, T., 2004, *Basic Manufacturing*, 3rd Edition Butterworth-Heinemann.

b. Kibbe, R.R., Meyer, R.O., White, W.T., and Neely, J.E., 2009, *Machine Tool Practices*, 9th Edition, Prentice Hall.

c. Kalpakjian, S., 2009, *Manufacturing Engineering and Technology*, 6th Edition, Prentice Hall
d. Amstead, B.H., 1977, *Manufacturing Processes*, John Woley & Son.
e. Black, B.J., 2010, *Workshop Processes, Practice and Materials* (4th Edition), Newnes.

DMCS 1313 STATICS

LEARNING OUTCOMES

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

LO1 Identify vector signs to represent the vector quantities of a force and moment in 2-D and 3-D, and determine the magnitude and direction of resultant forces in 2-D and 3-D.
LO2 Construct Free Body-Diagram in order to solve engineering mechanics of statics problems correctly.
LO3 Apply the principle of equilibrium in order to calculate forces acting on particles and rigid bodies, in structures, frames and machines problems.
LO4 Apply the concept of dry friction in machines.
LO5 Determine the center of gravity/mass and centroid of a body, volume, area and line.

SYNOPSIS

The introduction and 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

a. Hibbeler, R.C., 2004, Engineering Mechanics – Statics, 3th Ed. Prentice Hall.
b. Beer, F.P., and Johnston, E.R., 2000, Vector Mechanic for Engineer, McGraw-Hill.
c. Meriam, J.L., & Kraige, L.G., 1987, Engineering Mechanics – Static, John Wiley & Sons.
d. Schmict and Boresi, 2000, Engineering Mechanics- Statics, Thomson Learning.
e. Pitel and Kiu, 1999, Engineering Mechanics- Static, Thomson Learning.

DITG 1113 COMPUTER PROGRAMMING

LEARNING OUTCOMES

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

LO1 Explain and describe the language elements in C++ programming language.
LO2 Solve programming problems and discover alternative solution by developing the algorithm.
LO3 Modify and reproduce a simple program using programming structures such as conditionals, loops and functions.

SYNOPSIS

This course discusses about the basic principles of computers, software development methodology and 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, structure and pointer are learnt towards the end of this course.

REFERENCES

a. Gaddis, T., 2011, Starting Out with C++ Brief Version: From Control Structures Through Objects, 7th. Edition, Pearson Education.
b. Ibrahim, Y., et. al, 2009, Module 1 Problem Solving using C++: A Practical Approach, FTMK, UTeM
c. Friedman, Koffman, 2010, Problem Solving, Abstraction, and Design Using C++, 6th Edition, Pearson.

d. Savitch, Walter, 2006, Absolute C++, Addison Wesley.
e. Deitel, H.M., Deitel, P.J., 2005, C++ How To Program, Prentice Hall.
f. Forouzan, A., Behrouz, 2000, A Structured Programming Approach Using C++, Brooks/Cole Thomson Learning.

DMCU 1323 MANUFACTURING PROCESS

LEARNING OUTCOMES

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

LO1 Recognize and explain very well on the issues and aspects of manufacturing.
LO2 Identify and select the most suitable manufacturing processes in producing a particular product without ignoring the safety, economic and environment aspects.
LO3 Identify and select the most suitable material for a particular manufacturing process.
LO4 Identify and select the most suitable machines for a particular manufacturing process.

SYNOPSIS

This course covers manufacturing and the aspects of manufacturing, joining processes and equipments, metal casting processes and equipments, metal and plastic forming processes and equipments, material removal processes and machines, and modern machining processes.

REFERENCES

a. Groover, M.P., 2012, Introduction to Manufacturing Process, John Wiley & Sons Inc.
b. Groover, M.P., 2010, Fundamentals of Modern Manufacturing, John Wiley & Sons Inc.
c. Kalpakjian, S., and Schmid, S. R., 2009, Manufacturing Processes for Engineering Materials, Prentice Hall International.
d. Schey, J.A., 2008, Introduction to Manufacturing Processes, McGraw Hill.

DMCD 1543 ENGINEERING GRAPHICS

LEARNING OUTCOMES

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

LO1 Use standard drafting tools to draw engineering drawing.
LO2 Produce geometric, orthographic, isometric, section cut and detail drawing using manual technique or CAD.
LO3 Use CAD software in order to produce 2D drawing and 3D solid modelling.
LO4 Produce accurate engineering drawing base on project given.

SYNOPSIS

In the first part of this course; geometric, orthographic, dimensioning, isometric, sectional view and assembly drawing will be explains using manual drafting technique. In the second part, CAD software will be used in order to generate those drawing. Additional 3D solid modeling also will be introduced in this course.

REFERENCES

a. Goetsch, D.L., Nelson, J.A. and Chalk, W.S., 2000, Technical Drawing, 4th Ed., Delmar.
b. Jenson, C., Helsel, J.D., and Short, D.R., 2008, Engineering Drawing and Design, McGraw Hill.
c. Zainal, M.R., Ghani, B.A., and Samian, Y., 2000, Lukisan Kejuruteraan Asas, Penerbit UTM.
d. Alkahari, M.R., 2009, Modul Lukisan Berbantu Komputer, Penerbit UTeM.

DMCU 1042 CALCULUS

LEARNING OUTCOMES

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

LO1 Understand the concepts of limits, theorem and procedures for calculating limits, then using the limits to study the continuity of a curve at a point.

LO2 Find the derivatives of the functions and solve various applications of the derivative.
LO3 Solve the integration by using various techniques: substitution, integration by parts, Tabular Method and partial fraction.
LO4 Discuss methods for integrating that involve trigonometric functions.
LO5 Apply the technique of integration to find areas and volumes.

SYNOPSIS

This course will discuss about the concepts of Limits & Continuity; The Derivatives; Applications of Differentiation; Integration; and Applications of Integration.

REFERENCES

a. Md. Raji, A.W., Rahmat, H., Kamis, I., Mohamad, M.N., & Ong, C.T., 2009, Calculus for Science and Engineering Students, Jabatan Matematik, Fakulti Sains, UTM & Pusat Pengajian Sains, Universiti Tun Hussein Onn Malaysia.
b. Frank Ayers Jr. and Mendelson E., 1999, Schaum's Outlines Calculus, 4th ed. New York: Mc Graw-Hill.
c. Thomas Jr., G.B., 2009, Thomas Calculus, 12th ed. Pearson Education, Inc.
d. Anton, H., Bivens, I., and Davis, S., 2005, Calculus, 8th ed. New York: John Willey & Sons, Inc.
e. Smith, R.T., and Minton, R.B., 2006, Calculus: Concepts and Connections, New York: Mc Graw-Hill.

DMCU 2922 TECHNOLOGY AND ENGINEERING WORKSHOP PRACTICE II

LEARNING OUTCOMES

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

LO1 Understand the technical drawing and translate to machining/manufacturing processes.
LO2 Determined the processing method applied on the given project.
LO3 Identify the cutting parameter and machine parameters.
LO4 Select suitable cutting tool and tool path.
LO5 Create programming cycle for CNC machine.
LO6 Understand the advantages/limitation for conventional and CNC machines.

SYNOPSIS

a. Conventional Machine

Introduction to fundamentals of machining process on conventional (Lathe and Milling) machines and its application, such as in handling aspect, safety factor, main function and machining/manufacturing process includes in conventional lathe and milling machining.

b. CNC Machine

Covers fundamentals of machining process on advance machine as CNC lathe machine, CNC milling machine, EDM machine and wire cut machine and its applications such as in handling aspect, safety factor, main function and machining/manufacturing process with high accuracy and complex method.

REFERENCES

a. Kibbe, Neely, Meyer and White, 2009, Machine Tool Practices, 9th Edition, Prentice Hall, New York.
b. Fakulti Kejuruteraan Mekanikal, Modul Latihan Praktikal dalam Kampus, Universiti Teknologi Malaysia.
c. Rajput, R.K., 2008, A Textbook of Manufacturing Technology, Firewall Media.

YEAR 2 COURSES - UNIVERSITY COMPULSORY

DLHW 2422 ENGLISH FOR EFFECTIVE COMMUNICATION

LEARNING OUTCOMES

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

LO1 Perform oral skills through impromptu speech.

LO2 Give descriptions of a product through informative speech.

LO3 Describe processes from manual instructions in an oral presentation.

LO4 Demonstrate oral social skills (role-play) based on a situational context.

SYNOPSIS

This course is designed to provide students with the necessary communication skills to communicate effectively. The skills covered are speaking, reading and writing. The elements of grammar are taught to complement the topics covered in this course. The documents covered are product descriptions and manual instructions. Students demonstrate interpersonal skills through speeches and role-play. The elements of problem-based learning (PBL) are especially exercised during the oral presentation of the product and manual descriptions as well as role-play.

REFERENCES

a. Azar, B. S., 2010, Understanding and using English grammar, New York: Longman.

b. Dobrin, S.I., Keller, C.J., & Weisser, C.R., 2008, Technical communication in the twenty-first century, New Jersey: Pearson Prentice Hall.

c. Gerson, S.J., & Gerson, S.M., 2010, Workplace writing: Planning, packaging and perfecting communication, US: Prentice Hall.

d. Osman, H., et al., 2011, Effective communication skills, Shah Alam: UPENA.

e. Lannon, J.M., & Gurak, L.J., 2011, Technical Communication, US: Longman.

f. Mohd Nor, N., Mansor, S., & Atin, J., 2010, Technical English Skills, Malaysia: August Publishing Sdn. Bhd.

DKKX XXX1 CO-CURRICULUM II

LEARNING OUTCOMES

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

LO1 Understand a balanced and comprehensive education hence generating a more mature student.

LO2 Develop leadership aspects stressing on diciplines and cooperation within a group or organisaton.

LO3 Build personality and character guided by rules of conduct.

LO4 Foster cooperation and unity in multi-racial society.

SYNOPSIS

a. Culture
Choir, *Gamelan*, *Cak Lempung, Nasyid*, *Khat*, Acting, Art, Debate (*Bahasa Malaysia*), Debate, Interior Design and *Kompang*.

b. Entrepreneurship
Video, Film & Photography, Journalism and Publication, e-computer and Technopreneurship.

c. Community
Fiqh Muamalat, Fiqh Amali, Translation of *Al-Quran & Recitation of Yaasin* and Peer Group Programmes (PRS) & *Sahabat Khidmat*.

d. Recreation
Go-Kart, Adventure dan Cycling

e. Sports

Swimming (Male), Volleyball, Golf, *Kayak*, *Sepak Takraw*, Swimming (Female), Aerobics, Badminton, Football and Netball.

f. Martial Arts
Silat Gayong, Karate-Do and *Taekwando*

DTKW 1012 ASAS PEMBUDAYAAN KEUSAHAWANAN

LEARNING OUTCOMES

Di akhir kursus ini pelajar akan dapat:

LO1 Menerap budaya keusahawanan berdasarkan teori keusahawanan, revolusi usahawan, sejarah pembangunan usahawan dan perkembangan keusahawanan di Malaysia.

LO2 Memperakui dan mengaplikasikan kemahiran keusahawanan seperti kreativiti, inovasi, pro-aktif, mengambil risiko, mengenalpasti peluang, pemasaran, dan rangkaian untuk memasuki/menembusi pasaran.

LO3 Melaksanakan penganjuran seminar keusahawanan dan kerja lapangan perniagaan di samping membuat pembentangan projek perniagaan serta berkongsi pengalaman berkaitan perlaksanaan projek perniagaan kumpulan masing-masing.

SYNOPSIS

Kursus ini akan membekalkan pelajar dengan motivasi dan kemahiran utama keusahawanan. Disamping itu, pelajar juga akan mendapat kemahiran tentang prinsip-prinsip dan amalan yang diperlukan untuk memulakan, mengembangkan dan memperkukuhkan sesebuah perniagaan. Aktiviti pengajaran, pembelajaran dan aplikasi yang menerapkan teori dan amalan akan membantu pelajar menguasai kompetensi yang perlu sebelum menceburkan diri dalam bidang perniagaan. Kursus ini juga membantu pelajar membentuk jaringan/rangkaian perniagaan melalui perbincangan perniagaan, similasi dan seminar. Pelajar akan didiedahkan dengan isu-isu yang berkaitan dengan pemasaran, pengurusan strategi dan risiko. Disamping itu, pelajar akan dibekalkan dengan kemahiran yang perlu untuk menyediakan penyata aliran tunai dan asas dalam membangunkan menyediakan perancangan perniagaan.

REFERENCES

a. Hisrich, D.R., Peters, M.P., and Shepherd, D.A, 2005, Entrepreneurship, McGraw Hill IE.
b. UiTM Entrepreneurship Study Group, 2004, Fundemental of Entrepreneurship, Prentice Hall.
c. Mankani, D., 2003, Technopreneurship, Prentice Hall.
d. Yusof, A.A., 2003, Prinsip Keusahawan, Prentice Hall.
e. Buang, N.A., 2002, Asas Keusahawanan, Penerbit Fajar Bakti Sdn. Bhd.
f. Kuratko, D.F., and Hodgetts, R.M., 2001, Entrepreneurship: A Contemporary Approach, 5th Edition, South-Western: Ohio.

DLHW 3432 ENGLISH FOR MARKETABILITY

LEARNING OUTCOMES

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

LO1 Produce a reflective writing (A2), resume, job application letter/ online job application letter and short report.

LO2 Response appropriately to questions during mock interview session.

LO3 Analyse possible solutions based on the given problem in a group discussion.

LO4 Use appropriate types of communication using a variety of sentences based on the workplace contexts.

SYNOPSIS

This course aims to introduce and expose students to the basic tenets of communication specifically the oral and written communication required at the workplace. Students will be provided with the opportunity to produce a reflective writing, resume, job-application letter, e-message and report. They will also be able to participate in an interview, and to discuss and explain information in group discussions. Students will be exposed to situations where they learn to function as individuals and team members by communicating in spoken and written forms using appropriate language in a variety of workplace contexts.

REFERENCES

a. Dobrin, S.I., Keller, C.J., & Weisser, C.R., 2008, Technical communication in the twenty-first century, NJ: Pearson Prentice Hall.
b. Fisher, R., Larkin, S., & Jones, S., 2010, Using talk to support writing, UK: Sage Publication Limited.
c. Gail, F., & Lockwood, J., 2010, Globalization, communication and the workplace: talking across the world, UK: Continuum International Publishing.
d. Gerson, S.J., & Gerson, S.M., 2010, Workplace writing, New Jersey: Prentice Hall.
e. Osman, H., et al., 2011, Effective communication skills, Shah Alam: UPENA.
f. Samsiah, A.H., Rosyati, A.R., 2012, Mastering English for employment, Cengage Learning Asia
g. Rizvi, M.A., 2008, Resumes and interviews: The art of winning Interview, New Delhi:Tata McGraw Hill.
h. Timm, P.R., & Bienvenu, S., 2010, Straight talk: written communication for career, UK: Routledge.
i. White, P., 2012, The 5 languages of appreciation in the workplace: empowering organizations by encouraging people, UK: Northfield Publishing.

YEAR 2 COURSES - PROGRAMME CORE

DMCT 2123 THERMODYNAMICS I

LEARNING OUTCOMES

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

LO1 Define basic terms of thermodynamics and identify systems, properties and processes.
LO2 Use property tables and draw property diagrams of pure substances to define the state of the system.
LO3 Apply the concept of First Law of Thermodynamics in Closed Systems and Control Volumes.
LO4 Use the concept of Second Law of Thermodynamics to determine the performance of heat engines, refrigerators and heat pumps.
LO5 Determine the entropy change of the pure substance based on related principles.

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

a. Cengel, Y.A. and Boles, M.A., 2011, Thermodynamics: An Engineering Approach, 7th ed, McGraw Hill. Singapore.
b. Gupta, S.C., 2008, Thermodynamics, 1st ed, Pearson Education (Singapore) Pte. Ltd
c. Sonntag, R.E., Borgnakke, C., Van, W., and Gordon, J., 2008, Fundamentals of Thermodynamics, 7th ed, John Wiley & Sons, Inc. New York.

DMCS 2323 SOLID MECHANICS I

LEARNING OUTCOMES

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

LO1 Use concept of stress-strain relationship and factor of safety appropriately in engineering design.
LO2 Sketch normal force, shear force and bending moment diagrams in determining stresses and displacement appropriately.
LO3 Determine stresses within structure courseed to torsion correctly.
LO4 Analyse the slope and displacement of a continuous beam due to static loading using singularity function correctly.

SYNOPSIS

This course introduces to the various types of structures and type of supports. Understand the concepts of stress, strain, shear force and bending moment. It also covers the theory of torsion, shear flow with combination of loads, including the deflection of beams.

REFERENCES

a. Beer, F.P., et al., 2006, *Mechanics of Materials* 4th Edition in SI Units, McGraw-Hill.
b. Hibbeler, R.C., 2004, *Mechanics of Materials* SI Edition, Prentice Hall.
c. Gere, J.M., 2004, *Mechanics of Materials*, Thomson.
d. Vable, M., 2002, *Mechanics of Materials*, Oxford University Press.

DMCB 2423 MATERIALS SCIENCE

LEARNING OUTCOMES

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

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LO1 Describe the classifications, structures and applications of metals, ceramics and polymers correctly.
LO2 Analyze deformations behavior and strengthening mechanisms relying to its structure and properties of materials clearly.
LO3 Apply Fick's Law in calculating the diffusion process and its mechanism in solids properly.
LO4 Demonstrate appropriate test methods in determining mechanical properties.
LO5 Apply the relation between composition, microstructure and properties of metallic materials by using apposite phase diagram and heat treatment process.

SYNOPSIS

Introduction to fundamentals of Materials Science and its applications, atomic structure, crystal structure, solidification, imperfections and solid diffusion, mechanical and physical properties, phase diagrams and transformation, types and applications of materials.

REFERENCES

a. Calister, W.D., 2008, *Materials Science and Engineering: An Introduction,* 6th Edition, John Wiley & Sons.
b. Smith, W.F., 2004, *Foundation of Materials Science and Engineering,* 4th Edition, McGraw Hill.
c. Shackelford, J.F., 2000, *Introduction to Materials Science for Engineers,* 5th Edition, Prentice Hall.
d. Askeland, D.R., 1994, *The Science and Engineering of Materials*, 3rd Edition, PWS Publication Co.
e. Budinski, K.G. and Budinski M.G., 1999, *Engineering Materials: Properties and Selection*, 6th Edition, Butterworth-Heinemann UK.

DMCM 2713 DYNAMICS

LEARNING OUTCOMES

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

LO1 To apply the concept of position, velocity and acceleration in determine the motion of particle and rigid body.
LO2 Apply equation of motion in solving the particle and rigid body motion.
LO3 Solve the problem involving rectilinear and curvilinear motion.
LO4 Analyze dynamics problem using principle of work and energy.
LO5 Analyze reaction of forces and acceleration for a translating and rotating rigid body using Newton's law of motion.

SYNOPSIS

This course introduce to the principle of dynamics based on kinematics and kinetic. Understand the concept of position, velocity and acceleration, application of Newton second law, principle of work and energy, principle of impulse and momentum for particle and rigid body.

REFERENCES

a. Beer, F.P., 2010, *Vector Mechanics for Engineers, Dynamics SI Units*, 9th Edition, McGraw-Hill.
b. Hibbeler, R.C., 2010, *Engineering Mechanics, Dynamics*, 12 Editions, Prentice Hall.
c. Bedford, A., and Fowler, W., 2008, *Engineering Mechanics, Dynamics*, 5th Edition, Prentice Hall.

DMCU 2052 ENGINEERING MATHEMATICS

LEARNING OUTCOMES

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

LO1 Describe the concept and applications of multivariable functions.
LO2 Apply partial derivatives method in solving engineering problems
LO3 Evaluate and apply two variable integral function over the plane region.
LO4 Evaluate and apply three variable integral function over the plane region.
LO5 Evaluate and apply calculus techniques in solving vector valued functions.

SYNOPSIS

This course consists of three chapters: Functions of Several Variables, Multiple Integrals and Vector-Valued Functions. The syllabus is developed by introducing the concepts of the functions with several variables, integration and also vector-valued function, followed by learning various techniques in solving the problems and its application in physical and engineering fields.

REFERENCES

a. Jusoh, M.M., et al., 2010, *Engineering Mathematics*, Pearson.

b. Finney, R.L., Weir, M.D., and Giordano, F.R., 2008, *Thomas's Calculus*, 11th Ed., Pearson.
c. Anton, H., 2009, *Calculus Multivariable*, 9th Ed., John Wiley.
d. Smith, R.T., and Minton, R.B., 2007, *Multivariable Calculus*, McGraw-Hill.
e. Steward, J., 2007, *Calculus – Concepts And Contexts*, Brooks/Cole, 2nd Ed.
f. Stroud, K.A., 2007, *Engineering Mathematics*, 6th Ed, Palgrave Macmillan

DMCF 2213 FLUID MECHANICS I

LEARNING OUTCOMES

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

LO1 Use fluid and its properties equation in the context of fluid mechanics application.
LO2 Apply fluid mechanics equations in solving fluid statics and dynamics problems.
LO3 Respond to the procedure that has been given in laboratory as a team.
LO4 Interpret the experimental data accordingly and to report the results in the appropriate scientific manner.

SYNOPSIS

This course introduces the basic properties of fluids. It covers the definition to the pressure, heads, the derivation of hydrostatic equation and its application in pressure measurement, static forces analysis on immersed surface and also buoyancy analysis. The course also introduces fluid dynamics, fluid flow analysis, derivation of flow equations, the application of the energy equation, Bernouli equation in the calculation of flow velocity, discharge, heat lost in piping systems, dimensional analysis and also its application.

REFERENCES

a. Munson, B.R., Young, D.F. and Okiishi, T.H., 2006, *Fundamentals of Fluid Mechanics*, 5th Ed., John Wiley & Sons, Inc, Asia.
b. Som, S.K., and Biswas, G., 2004, *Introduction to Fluid Mechanics and Fluid Machines*, 2nd Ed., Tata McGraw-Hill, New Delhi.
c. Douglas, J.F., Gasiorek J.M. and Swaffield, J.A., 2001, *Fluid Mechanics*, 4th Ed., Prentice Hall, Spain.
d. Cengel, Y.A. and Cimbala, J.M., 2006, *Fluid Mechanics: Fundamentals and Applications*, International Edition, McGraw-Hill, Singapore.
e. Streeter, V.L. and Wylie, E.B., 1983, *Fluid Mechanics*, First SI Metric Ed., McGraw-Hill, Singapore.

DMCS 3333 SOLIDS MECHANICS II

LEARNING OUTCOMES

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

LO1 Use transformation of stress and strain in determining the principal stresses, principal strains and planes using formulation (analytical) and Mohr's circle methods.
LO2 Analyze stresses in thin and thick cylinder pressure vessels and stresses in shrink-fit problems.
LO3 Apply yield criteria for ductile and brittle materials to avoid failure of the structure under plane stress condition caused by yielding.
LO4 Determine strain energy due to axial, bending and torsional loadings and define structures' deformations (displacements and angle of twist) under such loadings.
LO5 Evaluate instability, strength and buckling behaviour of struts or slender structures courseed to compressive axial load with various end-conditions.

SYNOPSIS

To develop students that are capable to define and apply principles of strength and stability in structures and capable to evaluate structures strength in engineering design.

REFERENCES

a. Beer, F.P, Johnston, E.R, and Dewolf, J.T., 2012, *Mechanics of Materials*, 6th edition. in SI Units, McGraw-Hill.
b. Hibbeler, R.C., 2011, *Mechanics of Materials*, 8th edition. In SI unit., Prentice Hall.
c. Vable, M., 2004, *Mechanics of Materials*, Oxford University Press.
d. Benham, P.P., Crawford, R.J., and Armstrong, C.G., 1996, *Mechanics of Engineering Materials*, Longman Group, Ltd., UK.

DMCU 3082 STATISTICS

LEARNING OUTCOMES

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

LO1 Summarize data graphically and numerically.
LO2 Identify clearly the concept of probability and its distribution.
LO3 Distinguish the use of population and sample in inferential statistics.
LO4 Determine the concept of estimation and hypothesis testing for one population.
LO5 Apply the concept of correlation, linear model and slope testing appropriately.

SYNOPSIS

This course covers Data description and Numerical Measures, Probability, Random Variables and Probability Distributions, Sampling Distributions, Estimation, Hypothesis Testing, Simple Linear Regression.

REFERENCES

a. Devore, J.L., 2008, *Probability and Statistics for Engineering and the Sciences*, 7th Edition, Thomson – Duxbury.
b. Montgomery, D.C., Runger, G.C., 2007, *Applied Statistics and Probability for Engineers*, 5rd Edition, John Wiley.
c. Hayter, Anthony, J., 2007, *Probability and Statistics for Engineers and Scientists*, 3rd Edition, Thomson Brooks.
d. Mann, P.S., 2005, *Introductory Statistics Using Technology*, 5th Edition, John Wiley.

DENG 2223 FUNDAMENTAL ELECTRIC AND MICROPROCESSOR

LEARNING OUTCOMES

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

LO1 Describe and identify the application of digital circuits in microprocessor.
LO2 Classify the numbering systems such as binary, decimal and hexadecimal.
LO3 Describe the concept and differentiate the basic electronic component.
LO4 Perform experiments and present technical report.
LO5 Demonstrate effectively throughout an individual assignment.

SYNOPSIS

This course will be divided into two sections; basic electronics and microprocessor technology. The first section covers the topic on concept and function of electronic components in a computer system (resistor, capacitor, inductor, transformers, fuse, cable, diode, and transistor). The next section will deal with topics such as system numbers, logic gates, Boolean operation, combination logic (type of flip flop), register and digital circuit application in microprocessor.

REFERENCES

a. Gates, E.D., 2007, *Introduction to Electronic*, 5th Edition, Delmar Thomson Learning.
b. Schuler, C.A., 1999, *Electronics, Principles and Application*, 5th Edition, Mc-Graw-Hill.
c. Crisp, J., 2000, *Introduction to Digital Systems*, Newness.
d. Tocci, R.J., *Digital System, Principles and Application*, 4th Edition, Prentice Hall.
e. Green, D.C., *Digital Electronics*, 5th Edition, Addison Wesley Longman.

DMCU 2062 DIFFERENTIAL EQUATIONS

LEARNING OUTCOMES

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

LO1 Understand the basic concepts of Differential Equations, Laplace Transform and Fourier Series.
LO2 Identify and analyze the problems of ordinary differential equations.
LO3 Solve the problems of ordinary differential equations.
LO4 Apply the knowledge of differential equations in order to solve engineering problems.
LO5 Operate the CNC machine to produce a product.

SYNOPSIS

This course will discuss about the basic concepts of Differential Equations; First Order Differential Equations; Second Order Linear Differential Equation with constant coefficients, Laplace Transform and Fourier Series.

REFERENCES

a. Md. Raji, A.W., and Mohamad, M.N., *Modul Persamaan Pembezaan*, Jabatan Matematik, Fakulti Sains, UTM & Pusat Pengajian Sains, Universiti Tun Hussein Onn Malaysia, Malaysia.
b. Zill D.G., & Cullen, M.R., 2005, *Differential Equations with Boundary-Value Problems*, 6th Edition, Thomson Learning, Inc.
c. Bronson, R., 2003, *Differential Equations*, New York: Mc Graw Hill.
d. Boyce, W.E., and Diprima, R.C., 2001, *Elementary Differential Equations with Boundary Value Problems*, John Willey & Sons, Fifth Edition.

DMCU 2963 INDUSTRIAL TRAINING

LEARNING OUTCOMES

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

LO1 Describe relevant process in company through report writing, interview and presentation session.
LO2 Apply theory and skills acquired in class, workshop and labs in actual industrial environment.
LO3 Solve the given technical problem during the industrial training.
LO4 Cooperate in a team and contribute to project outcome.
LO5 Adopt professional practice and ethics in work. Obey company rules and regulations.
LO6 Seek additional relevant information from various sources related to the problem independently to make improvement.

SYNOPSIS

All students are required to undergo industrial training as part of their curiculum to complete their three (3) years course for the Diploma of Mechanical Engineering. It is compulsory for all diploma program students to undergo the Industrial Training Programme. The duration of training is 10 weeks and it will be taken place during semester break after semester 4.

REFERENCE

a. *UTeM Guideline Handbook for Industrial Training*.

DMCU 2972 INDUSTRIAL TRAINING REPORT

LEARNING OUTCOMES

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

LO1 Explain detail about training and flow of activity/work.

LO2 Discuss result/finding that has been obtained from training.

LO3 Make conclusion based on engineering practice work.

SYNOPSIS

Each student is required to prepare and send technical report for evaluation purpose. Report that will be prepared must be complied with the format and criteria that is fixed by faculty. Details format of report has been explained in the industrial training handbook.

REFERENCE

a. Evelyn, K., 2010, *Report writing*, McGraw – Hill.

b. Jack, F.O., 2008, *Writing Skills for Technical Students*, 6th edition, Prentice Hall Pearson.

c. Phyllis, C., and Mary, R.L., 2008, *Writing at University: a guide for students*, 3rd edition, Maidenhead: Open University Press.

YEAR 3 COURSES - PROGRAMME CORE

DMCT 3133 THERMODYNAMICS II

LEARNING OUTCOMES

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

LO1 Define the thermodynamics cycles, air standard cycles, heat engines, Brayton cycle, gas turbines and the related processes, calculate the thermal efficiency, gross work output, net work output and work ratio for basic gas turbine, gas turbine with intercooler and gas turbine with reheat.

LO2 Define and analyze the operation of ideal Rankine cycle, reheat and regenerative cycle for steam power plant, calculate the efficiency and work ratio for each cycle.

LO3 Define and analyze the operation of spark and compression ignition engines; Evaluate the performance characteristics of IC engine consists of indicated HP, brake HP, mechanical efficiency, specific fuel consumption and volumetric efficiency.

LO4 Explain the principle of reciprocating air compressors, indicator diagram and calculation of power required for single stage and multistage for ideal and actual compression.

LO5 Describe the reverse Carnot cycle and the vapor compression refrigeration system and the related components, determination of efficiency and COP for each cycle.

LO6 Define the different modes of heat transfer: conduction, convection and radiation and calculate the thermal conductivity, heat transfer coefficient, heat transfer through plates, cylinders and spheres.

SYNOPSIS

This course introduces the essential underlying concepts related to heat engines (with working fluids as gases and vapors) based on different thermodynamics cycles, criteria performance of various type of power cycles, refrigerants and their properties, refrigeration cycles and types of internal combustion engines, air compressor systems and introduction to heat transfer.

REFERENCES

a. Cengel, Y.A., Boles, M.A., 2011, *Thermodynamics : An Engineering Approach*, 7th edition. in SI Units, McGraw-Hill.
b. Cengel, Y.A., Ghajar, A.J., 2011, *Heat and Mass Transfer : Fundamentals and Applications*, 4th edition in SI Units, McGraw-Hill.
c. Morad, N.A., Mulop, N., Darus, A.N., 2011, Universiti Teknologi Malaysia, Pearson Malaysia Sdn Bhd.
d. Shavit, A., Gutfinger, C., 2009, *Thermodynamics: from concepts to applications*, 2nd edition, Boca Raton, FL: CRC Press.

DMCF 3233 FLUID MECHANICS II

LEARNING OUTCOMES

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

LO1 Use the concepts of irrotationality, incompressibility, stream and potential functions for two-dimensional ideal fluid flows.

LO2 Use the concept of boundary layer theory over flat plate.

LO3 Apply dimensional analysis and similarity concepts in their usage of simplifying experiments.

LO4 Apply the various formulations in solving problems related to pump and turbine.

SYNOPSIS

This course covers the two-dimensional ideal fluid flow theory by establishing methods employed in solving their problems. This course also covers the concept of boundary layer over flat plate/surface and the application of dimensional analysis and similarity. Besides that, the introduction to pump and turbine as well as solving problems related to their application will be also covered.

REFERENCES

a. Potter, M.C., & Wiggert, D.C., 2010, *Mechanics of Fluids*, 4th Edition, Brooks/Cole, USA.
b. Douglas, J.F., 2005, *Fluid Mechanics*, 5th Edition, Pearson/Prentice Hall, England.
c. Cengel, Y.A. and Cimbala, J.M., 2010, *Fluids Mechanics: Fundamental and Applications*, 2nd Edition, McGraw Hill Higher Education, New York.
d. White, F.M., 2011, *Fluid Mechanics*, 7th Edition, McGraw Hill, 2011, New York.
e. Munson, B.R., Donald, F.Y., and Okiishi, T.H., 2010, *Fundamentals of Fluid Mechanics*, 6th Edition, Wiley, USA.

DMCM 3723 MECHANIC OF MACHINES

LEARNING OUTCOMES

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

LO1 Demonstrate kinematics principle to solve flat and V-belt problems.

LO2 Apply the concept of gear transmission system in the real world applications.

LO3 Solve related problems in balancing system of rotating body using graphical or trigonometric method.

LO4 Demonstrate the usage of free body diagram to solve problems in flywheel and governor and explain its functionality.

LO5 Analyze the effect of gyroscopic couple to the real world applications.

LO6 Evaluate the natural frequency in free vibration system using either Energy Conservation Method, Equivalent Method or Newton's Law Method.

SYNOPSIS

This course will cover the power transmission system (belt drive, gears application, gear efficiency), Dynamic system balancing (rotor balancing such as planar and multi planar and reciprocating balancing such as in-line engine, radial and V-engine), Governors (Flywheel and Porter governor), Gyroscope, Free vibration (pendulum system, spring-mass system and shaft-inertia system by using energy conservation method, equivalent method and Newton's Law method), Free vibration with viscous damping (basic principle).

REFERENCES

a. Sawhney, G.S., 2009, *Fundamentals of Mechanical Engineering: Thermodynamics, Mechanics, Theory of Machines and Strength of Materials*, New Delhi: PHI Learning.

b. Cleghorn, W.L., 2009, *Mechanics of Machines*, New York: Oxford University Press.

c. Ramamurti, V., 2010, *Mechanics of Machines,* Manohar Puslisher & Distributor.

d. Gupta, B.V.R., 2011, *Theory of Machines: Kinematics and Dynamics,* I. K. International Publishing House Pvt. Ltd.

e. Balakannan, K., 2011, *Mechanics of Machines,* Lambert Academic Publishing.

DMCD 3523 ENGINEERING DESIGN

LEARNING OUTCOMES

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

LO1 Recognize terminology used in machine components and its design.

LO2 Explain the type of failures of machine components design.

LO3 Apply the formulation of the safe design for machine components.

LO4 Design the most suitable size and shape of machine components.

LO5 Analyze and design machine components under different loads and conditions.

SYNOPSIS

This course covers Introduction to Engineering Design, Design of Static and Fatigue Strength, Design of Threaded and Welded Joints, Bearings, Shafts/rods, Gears and Springs. Student will learn to design a simple machine applying foundation of mechanical engineering concept. A part from that, a topic on sustainability of design is introduced for eco-friendly design.

REFERENCES

a. Budynas, R.G., Nisbett, K., 2011, *Shigley's Mechanical Engineering Design*, Nineth Edition in SI Units, McGraw-Hill, Singapore.
b. Mott, R.L., 2013, *Machine Elements in Mechanical Design in SI Units*, Fifth Edition, Pearson Education, Singapore
c. Norton, R.L., 2010, *Machine Design: An Integrated Approach*, Fourth Edition, Prentice Hall, Singapore.
d. Juvinall, R.C. & Marshek, K.M, 2011, *Fundamentals of Machine Component Design*, Fourth Edition, John Wiley & Sons, Inc., New York.

DMCU 3973 DIPLOMA PROJECT

LEARNING OUTCOMES

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

LO1 Apply basic science, mathematics and mechanical engineering knowledge.
LO2 Design and conduct experiment/product fabrication to fulfill project objectives.
LO3 Make conclusion based on findings.
LO4 Present the results in written and oral format.

SYNOPSIS

The student needs to plan and implement the project individually that related to the mechanical engineering field. It covers report writing (including methodology and results) and hands on activities. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES

Depends on the project given.

5 ACADEMIC SYSTEM GUIDELINE

5.1 STUDY PERIOD

The maximum study period in semester system for the normal entry students are 12 semesters for Bachelor of Mechanical Engineering programme. For Diploma of Mechanical Engineering, the maximum study period in semester system for the normal entry students is 10 semesters.

Maximum study period in semester system for Bachelor and Diploma Programmes are shown in **Table 5.1** and **Table 5.2,** respectively.

Table 5.1 Maximum study period for Bachelor Programme

Entry Method	Entry to year	Maximum Study Period in Semester System
Normal Entry	1	12
Direct Entry	2	10

Table 5.2 Maximum study period for Diploma Programme

Entry Method	Entry to year	Maximum Study Period in Semester System
Normal Entry	1	10

5.2 CREDIT FOR STUDY PROGRESS

The status of a student's academic year is based on the total Credit Earned, KD (Kredit Dapat). The formula to determine the status of academic year is as follows:

$$KD \geq JKL - 6$$

where JKL = Total Number of Regular Credits (Jumlah Kredit Lazim) decided by the faculty.

Table 5.3 shows the credit for study progress and the procedure to promote to the next academic year for Bachelor of Mechanical Engineering Programme.

Table 5.3 Credit for Study Progress Details for Year Promotion (Bachelor of Mechanical Engineering)

Academic Year	Semester	Credit Load	JKL	Total KD for Year Promotion
YEAR 1	Sem. 1	16	33	27 promote to YEAR 2
	Sem. 2	17		
YEAR 2	Sem. 3	16	64	58 promote to YEAR 3
	Sem. 4	15		
YEAR 3	Sem. 5	15	99	93 promote to YEAR 4
	Sem. 6	15		
	Short Sem	5		
YEAR 4	Sem. 7	15	129	End of Study
	Sem. 8	15		

Table 5.4 shows the credit for study progress and the requirement to promote to the next academic year for Diploma of Mechanical Engineering.

Table 5.4 Credit for Study Progress Details for Year Promotion (Diploma of Mechanical Engineering)

Academic Year	Semester	Credit	JKL	Total KD for Year Promotion	Remarks
Year 1	Sem. 0	6	40	34 promote to year 2	
	Sem. 1	17			
	Sem. 2	17			
Year 2	Sem. 3	17	79	73 promote to year 3	Prerequisite for Industrial Training: Minimum KD 51
	Sem. 4	17			
	Special Sem.	5			
Year 3	Sem. 5	15	94	End of study	Prerequisite to register for Diploma Project: Minimum KD 62

5.3 TEACHING AND LEARNING

Teaching and learning (T&L) activities are conducted in Semester 1 and Semester 2 every year. The T&L activities are planned by Academic Management Division (BPA) on yearly basis and presented in the academic calendar. The academic calendar shows the detail of T&L activities including lectures, semester break, final examination and etc.

Teaching and learning are based on specific recognized techniques by which the knowledge is conveyed in an effective manner to the students. The programme will adopt a unique strategy for effective teaching and learning that includes the following aspects:

(a) Computer-based teaching

This is based on teaching process through computer-based knowledge presentation and computer-based interactions for knowledge acquisition. The objective is to teach the students through the optimum usage of computer to help them acquire specific information on any topic of interest and develop understanding on specific knowledge in any particular course. Example of related course is Computer Programming.

(b) Problem-based learning

Problem-based learning is an instructional approach that has been used successfully for over 30 years and continues to gain acceptance in multiple disciplines including mechanical engineering. It is an instructional (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem. This experience will help elucidate how actual engineering problems are solved. The example of course is Mechanical Design.

(c) Project-based learning

Project Based Learning is a teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an

engaging and complex engineering questions and problems. The example of course is Integrated Design Project (IDP).

(d) Simulation

Simulation-based teaching is another teaching practised by UTeM academic staff in conducting lectures, tutorials and laboratory sessions. This technique aims at supporting the tutorials and laboratory sessions by facilitating a better understanding on the course materials. It consolidates the learning process of the course. Simulation is more relevant to the physical modelling of the problems in certain domains such as those involving dangerous, intricate or expensive processes. Examples of courses using this technique are Computer Aided Design and Manufacturing, Mechanism Design and Vehicle System Modelling and Simulation.

(e) Industrial application software

In addition to the normal educational software, specific industry application software, are also used for teaching and learning activities. Lecturers and tutors apply industry based software packages in their respective courses to expose students to the use of industry-related tools. The industry-based and academic-based teaching and learning tools are combined for the purpose of enriching students' technical competencies in the courses studied. The examples of the related software are Solidworks, AutoCAD, ANSYS, ABAQUS and MATLAB & SIMULINK.

(f) Industrial exposure

Industrial exposure is also given to students. Arrangement is made to enable students of the department to have visit to various relevant manufacturing and engineering companies. These educational visits give the opportunity to students to have some ideas of how engineering knowledge is applied in the industries. Apart of that, there are several technical talks organised by the faculty. The speakers that invited have vast experience in the industry.

(g) Projects

It is a learning technique based on conducting specific activities in order to find out the solution of a problem under consideration. This learning process may involve theoretical, experimental, simulation, industrial exposure, industrial application software and any other teaching and learning techniques pracitised. Conducting a project is one of the ways to solve an outstanding problem. It is therefore one of the more effective teaching and learning techniques adopted by UTeM. Final Year Project (*Projek Sarjana Muda*) course is the best example of this method. Final Year Project (*Projek Sarjana Muda*) and Diploma Project (Projek Diploma) courses are the best example of this method. Final Year Project allows students to apply the basic engineering problem solving skills, which they have learned before.

(h) Tutorials

Tutorials are carried out regularly to provide continuous exercise/practice to enhance students' understanding after lecture on each chapter had been completed. Each tutorial session takes one hour per week for 14 weeks.

5.4 ASSESSMENT

The assessment on learning outcomes in semester system is performed continuously based on the students' works during the lecture weeks in a semester. Students are expected to be ready for any kind of assessment being held during the semester. The methods for assessment are through coursework and final semester examination. The final examination is comprehensive in the sense that it covers the entire syllabus learned in the semester. The coursework assessment is a continuous process carried out to evaluate student's performance throughout the semester. Coursework encompasses among others Problem Based Learning (PBL), quiz, test, assignment, practical work, project, case studies, and industrial visit etc.

5.4.1 COURSEWORK

Coursework is assessed by not more than 40% for degree programme and 60% for diploma programme. Normally the coursework are categorized as:

(a) Mid Semester Examination

Mid semester examination is conducted to find out what the students have learned during the first half of the semester. The format of examination may be in form of multiple choice questions, calculation or open-ended questions. The processes of conducting of the mid semester examination is similar to the final examination procedures. The marks allocated for this exam is 20% to 30% of the overall marks. Generally, the duration of the examination is from one (1) hour to 1.5 hours. The tentative date of the examination will be announced in the teaching plan which is distributed during the first lecture.

(b) Quizzes

Quizzes consist of short questions, objective questions, or questions with "fill in the blanks" techniques or simple question/calculations which designed to evaluate students' understanding during the lecture. Time allocated is approximately 15 minutes.

(c) Projects

Project or assignment is an efficient way to strengthen the understanding of students for a particular course. It also provides research skill to the students. Project involves activities, such as literature survey, methodology and some design stages. The project generally requires the students to apply the theory in the real engineering field. At the end of the project, students must submit a project report and present the project. Assessment for the project is based on a written report and presentation by the students.

(d) Assignments / Lab Report

Assignments or Lab Report are for training individual students for using references and research works and able to present their works in an academic report form. It is also formulated for training the students solving problems related to the topic given and hence updating students' lecture notes. Coursework could be given to the students in several forms:

i. Design, essay forms or report on specific topic;
ii. Research works through references, computer software and programming for problem solving.
iii. Technical report i.e. formal report for experiment/practical.

The laboratory works are becoming more challenging and less prescriptive (open ended).

Other kinds of assessments on coursework could also be considered upon faculty approval.

5.4.2 FINAL EXAMINATION

The Final Examination is held for two weeks at the end of the semester. It is the final evaluation on courses as set by the Faculty. For degree programme, the weightage of the Final Examination shall be no less than 60%. On the other hand for the diploma programme the Final Examination shall be no less than 40%. The duration of the Final Examination depends on the credit hours of the course.

5.4.2.1 CONDITIONS FOR FINAL EXAMINATION

Students are expected to attend all lectures being held in the semester. The student whose attendance is less than 80% from the total lecture hours of any course will be barred from sitting for the final examination. This regulation can be referred to the Guidelines for the Academic Regulation System, UTeM.

5.4.2.2 SPECIAL EXAMINATION

Students are allowed to request for a Special Examination of a course subject to approval of the Senate. The Academic Management Division will send an official letter to the faculty to offer and run the special examination to the affected students. The special examination for Semester I should not be later than 2 weeks after the Semester II begins. For the semester

II, the special examination should be held no later than 3 weeks after the Semester II examination's result released.

Special examination is carried out during the semester break for the student with the medical reason and for the final semester student based on the following cases:

(i) Medical Reason

(a) Student who is unable to sit for the Final Examination after being being issued a Medical Certificate by the University Medical Officer or a Government Hospital/ Clinic, must submit the Medical Certificate to the Faculty within 24 hours after the start of the Final Examination of a course, unless there is a reason acceptable to the University. If the Medical Certificate is from a Private Hospital/ Clinic, it has to be verified by the University Medical Officer or a Government Hospital/ Clinic.

(b) The student's result states Incomplete (TS) until the results of the Special Examination is announced.

(c) Special Examination results will be counted into the calculation of the Credit Earned and Credit Counted in determining the GPA, CGPA and Academic Standing.

(ii) Cases of the Final Semester Student

(a) Final semester student who has passed with Good Academic Standing (KB) but has failed one repeated course with the condition that the student has repeated the same course everytime it was offered.

(b) The Special Examination results shall be stated in the examination result's transcript as "Special Examination Passed (LPK)" with HL grade for those who passed or "Special Examination Failed (GPK)" with HG grade for those who failed the course. If the student passes, the course credit will be counted as Credit Earned but not counted in the calculation of the GPA and CGPA. The original coursework marks shall not be considered.

(c) If the student fails, the candidate will have to repeat the course in the next semester when offered and the student will have to register as full-time student as long as he has not utilise the maximum duration of study.

(d) The Faculty has the authority to register the student as Special Student. It is not compulsory for the student to attend any teaching and learning activities. The assessment will be based on previous semester's coursework marks and final examination marks of the current semester.

(e) Special examination is not applicable for course that is assessed by 100% coursework.

5. 5 GRADING SYSTEM

Student's performance in a course is evaluated based on the grade obtained. Grading system is shown in **Table 5.5**. Generally, minimum passing grade for a course is Grade D. However Grade D up to C- are categorised as Conditional Pass and the students are allowed to improve their grade by repeating the course only once.

Table 5.5 Grading System

GRADE (ACHIEVEMENT)	RELATIONS BETWEEN MARKS AND GRADE POINT VALUE	
	MARKS PERCENTAGE	GRADE POINT VALUE
A (Distinction)	80 – 100	4.0
A- (Distinction)	75 – 79	3.7
B+ (Credit)	70 – 74	3.3
B (Credit)	65 – 69	3.0
B- (Pass)	60 – 64	2.7
C+ (Pass)	55 – 59	2.3
C (Pass)	50 – 54	2.0
C- (Conditional pass)	47 – 49	1.7
D+ (Conditional pass)	44 – 46	1.3

D (Conditional pass)	40 – 43	1.0
E (Fail)	0 – 39	0.0

The status for each course is summarized in **Table 5.6**.

Table 5.6 Course Status

Grade/ Status Acronym	Explanations
HW = Compulsory Attendance Courses (*Matapelajaran Hadir Wajib*)	HW status is given to the course that the credit is not counted in the GPA and CGPA calculations but counted for KD. For this course, the results are graded as Attendance Pass, HL (*Hadir Lulus*) or Attendance Fail , HG (*Hadir Gagal*)
UM = Repeat Course (*Ulang Matapelajaran*)	UM status is given to the course that is repeated by the students who failed in that course previously. The credits for UM will not be counted for CGPA calculations.
HWUM = Compulsory Attendance Repeat Course (*Hadir Wajib Ulang Matapelajaran*)	HWUM status is given to the Compulsory Attend course for students who previously failed the course.
UG = Repeat Grade (*Ulang Gred*)	UG status is given to the repeated course for students who want to improve their grade.
TM = Redeem Course (*Tebus Matapelajaran*)	TM status is given to the course for repeating student who holds Conditional Academic Standing (KS).

The academic standing for each student is determined by the examination results obtained at the end of every semester. The status is shown in **Table 5.7**.

Table 5.7 Academic Standing

Grade/Status Acronym	Explanations
KB = Good Academic Standing (*Kedudukan Baik*)	Students with CGPA ≥ 2.00
KS = Conditional Academic Standing (*Kedudukan Bersyarat*)	Students with CGPA 1.70 ≤ CGPA < 2.00
KG = Failed Academic Standing (*Kedudukan Gagal*)	Students with CGPA < 1.70, or Students with KS three times consecutively
TD = Course Withdrawal (*Tarik Diri*)	Students withdraw from any registered course except for University Compulsory course
TS = Incomplete (*Tidak Selesai*)	Students unable to sit an examination due to illness certified by Medical Officer
KBA = Good Academic Standing Award (*Kedudukan Baik Anugerah)*	Students pass all the required courses and having KB.

5.6 CREDIT TRANSFER

Student can apply for credit transfer if they pass the same or equivalent course or possess experiences recognized by the faculty. Credit transfer can be granted to the student who had passed with minimum grade of C+ according to the University grading system. The application for credit transfer must be done within 2 weeks after the beginning of the first semester. The policy is as follows:

a. Credit transfer is a total credit that has been approved to the student based on certain courses taken by him/her at any other Institution of Higher Learning (IHL) either local or overseas. All the courses taken must be recognized by the university as equivalent and fulfill the curriculum of the chosen programme.
b. Credit transfer can be granted to the student that has taken the similar course and pass according to the UTeM grading system provided that the course content is 80% equivalent.
c. Educational level permitted for credit transfer must be equivalent with UTeM educational programme curriculum in terms of academic load and credit hours calculation.
d. With University's permission, students are allowed to take course in other IHL and can apply for credit transfer for those courses. The approved credit transfer will be accounted into their GPA and CGPA calculations.
e. Students are not allowed to complete their final semester study in other IHL.
f. The approval of credit transfer application will be announced to the students by the Academic Management Division *(BPA*). Granted credit transfer courses are recorded in the *Sistem Maklumat Pelajar* (SMP).

NOTE:
Any conflict in the interpretation of the above mentioned policy must be referred to the The Academic Rules and Regulations for the Bachelor Degree and Diploma Programs.

5.7 CREDIT EXEMPTION

Credit exemption can be granted to the student who has taken similar and equivalent course and passed with respect to UTeM grading system. Application for credit exemption must be done within two (2) weeks after the beginning of the first semester.

a. Provision for the Credit exemption is outlined in the The Academic Rules and Regulations for the Bachelor Degree and Diploma Programs to shorten the duration of study.
b. Credit exemption is a total credit that has been exempted for degree/diploma award that is granted based on the diploma qualification or equivalent experience that is recognised by the University.
c. The maximum credit exemption allowed must not exceed 30% of the overall credit required for a programme.
d. The application for credit exemption must be submitted to FKM within the first two (2) weeks of the first semester.
e. Credit exemption can be granted to student who has taken the same course or equivalent and passed with the minimum grade of C+ according to the university grading system with the condition that the course contents is 80% equivalent.
f. Educational level permitted for credit exemption must be equivalent to the UTeM educational programme curriculum in terms of academic load and credit hours calculation.
g. A transfer student from other IHL either local or overseas is eligible to apply for credit exemption. Upon submission, FKM will determine the courses that can be exempted.
h. For the award of degree, the total credit gain needed for credit exempted-students is the difference between the overall credit and the exempted credit.
i. The approval of credit exemption application will be announced to the students by the *BPA*. Granted credit transfer courses are recorded in the SMP.
j. The combination of credit exemption and credit transfer must **not exceed 30%** of the total credit stipulated for the award of the degree programme.

5.8 GRADE POINT AVERAGE

GPA (Grade Point Average) is an average grade point values earned by a student in a semester. It is calculated as below:

Total Grade Point Value / *Jumlah Mata Nilai, (JMN)* = $k_1 m_1 + k_2 m_2 + \ldots\ldots + k_n m_n$

Total Credit Counted / *Jumlah Kredit Kira, (JKK)* = $k_1 + k_2 + \ldots\ldots + k_n$

$$GPA = \frac{JMN}{JKK}$$

$$= \frac{k_1 m_1 + k_2 m_2 + \ldots + k_n m_n}{k_1 + k_2 + \ldots + k_n}$$

where

k_n = Credit for n^{th} course.

m_n = Grade point value earned for n^{th} course.

5.9 CUMULATIVE GRADE POINT AVERAGE

CGPA (Cumulative Grade Point Average) is an average grade point earned by a student through out all semesters undertaken. It is calculated as below:

$$CGPA = \frac{(JMN)_1 + (JMN)_2 + ... + (JMN)_n}{(JKK)_1 + (JKK)_2 + ... + (JKK)_n}$$

where

$(JMN)_n$ = Total grade point value earned in n^{th} semester.
$(JKK)_n$ = Total credit counted in n^{th} semester.

5.9.1 DEGREE PROGRAMME

Example 1 GPA Calculation

YEAR 1 (SEMESTER I)

CODE	COURSE	GR	MN	KR	JMN	ST
BLHW 1702	ISLAMIC AND ASIAN CIVILISATIONS	B+	3.3	2	6.6	
BLHL XXX2	THIRD LANGUAGE	A	4.0	2	8.0	
BMFG 1113	ENGINEERING MATHEMATICS	C	2.0	3	6.0	
BMFG 1213	ENGINEERING MATERIALS	A	4.0	3	12.0	
BMCG 1523	ENGINEERING GRAPHICS AND CAD	B-	2.7	3	8.1	
BMCG 1113	STATICS	B	3.0	3	9.0	
	TOTAL			**16**	**49.7**	

	CURRENT SEMESTER	ALL SEMESTER
KD	16	16
KP		0
KK	16	16
JMN	49.7	
GPA	3.11	
CGPA		3.11
FINAL RESULT		
Good Academic Standing(KB)		

GPA for Semester 1

Total Grade Point Value (JMN) = 49.7
Total Credit Counted (JKK) = 16

GPA = 49.7 / 16 =3.11

Example 2 CGPA Calculation

YEAR 1 (SEMESTER 2)

CODE	COURSE	GR	MN	KR	JMN	ST
BKKX XXX1	CO-CURRICULUM I	B+	3.3	1	3.30	
BMCG 1013	DIFFERENTIAL EQUATIONS	B	3.0	3	9.00	
BITG 1233	COMPUTER PROGRAMMING	A	4.0	3	12.00	
BEKG 1233	PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT	C-	1.7	3	5.10	
BEKG 1123	PRINCIPLES OF ELECTRIC AND ELECTRONICS	C+	2.3	3	6.90	
BMCG 1011	MECHANICAL ENGINEERING LABORATORY I	B-	2.7	1	2.70	
BMCG 1213	DYNAMICS	E	0.0	3	0.00	UM
	TOTAL			**17**	**39.0**	

	CURRENT SEMESTER	ALL SEMESTER
KD	14	30
KP		0
KK	17	33
JMN	39.0	88.7
GPA	2.29	
CGPA		2.69
FINAL RESULT		
Good Academic Standing (KB)		

GPA for Semester 2

Total Grade Point Value (JMN) = 39.0
Total Credit Counted (JKK) = 17

GPA = 39.0 / 17 = 2.29

CGPA for all semester (1 and 2)

Total Grade Point Value (JMN) = 49.7 + 39.0 = 88.7
Total Credit Counted (JKK) = 16 + 17= 33

CGPA = 88.7 / 33 = 2.69

5.9.2 DIPLOMA PROGRAMME

Example 3 GPA calculation

YEAR 1 (SEMESTER 1)

CODE	COURSE	GR	MN	KR	JMN	ST
DMCU 1012	EXPERIMENTAL METHOD	B	3.0	2	6.0	
DMCD 1543	ENGINEERING GRAPHIC	E	0.0	3	0.0	
DMCU 1032	FUNDAMENTAL MATHEMATICS	B-	2.7	2	5.4	
DEKG 2113	ELECTRICAL AND ELECTRONIC PRINCIPLES	C	2.0	3	6.0	
DACS 1263	FUNDAMENTAL PHYSICS	B-	2.7	3	8.1	
DMCU 1912	TECHNOLOGY & ENGINEERING WORKSHOP PRACTICE I	A	4.0	2	8.0	
DLHW 2712	HUBUNGAN ETNIK	B+	3.3	2	6.6	
	TOTAL			**17**	**40.1**	

	CURRENT SEMESTER	ALL SEMESTER
KD	14	14
KP		0
KK	17	17
JMN	40.1	
GPA	2.36	
CGPA		2.36
FINAL RESULTS		
Good Academic Standing (KB)		

GPA for semester 1

Total Grade Point Value (JMN) = 40.1
Total Credit Counted (JKK) = 17

GPA = 40.1 / 17 = 2.36

Example 4 CGPA calculation

YEAR 1 (SEMESTER 2)

CODE	COURSE	GR	MN	KR	JMN	ST
DMCS 1313	STATICS	B+	3.3	3	9.9	
DITG 1113	COMPUTER PROGRAMMING	A	4.0	3	12.0	
DMCU 1323	MANUFACTURING PROCESS	E	0.0	3	0.0	
DMCU 1233	CHEMISTRY	B	3.0	3	9.0	
DMCU 1042	CALCULUS	C	2.0	2	4.0	
DMCU 2922	TECHNOLOGY & ENGINEERING WORKSHOP PRACTICE II	B+	3.3	2	6.6	
DXXX XXX1	CO-CURRICULUM I	A	4.0	1	4.0	
	TOTAL			**17**	**45.5**	

	CURRENT SEMESTER	ALL SEMESTER
KD	14	28
KP		0
KK	17	34
JMN	45.5	
GPA	2.68	
CGPA		2.52
FINAL RESULTS		
Good Academic Standing (KB)		

GPA for semester 2

Total Grade Point Value (JMN) = 45.5
Total Credit Counted (JKK) = 17
GPA = 45.5 / 17 = 2.68

CGPA for semester 2

Total Grade Point Value (JMN) = 40.1+45.5=85.6
Total Credit Counted (JKK) = 17+17=34
CGPA = 85.6 / 34 = 2.52

5.10 COURSE WITHDRAWAL

The students are entitled to Course Withdrawal (TD) from any course if they feel that their performance is poor. **The last date for course withdrawal is in week twelve (12).** The students are allowed to sit or repeat the course if it is offered by the faculty. With the verification from the Academic Advisor, students can withdraw any registered course provided that the minimum load of 12 credit hours remains.

If the credit hour taken is less than 12 credits and the student decided to withdraw any course, the Faculty's Dean approval is required.

The normal guideline for course withdrawal is as follows:

a. Course withdrawal is allowed within the period regulated by the University. Withdrawal is not encouraged as it reflects the student's weaknesses in planning for course enrolment and failure to follow the projected credit hours. The Course Withdrawal (TD) status will be printed in the programme registration slip and final transcript.
b. The student is not allowed to withdraw any co-curriculum course.
c. The students are required to re-register for the course that they had withdrawn, except the elective course which can be substituted with other elective courses.
d. Any tuition fees paid (if relevant) prior to withdrawal, will not be refunded.

5.10.1 DEGREE PROGRAMME

Below are examples of student who wants either to withdraw or continue taking any particular course during the same semester as shown in Examples 5 and 6.

Students who withdraw the course (i.e. BMCG 2713) will be exempted from taking the final examination and the credit hour for that course will not be considered in the GPA calculation for that particular semester.

Example 5 Course Withdrawal GPA Calculation

YEAR 2 (SEMESTER 3)

CODE	COURSE	GR	MN	KR	JMN	ST
BLHW 2712	ETHNICS RELATIONS	A-	3.7	2	7.4	
BKKX XXX1	CO-CURRICULUM II	A	4.0	1	8.0	
BEKG 2433	ELECTRICAL SYSTEM	C	2.0	3	6.0	
BMCG 2113	SOLID MECHANICS I	C	2.0	3	6.0	
BMCG 2713	THERMODYNAMICS I	TD	-	-	-	
BMCG 2613	FLUID MECHANICS I	C	2.0	3	6.0	
BMCG 2011	MECHANICAL ENGINEERING LABORATORY II	B	3.0	1	3.0	
	TOTAL			**13**	**36.4**	

	CURRENT SEMESTER	ALL SEMESTER
KD	13	43
KP		0
KK	13	46
JMN	36.4	125.1
GPA	2.80	
CGPA		2.72
FINAL RESULTS		
Good Academic Standing (KB)		

GPA for Semester 3
Total Grade Point Value (JMN) = 36.4
Total Credit Counted (JKK) =13

GPA = 36 / 14 = 2.80

CGPA for all semester (1, 2 dan 3)
Total Grade Point Value (JMN) = 49.7 + 39.0 + 36.4 = 125.1
Total Credit Counted (JKK) = (16+ 17) + 13 = 46

CGPA = 125.1 / 46 = 2.72

Example 6 GPA Calculation if the Student Continue Taking the Course (No Withdrawal)

For student who decided NOT to withdraw the course (i.e BMFG 2713) then the credit hours for that course will be counted for the GPA calculation for Semester 3.

YEAR 2 (SEMESTER 3)

CODE	COURSE	GR	MN	KR	JMN	ST
BLHW 2712	ETHNICS RELATIONS	A-	3.7	2	7.4	
BKKX XXX1	CO-CURRICULUM II	A	4.0	1	8.0	
BEKG 2433	ELECTRICAL SYSTEM	C	2.0	3	6.0	
BMCG 2113	SOLID MECHANICS I	C	2.0	3	6.0	
BMCG 2713	THERMODYNAMICS I	E	0.00	3	0.0	
BMCG 2613	FLUID MECHANICS I	C	2.0	3	6.0	
BMCG 2011	MECHANICAL ENGINEERING LABORATORY II	B	3.0	1	3.0	
	TOTAL			**16**	**36.4**	

	CURRENT SEMESTER	ALL SEMESTER
KD	13	43
KP		0
KK	16	49
JMN	36.4	125.1
GPA	2.28	
CGPA		2.55
FINAL RESULTS		
Good Academic Standing (KB)		

GPA for Semester 3
Total Grade Point Value (JMN) = 36.4
Total Credit Counted (JKK) = 16
GPA = 36.4 / 16 = 2.28

CGPA for all semester (1, 2 and 3)
Total Grade Point Value (JMN) =49.7 + 39.0+ 36.4 = 125.1
Total Credit Counted (JKK) = (16+ 17) + 16 = 49
CGPA = 125.1 / 49 = 2.55

Examples 5 and 6 have shown that the student's results are affected if the student decided to Withdraw (TD) or continuing taking the course. In Example 6, the student's GPA will be drastically dropped to 2.28 as compared to 2.72 in Example 5. The withdrawal will also affect the CGPA from 2.72 to 2.55. Therefore the student has to consider carefully when deciding whether or not to withdraw.

Any conflict in the interpretation of the above mentioned policy must be referred to the *Peraturan Akademik Bagi Program Ijazah Sarjana Muda & Program Diploma* handbook.

5.10.2 DIPLOMA PROGRAMME

Below are two examples of student who wants to either withdraw or continue taking any particular course during the same semester as shown in Example 9 and 10.

Example 7 Course withdrawal GPA calculation

For students who withdraw the course (i.e. DMCM 2713) they will be exempted from taking the final examination and the credit hour for that course will not be considered in the GPA calculation for that particular semester.

YEAR 2 (SEMESTER 3)

CODE	COURSE	GR	MN	KR	JMN	ST
DMCT 2123	THERMODYNAMICS I	B+	3.3	3	9.9	
DMCS 2323	SOLID MECHANICS I	A	4.0	3	12.0	
DMCB 2423	MATERIAL SCIENCE	C	2.0	3	6.0	
DMCM 2713	DYNAMICS	TD	-	-	-	
DMCU 2052	ENGINEERING MATHEMATICS	B	3.0	2	6.0	
DLHW 2422	TECHNICAL COMMUNICATION I	C	2.0	2	4.0	
DXXX XXX1	CO-CURRICULUM II	A	4.0	1	4.0	
	TOTAL			**14**	**41.9**	

	CURRENT SEMESTER	ALL SEMESTER
KD	14	42
KP		0
KK	14	48
JMN	41.9	
GPA	2.99	
CGPA		2.66
FINAL RESULTS		
Good Academic Standing (KB)		

GPA for semester 3
Total Grade Point Value (JMN) = 41.9
Total Credit Counted (JKK) = 14
GPA = 41.9 / 14 = 2.99

CGPA for semester 3
Total Grade Point Value (JMN) =
40.1+45.5+41.9=127.5
Total Credit Counted (JKK) = 17+17+14 = 48
CGPA = 127.5 / 48 = 2.66

Example 8 Calculation of GPA if student continues taking the course (no withdrawal)

For student who decides NOT TO WITHDRAW the course (i.e. DMCM 2713), then the credit hours for that course will be counted for the GPA calculation for that particular semester.

YEAR 2 (SEMESTER 3)

CODE	COURSE	GR	MN	KR	JMN	ST
DMCT 2123	THERMODYNAMICS I	B+	3.3	3	9.9	
DMCS 2323	SOLID MECHANICS I	A	4.0	3	12.0	
DMCB 2423	MATERIAL SCIENCE	C	2.0	3	6.0	
DMCM 2713	DYNAMICS	E	0.0	3	0.0	
DMCU 2052	ENGINEERING MATHEMATICS	B	3.0	2	6.0	
DLHW 2422	TECHNICAL COMMUNICATION I	C	2.0	2	4.0	
DXXX XXX1	CO-CURRICULUM II	A	4.0	1	4.0	
	TOTAL			**17**	**41.9**	

	CURRENT SEMESTER	ALL SEMESTER
KD	14	42
KP		0
KK	17	51
JMN	41.9	
GPA	2.46	
CGPA		2.5
FINAL RESULTS		
Good Academic Standing (KB)		

GPA for semester 3
Total Grade Point Value (JMN) = 41.9
Total Credit Counted (JKK) = 17

GPA = 41.9 / 17 = 2.46

CGPA for semester 3
Total Grade Point Value (JMN)
=40.1+45.5+41.9=127.5
Total Credit Counted (JKK) = 17+17+17 = 51

CGPA = 127.5 / 51 = 2.5

Examples 7 and 8 show that the student results are affected if the student decides to Withdraw or continue taking the course. In Example 7, the student GPA will drastically drop to 2.46 as compared to 2.99 in Example 8. The withdrawal will also affect the CGPA from 2.66 to 2.5. Therefore the student has to consider carefully when deciding whether or not to withdraw.

5.11 COURSE REPEATING

Students are allowed to repeat any failed course if the course is offered by the faculty. The repeating grade will be the official grade in the transcript if it is higher than the previous one, otherwise the previous grade prevails.

5.11.1 DEGREE PROGRAMME

Referring to Examples 2 and 5, assuming that the student wants to resit for BMCG 1213, CGPA calculation is shown as below:

Example 9 CGPA Calculation for Resitting

YEAR 2 (SEMESTER 4)

CODE	COURSE	GR	MN	KR	JMN	ST
BLHW 2403	TECHNICAL ENGLISH	A-	3	3.7	11.1	
BENG 2142	STATISTICS	B-	2	2.7	5.4	
BEKS 2452	NUMERICAL METHODS	B+	2	3.3	6.6	
BMCG 2513	COMPUTER AIDED DESIGN AND MAUFACTURING	A-	3	3.7	11.1	
BMCG 2021	MECHANICAL ENGINEERING WORKSHOP	A	1	4.0	4.0	
BMCG 2212	MICROPROCESSOR TECHNOLOGY	C+	2	2.3	4.6	
BMCG 2312	MANUFACTURING PROCESS	B+	2	3.3	6.6	
BMCG 1213	DYNAMICS	C+	3	2.3	6.9	UM
	TOTAL		**18**		**56.3**	

	CURRENT SEMESTER	ALL SEMESTER
KD	18	61
KP		0
KK	18	64
JMN	56.3	181.4
GPA	3.13	
CGPA		2.97
FINAL RESULTS		
Good Academic Standing (KB)		

Semester 1,2 and 3
Total Grade Point Value (JMN) = 49.7 + 39.0 + 36.4 = 125.1
Total Credit Counted (JKK) = 16+ 17 + 13 = 46

GPA for Semester 4

Total Grade Point Value (JMN) = 56.3
Total Credit Counted (JKK) = 18
GPA = 56.3 / 18 = 3.13

CGPA for all semester (1, 2, 3 and 4)

Total Grade Point Value (JMN) = 49.7+39.0+36.4+56.3 = 181.4
Total Credit Counted (JKK) =16+17+13+18-3 = 61
CGPA = 181.4 / 61= 2.97

For CGPA calculation, the course BMCG 1213 is a repeat course (in Semester 2 and the previous grade obtained is E). The previous grade should be discarded for the CGPA calculation in Semester 4.

5.11.2 DIPLOMA PROGRAMME

Refer Examples 3 and 8, assuming student wishes to repeat DMCD 1543 course. Here is a sample calculation of CGPA:

Example 10 CGPA calculation for resitting

YEAR 2 (SEMESTER 3)

CODE	COURSE	GR	MN	KR	JMN	ST
DMCT 2123	THERMODYNAMICS I	B+	3.3	3	9.9	
DMCS 2323	SOLID MECHANICS I	A	4.0	3	12.0	
DMCB 2423	MATERIAL SCIENCE	C	2.0	3	6.0	
DMCM 2713	DYNAMICS	C	2.0	3	6.0	
DMCU 2052	ENGINEERING MATHEMATICS	B	3.0	2	6.0	
DLHW 2422	TECHNICAL COMMUNICATION I	C	2.0	2	4.0	
DXXX XXX1	CO-CURRICULUM II	A	4.0	1	4.0	
DMCD 1543	ENGINEERING GRAPHIC	A	4.0	3	12	UM
	TOTAL			**20**	**59.9**	

	CURRENT SEMESTER	ALL SEMESTER
KD	20	48
KP		0
KK	20	51
JMN	59.9	
GPA	3.0	
CGPA		2.85
FINAL RESULTS		
Good Academic Standing (KB)		

GPA for semester 3
Total Grade Point Value (JMN) = 59.9
Total Credit Counted (JKK) = 20

GPA = 59.9 / 20 = 3.00

CGPA for semester 3
Total Grade Point Value (JMN) = 40.1 + 45.5 + 59.9 = 145.5
Total Credit Counted (JKK) = 17 + 17 + 20-3 = 51

CGPA = 145.5 / 51 = 2.85

5.12 FAILED ACADEMIC STANDING (KG)

5.12.1 DEGREE PROGRAMME

Example 11 Failed Academic Standing (KG)- Dismissal

YEAR 1 (SEMESTER I)

CODE	COURSE	GR	MN	KR	JMN	ST
BLHW 1702	ISLAMIC AND ASIAN CIVILISATIONS	C-	1.7	2	3.4	
BLHL XXX2	THIRD LANGUAGE	C-	1.7	2	3.4	
BMFG 1113	ENGINEERING MATHEMATICS	D+	1.3	3	3.9	
BMFG 1213	ENGINEERING MATERIALS	D	1.0	3	3.0	
BMCG 1523	ENGINEERING GRAPHICS AND CAD	C-	1.7	3	5.1	
BMCG 1113	STATICS	D	1.0	3	3.0	
	TOTAL			**16**	**21.8**	

	CURRENT SEMESTER	ALL SEMESTER
KD	16	16
KP		0
KK	16	16
JMN	21.8	21.8
GPA	1.36	
CGPA		1.36
FINAL RESULTS		
Failed Academic Standing (KG)-Dismissal		

GPA for Semester 1

Total Grade Point Value (JMN) = 21.8
Total Credit Counted (JKK) = 16

GPA = 21.8 / 15 = 1.36

Note:
In the Example 11, the GPA and CGPA of the student is 1.36. Even if the student passed all the courses with a minimum of D grade, the student will still be dismissed since CGPA is less than 1.70.

5.12.2 DIPLOMA PROGRAMME

Example 12 Failed Academic Standing (KG) – Dismissal

YEAR 1 (SEMESTER 1)

CODE	COURSE	GR	MN	KR	JMN	ST
DMCU 10XX	EXPERIMENTAL METHOD	B	3.0	2	6.0	
DMCD 1512	ENGINEERING GRAPHIC	D	1.0	3	3.0	
DMCU 1032	FUNDAMENTAL MATHEMATICS	C-	1.7	2	3.4	
DEKG 2113	ELECTRICAL & ELECTRONIC PRINCIPLES	C	2.0	3	6.0	
DACS 1263	FUNDAMENTAL PHYSICS	D	1.0	3	3.0	
DMCU 1912	TECHNOLOGY & ENGINEERING WORKSHOP PRACTICE I	D+	1.3	2	2.6	
DLHW 2712	HUBUNGAN ETNIK	D	1.0	2	2.0	
	TOTAL			**17**	**26**	

	CURRENT SEMESTER	ALL SEMESTER
KD	17	17
KP		0
KK	17	17
JMN	26	
GPA	1.53	
CGPA		1.53
FINAL RESULTS		
Failed Academic Standing (KG)-Dismissal		

GPA for semester 1

Total Grade Point Value (JMN) = 26
Total Credit Counted (JKK) = 17

GPA = 26 / 17 = 1.53

Note:
Even if the student passed all the courses with a minimum of D grade, the student will still be dismissed since **GPA = CGPA = 1.53 which is less than 1.70,** which is the minimum requirement for students to continue their study for the following semester.

5.13 CONDITIONAL ACADEMIC STANDING (KS)

5.13.1 DEGREE PROGRAMME

Example 13 Conditional Academic Standing (KS)

YEAR 1 (SEMESTER I)

CODE	COURSE	GR	MN	KR	JMN	ST
BLHW 1702	ISLAMIC AND ASIAN CIVILISATIONS	C	2.0	2	4.0	
BLHL XXX2	THIRD LANGUAGE	C-	1.7	2	3.4	
BMFG 1113	ENGINEERING MATHEMATICS	C-	1.7	3	5.1	
BMFG 1213	ENGINEERING MATERIALS	D+	1.3	3	3.9	
BMCG 1523	ENGINEERING GRAPHICS AND CAD	C	2.0	3	6.0	
BMCG 1113	STATICS	C-	1.7	3	5.1	
	TOTAL			**16**	**27.5**	

	CURRENT SEMESTER	ALL SEMESTER
KD	16	16
KP		0
KK	16	16
JMN	27.5	27.5
GPA	1.72	
CGPA		1.72
FINAL RESULTS		
Conditional Academic Standing (KS)		

GPA for Semester 1

Total Grade Point Value (JMN) = 27.5
Total Credit Counted (JKK) = 16

GPA = 27.5 / 16 = 1.72

5.13.2 DIPLOMA PROGRAMME

Example 14 Conditional Academic Standing (KS)

YEAR 1 (SEMESTER 1)

CODE	COURSE	GR	MN	KR	JMN	ST
DMCU 10XX	EXPERIMENTAL METHOD	B	3.0	2	6.0	
DMCD 1512	ENGINEERING GRAPHIC	B	3.0	3	9.0	
DMCU 1032	FUNDAMENTAL MATHEMATICS	C-	1.7	2	3.4	
DEKG 2113	ELECTRICAL & ELECTRONIC PRINCIPLES	D	1.0	3	3.0	
DACS 1263	FUNDAMENTAL PHYSICS	C-	1.7	3	5.1	
DMCU 1912	TECHNOLOGY & ENGINEERING WORKSHOP PRACTICE I	D+	1.3	2	2.6	
DLHW 2712	HUBUNGAN ETNIK	D	1.0	2	2.0	
	TOTAL			**17**	**31.1**	

	CURRENT SEMESTER	ALL SEMESTER
KD	17	17
KP		0
KK	17	17
JMN	31.1	
GPA	1.83	
CGPA		1.83
FINAL RESULTS		
Conditional Academic Standing (KS)		

GPA for semester 1

Total Grade Point Value (JMN) = 31.1
Total Credit Counted (JKK) = 17

GPA = 31.1 / 17 = 1.83

Note:
The result of the student shown in Example 14 is better than in Example 12, however it is non-satisfactory. This student is allowed to continue the study with a maximum of 12 credit hours for the following semester until the student achieves Good Academic Standing (KB).

Normally the sponsors have the right to suspend the financial support for the students until they improve their study by getting CGPA > 2.0. If the Conditional Academic Standing (KS) is repeated 3 times consecutively, then the candidate will be dismissed.

5.14 GOOD ACADEMIC STANDING (KB)

5.14.1 DEGREE PROGRAMME

Example 15 Good Academic Standing (KB)

CODE	COURSE	GR	MN	KR	JMN	ST
BLHW 1702	ISLAMIC AND ASIAN CIVILISATIONS	B+	3.3	2	6.6	
BLHL XXX2	THIRD LANGUAGE	B	4.0	2	8.0	
BMFG 1113	ENGINEERING MATHEMATICS	B+	2.0	3	6.0	
BMFG 1213	ENGINEERING MATERIALS	A-	4.0	3	12.0	
BMCG 1523	ENGINEERING GRAPHICS AND CAD	B+	2.7	3	8.1	
BMCG 1113	STATICS	E	0.0	0	0.0	
	TOTAL			**16**	**40.7**	

	CURRENT SEMESTER	ALL SEMESTER
KD	13	13
KP		0
KK	16	16
JMN	40.7	40.7
GPA	2.54	
CGPA		2.54
FINAL RESULTS		
Good Academic Standing (KB)		

GPA for Semester 1

Total grade points (JMN) = 40.7
Total calculated credit (JKK) = 16
GPA = 40.7 / 16 = 2.54

Note 1:
This student passed 5 (KD = 13) out of 6 courses (KK = 16) taken. The student obtained KB with GPA = 2.54.

5.14.2 DIPLOMA PROGRAMME

Example 16 Good Academic Standing (KB)

YEAR 1 (SEMESTER 1)

CODE	COURSE	GR	MN	KR	JMN	ST
DMCU 10XX	EXPERIMENTAL METHOD	B	3.0	2	6.0	
DMCD 1512	ENGINEERING GRAPHIC	B	3.0	3	9.0	
DMCU 1032	FUNDAMENTAL MATHEMATICS	C-	1.7	2	3.4	
DEKG 2113	ELECTRICAL & ELECTRONIC PRINCIPLES	C	2.0	3	6.0	
DACS 1263	FUNDAMENTAL PHYSICS	E	0.0	3	0.0	
DMCU 1912	TECHNOLOGY & ENGINEERING WORKSHOP PRACTICE I	B-	2.7	2	5.4	
DLHW 2712	HUBUNGAN ETNIK	A-	3.7	2	7.4	
	TOTAL			**17**	**37.2**	

	CURRENT SEMESTER	ALL SEMESTER
KD	14	14
KP		0
KK	17	17
JMN	37.2	
GPA	2.19	
CGPA		2.19
FINAL RESULTS		
Good Academic Standing (KB)		

GPA for semester 1

Total Grade Point Value (JMN) = 37.2
Total Credit Counted (JKK) = 17

GPA = 37.2 / 17 = 2.19

Note:

This student passed 7 (KD=14) out of 8 courses (KK=17) taken. However, the student obtained KB with GPA = 2.19. But he/she failed in the DACS 1263 FUNDAMENTAL PHYSICS course, which is the pre-requisite for DMCS 1313 STATICS. The student **MUST RESIT** the DACS 1263 FUNDAMENTAL PHYSICS course until he/she get at least a minimum D grade in order to take DMCS 1313 STATICS course. The student is also expected to extend his/her duration of study to more than 6 semesters, depending on the total credit hours required to graduate. Similar problem will also affect the student in Example 14.

5.15 DEAN'S LIST AWARD

5.15.1 DEGREE PROGRAMME

Example 17 Good Academic Standing (KB) with Dean's List Award

YEAR 1 (SEMESTER I)

CODE	COURSE	GR	MN	KR	JMN	ST
BLHW 1702	ISLAMIC AND ASIAN CIVILISATIONS	A-	3.7	2	7.4	
BLHL XXX2	THIRD LANGUAGE	A	4.0	2	8.0	
BMFG 1113	ENGINEERING MATHEMATICS	B+	3.3	3	9.9	
BMFG 1213	ENGINEERING MATERIALS	B+	3.3	3	9.9	
BMCG 1523	ENGINEERING GRAPHICS AND CAD	A	4.0	3	12.0	
BMCG 1113	STATICS	A-	3.7	3	11.1	
	TOTAL			**16**	**58.3**	

	CURRENT SEMESTER	ALL SEMESTER
KD	16	16
KP		0
KK	16	16
JMN	58.3	58.3
GPA	3.64	
CGPA		3.64
FINAL RESULTS		
Good Academic Standing (KB)		

GPA for Semester 1

Total grade points (JMN) = 58.3
Total calculated credit (JKK) = 16

GPA = 58.3/ 16 = 3.64

Note:
Example 17 above shows an excellent result obtained by the student. With GPA ≥ 3.5, the student will be awarded with Dean's List Award for his/her outstanding achievement which will be stated in the transcript.

5.15.2 DIPLOMA PROGRAMME

Example 18 Good Academic Standing (KB) with Dean's List Award

YEAR 1 (SEMESTER 1)

CODE	COURSE	GR	MN	KR	JMN	ST
DMCU 10XX	EXPERIMENTAL METHOD	A	4.0	2	8.0	
DMCD 1512	ENGINEERING GRAPHIC	B	3.0	3	9.0	
DMCU 1032	FUNDAMENTAL MATHEMATICS	A	4.0	2	8.0	
DEKG 2113	ELECTRICAL & ELECTRONIC PRINCIPLES	B	3.0	3	9.0	
DACS 1263	FUNDAMENTAL PHYSICS	A-	3.7	3	11.1	
DMCU 1912	TECHNOLOGY & ENGINEERING WORKSHOP PRACTICE I	A	4.0	2	8.0	
DLHW 2712	HUBUNGAN ETNIK	A	4.0	2	8.0	
	TOTAL			**17**	**61.1**	

	CURRENT SEMESTER	ALL SEMESTER
KD	17	17
KP		0
KK	17	17
JMN	61.1	
GPA	3.59	
CGPA		3.59
FINAL RESULTS		
Good Academic Standing (KB)		

GPA for semester 1

Total Grade Point Value (JMN) = 61.1
Total Credit Counted (JKK) = 17

GPA = 61.1 / 17 = 3.59

Note: Example 18 above shows an excellent result obtained by the student. With GPA ≥ 3.5, the student will be awarded with Dean's List Award for his/her outstanding achievement which will be stated in the transcript.

5.16 GRADUATION REQUIREMENTS

Students deserve to be awarded with certificate (Bachelor/Diploma) upon satisfying the following requirements:

a. Student must obtain a Good Academic Standing (KB) in the final semester.
b. Student has passed all courses required by the programme and obtains Good Academic Standing Award (KBA). Please refer to **Table 6.9** for total credit numbers based on course categories for KBA.

Table 5.9 Credit number for Graduation status

Category / Course	W	P	K	E	TOTAL
BMCG	18	48	51	12	**129**
DMC	16	78	-	-	**94**

c. Student has applied for graduation status, approved by faculty and endorsed by University Senate.
d. Student has passed MUET and obtain band specified by the University.
e. Student has fulfilled other requirements as specified by the University.

6 ACADEMIC ADVISORY SYSTEM

6.1 INTRODUCTION

The Academic Advisory System is established for the purpose of providing comprehensive advice in terms of education, teaching and assessment for students during their studies in UTeM. The faculty has established an Academic Advisory Committee which is chaired by the Dean to implement and to monitor this mechanism effectively. The system also involves all FKM academic staffs.

6.2 ACADEMIC ADVISORY OBJECTIVES

Students in university have life that is totally different from the school environment. Being away from family, relatives and old friends, students are required to have good self motivation in order to survive and succeed in their studies. The students are also expected to gain information and to adapt quickly with the change of rules in a campus life.

Students should therefore utilize the existence of the Academic Advisory System that can help them in their academic achievement. Academic staffs shall be regarded as a friend to seek for advice and opinion.

The objectives of Academic Advisory System are:

a. To provide a proper channel for students to obtain an advice and counselling especially on academic problem.
b. To establish two ways of communications between students and faculty/university.
c. For the advisor to recognize the students' ability and capability.
d. To produce a discipline and balance attitude of students.

e. As a platform for sharing opinion, information and giving advice on the overall aspects of the student's life in university.

6.3 ACADEMIC ADVISORY STRUCTURE

The faculty has set the Academic Advisory System as one of the platforms to obtain feedback from students. This is important for the continuous improvement based on the positive as well as demanding feedback received from the students. The procedures of the Academic Advisory System are shown in **Figure 6.1**.

Figure 6.1 Academic Advisory System

There are two important components in the system. First is the meeting with the students to seek for feedback and second, is for the academics to give advice and to take action related to the student's academic problem appropriately. Student's feedback can be gathered from annual meeting and or personal meeting. All records such as student's personal and academic information are updated during the meeting and documented in the faculty. There are two meetings organized annually by Academic Advisory Committee and these are chaired by the Dean.

The Academic Advisory Committee's working procedure is as follows:

a. Students will be divided into several groups consisting of 20 to 30 students. Each group is led by one Academic Advisor (Penasihat Akademik, PA). The PA is an academic staff with teaching experience.
b. PA will remain with the students until they graduate. PA shall be regarded as a mentor for the students.
c. PA keeps and updates the students' records under his/her group. These records include academic performances of the students until they graduate. The records also include feedback, application letters as well as issues relating to academic and non-academic. These records are kept by the PA for future reference.

6.4 STUDENT'S ACADEMIC ADVISORY MECHANISM

Each academic staff should be aware of the objectives of the Academic Advisory System. Formal and informal meeting sessions are important. Students shall be responsive to the faculty's intention to help them through the following mechanism:

a. Faculty has set minimum 2 formal meetings per semester organized by Academic Advisory Committee for students to meet their PA.
b. Students can meet their PA at their own initiative. More informal meetings are encouraged.

c. Formal meeting between students and PA is made by appointment or any other methods agreed.
d. Detail of the discussion is recorded for future reference.
e. Attendance is compulsory for the meeting organized by their PA.

6.5 ACADEMIC ADVISORS RESPONSIBILITY

PA has the responsibility to help students with poor academic achievement. Normally, good students are more approachable whilst poor students are difficult to engage for discussion and meeting. From the beginning the students must be aware that academic progress and achievement are their responsibility.

The faculty has outlined the role of PA are as follows:
a. Play an important role in giving advice, guidance and motivation to students regarding their academic and non-academic matters.
b. Monitor student's academic development, progress and performance.
c. Schedule meeting which is agreed by both parties.
d. Assist students in understanding the organization structure, method and procedure of university's administration.
e. Refer to professional counsellor in order to solve student problem, when necessary.
f. Encourage students to be involved in academic and non-academic activities organized by the university.

6.6 STUDENT RESPONSIBILITY

In the university, students are fully responsible of their achievement in their studies. The student's responsibilities are as follows:

a. Consistently meet their PA to seek for advice in solving academic and non-academic problems.
b. Discuss the study plan every semester before registering new courses for the next new semester.
c. Discuss with the PA to plan for future meeting schedule and must commit to their plan.
d. Meet the PA during free time to discuss any issue arises related to education, general knowledge, technology development and career.
e. Consider any advice given and act appropriately.
f. Regard the PA as a good friend to open-up for discussion.

6.7 LEARNING GUIDANCE IN UNIVERSITY

The learning environment in university differs greatly to that in school. Students must therefore adapt to the new learning method accordingly, where most of the time, students are expect to have self motivation and self indepence to learn the materials giving in the class by the lectures. Several measures on how to succeed in the university are pointed out as follows:

a. Manage time effectively. Students should participate in positive activities and stay away from being involved in any illegal activities.
b. Plan-out properly for the courses to be registered for each semester by consulting the PA.
c. Choose co-curriculum and elective courses that are suitable according to own capability and interest.
d. Well disciplined in attending lectures, tutorials, and lab sessions.
e. Motivated and highly aspired throughout the studies in university to ensure good performance in quizzes, assignments, laboratories works, tests and final exam.
f. Avoid last-minute studying. Revision should be done on a regular basis.

7 FACILITIES AND ETHICS IN LABORATORY WORK

The facilities of FKM include lecture rooms and laboratories where most of the lecture rooms are located in Technology Campus. Table 7.1 lists the locations of facilities in the main building of FKM in Technology Campus. Faculty has developed the laboratories based on the courses offered. Through these laboratories, students will be exposed to the related machine handling experience as well as practical exposure on theory proofing learned in the lecture hall. This is to prepare themselves to become not only a knowledgeable engineer but also highly competitive in application and technical aspects.

Table 7.1 Locations of Related Facilities in FKM Main Building

No.	Name	Level
1	Administration Office	3
2	Security Office	G
3	Development Office	G
4	Student Clinic	G
5	Lecture Rooms 1-10	G
6	Lecture Rooms 11-17	1
7	Post Graduate Area	1
8	Faculty of Mechanical Engineering Student Association (FaMESA) room	1
9	Library	2
10	Lecturer Rooms	5 & 6

The entire laboratory is managed by a Lab Manager with the help of Laboratory's Head appointed among the academic staff. The lab management is also supported by technical support staff led by a technical assistant. The tools, machines and equipments of each laboratory are developed by respective departments. The lab management committee is responsible for the daily usage, consumables and maintenance of the labs.

7.1 OBJECTIVES OF LABORATORY WORK AND WORKSHOP

The faculty has developed laboratory work to enhance the understanding of the theory given during the lecture. The activities have been developed for the students so that it will not only provide better understanding of the concepts learned but also skills in handling the equipment and ability to solve the given problem. The laboratories are also utilised for research and consultation work for the public. Below are the objectives of the laboratory work:

a. To develop the interest of the students in engineering field by exposing them to the work procedure and equipment handling in solving engineering problem.
b. To relate the engineering theory by validating data obtained from the experiment.
c. To increase the tools-handling skill and also understanding the concept taught during the lecture.
d. To simulate and analyse engineering problems that are based on the knowledge acquired in the lecture.
e. To build up team work among the students during laboratory and workshop activities.
f. To support the research activities.
g. To provide consultation work for other institutions or agencies.

7.2 LABORATORY FACILITIES

In line with the university's aim, the development of the facilities has rapidly increased to support teaching & learning, and research activities. As the course curriculum comprises of laboratory courses, therefore the development of the lab shall reflect the syllabus of the course.

Most of the laboratories are equipped with state-of-the-art facilities. These facilities are used not only for teaching and learning activities, but also for research and consultation works. In line with the Engineering Accreditation Councils (EAC) requirements, the faculty managed to reduce the ratio of students to the equipments/tools down to 1:6. Besides that,

the computer facilities for the students are undergoing staggered upgrading in order to achieve the ratio of 1:1 (computer: student).

The development of the FKM laboratories has been carried out progressively. **Tables 7.2** and **7.3** show the list of existing laboratories for teaching and learning as well as research in FKM. At present, 31 laboratories have been developed for teaching and learning and 11 laboratories for research activity as planned. Currently, there are two laboratories complexes which are located at Mechanical Engineering Laboratory Complex, Taman Tasik Utama and Technology Campus. The laboratory complex in Technology Campus is located behind the main building of Fakulti Teknologi Kejuruteraan. FKM laboratories are specifically at Laboratory 2 (Door P4). Generally, each laboratory can accommodate at least 30 students at a time.

Table 7.2 List of Laboratories for Teaching and Learning

No.	Name of Laboratoriy	Location
1	Combustion Lab	Mechanical Engineering Laboratory Complex, Taman Tasek Utama (TTU)
2	Fluid Mechanics Lab	
3	Fitting & Fabrication Workshop	
4	Welding Workshop	
5	Machine Workshop	
6	Computer Aided Design Studio 1	
7	Computer Aided Design Studio 2	
8	Computer Aided Design Studio 3	
9	Computer Aided Design Studio 4	
10	Instrumentation Lab	
11	General Computer Studio	
12	Control Engineering Lab	
13	Heat Transfer Lab	
14	Computer Aided Engineering (CAE) Studio	
15	Material Science Lab	
16	Thermodynamics Lab	
17	Fluid Power Lab	
18	Dynamics Lab	
19	Structure Mechanics Lab	

20	Statics Lab	
21	PSM Workshop	
22	Basic Automotive & Racing Machine Lab	
23	Automotive Services & Maintenance Lab	
24	Automotive Design Studio	
25	Chemistry Lab	Laboratory Complex of Technology Campus
26	Engineering Drawing Studio 1	
27	Engineering Drawing Studio 2	
28	Maintenance Engineering Lab	
29	Condition Based Maintenance Lab	
30	Tribology Lab	
31	Mechanics of Machine Lab	

Table 7.3 List of Research Laboratories

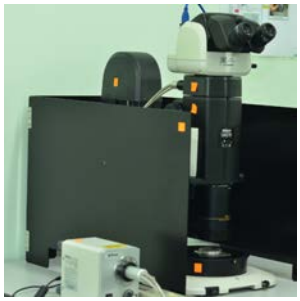
No.	Name of Laboratory	Name of Research Group	Location
1	Green Technology Vehicle Lab	Green Technology Vehicles (GTeV)	Mechanical Engineering Laboratory Complex, Taman Tasek Utama (TTU)
2	Noise & Vibration Vehicle Lab	High Performance Structure (HiPS)	
3	Non-destructive Test Lab	Advanced Materials (A-MAT)	
4	Refrigeration & Air Conditioning Lab	Efficient Energy and Thermal Management System (EFFECTS)	
5	Control & Vehicle Electronic System Lab	Advanced Vehicle Technology (AcTiVe)	
6	Turbo Machinery Lab	Efficient Energy and Thermal Management System (EFFECTS)	
7	Engine Performance Test Lab	-	
8	Rapid Prototype Lab	Integrated Design (IDeA)	
9	Maintenance Engineering	Sustainable Maintenance Engineering (SusME)	Laboratory Complex of Technology Campus
10	Research Computer Studio	Integrated Design (IDeA)	
11	Innovation Lab	Integrated Design (IDeA)	
12	Vibration and Acoustics Lab	Vibro-Acoustics Research Group	

Sample of Laboratory Facilities

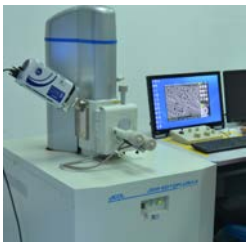
DESKTOP ENGRAVER

UNIVERSAL TESTING MACHINE

LOW POWER MICROSCOPE



TRIVECTOR WEAR DEBRIS ANALYZER



SCANNING ELECTRON MICROSCOPE

FTIR SPECTROPHOTOMETER

HIGH SPEED CAMERA

CNC LATHE MACHINE

SCANNING ELECTRON MICROSCOPE

HYDRAULIC PNUEMATIC TRAINING KIT

7.3 WORK ETHICS

All students are bound to the University Regulation & Guideline while working in the laboratory. These guidelines are meant to provide safe working environment in order to safe guard the equipments and building in the laboratory as well as to avoid accident.

The faculty has detailed out the regulations for working in laboratories as the working procedures is the fundamental aspect of laboratory activities. Students are required to follow these guidelines while they are in the laboratory or within the vicinity of the laboratory. The objectives of these guidelines are as follows:-

a. To create a secure, safe and conducive working environment during laboratory and practical works.
b. To guarantee the safety of the students and their environment.
c. To cultivate highly discipline culture among students.
d. To adapt professional working ethics.
e. To prolong the equipments' life span and also to maintain it with proper use and procedures.
f. To prevent misuse of equipments and avoid inappropriate and unnecessary damage to the equipments.
g. To make sure the practical work session is efficient without undue interference.

The working ethics are divided into three (3) categories, namely General Work Ethics, Laboratory Work Ethics and Dress Code in the Laboratory.

7.3.1 GENERAL WORK ETHICS

General work ethics is inevitably important. As student and future mechanical engineer are the people who will shape the national future engineering environment, general work ethics should be emphasised no matter where they are. To uphold these basic guidelines, the following instructions are enforced:

a. No entrance into the laboratory or work with the equipments without permission of laboratory manager or authorised staff.

b. No equipments are allowed to be taken out of the laboratory without prior permission from laboratory manager or authorised staff.
c. No food or drinks are allowed in the laboratory or workshops.
d. Non-related items are not allowed in the laboratory, such as bags and helmets.
e. Unacceptable behaviour or act will not be tolerated.
f. Obey the instructions given by the supervisor.
g. Adhere and understand the procedures in the laboratory such as laboratory submission procedures, equipment on loan procedures and the procedure of working during non-office hours.

h. Report any accident to the supervisor immediately.
i. Keep the laboratory clean and safe after every laboratory session.
j. Place any laboratory leftover or waste materials in the respective bin.

7.3.2 OPERATIONAL WORK ETHICS

The Laboratory Operational Work Ethics is one of the guideline that all mechanical engineering students should adhere to during their laboratory session. This guideline is specifically focused in handling practical works in the laboratory. Among the aspects to be observed by the students are as follows:-

a. During laboratory session, students should always be supervised by at least either a laboratory instructor or a technician.
b. Students should obtain a copy of laboratory sheet that could be downloaded from faculty website before starting a practical works.
c. Students should understand the working procedures of equipment before commencing laboratorial activities by referring to the work manual or instruction given by the lecturer or technician.
d. Students should sign attendance list distributed by the technician in charge.
e. Students should use and optimise the time allocated to finish off their practical works including recording observations and conclusions.

f. All laboratory reports should be submitted on time. Informal report should be handed in three (3) working days after the laboratory session took place. For formal report, it should be submitted seven (7) working days after the date of the laboratory session.
g. Laboratory reports should be submitted to the lecturer that in charge during the laboratory session.
h. For any defects found on the equipments, kindly report to the lecturer or technician in charge.
i. Equipments/tools must be returned to their designated location.

7.3.3 DRESS CODE

Dressing reflects the culture of the working environment. Irrespective of type of working environment, one must dress appropriately. The university has distributed a general guideline to the students on dress code within the university area. As far as the faculty is concerned, the dress code applies specifically for workshops or laboratories. The detail of the dress code can be referred to the Pejabat Hal Ehwal Pelajar dan Alumni. The following instruction must be carefully observed by the students while they are around or working in the laboratory.

a. Students should always display matrix cards for ease of identification.
b. Students should always wear appropriate dress corresponding to the activities undertaken.
c. Students should always wear proper personal protective equipment such as goggles, hand gloves or aprons while handling high risk equipments.
d. Students must wear covered shoes inside the laboratory. Any uncovered shoes are not allowed at all times.
e. For all activities inside the workshop, student must wear safety shoes.
f. Students are encouraged to wear workshop coat at the laboratory compound. Any collarless or round neck T-shirt is not allowed.
g. Female student with scarf should tie it at the back of her neck or tug it in her workshop coat. Loose clothing could increase possibility of accident.

h. Students are not allowed to wear any jewellery such as necklace or bracelet that will affect their safety.
i. Male students should keep their hair short. Female students with long hair should tie up their hair at the back of their head.
j. Students should always be neat and tidy.

7.4 IMPLEMENTATION OF LABORATORY WORK

The purpose of laboratory work is to increase student's understanding on the course thought. A number of laboratories were developed to cater the demand for the courses. In general, the conduct of the laboratory is parallel to the course registered on that particular semester.

7.4.1 LABORATORY WORK CONCEPT

Each laboratory session is conducted in a period of 14 weeks. During the first week, student will be briefed on the content and how the laboratory will be conducted. Some of the content during the orientation (1 week) period are as follows:
a. Name of laboratory station and how the experimental will be conducted.
b. Number and name of experimental work to be carried out.
c. Brief explanation of the laboratories work.
d. Group formation.
e. Format of report writing and marking scheme.

However, there are two approaches of laboratory work which are prescriptive laboratory work and open-ended laboratory work. For prescriptive laboratory activities, the students are provided with complete laboratory sheet and are fully guided by the lecturer or the instructor during the laboratory session. Prescriptive laboratory work will be conducted for diploma laboratory courses. Meanwhile, bachelor laboratory courses will implement open-ended approach. In this approach, the students will be given a very minimum guidance from

the lecturer or instructor. The laboratory sheet is given for the open ended laboratory with minimum guideline. Open ended laboratory work allows the opportunity for students to be creative about the execution, analysis and evaluation of laboratory work. Students create, for example, the evidence, the analysis, and the evaluation of laboratory work. Often synthesis is also involved in open-ended work. These processes involve the interactive while in the laboratory (in-lab work) and after leaving the laboratory (post-lab work).The students are fully responsible to conduct and handle the experiment themselves after short briefing given by the lecturer or the instructor. The students are working in a group of 4 to 5 persons. They need to determine the objectives, apparatus and methods as well as execute the experiment. A report including results, discussion, conclusion and references is submitted for evaluation. The final presentation of students' work is organized at the end of the semester. Skills such as communication (oral and written), organization, teamwork, innovation and creativity are evaluated in the open-ended laboratory approaches.

7.5 INDUSTRIAL TRAINING

Industrial training will expose students to working experience in professional bodies that is related to mechanical engineering field. During industrial training, students will be able to apply theoretical and practical knowledge to real working environment. In addition, students will also develop their soft skills throughout the training. For bachelor degree students, they should undergo industrial training for 12 weeks. The training will be performed during the short semester of 3rd year study. Meanwhile, for diploma degree students, they should undergo industrial training during short semester in Year 2.

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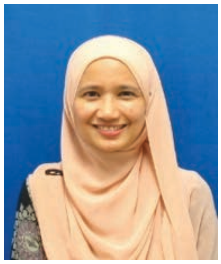

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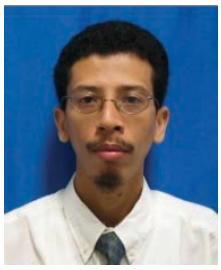

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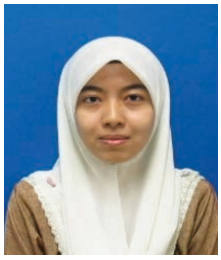

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