

# PROGRAM GUIDEBOOK

**SESSION  
2024/2025**

SEMESTER 2 INTAKE

## Bachelor of Mechanical Engineering

DEPARTMENT OF MECHANICAL ENGINEERING

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# UNIVERSITI MALAYA

*Vision, Mission, Core Values, Tagline*

## VISION

A global university impacting the world.

## MISSION

Pushing the boundaries of knowledge and nurturing aspiring leaders.

## CORE VALUES



## TAGLINE

*Home of the Bright, Land of the Brave*  
*Di Sini Bermulanya Pintar, Tanah Tumpahnya Berani*

# INTRODUCTION TO FACULTY OF ENGINEERING



*The profession in which a knowledge of the mathematical or natural sciences gained by study, experience and practice is applied with judgement to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind.*



**Accreditation Board for Engineering and Technology**  
(FORMERLY The Engineers' Council for Professional Development (ECPD))

**Engineering** is not simply an academic field that deals with technology, statistics, and science. It is an exciting and rewarding discipline that has a much wider scope, ranging from basic science to applied technology. Engineers make a significant difference in the lives of millions of people. Through identifying problems and seeking new solutions, they create and design items that benefit the lives of everyone, from cars, computers, and buildings, through to life saving equipment, the generation of energy and medical procedures. Engineering is not about what the world is, it is about what the world can be.

# i-LEAD

Innovative engineer with exceptional **L**eadership, **E**thical, **A**daptive and **D**ynamic values

## Innovative

Innovative engineers possess the ability to use approaches, processes, resources, behaviors and mindsets of innovation culture using knowledge and expertise in emerging technologies.

## Leadership

Effective leadership influences others to effectively collaborate to implement transformative change and innovation. It requires personal effectiveness and the ability to synthesize diverse expertise and skillsets to inspire people to engage with the organization's vision.

## Ethical

Ethics in engineering practices is directed by respect for ethical beliefs and values, and for the dignity and rights of others. It promotes good practices through mutual respect and trust, integrity, honesty, accountability, transparency, equality and fairness.

## Adaptive

Adaptive engineers embrace change, experimentation and innovation. They leverage on the creativity of an entire organization to adapt and thrive in a multitude and myriad of evolving environments.

## Dynamic

Dynamic engineers are influencers, that understand the importance of inspiring others and achieving success through teamwork. They have the ability to properly analyze situations and take deliberate, calculated risks to move the team forward.

# MESSAGES FROM DEAN



**PROFESSOR IR. DR. NIK NAZRI BIN NIK GHAZALI**

“ As we launch into another dynamic academic year at Universiti Malaya's Faculty of Engineering, I want to extend my warmest welcome to each of you. This is a time of great potential, where your creativity and determination can lead to groundbreaking advancements. The engineering field is rapidly evolving, and with it comes the responsibility to approach challenges with innovative solutions and a commitment to sustainability. I encourage you to explore the intersections of technology, ethics, and community engagement in your work. Let's harness this opportunity to not only advance your skills but also to become responsible engineers who contribute positively to society.

Moreover, I want to emphasize the value of collaboration and inclusivity in our faculty. Every voice matter, and the diversity of our community enriches our collective experience. I urge you to participate actively in campus life—join clubs, engage in workshops, and seek opportunities for interdisciplinary projects. Together, we can create a supportive environment where everyone feels empowered to share their ideas and pursue their passions. As we move forward, let's commit to uplifting one another, fostering innovation, and making the most of the resources available to us. I am excited to see the extraordinary contributions each of you will make to faculty and beyond. ”

# THE MANAGEMENT



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“**Mechanical Engineering** is all about solving complex, real-world problems. Engineers are trained to analyze challenges, break them down, and develop innovative, practical solutions. Whether designing energy-efficient systems, improving manufacturing processes, or creating life-saving medical technologies, problem-solving is at the core of everything they do. Critical thinking, creativity, and hands-on experience are essential in ensuring engineers can approach any issue with confidence. Mechanical engineers are thinkers and innovators, finding ways to make systems more efficient, sustainable, and reliable, ultimately shaping a better future for society.”

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# OFFICE DIRECTORY

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<b>Deputy Dean (Postgraduate)</b>	Tel: 03-7967 4477 Email: fk_tdit@um.edu.my
<b>Deputy Dean (Student Affairs)</b>	Tel: 03-7967 5209 Email: fk_tdhep@um.edu.my
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Enquiries	Link / Email
General complaints	<a href="https://helpdesk.um.edu.my/">https://helpdesk.um.edu.my/</a>
Academic programmes, entry requirements, applications	<a href="mailto:study@um.edu.my">study@um.edu.my</a>
Scholarships	<a href="mailto:bptajaan_aasd@um.edu.my">bptajaan_aasd@um.edu.my</a>
Visa	Kindly submit application to: Faculty: <a href="https://shorturl.at/5EdMR">https://shorturl.at/5EdMR</a> Central: <a href="mailto:bpvisa_aasd@um.edu.my">bpvisa_aasd@um.edu.my</a>
Student Confirmation Letter – Active Students	Kindly submit application to Faculty: <a href="https://shorturl.at/jxE0e">https://shorturl.at/jxE0e</a>
Problem with MAYA system	Kindly lodge your enquiry/complaint via <a href="https://helpdesk.um.edu.my/">https://helpdesk.um.edu.my/</a>
Transcript application & academic verification	<a href="mailto:verify_um@um.edu.my">verify_um@um.edu.my</a>
Internship hiring/placement	<a href="mailto:citra@um.edu.my">citra@um.edu.my</a>
Career opportunities / job vacancies / management trainee programmes for UM students	<a href="mailto:gecc@um.edu.my">gecc@um.edu.my</a>
Institutional collaborations, MoU/MoA and visits to UM	<a href="mailto:international@um.edu.my">international@um.edu.my</a>
Industry-academia collaborations	<a href="mailto:industry@um.edu.my">industry@um.edu.my</a>
Visit requests by student groups	Schools & local universities: <a href="mailto:study@um.edu.my">study@um.edu.my</a>  International universities: <a href="mailto:study@um.edu.my">study@um.edu.my</a>
Rental of spaces in UM	Make your booking at <a href="https://umpoint.um.edu.my/">https://umpoint.um.edu.my/</a>

# STUDENT AFFAIRS

## Introduction

**Deputy Dean (Student Affairs) Office Faculty of Engineering, Universiti Malaya**, is dedicated to supporting the holistic development and well-being of the students. The office oversees various aspects of student life, providing essential services that enhance the student experience, including student welfare, competition, student associations, co-curricular activities, competition, exchange program, professional development opportunities/ upskilling program and scholarship information. We strive to ensure that every student receives the necessary resources and support throughout their academic journey.

## Team



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**MR. MOHD AZMI MAHAD**  
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## Core Functions

### Student Welfare

Our office is committed to student welfare, providing a range of services to address financial aid, counselling, and other support systems.

### Competitions and Student Clubs

We actively support student participation in engineering competitions, both locally and internationally, to foster innovation and practical learning. Our office also encourages students to join and lead engineering clubs and societies, promoting leadership, teamwork, and co-curricular involvement.

### Upskilling Programs

To ensure our students are equipped for the evolving demands of the engineering industry, we offer a range of upskilling programs, workshops, and training sessions. These initiatives focus on developing critical skills such as leadership, communication, and technical expertise to prepare students for future careers.

### Co-Curricular Activities

In addition to academic excellence, we believe in the importance of well-rounded personal development. Our office provides resources and opportunities for students to participate in various co-curricular activities, enhancing university experience and preparing for a balanced professional life.

### Exchange Programs

We facilitate student exchange programs with universities worldwide, offering our students the opportunity to gain international exposure, broaden their perspectives, and enhance their learning experience in diverse academic and cultural settings.

### Scholarship Opportunities

The Deputy Dean's Office provides information and guidance on various scholarships available to our students. These scholarships aim to support academic excellence and alleviate financial burdens, allowing students to focus on their studies and professional development.

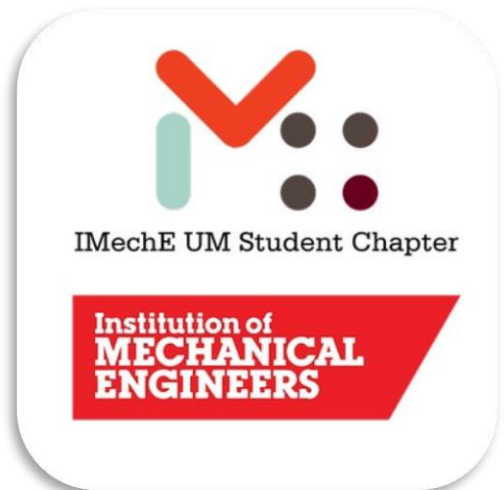
For any inquiries, feel free to reach out to us at [fk\\_tdhep@um.edu.my](mailto:fk_tdhep@um.edu.my).  
Tel: +603 7967 7621

# STUDENT ENGAGEMENT DEPARTMENT

## Institution of Mechanical Engineers Universiti Malaya Student Chapter (IMechE UM)

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**Under the umbrella of Young Member’s Section (YMS) of IMechE Malaysian Branch**, IMechE Universiti Malaya Student Chapter was established in 2012 with currently 572 active members in the Faculty of Engineering. It is an entirely non profitable, self-sustaining, student-run society under the efforts of students from the Faculty of Engineering, Universiti Malaya. With the vision “Improving the world through engineering”, our members strive to widen their knowledge and improve interpersonal skills through various activities conducted by the student chapter.



Social media: <https://www.facebook.com/imecheUM>  
Official website: [https://linktr.ee/IMechE\\_UM](https://linktr.ee/IMechE_UM)





# ASHRAE UM Student Chapter (American Society of Heating, Refrigerating and Air-Conditioning Engineers)



**ASHRAE** is a global society advancing human well-being through sustainable technology for the built environment. The Society and its members focus on building systems, energy efficiency, indoor air quality, refrigeration and sustainability within the industry. Through research, standards writing, publishing and continuing education, ASHRAE shapes tomorrow's-built environment today. ASHRAE UM is a student body under ASHRAE Malaysia and aimed to provide a platform for engineering students to gain exposure from the industries and improve soft skills.

Social media: <https://www.facebook.com/ASHRAEUM>  
Official website: <https://linktr.ee/ASHRAEUM>



## Annual Events

Throughout the semester, the organizing committees of all student chapters work hard to organize exciting and interesting events for their peers. Here are some of the common events held:

### The Engineering Festival (TEF)

The Engineering Festival (TEF) is an annual event organized by Engineering Council, welcoming first year students to the Faculty of Engineering. Some of the activities in the past event include faculty and departmental interaction sessions, exhibition of student clubs/chapters, and explore race.



### Mechanical Week

Mechanical Week, an annual event organized by IMechE UM SC, serves as a vital bridge between students and potential employers from diverse sectors of the industry. It provides students with opportunities to nurture professional relationships and discuss prospects for internships and employability. The event is accompanied by activities such as Sports Day, Mechanical Open Day, SolidWorks Competition, Industrial Talks, Industrial Visits, and the Speak Out for Engineering (SOE) competition, which together enrich the students' experience. Additionally, Mechanical Week focuses on expanding students' knowledge of various engineering fields, making them aware of current and future industry trends, helping them explore and shape their career paths early on. Beyond its professional benefits, it fosters social integration among students through games and activities, while also promoting the importance of teamwork in an engaging and interactive environment.



### Meeting with Academic Advisor Day

Academic Advisor Day is a recurring event held at the beginning of each semester, where students are required to meet with their academic advisors, as per faculty regulations. It offers students a chance to discuss their academic progress, receive guidance, and foster stronger relationships with their advisors. The day also highlights and celebrates outstanding academic achievements and contributions to JKM. Students can enjoy free food and refreshments while engaging in meaningful conversations about their academic journeys, making it a day of support, interaction, and celebration.



## ASHRAE Run

Are you a sporty person and looking for a fun run? Join ASHRAE Run as a participant to make your university life unique and memorable! ASHRAE Run stands as a historic and grand event within the UM Engineering Faculty's event calendar.



## Competitions

In the past few years, our student chapters have also organized some competitions (with exciting prizes) that allow students to apply their learnt engineering skills and knowledge. Here are some of the past competitions:

- Solidworks Design Competition
- HVAC Case Challenge Competition
- JAF Case Study & Pitching Competition
- ACSO Case Challenge Competition
- Suncon Case Study Competition



## Technical Talks and Industrial Site Visits

To expose our students to the industrial world, student chapters are always committed to engage with the industries to organize informative sessions such as technical talks and industrial site visits. Here are some of the technical talks and sites (there are many more!) that have been organized in the recent years:

### Technical Talks:

- NYKK Industrial Talk: Future and the Career Path of HVAC Industry by Ir. Ng Yong Kong (Director of NYKK Engineering Group Sdn. Bhd., past president of Malaysia Air-Conditioning and Refrigeration Association)
- NXP Career Aspirations by Dr. Eu Poh Leng (Senior Director, Package Innovation NXP Malaysia Sdn. Bhd.)
- NXP Training Workshop: Introduction to IC Packaging by Mr. Azham Mohd Sukemi (Sr. Principal Engineer Package Innovation, NXP Malaysia Sdn. Bhd.)
- Career talk with Gamuda: A Human-Centered Approach to Innovation by Mr. Liew Kit Shen (Head of Tunnel R&D)



- Introduction to Mechanical Static Equipment for Oil & Gas by Mr. Hanafi Basri (Principal Mechanical Static Unfired, Petronas)
- Industrial Site Visits:
  - Systemair Sdn. Bhd.
  - American Air Filter Manufacturing Sdn. Bhd.
  - Dunham-Bush Industrial Visit
  - KLK Palm Oil Mill
  - PNB Aluminium (PMB) Sdn. Bhd.
  - Hino Motors

# RULES AND REGULATIONS

All students are required to follow **Universiti Malaya (Bachelor's Degree) Rules & Regulations 2024**, which include key aspects such as registration, payment, duration of study, structure of programme of study, examination, appeal and graduation. For more detailed information on the university regulations, please meet your Programme Coordinator and/or visit:

<https://engine.um.edu.my/um-wow-2024-2025#>

# ACADEMIC CALENDAR

SEMESTER I				
Orientation Week		29.09.2024	-	06.10.2024
Lectures	7 weeks*	07.10.2024	-	24.11.2024
Mid-Semester I Break	1 week	25.11.2024	-	01.12.2024
Lectures	7 weeks*	02.12.2024	-	19.01.2025
Revision Week	1 week*	20.01.2025	-	26.01.2025
Semester I Final Examination	3 weeks*	27.01.2025	-	16.02.2025
Semester I Break	4 weeks	17.02.2025	-	16.03.2025
	<u>23 weeks</u>			
SEMESTER II				
Lectures	7 weeks*	17.03.2025	-	04.05.2025
Mid-Semester II Break	1 week	05.05.2025	-	11.05.2025
Lectures	7 weeks*	12.05.2025	-	29.06.2025
Revision Week	1 week*	30.06.2025	-	06.07.2025
Semester II Final Examination	3 weeks*	07.07.2025	-	27.07.2025
Semester II Break	4 weeks	28.07.2025	-	24.08.2025
	<u>23 weeks</u>			
SPECIAL SEMESTER				
Lectures	7 weeks*	28.07.2025	-	14.09.2025
Special Semester Final Examination	1 week*	15.09.2025	-	21.09.2025
Break	1 week	22.09.2025	-	28.09.2025
	<u>9 weeks</u>			

**Note:**

(\*) The Academic Calendar has taken into account public and festive holidays and is subject to change:

Deepavali	01 November 2024 (Friday)
Christmas Day	25 December 2024 (Wednesday)
New Year	01 January 2025 (Wednesday)
Chinese New Year	29 & 30 January 2025 (Wednesday & Thursday)
Federal Territory Day	01 February 2025 (Saturday)
Thaipusam	11 February 2025 (Tuesday)
Nuzul Al-Quran	17 March 2025 (Monday)
Eidul Fitri	31 March & 01 April 2025 (Monday & Tuesday)
Wesak Day	12 May 2025 (Monday)
His Majesty's King's Birthday	02 June 2025 (Monday)
Eidul Adha	06 June 2025 (Friday)
Awal Muharam	27 June 2025 (Friday)

# BACHELOR OF MECHANICAL ENGINEERING

## Introduction

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**The Department of Mechanical Engineering** was established in 1958 and is one of the oldest departments at the Universiti Malaya. Many graduates from this department have moved on to become successful individuals in government and private sectors and have significantly contributed to the growth of the nation. Some of them also participated actively in the professional bodies. The Department of Mechanical Engineering currently offers undergraduate and postgraduate programmes.

The undergraduate intake is taken from the students that have completed the matriculation course, A-Level, IB and STPM, Diploma and other pre-university programmes. All degrees require a minimum of four years to complete, and the students are required to undergo 10 weeks of industrial training. The undergraduate programme offered by the Department of Mechanical Engineering is accredited by Malaysian Qualification Agency (MQA) and Engineering Accreditation Council (EAC).

The first Engineering Accreditation Council (EAC) evaluation in 2004, the programme was awarded full accreditation (5 years). There are stringent staff recruitment criteria for academic staff, in order to comply with the EAC requirement. In addition to undergraduate programmes, the department also offers the degree in Master of Mechanical Engineering and Doctor of Philosophy.

## Programme Synopsis

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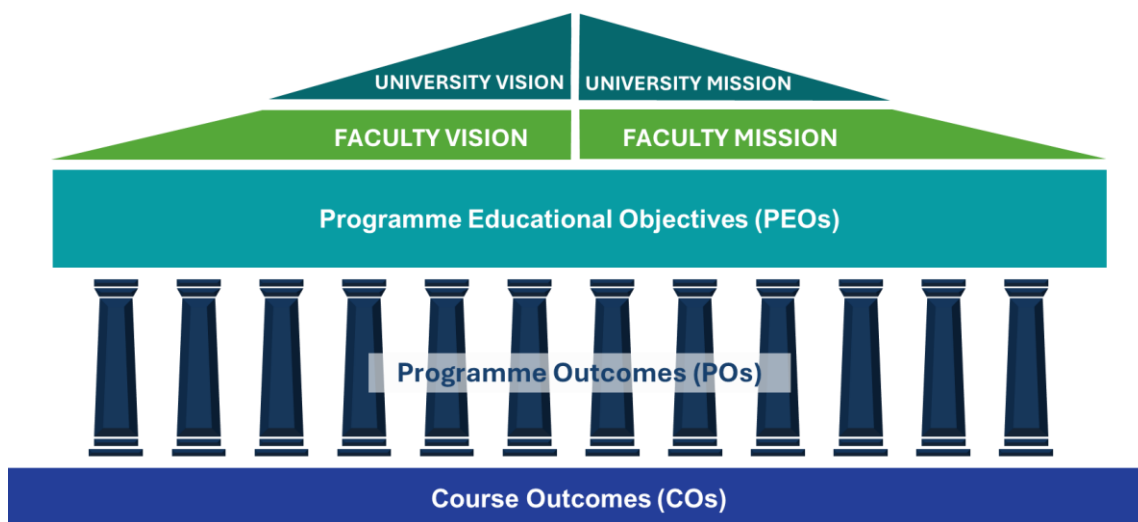
Mechanical Engineering programme provides a strong base in Mechanical Engineering with a well-established balance between theory and experiments during four years of study. This bachelor's degree programme is designed to prepare students with an understanding of fundamental theories and concepts in mechanical engineering, primarily the scientific knowledge to solve challenges and design systems in automotive, power generation, aerospace, and manufacturing industries. The curriculum consists of a combination of general courses as well as core Mechanical Engineering courses. A total of 143 credit hours will be taught in 8 semesters. The general courses consist of non-technical subjects such as Basic Entrepreneurship Culture and English Communication Programme to develop soft skills among engineering students. The core courses emphasize on Mechanical Engineering components, to equip students with engineering knowledge and complex problem solving skills, in order to solve challenges in actual engineering applications. A minimum of 10-week industrial training attachment is mandatory for undergraduates of the Faculty of Engineering. The idea of this attachment is to enable students to gain first-hand experience in the industry as well as to learn how theories are put into practice in real engineering situations.

Instead of theoretical courses, the students will also involve in Project-Based Learning (PBL) courses which are Integrated Design Project (IDP) and Final Year Project (FYP). These courses will provide students with in-depth knowledge and skills in project management and significant experience in developing, designing, prototyping, proving, and verifying their design. In the fourth year, each of Mechanical Engineering student must select a set of 6 elective courses. These electives are chosen based on the student's interest and the student's ultimate career goal after graduation. After graduating from this programme, the students are employed in various industries such as automotive industries, manufacturing industries, industrial machines and components industries. The job involves designing mechanical components and devices, supervising, and supporting the production operation. Mechanical engineers are also in demand in the oil and gas sector and energy-related sectors.

## Outcome-Based Education (OBE)

Outcome-Based Education (OBE) had been implemented in the Faculty of Engineering since 2004, in accordance with the directives of the Ministry of Higher Education Malaysia and the Board of Engineers Malaysia (BEM). This is also one of the requirements for Malaysia to become a full member of the Washington Accord (WA), an international agreement to mutually recognize Bachelor degrees in the field of engineering.

OBE is an internationally practised educational model that focuses on the measurement of student outcomes and the implementation of corrective measures to overcome deficiencies in course delivery methods/assessment/student attitude, etc. Curriculum is designed with specific course outcomes (COs) to prepare the graduates to achieve the graduate attributes/programme outcomes (POs) at the point of graduation. The POs are designed to produce graduates who are well-prepared to achieve the programme educational objectives (PEOs) 3 - 5 years after they have graduated. The PEOs and POs had been formulated in consultation with all major stakeholders (employers, alumni and students), to meet the demands of a challenging and globalized workplace.



# PROGRAMME STRUCTURE

## BACHELOR OF MECHANICAL ENGINEERING

Courses	Content	Credit Hours
<b>University Courses</b>	GIG1012: Philosophy and Current Issues* / GLT1049: <i>Bahasa Melayu Komunikasi</i> **	2
	GIG1013: Appreciation of Ethics and Civilization	2
	GIG1003: Basic Entrepreneurship Enculturation	2
	GLTXXXX: English Communication Programme †	4
	University Elective Courses (Student Holistic Empowerment)	8
	Co-Curriculum	2
<b>Sub-total Credit Hours</b>		<b>20</b>
<b>Faculty Courses</b>	Faculty Core Courses	12
<b>Sub-total Credit Hours</b>		<b>12</b>
<b>Department Courses</b>	Department Core Courses	93
	Department Elective Courses	18
<b>Sub-total Credit Hours</b>		<b>111</b>
<b>TOTAL CREDIT HOURS</b>		<b>143</b>

\* Compulsory for local students.

\*\* Compulsory for international students.

† Students are required to complete the courses based on their English Proficiency qualification (MUET/IELTS/TOEFL), as stipulated in the respective PATH on page 35.

University courses subject to availability.

# ACADEMIC PLANNER

## SEMESTER 2 INTAKE, SESSION 2024/2025

YEAR 1						
CODE	COURSE	S2	S1	SS	TOTAL CREDIT	PRE-REQUISITE
<b>UNIVERSITY COURSES</b>						
GIG1012 GLT1049	Philosophy And Current Issues* / <i>Bahasa Melayu Komunikasi **</i>	2				
GLTXXXX	English Communication I	2				
GLTXXXX	English Communication II		2			
<b>Sub-total Credit Hours</b>		<b>4</b>	<b>2</b>		<b>6</b>	
<b>UNIVERSITY ELECTIVE COURSES (STUDENT HOLISTIC EMPOWERMENT)</b>						
Cluster 1	Thinking Matters: Mind and Intellect	4	2			
Cluster 2	Emotional, Physical and Spiritual Intelligence: Heart, Body & Soul					
Cluster 3	Technology/Artificial Intelligence and Data Analytics: I-Techie					
Cluster 4	Global Issues and Community Sustainability: Making the World a Better Place					
<b>Sub-total Credit Hours</b>		<b>4</b>	<b>2</b>		<b>6</b>	
<b>FACULTY COURSES</b>						
KIX1001	Engineering Mathematics 1		3			
KIX1002	Engineering Mathematics 2	3				
<b>Sub-total Credit Hours</b>		<b>3</b>	<b>3</b>		<b>6</b>	
<b>DEPARTMENT CORE COURSES</b>						
KIG1013	Engineering Thermodynamics 1	3				
KIG1016	Machining And Manufacturing Processes	4				
KIG1009	Statics		3			
KIG1010	Fluid Mechanics 1		3			
KIG1011	Engineering Materials 1		3			
KIG1012	Engineering Design and Modelling		3			
<b>Sub-total Credit Hours</b>		<b>7</b>	<b>12</b>		<b>19</b>	
<b>TOTAL CREDIT HOURS</b>		<b>18</b>	<b>19</b>		<b>37</b>	

\* Compulsory for local students.

\*\* Compulsory for international students.



YEAR 2						
CODE	COURSE	S2	S1	SS	TOTAL CREDIT	PRE-REQUISITE
<b>UNIVERSITY COURSES</b>						
GIG1003	Basic Entrepreneurship Enculturation	2				
GIG1013	Appreciation Of Ethics and Civilisations		2			
Sub-total Credit Hours		2	2		4	
<b>UNIVERSITY ELECTIVE COURSES (STUDENT HOLISTIC EMPOWERMENT)</b>						
Cluster 1	Thinking Matters: Mind and Intellect	2				
Cluster 2	Emotional, Physical and Spiritual Intelligence: Heart, Body & Soul					
Cluster 3	Technology/Artificial Intelligence and Data Analytics: I-Techie					
Cluster 4	Global Issues and Community Sustainability: Making the World a Better Place					
Sub-total Credit Hours		2			2	
<b>FACULTY COURSES</b>						
KIX2006	Engineering Economics and Project Management	3				
Sub-total Credit Hours		3			3	
<b>DEPARTMENT CORE COURSES</b>						
KIG1014	Mechanics Of Materials 1	3				
KIG1015	Dynamics	3				
KIG2018	Engineering Thermodynamics 2	3				
KIG2019	Numerical And Statistical Methods in Engineering	3				
KIG2012	Mechatronics 1		3			
KIG2013	Computer Programming		3			
KIG2014	Fluid Mechanics 2		3			
KIG2015	Mechanics Of Materials 2		3			
KIG2016	Product Design and Innovation		3			
Sub-total Credit Hours		12	15		27	
<b>TOTAL CREDIT HOURS</b>		<b>19</b>	<b>17</b>		<b>36</b>	

YEAR 3						
CODE	COURSE	S2	S1	SS	TOTAL CREDIT	PRE-REQUISITE
<b>UNIVERSITY COURSES</b>						
	Co-Curriculum		2			
<b>Sub-Total Credit Hours</b>			2		2	
<b>FACULTY COURSES</b>						
KIX2005	Law, Ethics and Sustainability for Engineers	3				
<b>Sub-total Credit Hours</b>		3			3	
<b>DEPARTMENT CORE COURSES</b>						
KIG2017	Design Of Machine Elements	3				
KIG2020	Mechatronics 2	3				
KIG3012	Control Engineering	3				
KIG3013	Heat Transfer	3				
KIG3014	Finite Element Analysis	3				
KIG3007	Integrated Design 1		3			
KIG3008	Instrumentation And Measurement Techniques		3			
KIG3009	Mechanical Vibrations		3			
KIG3010	Engineering Materials 2		3			
KIG4053	Production And Operations Management		3			
<b>Sub-total Credit Hours</b>		15	15		30	
<b>TOTAL CREDIT HOURS</b>		18	17		35	

YEAR 4						
CODE	COURSE	S2	S1	SS	TOTAL CREDIT	PRE-REQUISITE
<b>DEPARTMENT CORE COURSES</b>						
KIG3011	Integrated Design 2	3				
KIG4052	Materials Selection in Mechanical Design	3				
KIG4054	Final Year Project 1	3				
KIG4055	Final Year Project 2		3			
KIG3015	Industrial Training			5		
<b>Sub-total Credit Hours</b>		<b>9</b>	<b>3</b>	<b>5</b>	<b>17</b>	
<b>DEPARTMENT ELECTIVE COURSES</b>						
	Elective Course I	3				
	Elective Course II	3				
	Elective Course III		3			
	Elective Course IV		3			
	Elective Course V		3			
	Elective Course VI		3			
<b>Sub-total Credit Hours</b>		<b>6</b>	<b>12</b>		<b>18</b>	
<b>TOTAL CREDIT HOURS</b>		<b>15</b>	<b>15</b>	<b>5</b>	<b>35</b>	

# DEPARTMENT ELECTIVE COURSES

CODE	COURSE	CREDIT HOURS	PRE-REQUISITE
KIG4056	Tribology	3	
KIG4057	Machinery Vibration and Condition Monitoring	3	
KIG4058	Engineering Acoustics and Noise Control	3	
KIG4059	Internal Combustion Engine	3	
KIG4060	Heat Exchanger Equipments	3	
KIG4061	Pump Characteristics and Application	3	
KIG4062	Computational Fluid Dynamics	3	
KIG4063	Heating, Ventilation, Air Conditioning And Refrigeration	3	KIG2018, KIG3013
KIG4064	Human Factors Design	3	
KIG4065	Sustainable Design	3	
KIG4066	Rapid Manufacturing Technology	3	
KIG4067	Manufacturing Strategy	3	
KIG4068	Machine Learning	3	
KIG4069	Ceramic Engineering	3	
KIG4070	Constitutive Modeling of Materials	3	
KIG4071	Electronic Packaging	3	
KIG4072	Failure Analysis and Prevention	3	
KIG4073	Metals And Alloys Engineering	3	
KIG4074	Nanomaterials	3	
KIG4075	Polymer And Rubber Engineering	3	
KIG4076	Semiconductor Manufacturing Process and Technology	3	
KIG4077	Mold and Die Design	3	
KIG4078	Microfabrication and Devices	3	
KIG4079	Theory And Applications in Metal Forming	3	
KIG4080	Industrial Robotics	3	
KIG4085	Corrosion Engineering	3	
KIG4086	Power Plant Engineering	3	
KIG4087	Technopreneurship In Engineering	3	

# UNIVERSITY COURSES

The list of university courses offered for each semester could be found through the following link:

<https://citra.um.edu.my/list-of-university-courses>

## A. Student Holistic Empowerment (SHE)

The Student Holistic Empowerment (SHE) courses are categorized into four (4) clusters:

### Cluster 1

Thinking Matters: Mind and Intellect

### Cluster 2

Emotional, Physical and Spiritual Intelligence: Heart, Body & Soul

### Cluster 3

Technology/Artificial Intelligence and Data Analytics: i-Techie

### Cluster 4

Global Issues and Community Sustainability: Making the World a Better Place

All students are required to register one (1) course from each cluster.

## B. Co-curricular Courses

The list of co-curricular courses available is as follows:

CODE	COURSE
GKA1001	Attach@Industry
GKI1001	Independent Research
GKK1001	Community Services
GKP1001	Talent Development
GKS1001	Volunteerism
GKU1001	Entrepreneurship

# PATH FOR ENGLISH COMMUNICATION PROGRAMME

ENGLISH COMMUNICATION PROGRAMME (UNIVERSITY COURSE) LIST OF COURSES TO BE COMPLETED BY ALL STUDENTS			
PATH 1	PATH 2	PATH 3	PATH 4
<ul style="list-style-type: none"> <li>• MUET BAND 2</li> <li>• IELTS Band 4.0</li> <li>• TOEFL Paper – Based Test (437 – 473)</li> <li>• TOEFL Computer – Based Test (123 – 150)</li> <li>• TOEFL Internet – Based Test (41 – 52)</li> <li>• PTE (Academic) – (10 – 28)</li> </ul>	<ul style="list-style-type: none"> <li>• MUET BAND 3</li> <li>• IELTS Band 4.5 – 5.0</li> <li>• TOEFL Paper – Based Test (477 – 510)</li> <li>• TOEFL Computer – Based Test (153 – 180)</li> <li>• TOEFL Internet – Based Test (53 – 64)</li> <li>• PTE (Academic) – (29 - 41)</li> </ul>	<ul style="list-style-type: none"> <li>• MUET BAND 4</li> <li>• IELTS Band 5.5 – 6.0</li> <li>• TOEFL Paper – Based Test (513 – 547)</li> <li>• TOEFL Computer – Based Test (183 – 210)</li> <li>• TOEFL Internet – Based Test (65-78)</li> <li>• PTE (Academic) – (42 – 57)</li> <li>• FCE (B &amp; C)</li> <li>• GCE A Level (English) (Minimum C)</li> <li>• IGCSE/GCSE (English) (A, B &amp; C)</li> </ul>	<ul style="list-style-type: none"> <li>• MUET BAND 5 &amp; BAND 6</li> <li>• IELTS Band 6.5 – 9.0</li> <li>• TOEFL Paper – Based Test (550 – 677)</li> <li>• TOEFL Computer – Based Test (213 – 300)</li> <li>• TOEFL Internet – Based Test (79 – 120)</li> <li>• PTE (Academic) (58 – 90)</li> <li>• FCE (A)</li> <li>• GCE A Level (English) (B &amp; A)</li> </ul>
Students need to complete 2 courses (2 courses x 2 credits each) from this PATH	Students need to complete 2 courses (2 courses x 2 credits each) from this PATH	Students need to complete 2 courses (2 courses x 2 credits each) from this PATH	Students need to complete 2 courses (2 courses x 2 credits each) from this PATH
<b><u>COMPULSORY</u></b>	<b><u>COMPULSORY</u></b>	<b><u>COMPULSORY</u></b>	<b><u>CHOOSE TWO:</u></b>
GLT1018 – Proficiency in English I	GLT1021 – Proficiency in English II	GLT1024 – Proficiency in English III	<ul style="list-style-type: none"> <li>• GLT1027 – Advanced Oral Communication*</li> <li>• GLT1028 – Advanced Business Writing*</li> <li>• Alternative courses - Foreign Language</li> </ul>
<b>** <u>CHOOSE ONE:</u></b>	<b>** <u>CHOOSE ONE:</u></b>	<b>** <u>CHOOSE ONE:</u></b>	*Students can only register for one course per semester
<ul style="list-style-type: none"> <li>• GLT1019 – Let’s Speak</li> <li>• GLT1020 – Fundamental Writing</li> </ul>	<ul style="list-style-type: none"> <li>• GLT1022 – Speak Up</li> <li>• GLT1023 – Effective Workplace Writing</li> </ul>	<ul style="list-style-type: none"> <li>• GLT1025 – Effective Oral Communication</li> <li>• GLT1026 – Writing at the Workplace</li> </ul>	

\*\* These courses have prerequisites and students can only register for them after obtaining a PASS in the compulsory course as stipulated in the respective PATH.

# LIST OF FOREIGN LANGUAGE COURSES

*Alternative Courses for Path 4*

No.	Course Code	Course Name	Credit Hours
1	GLT1029	Bahasa Arab Asas 1 / <i>Basic Arabic Language 1</i>	2
2	GLT1030	Bahasa Arab Asas 2 / <i>Basic Arabic Language 2</i>	2
3	GLT1031	Bahasa Jepun Asas 1 / <i>Basic Japanese Language 1</i>	2
4	GLT1032	Bahasa Jepun Asas 2 / <i>Basic Japanese Language 2</i>	2
5	GLT1033	Bahasa Korea Asas 1 / <i>Basic Korean Language 1</i>	2
6	GLT1034	Bahasa Korea Asas 2 / <i>Basic Korean Language 2</i>	2
7	GLT1035	Bahasa Parsi Asas / <i>Basic Persian Language</i>	2
8	GLT1036	Bahasa Portugis Asas 1 / <i>Basic Portuguese Language 1</i>	2
9	GLT1037	Bahasa Portugis Asas 2 / <i>Basic Portuguese Language 2</i>	2
10	GLT1038	Bahasa Rusia Asas 1 / <i>Basic Russian Language 1</i>	2
11	GLT1039	Bahasa Rusia Asas 2 / <i>Basic Russian Language 2</i>	2
12	GLT1040	Bahasa Sepanyol Asas 1 / <i>Basic Spanish Language 1</i>	2
13	GLT1041	Bahasa Sepanyol Asas 2 / <i>Basic Spanish Language 2</i>	2
14	GLT1042	Bahasa Thai Asas 1 / <i>Basic Thai Language 1</i>	2
15	GLT1043	Bahasa Thai Asas 2 / <i>Basic Thai Language 2</i>	2
16	GLT1044	Bahasa Turki Asas / <i>Basic Turkish Language</i>	2



# **COURSE INFORMATION**

## **University Courses**

## GIG1012: Falsafah dan Isu Semasa / *Philosophy and Current Issues*

Kredit <i>Credit</i>	2
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Melayu <i>Malay</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menjelaskan isu semasa berlandaskan ilmu falsafah, Falsafah Pendidikan Kebangsaan dan Rukun Negara.</li> <li>2. Menerangkan isu semasa berdasarkan aliran pemikiran utama dalam pelbagai aliran falsafah.</li> <li>3. Menghuraikan isu semasa melalui perspektif perbandingan falsafah sebagai asas bagi menjalinkan dialog antara budaya.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Explain current issues based on philosophy, the Philosophy of National Education and the Rukunegara.</i></li> <li>2. <i>Explain current issues based on the main of thoughts from the various streams of philosophy.</i></li> <li>3. <i>Explain current issues through a comparative perspective of philosophy as a basis for establishing inter-cultural dialogue.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini merangkumi hubungan ilmu falsafah dengan Falsafah Pendidikan Kebangsaan dan Rukunegara. Penggunaan falsafah sebagai alat untuk memurnikan budaya pemikiran dalam kehidupan melalui seni dan kaedah berfikir serta konsep insan. Topik utama dalam falsafah iaitu epistemologi, metafizik dan etika dibincangkan dalam konteks isu semasa. Penekanan diberi kepada falsafah sebagai asas bagi menjalin dialog antara budaya serta memupuk nilai sepunyai. Di hujung kursus ini pelajar akan mampu melihat disiplin-disiplin ilmu sebagai satu badan ilmu yang komprehensif dan terkait antara satu sama lain.</p> <p><i>This course covers philosophical relations with the Philosophy of National Education and Rukunegara. The use of philosophy as a tool to purify the culture of thought in life through the arts and methods of thinking and human concepts. The main topics in philosophy are epistemology, metaphysics and ethics discussed in the context of current issues. Emphasis is given to philosophy as a basis for fostering intercultural dialogue and fostering one's values. At the end of this course students will be able to see the disciplines of science as one comprehensive body of knowledge and related to each other.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 70% Peperiksaan Akhir / <i>Final Examination</i>: 30%</p>

## GIG1013: Penghayatan Etika dan Peradaban / *Appreciation of Ethics and Civilisations*

Kredit <i>Credit</i>	2
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Melayu (pelajar warganegara) / Bahasa Inggeris (pelajar bukan warganegara) <i>Malay (local students) and English (international students)</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menjelaskan konsep etika dari peradaban yang berbeza.</li> <li>2. Membandingkan sistem, tahap perkembangan, kemajuan sosial dan kebudayaan merentas bangsa.</li> <li>3. Membincangkan isu kontemporari berkaitan ekonomi, politik, sosial, budaya dan alam sekitar daripada perspektif etika dan peradaban.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Explain the ethical concepts of different civilizations.</i></li> <li>2. <i>Compare systems, levels of development, social progress and culture across nations.</i></li> <li>3. <i>Discuss contemporary issues related to economic, political, social, cultural and environmental from the perspective of ethics and civilization.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini menerangkan tentang konsep etika daripada perspektif peradaban yang berbeza. Ia bertujuan bagi mengenal pasti sistem, tahap perkembangan, kemajuan dan kebudayaan sesuatu bangsa dalam mengukuhkan kesepaduan sosial. Selain itu, perbincangan berkaitan isu-isu kontemporari dalam aspek ekonomi, politik, sosial, budaya dan alam sekitar daripada perspektif etika dan peradaban dapat melahirkan pelajar yang bermoral dan profesional. Penerapan amalan pendidikan berimpak tinggi (HIEPs) yang bersesuaian digunakan dalam penyampaian kursus ini. Di hujung kursus ini pelajar akan dapat menghubungkan etika dan kewarganegaraan berminda sivik.</p> <p><i>This course discusses ethical concepts from different civilization perspectives. It aims to identify the systems, developmental stages, progress and culture of a nation in strengthening social cohesion. In addition, discussions on contemporary issues in the economic, political, social, cultural and environmental aspects from an ethical and civil perspective can produce students who are morally and professionally sound. The application of appropriate High Impact Education Practices (HIEPs) is used in the delivery of this course. At the end of this course students will be able to relate ethics and civic-minded citizenship.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 70% Peperiksaan Akhir / <i>Final Examination</i> : 30%

## GIG1003: Asas Pembudayaan Keusahawanan / Basic Entrepreneurship Enculturation

Kredit <i>Credit</i>	2
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menerangkan konsep asas keusahawanan.</li> <li>2. Menghasilkan idea keusahawanan yang kreatif dan inovatif.</li> <li>3. Membangunkan kerangka rancangan perniagaan.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Explain the basic concepts of entrepreneurship.</i></li> <li>2. <i>Producing creative and innovative entrepreneurial ideas.</i></li> <li>3. <i>Develop a business plan framework.</i></li> </ol>
Sinopsis Kandungan Kursus / <i>Synopsis of Course Contents</i>	<p>Kursus ini menerapkan elemen asas pembudayaan keusahawanan kepada semua pelajar. Inisiatif ini diambil untuk membuka minda dan merangsang semangat keusahawanan kepada kumpulan sasaran yang berpotensi. Antara topik yang akan diajar termasuklah konsep dan perkembangan keusahawanan, faktor yang menggalakkan keusahawanan, perkembangan keusahawanan di Malaysia, etika keusahawanan, kreativiti dan inovasi dalam keusahawanan dan merancang perniagaan. Di samping itu, kursus ini juga memberikan pelajar latihan yang lebih bermakna dan berkesan mengenai pemikiran, kemahiran dan kecekapan keusahawanan.</p> <p><i>The course will attempt to inculcate the basic elements of entrepreneurship in the students. Initiatives are taken to open their minds and motivate the entrepreneurial spirit in this potential target group. The course encompasses theory and development of entrepreneurship, factors affecting entrepreneurship, entrepreneurship development in Malaysia, ethics of entrepreneurship, creativity and innovation in entrepreneurship and developing business plans. This course also incorporates a direct exposure to entrepreneurial mindset, skills and competencies.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 100% Peperiksaan Akhir / <i>Final Examination</i> : 0%

## English Communication Programme (Path 1)

### GLT1018: Proficiency in English I

Credit	2
Course Pre-requisite(s) / Minimum Requirement(s)	CEFR A2+ <ul style="list-style-type: none"> <li>• MUET BAND 2</li> <li>• IELTS Band 4.0</li> <li>• TOEFL Paper-Based Test (437 – 473)</li> <li>• TOEFL Computer-Based Test (123 – 150)</li> <li>• TOEFL Internet-Based Test (41 – 52)</li> <li>• PTE (Academic) – (10 – 28)</li> </ul>
Course Learning Outcomes	At the end of the course, students are able to: <ol style="list-style-type: none"> <li>1. Identify information in short, simple reading texts.</li> <li>2. Present ideas related to everyday topics.</li> <li>3. Use grammar correctly to express ideas.</li> </ol>
Synopsis of Course Contents	This course is designed for students with basic proficiency in English. Focus is on building speaking and reading competence with an emphasis on accuracy in grammar and on vocabulary building.
Assessment Weightage	Continuous Assessment: 60% Final Examination: 40%

### GLT1019: Let's Speak

Credit	2
Course Pre-requisite(s) / Minimum Requirement(s)	GLT1018
Course Learning Outcomes	At the end of the course, students are able to: <ol style="list-style-type: none"> <li>1. Organise a speech in stages.</li> <li>2. Apply appropriate skills and strategies when delivering a short speech.</li> <li>3. Present a short speech.</li> </ol>
Synopsis of Course Contents	This course focuses on preparing a speech in English accurately and coherently. It also develops students' speech planning skills in stages. Students will learn to speak accurately using the appropriate language strategies to a selected audience.
Assessment Weightage	Continuous Assessment: 100% Final Examination: 0%

## GLT1020: Fundamental Writing

Credit	2
Course Pre-requisite(s) / Minimum Requirement(s)	GLT1018
Course Learning Outcomes	At the end of the course, students are able to: 1. Write short, connected texts on familiar subjects. 2. Organise ideas effectively for different purposes.
Synopsis of Course Contents	This course is designed for students with a pre-intermediate level of proficiency in English. It focuses on writing skills, with an emphasis on accuracy in grammar and vocabulary building. Students will be exposed to writing strategies that will enable them to write short texts effectively for different purposes.
Assessment Weightage	Continuous Assessment: 100% Final Examination: 0%



## English Communication Programme (Path 2)

### GLT1021: Proficiency in English II

Credit	2
Course Pre-requisite(s) / Minimum Requirement(s)	CEFR B1 <ul style="list-style-type: none"> <li>• MUET BAND 3</li> <li>• IELTS Band 4.5 – 5.0</li> <li>• TOEFL Paper-Based Test (477 – 510)</li> <li>• TOEFL Computer-Based Test (153 – 180)</li> <li>• TOEFL Internet-Based Test (53 – 64)</li> <li>• PTE (Academic) – (29 - 41)</li> </ul>
Course Learning Outcomes	At the end of the course, students are able to: <ol style="list-style-type: none"> <li>1. Write clear connected texts on a wide range of topics.</li> <li>2. Present ideas and opinions clearly and coherently.</li> <li>3. Interpret information from texts on various topics.</li> </ol>
Synopsis of Course Contents	This course is designed to improve students' English Language proficiency in terms of accuracy and language use at the intermediate level. Students will be exposed to a variety of reading texts in order to improve their reading skills. They will also be given ample speaking practice to develop their confidence in communicating and interacting with others in a multitude of situations. The course improves students' skills in writing texts coherently on various topics.
Assessment Weightage	Continuous Assessment: 60% Final Examination: 40%

### GLT1022: Speak Up

Credit	2
Course Pre-requisite(s) / Minimum Requirement(s)	GLT1021
Course Learning Outcomes	At the end of the course, students are able to: <ol style="list-style-type: none"> <li>1. Present ideas clearly and accurately.</li> <li>2. Employ appropriate communication strategies to converse effectively.</li> </ol>
Synopsis of Course Contents	This course focuses on speaking English accurately and coherently at the intermediate level. It develops students' communication strategies that enable them to interact appropriately in a variety of informal situations.
Assessment Weightage	Continuous Assessment: 100% Final Examination: 0%

## GLT1023: Effective Workplace Writing

Credit	2
Course Pre-requisite(s) / Minimum Requirement(s)	GLT1021
Course Learning Outcomes	At the end of the course, students are able to: 1. Use appropriate format and language structures in correspondence writing. 2. Apply appropriate tone and style according to purposes of correspondence.
Synopsis of Course Contents	This course introduces writing strategies at the intermediate level. Students will be exposed to a range of workplace communication. They will learn how to produce effective written communication and improve their overall skills in writing.
Assessment Weightage	Continuous Assessment: 100% Final Examination: 0%

## English Communication Programme (Path 3)

### GLT1024: Proficiency in English III

Credit	2
Course Pre-requisite(s) / Minimum Requirement(s)	CEFR B2 <ul style="list-style-type: none"> <li>• MUET BAND 4</li> <li>• IELTS Band 5.5 – 6.0</li> <li>• TOEFL Paper – Based Test (513 – 547)</li> <li>• TOEFL Computer – Based Test (183 – 210)</li> <li>• TOEFL Internet – Based Test (65-78)</li> <li>• PTE (Academic) – (42 – 57)</li> <li>• FCE (B &amp; C)</li> <li>• GCE A Level (English) (Minimum C)</li> <li>• IGCSE/GCSE (English) (A, B &amp; C)</li> </ul>
Course Learning Outcomes	At the end of the course, students are able to: <ol style="list-style-type: none"> <li>1. Demonstrate an understanding of complex texts on concrete topics.</li> <li>2. Write clear, detailed texts on a wide range of subjects.</li> <li>3. Share opinions fluently and spontaneously.</li> </ol>
Synopsis of Course Contents	This course is designed to fortify students' English Language proficiency in terms of accuracy and effectiveness at a developing upper intermediate level. Students will be taught the four language skills with a focus on reading, writing and speaking. They will be exposed to a variety of texts to develop a higher level of proficiency that will allow them to apply the skills learnt.
Assessment Weightage	Continuous Assessment: 60% Final Examination: 40%

### GLT1025: Effective Oral Communication

Credit	2
Course Pre-requisite(s) / Minimum Requirement(s)	GLT1024
Course Learning Outcomes	At the end of the course, students are able to: <ol style="list-style-type: none"> <li>1. Write relevant outlines for presentations.</li> <li>2. Present an impromptu speech.</li> <li>3. Adhere to appropriate strategies in oral communication.</li> </ol>
Synopsis of Course Contents	The course encompasses different aspects of oral communication used in delivering speeches and presentations at the high intermediate level. Appropriate examples from a variety of situations are used as practice materials for students to analyse, discuss and apply the strategies taught.
Assessment Weightage	Continuous Assessment: 100% Final Examination: 0%

## GLT1026: Writing at the Workplace

Credit	2
Course Pre-requisite(s) / Minimum Requirement(s)	GLT1024
Course Learning Outcomes	At the end of the course, students are able to: 1. Write texts using appropriate tone and style. 2. Complete an informal report for workplace purposes. 3. Prepare a formal report for workplace purposes.
Synopsis of Course Contents	This course will introduce students to effective writing skills at the workplace. Using relevant materials, students will be taught in stages how to produce documents within a workplace context.
Assessment Weightage	Continuous Assessment: 100% Final Examination: 0%

## English Communication Programme (Path 4)

### GLT1027: Advanced Oral Communication

Credit	2
Course Pre-requisite(s) / Minimum Requirement(s)	CEFR C1 <ul style="list-style-type: none"> <li>• MUET BAND 5 &amp; BAND 6</li> <li>• IELTS Band 6.5 – 9.0</li> <li>• TOEFL Paper – Based Test (550 – 677)</li> <li>• TOEFL Computer – Based Test (213 – 300)</li> <li>• TOEFL Internet – Based Test (79 – 120)</li> <li>• PTE (Academic) (58 – 90)</li> <li>• FCE (A)</li> <li>• GCE A Level (English) (B &amp; A)</li> </ul>
Course Learning Outcomes	At the end of the course, students are able to: <ol style="list-style-type: none"> <li>1. Integrate the effective use of language structures in communication</li> <li>2. Present a persuasive speech</li> <li>3. Develop appropriate interpersonal communication skills.</li> </ol>
Synopsis of Course Contents	The course encompasses different aspects of oral communication used in delivering speeches and presentations at the high intermediate level. Appropriate examples from a variety of situations are used as practice materials for students to analyse, discuss and apply the strategies taught.
Assessment Weightage	Continuous Assessment: 100% Final Examination: 0%

### GLT1028: Advanced Business Writing

Credit	2
Course Pre-requisite(s) / Minimum Requirement(s)	CEFR C1 <ul style="list-style-type: none"> <li>• MUET BAND 5 &amp; BAND 6</li> <li>• IELTS Band 6.5 – 9.0</li> <li>• TOEFL Paper – Based Test (550 – 677)</li> <li>• TOEFL Computer – Based Test (213 – 300)</li> <li>• TOEFL Internet – Based Test (79 – 120)</li> <li>• PTE (Academic) (58 – 90)</li> <li>• FCE (A)</li> <li>• GCE A Level (English) (B &amp; A)</li> </ul>
Course Learning Outcomes	At the end of the course, students are able to: <ol style="list-style-type: none"> <li>1. Apply appropriate features of effective business writing.</li> <li>2. Prepare documents common in business writing.</li> <li>3. Produce a report for workplace purposes.</li> </ol>
Synopsis of Course Contents	This course is designed to equip students with the necessary writing skills to meet the needs of the workplace. Students will also be taught how to produce clear, accurate and well organised professional business documents. Students will be required to analyse and respond to a variety of situations and to write for identified audiences. The course also explores the ways in which technology helps shape business writing and communication.
Assessment Weightage	Continuous Assessment: 100% Final Examination: 0%

# **COURSE INFORMATION**

## **Faculty Courses**

## KIX1001: Matematik Kejuruteraan 1 / *Engineering Mathematics 1*

Kod Kursus <i>Course Code</i>	KIX1001
Tajuk Kursus <i>Course Title</i>	Matematik Kejuruteraan 1 <i>Engineering Mathematics 1</i>
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. Glyn James, "Modern Engineering Mathematics", 5<sup>th</sup> Edition, 2015, Pearson.</li> <li>2. K.A. Stroud and D.J. Booth, "Engineering Mathematics", 8<sup>th</sup> Edition, 2020, Red Globe Press.</li> <li>3. Glyn James, "Advanced Modern Engineering Mathematics", 5<sup>th</sup> Edition, 2018, Pearson.</li> <li>4. K.A. Stroud and D.J. Booth, "Advanced Engineering Mathematics", 6<sup>th</sup> Edition, 2020, Red Globe Press.</li> <li>5. Erwin Kreyszig, "Advanced Engineering Mathematics", 10<sup>th</sup> Edition International Student Version, 2011, John Wiley &amp; Sons Ltd.</li> </ol>
Strategi Pembelajaran <i>Learning Strategies</i>	Kuliah, tutorial, tugas <i>Lectures, tutorial, and assignment</i>
Masa Pembelajaran Pelajar <i>Student Learning Time</i>	Bersemuka / <i>Face to face</i> : 46 jam/hours Tidak Bersemuka / <i>Non Face to face</i> : 16 jam/hour Masa Persediaan Pelajar / <i>Student Preparation Time</i> : 58 jam/hours
Kemahiran Boleh Pindah <i>Transferable Skills</i>	Pengaturcaraan MATLAB <i>MATLAB Programming</i>
Pensyarah / <i>Lecturer</i>  Bilik / <i>Room</i>  Telefon/e-mel <i>Telephone/e-mail</i>	Rujuk jadual waktu fakulti <i>Refer to the faculty's timetable</i>
Sesi Kuliah / <i>Lecture Session</i> :	Rujuk kepada myum.um.edu.my.
Hari/Masa / <i>Day/Time</i> Tempat / <i>Venue</i>	<i>Refer to myum.um.edu.my.</i>
Sesi Tutorial/Amali: <i>Tutorial/Practical Session</i> :  Hari/Masa / <i>Day/Time</i> Tempat / <i>Venue</i>	Rujuk jadual waktu fakulti <i>Refer to the faculty's timetable</i>
Perincian Pemberatan Penilaian <i>Detail of Assessment</i> <i>Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%



## KIX1001: Matematik Kejuruteraan 1 / Engineering Mathematics 1

Week	Topic & Activities
1.	<p>Fungsi: Had fungsi, had dan kesinambungan                      Derivatif: Konsep asas dan definisi, peraturan pembezaan, peraturan rantai, pembezaan parametrik dan tersirat, derivatif yang lebih tinggi.                      Aplikasi fungsi dan derivatif kejuruteraan: fungsi hampir, kecerunan garis lurus, kecekungan, gerakan dan derivatif kedua, kelengkungan satah lengkung.</p> <p><i>Functions: Limit of a function, limits and continuity                      Derivatives: Basic ideas and definitions, rules of differentiations, chain rule, Parametric and implicit differentiation, Higher derivatives.                      Engineering Applications of Functions and Derivatives: Approximating functions, The gradient of a straight line, Concavity, motion and the second derivatives, Curvature of a plane curves.</i></p>
2.	<p>Derivatif separa: Konsep asas dan definisi. Fungsi domain, pemboleh ubah bersandar dan pemboleh ubah tidak bersandar, derivatif separa peringkat lebih tinggi, pembezaan fungsi komposit dan fungsi tersirat.                      Derivatif separa menggunakan Jacobians, operasi pembezaan.                      Aplikasi kejuruteraan derivatif, satah tangen dan permukaan normal dalam tiga dimensi.</p> <p><i>Partial Derivatives: Basic ideas and definitions. Domain of the functions, Dependent and independent variables, Higher order partial derivatives, Differentiation of composite functions and implicit functions.                      Partial Derivatives using Jacobians, Differential operators.                      Engineering Applications of Partial Derivatives, Tangent planes and normal to surface in three dimensions.</i></p>
3.	<p>Vektor Algebra 1: Konsep asas, komponen kartesian, vektor dalam ruang, kecerunan, capahan, derivative arah curl.</p> <p><i>Vector Algebra I: Basic concepts, Cartesian components, Vectors in space, Gradient, Divergence, Curl Directional derivatives.</i></p>
4.	<p>Vektor Algebra II: Hasil darab skalaan dan hasil darab vektor, hasil darab triirangkap.</p> <p><i>Vector Algebra II: Scalar Product and Vector Product, Triple Product.</i></p>
5.	<p>Aplikasi kejuruteraan vektor algebra, Aplikasi kejuruteraan analisa vector.</p> <p><i>Engineering Applications of Vector Algebra, Engineering Applications of Vector Analysis.</i></p>
6.	<p>Algebra Matriks untuk Sistem Algebra Lelurus Tidak Homogen: Operasi Matriks Asas; Menyelesaikan Sistem Persamaan Lelurus Tidak Homogen; Penyongsangan Matriks; Kaedah Grafik; Peraturan Cramer; Kaedah Penghapusan; Penghapusan Gauss Naif; Penghapusan Gauss Secara Separasi; Bentuk Baris Eselon; Pengurangan Bentuk Baris Eselon; Pangkat; Pengantungan Lelurus; Aplikasi Kejuruteraan Sistem Persamaan Lelurus Tidak Homogen.</p> <p><i>Matrix Algebra for Non-Homogeneous Linear Algebraic System: Basic Matrices Operations; Solving Non-Homogeneous System of Linear Equations; Matrix Inversion Approach; Graphical Method; Cramer's Rule; Method of Elimination; Naïve Gauss Elimination; Gauss Elimination with Partial Pivoting; Row Echelon Form, Reduced Row Echelon Form, Rank, &amp; Linear Dependency; Engineering Application of Non-Homogeneous System of Linear Equations.</i></p>
7.	<p>Algebra Matriks untuk Sistem Algebra Lelurus Homogen: Menyelesaikan Sistem Persamaan Lelurus Homogen; Masalah Nilai Eigen/ Vector Eigen; Aplikasi Kejuruteraan untuk Masalah Nilai Eigen/ Vector Eigen; Pepenjuruan dan Penyambungannya; Teorem Cayley-Hamilton; Aplikasi Kejuruteraan untuk Sistem Algebra Lelurus Homogen.</p> <p><i>Matrix Algebra for Homogeneous Linear Algebraic System: Solving Non – Homogeneous System of Linear Equations; Eigenvalue/ Eigenvector Problem; Engineering Application of Eigenvalue/ Eigenvector Problem; Diagonalization &amp; Its Extension; Cayley-Hamilton Theorem; Engineering Application of Solving Homogeneous System of Linear Equations.</i></p>

8.	<p>Pengamilan: Konsep asas dan definisi, keedah pengamilan: kaedah penggantian, mengikut bahagian, pecahan separa. Kamiran wajar dan kamiran tidak wajar.</p> <p><i>Integration: Basic ideas and definitions, Techniques of Integrations: the substitution method, by parts, by partial fractions. Proper and Improper Integrals.</i></p>
9.	<p>Aplikasi pengamilan kejuruteraan: Kawasan pada satah, isipadu pepejal bagi keratan rentas yang diketahui, momen dan pusat jisim.</p> <p><i>Engineering Applications of Integrals: Areas of regions in the plane, Volumes of solids with known cross sections, Moment and center of mass.</i></p>
10.	<p>Pengamilan berganda: pengamilan ganda dua, pengamilan trirangkap.</p> <p><i>Multiple Integrals: Double Integrals and triple Integrals.</i></p>
11.	<p>Pengamilan berganda: pengamilan ganda dua, pengamilan trirangkap, kamiran isipadu.</p> <p><i>Multiple Integrals: Double Integrals and triple Integrals, volume integrals.</i></p>
12.	<p>Kamiran garisan dan kerja telaku. Teorem Green dalam satu satah.</p> <p><i>Line integral and work done. Green's theorem in a plane.</i></p>
13.	<p>Kamiran permukaan.</p> <p><i>Surface Integrals.</i></p>
14.	<p>Teorem Stoke.</p> <p><i>Stoke's Theorem.</i></p>

## KIX1002: Matematik Kejuruteraan 2 / *Engineering Mathematics 2*

Kod Kursus <i>Course Code</i>	KIX1002
Tajuk Kursus <i>Course Title</i>	Matematik Kejuruteraan 2 <i>Engineering Mathematics 2</i>
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. Glyn James, "Modern Engineering Mathematics", 5<sup>th</sup> Edition, 2015, Pearson.</li> <li>2. K.A. Stroud and D.J. Booth, "Engineering Mathematics", 8<sup>th</sup> Edition, 2020, Red Globe Press.</li> <li>3. Glyn James, "Advanced Modern Engineering Mathematics", 5<sup>th</sup> Edition, 2018, Pearson.</li> <li>4. K.A. Stroud and D.J. Booth, "Advanced Engineering Mathematics", 6<sup>th</sup> Edition, 2020, Red Globe Press.</li> <li>5. Erwin Kreyszig, "Advanced Engineering Mathematics", 10<sup>th</sup> Edition International Student Version, 2011, John Wiley &amp; Sons Ltd.</li> </ol>
Strategi Pembelajaran <i>Learning Strategies</i>	Kuliah, Tutorial, dan Perbincangan Kumpulan <i>Lectures, Tutorial and Group Discussion</i>
Masa Pembelajaran Pelajar <i>Student Learning Time</i>	Bersemuka / <i>Face to face</i> : 46 jam/hours Tidak Bersemuka / <i>Non Face to face</i> : 12 jam/hour Masa Persediaan Pelajar / <i>Student Preparation Time</i> : 62 jam/hours
Kemahiran Boleh Pindah <i>Transferable Skills</i>	-
Pensyarah / <i>Lecturer</i> Bilik / <i>Room</i>  Telefon/e-mel <i>Telephone/e-mail</i>	Rujuk jadual waktu fakulti <i>Refer to the faculty's timetable</i>
Sesi Kuliah / <i>Lecture Session</i> : Hari/Masa / <i>Day/Time</i> Tempat / <i>Venue</i>	Rujuk kepada myum.um.edu.my. <i>Refer to myum.um.edu.my.</i>
Sesi Tutorial/Amali: <i>Tutorial/Practical Session</i> :  Hari/Masa / <i>Day/Time</i> Tempat / <i>Venue</i>	Rujuk jadual waktu fakulti <i>Refer to the faculty's timetable</i>
Perincian Pemberatan Penilaian <i>Detail of Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%

## KIX1002: Matematik Kejuruteraan 2 / Engineering Mathematics 2

Week	Topic & Activities
1.	Pengenalan: Definisi dan Konsep Asas dalam Persamaan Pembezaan Biasa (ODE). Persamaan Pembezaan Turutan Pertama. <i>Introduction. Definitions and fundamental concept in ODE First order Differential Equations.</i>
2.	Teknik untuk Menyelesaikan Persamaan Pembezaan Turutan Pertama. <i>Strategy to Solve First Order Differential Equations.</i>
3.	Penyelesaian untuk Persamaan Pembezaan Turutan Kedua Homogen dan Linear. <i>Solutions to Homogeneous Linear Second Order ODE.</i>
4.	Penyelesaian untuk Persamaan Pembezaan Turutan Kedua Tidak Homogen dan Linear. <i>Solutions to Non-homogeneous Linear Second Order ODE.</i>
5.	Aplikasi Kejuruteraan bagi Persamaan Pembezaan Biasa. <i>Engineering Applications of ODE.</i>
6.	Penyelesaian Siri Kuasa untuk Persamaan Pembezaan. <i>Power Series Solutions for Differential Equations.</i>
7.	Kaedah Frobenius. <i>Frobenius Method.</i>
8.	Jelmaan Laplace. <i>Laplace Transform.</i>
9.	Jelmaan Laplace: Penyelesaian untuk Persamaan Pembezaan. <i>Laplace Transform: Solutions for Differential Equations.</i>
10.	Siri Fourier. <i>Fourier Series.</i>
11.	Siri Fourier: Fungsi-fungsi berkala; Siri Trigonometri; Fungsi-fungsi Genap dan Ganjil, Siri Fourier, Pengembangan Separuh Julat. <i>Fourier Series: Periodic functions; Trigonometric Series; Odd and even functions, Fourier Series, Half-range Expansion.</i>
12.	Persamaan Pembezaan Separa: Penyelesaian Umum untuk Persamaan Pembezaan Separa (PDE). <i>Partial Differential Equations: Solving General Solution of PDE.</i>
13.	Persamaan Pembezaan Separa: Penyelesaian Tertentu untuk Persamaan Laplace. <i>Partial Differential Equations: Solving Particular Solution of Laplace Equation.</i>
14.	Persamaan Pembezaan Separa: Penyelesaian Tertentu untuk Persamaan Haba & Persamaan Gelombang. <i>Partial Differential Equations: Solving Particular Solution of Heat Equation &amp; Wave Equation.</i>

## KIX2005: Undang-undang, Etika dan Kemampanan untuk Jurutera / Law, Ethics and Sustainability for Engineers

Kod Kursus <i>Course Code</i>	KIX2005
Tajuk Kursus <i>Course Title</i>	Undang-undang, Etika dan Kemampanan untuk Jurutera <i>Law, Ethics and Sustainability for Engineers</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menghurai implikasi undang-undang, terhadap tingkah laku jurutera.</li> <li>2. Menggunakan keperluan praktikal kod-kod etika untuk mengawal selia amalan kejuruteraan.</li> <li>3. Menilai implikasi kemampanan dalam kerja-kerja kejuruteraan.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Describe the implication of law for engineers' behaviour.</i></li> <li>2. <i>Apply the practical needs of the codes of ethics to regulate engineering practices.</i></li> <li>3. <i>Assess the implication of sustainability in engineering works.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini merangkumi pengenalan kepada undang-undang dan fungsinya, prinsip asas undang-undang dan kod-kod etika yang berkaitan dengan bidang kejuruteraan. Tanggungjawab dan hak jurutera, implikasi kebajikan awam, dan peranan jurutera kepada pembangunan mampan dan globalisasi juga turut dititik beratkan di dalam kursus ini.</p> <p><i>This course covers an introduction to law and functions, basic principles of law and the code of ethics related to the field of engineering. Responsibilities and rights of engineers, public welfare implications, and the role of engineers to sustainable development and globalization has also been emphasized in this course.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 40%</p> <p>Peperiksaan Akhir / <i>Final Examination</i>: 60%</p>

<p>Rujukan Utama <i>Main Reference</i></p>	<ol style="list-style-type: none"> <li>1. Martin Peterson, Ethics for Engineers, Oxford University Press, 2020.</li> <li>2. Mitcham, C. Duval, R.S, Engineering Ethics, Prentice Hall, 2012.</li> <li>3. Registration of Engineers Act 1967 (REA), 2016.</li> <li>4. Code of Conduct of Registered Person, Board of Engineers Malaysia (BEM), 2016.</li> <li>5. Law of torts in Malaysia, 2nd Ed., Norchaya Haji Talib, Petaling Jaya, Selangor, Sweet &amp; Maxwell Asia, 2003.</li> <li>6. Prinsip-prinsip asas tort, Norchaya Haji Talib, Petaling Jaya, Selangor, Sweet &amp; Maxwell Asia, 2003.</li> <li>7. Undang-undang kontrak di Malaysia, 2nd Ed., Salleh Buang, Kuala Lumpur, Central Law Book Co., 1995.</li> <li>8. Robert Brinkmann, Introduction to Sustainability, Wiley, 2nd Edition 2020.</li> </ol>
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## KIX2005: Undang-undang, Etika dan Kemampanan untuk Jurutera / Law, Ethics and Sustainability for Engineers

Minggu Week	Topik Topic
1	Pengenalan kepada Lembaga Jurutera Malaysia (BEM) dan Institusi Jurutera Malaysia (IEM) <i>Introduction to the Board of Engineers, Malaysia (BEM) and the Institution of Engineers, Malaysia (IEM)</i>
2	Akta Pendaftaran Jurutera (REA) 1967 <i>Registration of Engineers Act 1967 (REA)</i>
3	Pembatalan, Pengguguran dan Pengembalian Semula <i>Cancellation, Removal and Reinstatement</i>
4	Jenis Tort, Liabiliti Tort dan Pembelaan terhadap Tort <i>Type of Tort, Tort Liability and Defence against Tort</i>
5	Pengenalan dan Isi Kandungan Kontrak Liabiliti, Pembatalan dan Penyelesaian Kontrak <i>Introduction and the Content of Contracts Liability, Cancellation and Settlement of Contracts</i>
6	Jenis-jenis Perkhidmatan Kejuruteraan <i>Type of Engineering Services</i>
7	Ujian Pertengahan Semester <i>Mid-Term Test</i>
8	Peranan Jurutera Peluang dalam profesion Etika di dalam kajian dan Penyelidikan <i>Roles of Engineers Opportunities in the Profession Ethics in Experiment and Research</i>
9	Profesionalisme, Moral dan Etika <i>Professionalism, Moral and Ethics</i>
10	Etika Kejuruteraan, Konflik dan Penyelesaian <i>Engineering Ethics, Conflict and Resolution</i>



11	<p>Pengenalan kepada Kelestarian, Rukun Kelestarian, Keselamatan Makanan, Alam Sekitar (udara dan air), Kajian Kes Industri</p> <p><i>Introduction to Sustainability, Pillars of Sustainability, Food Security, Environmental (air and water) Security, Industrial Case Studies</i></p>
12	<p>Penilaian Kitaran Hayat (LCA) dan Matlamat Pembangunan Mampan (SDG)</p> <p><i>Life Cycle Assessment (LCA) and Sustainable Development Goals (SDG)</i></p>
13	<p>Kejuruteraan Hijau (proses, bahan, bangunan, dll.)</p> <p><i>Green Engineering (processess, materials, buildings, etc.)</i></p>
14	<p>Rumusan Kursus</p> <p><i>The Course Wrap Up</i></p>

## KIX2006: Ekonomi Kejuruteraan dan Pengurusan Projek / Engineering Economics and Project Management

Kod Kursus <i>Course Code</i>	KIX2006
Tajuk Kursus <i>Course Title</i>	Ekonomi Kejuruteraan dan Pengurusan Projek <i>Engineering Economics and Project Management</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menghurai prinsip-prinsip, konsep-konsep asas dan kaedah dalam analisa ekonomi kejuruteraan dan pengurusan projek.</li> <li>2. Mengaplikasi kaedah-kaedah analisa ekonomi kejuruteraan dalam memilih rekabentuk penyelesaian yang bersaing.</li> <li>3. Mengaplikasi kaedah-kaedah pengurusan projek dalam melaksanakan dan mencapai matlamat-matlamat strategik organisasi.</li> <li>4. Menilai kesan keputusan-keputusan ekonomi kejuruteraan dan pengurusan projek ke atas organisasi dan masyarakat.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Describe the principles, basic concepts, and methodology of engineering economy analysis and project management.</i></li> <li>2. <i>Apply engineering economics analysis methods on choosing competing design solutions.</i></li> <li>3. <i>Apply project management methods in implementing and achieving strategic goals of the organization.</i></li> <li>4. <i>Evaluate implications of both engineering economy and project management decisions on organisation and society.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini menawarkan pelajar-pelajar dengan konsep-konsep projek kejuruteraan yang mampu terhasil secara fizikal dan yang berpatutan dari segi ekonomi. Kursus ini membincangkan analisis kos dalam membuat keputusan kejuruteraan dan juga pengurusan dan pengawalan projek-projek yang kompleks. Topik-topik kejuruteraan ekonomi termasuklah konsep kos, kos kitaran hayat, rekabentuk ekonomik, kiraan setara, kiraan faedah, ukuran nilai pelaburan, analisa gantian dan analisa kos- manfaat. Topik-topik bagi pengurusan projek kejuruteraan pula termasuk kaedah-kaedah perancangan projek, organisasi, pengurusan risiko, anggaran kos dan bajet, penjadualan, laporan, penyeliaan dan perlaksanaan projek projek.</p> <p><i>This course provides students with the concepts of physically realizable and economically affordable engineering project. This course deals</i></p>

	<p><i>with cost analysis in engineering decision making as well as the management and control of complex projects. Engineering economics topics include cost concepts, life- cycle costing, design economics, equivalence calculations, interest considerations, measures of investment worth, replacement analyses and cost- benefit analysis. Engineering project management topics include methods for project planning, organization, risk management, cost estimating and budgeting, scheduling, reporting, monitoring, and implementation of projects.</i></p>
<p>Pemberatan Penilaian <i>Assessment Weightage</i></p>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 40% Peperiksaan Akhir / <i>Final Examination</i>: 60%</p>
<p>Rujukan Utama <i>Main Reference</i></p>	<ol style="list-style-type: none"> <li>1. William G. Sullivan, Elin M. Wicks and Patrick Koelling, Engineering Economy, 17th Ed., Prentice Hall, 2020</li> <li>2. Leland Blank and Anthony Tarquin, Engineering Economy, 8th Ed., McGraw-Hill, 2018</li> <li>3. Erik W Larson and Clifford F Gray, Project Management the Managerial Process, 2018, 7th Edition, McGraw-Hill.</li> </ol>

## KIX2006: Ekonomi Kejuruteraan dan Pengurusan Projek / *Engineering Economics and Project Management*

<b>Minggu Week</b>	<b>Topik Topic</b>
1	Pengenalan kepada Ekonomi Kejuruteraan dan Pengurusan Projek <i>Introductions to Engineering Economy and Modern Project Management</i>
2	Konsep-konsep Kos dan Ekonomik Rekabentuk <i>Cost Concepts and Design Economics</i>
3	Pentakrifan projek dan Penganggaran Kos <i>Defining the Project and Cost Estimations</i>
4	Faktor-faktor: Bagaimana masa dan kadar bunga memberi kesan kepada wang <i>Factors: How Time and Interest Affect Money</i>
5	Faktor-faktor bergabung: Kadar Bunga nominal dan Efektif <i>Combining Factors: Nominal and Effective Interest Rates</i>
6	Menilai Projek Tunggal <i>Evaluating a Single Project</i>
7	Perbandingan dan Pemilihan Antara Projek-Projek <i>Comparison and Selection Among Alternatives: Financial and non-financial criteria</i>
8	Analisa Penggantian <i>Replacement Analysis</i>
9	Menilai Projek Awam Menggunakan Kaedah Faedah-Kos <i>Evaluating Public Project Using Benefit-Cost Ratio Method</i>
10	Membangun Pelan Projek <i>Developing a Project Plan</i>
11	Mengurus Risiko <i>Managing Risk</i>
12	Pengagihan Sumber dan Penjadualan; Menjejak dan Mengawal Projek <i>Resource Allocation and Scheduling; Project Tracking and Control</i>
13	Pengkomputeran Pengurusan Projek dan Perancang Projek Microsoft <i>Project Management Computing and Microsoft Project Planner</i>
14	Pembentangan Projek Berkumpulan <i>Group Project Presentation</i>

# **COURSE INFORMATION**

## **Department Courses**

## KIG1009: Statik / Statics

Kod Kursus <i>Course Code</i>	KIG1009
Tajuk Kursus <i>Course Title</i>	Statik <i>Statics</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menghurai keadaan keseimbangan statik bagi zarah / badan tegar yang dikenakan daya / momen.</li> <li>2. Menganalisa daya dalaman dalam struktur termasuk daya paksi, momen lentur dan diagram daya ricih.</li> <li>3. Tentukan daya yang diedarkan dalam rasuk, geseran dan aplikasinya, dan selesaikan masalah praktikal.</li> <li>4. Menjalankan eksperimen dalam memahami asas statik.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>5. <i>Describe states of static equilibrium for particles/rigid bodies subjected to forces/moment.</i></li> <li>6. <i>Analyse internal forces in structures including axial force, bending moment and shearing force diagrams.</i></li> <li>7. <i>Determine distributed forces in beams, frictions and its applications, and solving practical problems.</i></li> <li>8. <i>Perform an experiment in understanding the fundamental of static.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini adalah untuk memperkenalkan kepada pelajar tentang bidang kejuruteraan mekanik – mekanik pepejal. Pelajar akan mempelajari analisa daya yang dikenakan pada zarah dan badan tegar dalam keseimbangan statik, termasuklah masalah dalam dua dan tiga dimensi. Pelajar akan didedahkan kepada konsep, rekaan, pembinaan dan pengujian suatu peranti atau struktur yang menanggung daya..</p> <p><i>The course aims at introducing the student to the field of mechanical engineering – solid mechanics. The student will learn to analyze forces acting on particles and rigid bodies in static equilibrium which involve problems in 2D and 3D. The students will be exposed to conceptualize, design, build, and test a load-bearing device or structure.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	1. Beer, F. P., Johnston Jr, E. R., Mazurek, D. F., & Eisenberg, E. R. (2019). Vector Mechanics for Engineers, 12th Edition. USA: McGraw Hill.

	<p>2. Meriam, J. L., &amp; Kraige, L. G. (2018) Engineering mechanics: Static, SI version. USA: John Wiley &amp; Sons.</p> <p>3. Hibbeler, R. C. (2018). Statics and Mechanics of Materials in SI Units. Pearson Higher Ed.</p>
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### **KIG1010: Mekanik Bendalir 1 / *Fluid Mechanics 1***

Kod Kursus <i>Course Code</i>	KIG1010
Tajuk Kursus <i>Course Title</i>	Mekanik Bendalir 1 <i>Fluid Mechanics 1</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. 1.Menerangkan ciri-ciri sifat bendalir dan aplikasinya.</li> <li>2. 2.Menganalisa daya-daya tekanan pada permukaan tenggelam di dalam bendalir.</li> <li>3. 3.Menganalisa keadaan aliran menggunakan persamaan Bernoulli, Tenaga dan Momentum.</li> <li>4. 4Menjalankan eksperimen dalam memahami asas Mekanik Bendalir.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Explain the characteristics of fluid properties and its applications.</i></li> <li>2. <i>Analyse the pressure forces on submerged surfaces in fluid.</i></li> <li>3. <i>Analyse flow condition using Bernoulli, Energy and Momentum equations.</i></li> <li>4. <i>Perform an experiment in understanding the fundamental of Fluid Mechanics</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Matlamat kursus ini adalah untuk memberikan pengetahuan, kefahaman dan penghargaan dalam bidang mekanik bendalir. Kursus ini termasuk kajian untuk sifat- sifat asas bendalir yang merangkumi kedua-dua gas dan cecair, konsep asas sistem, isipadu kawalan dan medan aliran, prinsip-prinsip asas keabadian jisim, tenaga dan momentum, persamaan asas yang mengawal tingkah laku cecair, penggunaan prinsip-prinsip dan persamaan dalam pemahaman operasi pelbagai jenis alat mengukur aliran serta kajian dan analisis dalam daya-daya yang bertindak ke atas badan-badan yang bergerak melalui cecair dan sebaliknya..</p> <p><i>The goal of this course is to impart knowledge, understanding and an appreciation of the field of fluid mechanics. This course includes the study of the basic properties of fluids which encompasses both gases and liquids, the basic concepts of system, control volume and</i></p>



	<i>flow field, the basic principles of conservation of mass, energy and momentum, the fundamental equations that govern the behavior of fluids, the application of the principles and equations to the understanding of the operations of various types of flow measuring equipment and the study and analysis of the forces that act on bodies moving through a fluid and vice versa</i>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1 Cengel, Y. A., Cimbala, J. M. (2020). Fluid Mechanics: Fundamentals and Applications. 4th Edition in SI Units. Printed in Singapore: McGraw-Hill.</li> <li>2 Kundu, P. K., &amp; Cohen, I. M. (2015). Fluid mechanics, 6th Edition. San Diego: Elsevier Academic Press.</li> <li>3 Young, D. F., Munson, B. R., Okiishi, T. H., &amp; Huebsch, W. W. (2013). Fundamentals of Fluid Mechanics, 7th Edition. USA: John Wiley &amp; Sons.</li> </ol>

## KIG1011: Bahan Kejuruteraan 1 / *Engineering Materials 1*

Kod Kursus <i>Course Code</i>	KIG1011
Tajuk Kursus <i>Course Title</i>	Bahan Kejuruteraan 1 <i>Engineering Materials 1</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahan Kejuruteraan 1 <i>Engineering Materials 1</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menerangkan teori asas struktur atom, ketidaksempurnaan dan resapan bagi bahan-bahan kejuruteraan.</li> <li>2. Menganalisa hubungan di antara mikro-struktur dan sifat-sifat mekanik bahan-bahan kejuruteraan.</li> <li>3. Melakukan eksperimen dalam memahami ujian mekanikal bagi bahan-bahan kejuruteraan.</li> <li>4. Menerangkan hubungan di antara gambarajah fasa, pembangunan mikrostruktur dan rawatan haba</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Explain the theory of basic atomic structure, imperfection and diffusion of engineering materials.</i></li> <li>2. <i>Analyze the relationship between micro-structure and mechanical properties of engineering materials.</i></li> <li>3. <i>Perform an experiment in understanding the mechanical testing of engineering materials.</i></li> <li>4. <i>Explain the relationship between phase diagrams, microstructure development and heat treatment.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini memberi tumpuan kepada struktur atom, ikatan antara atom dan kristal dan ketidaksempurnaan dalam pepejal. Hubungan antara struktur mikro dan sifat mekanik logam serta mekanisme pengukuhan akan dibincangkan. Dengan menggunakan rajah fasa, pembangunan struktur mikro dan perubahan sifat mekanik logam dan aloi bukan ferus juga akan dijelaskan.</p> <p><i>This course focuses on atomic structure, bonding between atoms and crystalline and imperfections in solids. The relationship between the microstructure and mechanical properties of metals as well as strengthening mechanisms will be discussed. Using the phase diagram, microstructure development and alteration of mechanical properties of metal and non-ferrous alloys will also be described.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 40%</p> <p>Peperiksaan Akhir / <i>Final Examination</i>: 60%</p>
Rujukan Utama	1 William D. Calister, David G. Rethwisch, Materials

<i>Main Reference</i>	<p>Sciences and Engineering: An Introduction, 10th ed., Wiley, 2018.</p> <p>2 Michael F. Ashby, David R.H. Jones, Engineering Materials 1: An Introduction to Properties, Applications and Design, 5th Ed., Elsevier, 2019.</p> <p>Michael F. Ashby, David R.H. Jones, Engineering Materials 2: An Introduction to Microstructures and Processing, 4th Ed., Elsevier, 2013.</p>
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## KIG1012: Reka Bentuk Kejuruteraan Dan Pemodelan / *Engineering Design and Modelling*

Kod Kursus <i>Course Code</i>	KIG1012
Tajuk Kursus <i>Course Title</i>	Reka Bentuk Kejuruteraan Dan Pemodelan <i>Engineering Design and Modelling</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Mentafsir lukisan-lukisan kejuruteraan</li> <li>2. Mengambarkan reka bentuk kejuruteraan dengan menggunakan amalan lukisan kejuruteraan piawai</li> <li>3. Membina lukisan-lukisan kejuruteraan dengan menggunakan satu perisian rekabentuk berbantuan komputer (CAD) dan dengan lakaran secara manual</li> <li>4. Mereka bentuk komponen/produk kejuruteraan yang kompleks</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Interpret engineering drawings</i></li> <li>2. <i>Illustrate engineering design using standard engineering drawing practices</i></li> <li>3. <i>Construct engineering drawings using a computational aided design (CAD) software and by manual drafting</i></li> <li>4. <i>Design a complex engineering component/product</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Dalam kursus ini, pelajar-pelajar diajar teknik-teknik berkomunikasi secara grafik dan pembangunan lukisan kejuruteraan standard dengan cara lakaran dan dengan menggunakan satu perisian CAD. Kursus ini merangkumi teknik-teknik lakaran, geometri kejuruteraan dan pemodelan 3D, lukisan berbilang pandangan untuk suatu objek, pandangan-pandangan tambahan, unjuran-unjuran bergambar dan pandangan keratan, amalan pendimensian geometri dan perlegaian (GDT) dalam lukisan-lukisan kejuruteraan. Akhirnya, pelajar-pelajar akan belajar teknik- teknik untuk lukisan-lukisan pemasangan bagi suatu produk yang lengkap.</p> <p><i>In this course, students are taught techniques for graphics communication and to develop a standard engineering drawing by sketching and by using a CAD software. This course covers sketching techniques, engineering geometry and 3D modelling, multi-views and visualizations such as multiviews drawing of an object, auxiliary views, pictorial projections and section view, the practices of geometric dimensioning and tolerancing (GDT) in engineering drawings. Finally, students will learn the techniques for assembly drawings of a complete product</i></p>

Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 100% Peperiksaan Akhir / <i>Final Examination</i> : -
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. Robert L. Mott, Machine Elements in Mechanical Design, Fourth Edition, Pearson Prentice Hall, 2004</li> <li>2. Bertoline, G. R., Wiebe, E. N., &amp; Miller, C. L. (2008). Technical graphics communication, 4th Edition. NY, USA: McGraw-Hill.</li> <li>3. Rhodes, R. S., &amp; Cook, L. B. (1990). Basic engineering drawing. Singapore: Longman Scientific &amp; Technical.</li> <li>4. Simmons, C. H., Maguire, D. E., &amp; Phelps, N. (2012). Manual of Engineering Drawing: Technical Product Specification and Documentation to British and International Standards. USA: Butterworth-Heinemann.</li> <li>5. Agrawal, B., &amp; Agrawal, C. M. (2014). Engineering Drawing. USA: McGraw-Hill Education</li> </ol>

## KIG1013 : Termodinamik Kejuruteraan 1/ *Engineering Thermodynamics 1*

Kod Kursus <i>Course Code</i>	KIG1013
Tajuk Kursus <i>Course Title</i>	Termodinamik Kejuruteraan 1 <i>Engineering Thermodynamics 1</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menerangkan hukum termodinamik pertama, persamaan tenaga, dan mekanisma pemindahan tenaga.</li> <li>2. Menyelesaikan masalah keseimbangan tenaga untuk sistem tertutup dan terbuka menggunakan Hukum Pertama proses termodinamik.</li> <li>3. Menyelesaikan masalah kejuruteraan yang berkaitan dengan Hukum Termodinamik Kedua.</li> <li>4. Menjalankan eksperimen dalam memahami asas termodinamik.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Explain the First Law of Thermodynamics, energy balances and mechanism of energy transfer.</i></li> <li>2. <i>Solve the energy balance problems for closed and open systems using First Law of Thermodynamic process.</i></li> <li>3. <i>Solve the engineering problem related to the Second Law of thermodynamics.</i></li> <li>4. <i>Perform an experiment in understanding the fundamental of thermodynamic..</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini adalah untuk memperkenalkan kepada pelajar tentang bidang kejuruteraan mekanik – mekanik pepejal. Pelajar akan mempelajari analisa daya yang dikenakan pada zarah dan badan tegar dalam keseimbangan statik, termasuklah masalah dalam dua dan tiga dimensi. Pelajar akan didedahkan kepada konsep, rekaan, pembinaan dan pengujian suatu peranti atau struktur yang menanggung daya.</p> <p><i>The goal of this course is cover the basic principles of thermodynamics. To present a wealth of real-world engineering applications to give students a feel forengineering practice. To develop an intuitive understanding of the subject matter by emphasizingthe physics and physical arguments. To apply the principles of conservation of mass and energy, production of entropy, work potential ofenergy, reversible work and irreversibility, and second- law efficiency.</i></p>

Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. Cengel, Y. A., &amp; Boles, M. A. (2018) Thermodynamics: an engineering approach, 9/e. New York: McGraw-Hill.</li> <li>2. Moran, M. J., Shapiro, H. N., Boettner, D. D., &amp; Bailey, M. B. (2018). Fundamentals of engineering thermodynamics, 9/e. USA: John Wiley &amp; Sons.</li> <li>3. Whitman, A. M. (2020). Thermodynamics: Basic Principles and Engineering Applications. Springer.</li> </ol>

## KIG1014: Mekanik Bahan 1 / *Mechanics of Materials 1*

Kod Kursus <i>Course Code</i>	KIG1014
Tajuk Kursus <i>Course Title</i>	Mekanik Bahan 1 <i>Mechanics of Materials 1</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menentukan tekanan, regangan dan ubah bentuk pada pelbagai anggota di bawah beban paksi</li> <li>2. Mengira tekanan, regangan dan ubah bentuk pada anggota silinder di bawah kilasan</li> <li>3. Menganalisa tegasan dan kelengkungan normal pada rasuk yang dihasilkan daripada pembengkokan dan pemuatan melintang</li> <li>4. Menyelesaikan transformasi tekanan dan regangan</li> <li>5. Menjalankan eksperimen pada aci di bawah kilasan</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Determine the stresses, strains and deformations in various structural members under axial loading</i></li> <li>2. <i>Calculate the stresses, strains and deformations in cylindrical members under torsion</i></li> <li>3. <i>Analyze the normal stress and curvature in beams resulting from bending and transverse loading</i></li> <li>4. <i>Solve the transformations of stresses and strains</i></li> <li>5. <i>Perform an experiment on a shaft under torsion.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini memberi tumpuan kepada menganalisis tekanan dan ubah bentuk bahan yang berada di bawah beban. Pelbagai jenis beban disiasat termasuk beban paksi, kilasan, lenturan dan beban melintang. Konsep asas transformasi tekanan dan regangan juga akan dibincangkan.</p> <p><i>This course focuses on analyzing stresses and deformations in materials under load. Various types of loads are investigated including axial loads, torsion, bending and transverse loads. Basic concept of stress and strain transformations will also be discussed.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 40%</p> <p>Peperiksaan Akhir / <i>Final Examination</i>: 60%</p>
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. F. P. Beer, E.R. Johnston Jr, J.T. DeWolf, D.F. Mazurek. (2019). <i>Mechanics of Materials</i>. 8th Edition. McGraw-Hill Education</li> <li>2. R.C. Hibbeler. (2016). <i>Mechanics of Materials</i>. 10th Edition.</li> </ol>



	Pearson 3. Barry J. Goodno, James M. Gere. Mechanics of Materials. 9th Edition. Cengage Learning
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## KIG1015: Dinamik / Dynamics

Kod Kursus <i>Course Code</i>	KIG1015
Tajuk Kursus <i>Course Title</i>	Dinamik <i>Dynamics</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menggunakan parameter kinematik dalam menyelesaikan pergerakan zarah</li> <li>2. Mengira pergerakan zarah menggunakan kaedah daya-tenaga kerja dan momentum-impuls</li> <li>3. Menganalisa gerakan kinematik dan kinetik untuk pelbagai jenis jasad tegar</li> <li>4. Menjalankan eksperimen dalam memahami dinamik objek bergerak</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Apply kinematics parameter in solving motion of particles</i></li> <li>2. <i>Calculate motion of particles using forces, work–energy and impulse–momentum methods</i></li> <li>3. <i>Analyze kinematic and kinetic motions for different types of rigid body</i></li> <li>4. <i>Perform an experiment in understanding the dynamics of moving objects</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Pengetahuan mengenai hukum-hukum asas gerakan dan konsep daya, tenaga, momentum, impuls dan getaran adalah asas bagi kajian mekanik dan penyelesaian banyak masalah kejuruteraan. Dalam kursus ini konsep asas ini dikaji dan teknik-teknik dikembangkan untuk membantu analisis pergerakan satah zarah, badan jasad tegar, badan yang saling berkaitan, mekanisme dan sistem gear.</p> <p><i>A working knowledge of the basic laws of motion and of the concepts of force, energy, momentum, impulse and vibration is fundamental to the study of mechanics and the solution of many engineering problems. In this course these basic concepts are reviewed and a number of techniques are developed to assist in the analysis of the plane motion of particles, bodies, interconnected bodies, mechanisms and geared systems</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 40%</p> <p>Peperiksaan Akhir / <i>Final Examination</i>: 60%</p>
Rujukan Utama <i>Main Reference</i>	<ul style="list-style-type: none"> <li>• Beer, F. P., Johnston Jr, E. R., Mazurek, D. F., &amp; Eisenberg, E. R. (2019). Vector Mechanics for</li> </ul>

	<p>Engineers, 12th Edition. USA: McGraw Hill.</p> <ul style="list-style-type: none"><li>• Meriam, J. L., &amp; Kraige, L. G. (2018) Engineering mechanics: Static, SI version. USA: John Wiley &amp; Sons.</li><li>• Russell C. Hibbeler. (2016), Engineering Mechanics – Dynamics, 14th Edition. USA: Pearson Prentice Hall.</li></ul>
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## KIG1016: Pemesinan dan Proses Pembuatan / *Machining and Manufacturing Processes*

Kod Kursus <i>Course Code</i>	KIG1016
Tajuk Kursus <i>Course Title</i>	Pemesinan dan Proses Pembuatan <i>Machining and Manufacturing Processes</i>
Kredit <i>Credit</i>	4
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Mengenalpasti proses pembuatan yang sesuai untuk menghasilkan produk berasaskan kejuruteraan mekanikal.</li> <li>2. Menunjukkan amalan keselamatan dalam bengkel pembuatan.</li> <li>3. Membina pemasangan mekanikal berdasarkan lukisan teknikal dengan menggunakan pelbagai proses pembuatan secara kolaboratif.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Identify the suitable manufacturing processes to produce mechanical engineering based products.</i></li> <li>2. <i>Demonstrate safety practices in manufacturing workshop.</i></li> <li>3. <i>Build a mechanical assembly as per technical drawing using various manufacturing process in a collaborative manner.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Pengenalan kepada teknologi pembuatan, keselamatan bengkel, proses penuangan, perkakas pemotongan, pemesinan, proses dan kualiti kimpalan, kerja panas dan sejuk, ubah bentuk dan metrologi. <i>Introduction to manufacturing technology, workshop safety, casting process, cutting tools, machining, welding process and quality, hot and cold work, deformation and metrology.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 40% Peperiksaan Akhir / <i>Final Examination</i>: 60%</p>
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. Waugh, D. G. (2020). Manufacturing engineering. Harlow, England: Pearson.</li> <li>2. Riemenschneider, P. and M. Ricketts (2017). Machine hazards, K-State Research and Extension.</li> <li>3. Kalpakjian, S., Schmid, S. R., &amp; Sekar, K. V. (2018). Manufacturing engineering and technology. Noida: Pearson India Education Services.</li> <li>4. Prakash, C., Singh, S., &amp; Davim, J. P. (2020). Functional materials and advanced manufacturing. Boca</li> </ol>

	<p>Raton: CRC Press.</p> <p>5. Rajmohan, T., Palanikumar, K., &amp; Davim, J. P. (2021). Advances in materials and manufacturing engineering: Select proceedings of ICMME 2019. Singapore: Springer.</p>
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## KIG2012: Mekatronik 1 / Mechatronics 1

Kod Kursus <i>Course Code</i>	KIG2012
Tajuk Kursus <i>Course Title</i>	Mekatronik 1 <i>Mechatronics 1</i>
Kredit <i>Credit</i>	1
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menerangkan asas kejuruteraan elektrik dalam reka bentuk litar elektrik</li> <li>2. Menganalisa konsep teorem rangkaian litar dengan kehadiran bekalan kuasa arus terus dan juga arus ulang alik</li> <li>3. Menerangkan konsep elektromagnetisma dalam aplikasi kejuruteraan elektrik</li> <li>4. Menjalankan eksperimen dalam memahami konsep arus terus dan/atau ulang alik</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1 <i>Explain the fundamental of electrical engineering in circuit design</i></li> <li>2 <i>Analyze the concept of circuit network theorem in the presence of power supply of direct and alternating current</i></li> <li>3 <i>Describe electromagnetism concept in electrical engineering applications Perform experiment in understanding the concept of directand/or alternating current.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini memperkenalkan pelajar mengenai elemen- elemen elektrik seperti resistor, kapasitor dan induktor yang digunakan di dalam asas litar elektrik. Fungsi dan hubungkait dibincangkan merangkumi litar arus terus dan ulang alik. Teorem seperti 'Kirchhoff's Voltage Law' dan 'Kirchhoff's Current Law' adalah di antara teorem-teorem yang didedahkan dalam menyelesaikan masalah untuk menentukan arus, voltan dan kuasa. Selain daripada itu, hubungkait di antara elektrik dan magnet (iaitu elektromagnet) dan strukturnya juga terangkum di dalam kursus ini. Seterusnya asas ini menjurus ke arah pemahaman pembinaan dan aplikasi motor dan generator.</p> <p><i>The course introducing students electrical elements such as resistor, capacitor and inductor that are used in thae basic electric circuit. Sfunctions and interconnection discussed covering direct and alternating current circuit. Theorems such as Kirchhoff's Voltage Law and Kirschhoff's Current Law are among the theorems exposed to solving problem to obtain current, voltage and power. Apart from that relationship between electric and magnet (ie electromagnet)</i></p>

	<i>structure is also covered in this course. These basics will direct to the understanding of the design and applications of motor and generator..</i>
<b>Pemberatan Penilaian Assessment Weightage</b>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
<b>Rujukan Utama Main Reference</b>	<ol style="list-style-type: none"> <li>1. Matthew N.O Sadiky, Sarhan M.Musa, Charles K. Alexander, "Applied Circuit Analysis". McGraw Hill (2013).</li> <li>2. Giorgio Rizzoni, "Principles and Applications of Electrical Engineering". McGraw Hill (2003).</li> <li>3. Stephen J. Chapman, "Electric Machinery Fundamentals". McGraw-Hill (2008).</li> <li>4. Stephen D. Umas, "Fitzgerald &amp; Kingsley's Electric Machinery". McGraw Hill (2014).</li> <li>5 Bobby S.Raul,"Electrical Engineering Fundamental". CRC Press (2020)</li> </ol>

## KIG2013: Pengaturcaraan Komputer / Computer Programming

Kod Kursus <i>Course Code</i>	KIG2013
Tajuk Kursus <i>Course Title</i>	Pengaturcaraan Komputer <i>Computer Programming</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menerangkan struktur asas pengaturcaraan komputer</li> <li>2. Menggunakan teknik pengaturcaraan asas untuk menyelesaikan masalah aritmatik dan logik</li> <li>3. Menyelesaikan masalah kejuruteraan dengan menggunakan teknik pengaturcaraan komputer</li> <li>4. Menunjukkan keupayaan pengaturcaraan melalui penggunaan algoritma dengan bahasapengaturcaraan.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Explain the basics structure of computer programming</i></li> <li>2. <i>Apply basic programming techniques to solve the arithmetic and logical problems Solve engineering problems using appropriate programming techniques</i></li> <li>3. <i>Demonstrate the applications of programming algorithms implementation using textual programming language.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini memperkenalkan pelajar kepada sistem komputer dan membuat mereka terbiasa dengan pengaturcaraan komputer. Kursus ini membantu pelajar mengembangkan kemahiran mereka dan merasa yakin menulis program komputer dan memetakan masalah saintifik ke dalam kerangka pengkomputeran.</p> <p><i>This course introduces students to computer systems and makes them familiar with the computer programming. The course helps students to develop their skill and feel confident to write computer programs and map scientific problems into computational frameworks.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 40% Peperiksaan Akhir / <i>Final Examination</i>: 60%</p>
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. Deitel, P.J. &amp; Deitel, H.M. (2017). C++ How to Program. Pearson</li> <li>2. Overland, B. (2015). C++ without Fear: A Beginner's Guide That Makes You Feel Smart. Prentice Hall.</li> <li>3. Savitch, W. (2018). Problem Solving with C++. Pearson.</li> </ol>



	4. Guttag, J.V. (2016). Introduction to Computation and Programming using Python: with Application to Understanding Data. MIT Press.
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## KIG2014: Mekanik Bendalir 2 / *Fluid Mechanics 2*

Kod Kursus <i>Course Code</i>	KIG2014
Tajuk Kursus <i>Course Title</i>	Mekanik Bendalir 2 <i>Fluid Mechanics 2</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. .Menggunakan hukum-hukum keserupaan dan analisis dimensi dalam berbagai keadaan aliran.</li> <li>2. Mnilai ciri-ciri aliran bendalir untuk aliran dalaman di dalam saluran tertutup dan aliran luaran untuk badan geometri yang berbeza.</li> <li>3. .M enganalisa ciri-ciri aliran bendalir dan keadaan operasi jentera turbo seperti pam, turbin dan pemampat.</li> <li>4. Menjalankan eksperimen dalam memahami operasi pam and turbin.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Apply the laws of similarity and dimensional analysis in various flow situations.</i></li> <li>2. <i>Evaluate the fluid flow characterises for internal flow inside closed conduit and external flow over different geometrical bodies.</i></li> <li>3. <i>Analyse fluid flow characteristics and operation conditions of turbomachinery such as pump, turbine and compressor.</i></li> <li>4. <i>Perform experiments for the understanding of the pump and turbine operations.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Tujuan kursus ini ialah melanjutkan pengetahuan dan pemahaman yang dicapai dalam kursus mekanik bendalir tahun satu. Kursus ini melibatkan terutamanya penggunaan pemahaman yang tercapai untuk menganalisis beberapa fenomena yang ditemui dalam bidang luas mekanik bendalir, seperti fenomena aliran dalam paip, kajian daya-daya angkat dan seret yang bertindak pada jasad yang terbenam dalam sesuatu bendalir, kajian dan analisis tentang aliran melalui mesinturbo seperti pam and turbin dan juga penggunaan hukum-hukum keserupaan dan analisis dimensi.</p> <p><i>The aim of this course is to further the knowledge and understanding acquired in the basic fluid mechanics course given in the first year.</i></p>

	<i>This course includes mainly the application of the understanding acquired to the analysis of various phenomena encountered in the very broad field of fluid mechanics. Such phenomena include the flow of fluids in pipes, the study of the lift and drag forces acting on bodies immersed in a fluid, the study and analysis of flow through turbomachines, such as pumps and turbines and the applications of the laws of similarity and dimensional analysis.</i>
<b>Pemberatan Penilaian Assessment Weightage</b>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
<b>Rujukan Utama Main Reference</b>	-

## KIG2015: Mekanik Bahan 2 / *Mechanics of Materials 2*

Kod Kursus <i>Course Code</i>	KIG2015
Tajuk Kursus <i>Course Title</i>	Mekanik Bahan 2 <i>Mechanics of Materials 2</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menganalisa tegasan ricih pada rasuk yang diperbuat daripada bahan homogen dan aliran ricih pada anggota terbina dan di dinding yang nipis.</li> <li>2. Menilai pesongan dan kecerunan pada mana-mana titik di rasuk dan aci dengan kaedah analisis dan teknik separa grafik.</li> <li>3. 3.Menilai kestabilan lajur elastik dengan mempertimbangkan pelbagai keadaan pada hujung lajur yang dikenakan beban-beban paksi pusat dan sipi.</li> <li>4. 4.Menggunakan kaedah tenaga untuk menilai masalah yang melibatkan anjakan dan kecerunan pada mana- mana titik di anggota struktur dan elemen mekanikal.</li> <li>5. 5.Menjalankan eksperimen dalam memahami teori mekanik bahan..</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Analyse the shear stress in beams made of homogeneous materials and shear flow in built up and in thin wall members.</i></li> <li>2. <i>Evaluate the deflection and slope at any point on the beams and shafts by analytical methods and semi graphical technique.</i></li> <li>3. <i>Evaluate the stability of elastic columns by considering various end conditions subjected to centric and eccentric axial loads.</i></li> <li>4. <i>Apply energy methods to evaluate problems involving the displacement and slope at any point on structural members and mechanical elements.</i></li> <li>5. <i>Perform experiment in understanding theories of mechanics of materials.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini memberi tumpuan kepada menganalisis tekanan dan ubah bentuk bahan yang berada di bawah beban. Pelbagai jenis beban disiasat termasuk beban paksi, kilasan, lenturan dan beban melintang. Konsep asas transformasi tekanan dan regangan juga akan dibincangkan.</p> <p><i>This course focuses on analyzing stresses and deformations in materials under load. Various types of loads are investigated including</i></p>

	<i>axial loads, torsion, bending and transverse loads. Basic concept of stress and strain transformations will also be discussed</i>
<b>Pemberatan Penilaian Assessment Weightage</b>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
<b>Rujukan Utama Main Reference</b>	<ol style="list-style-type: none"> <li>1. Hibbeler, R.C. (2016). <i>Mechanics of Materials</i> (10th ed.). Singapore. Prentice-Hall.</li> <li>2. Boresi, A. P. and Schmidt R. J. (2003). <i>Advanced Mechanics of Materials</i> (6th ed.). USA. John Wiley &amp; Sons, Inc.</li> <li>3. Beer, F.P. and Johnson Jr., and John DeWolf, E.R. (2006), <i>Mechanics of Materials</i>, SI Edition, McGraw-Hill.</li> <li>4. Ugural, A. C., and Fenster, S. K. (2011). <i>Advanced Mechanics of Materials and Applied Elasticity</i>. Pearson Education</li> </ol>

## KIG2016: Reka Bentuk dan Inovasi Produk / *Product Design and Innovation*

Kod Kursus <i>Course Code</i>	KIG2016
Tajuk Kursus <i>Course Title</i>	Reka Bentuk dan Inovasi Produk <i>Product Design and Innovation</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menggunakan kaedah dan peralatan moden yang sesuai untuk membangunkan penyelesaian baru bagi pembangunan reka bentuk produk.</li> <li>2. Mengutamakan objektif reka bentuk dan keperluan berdasarkan keperluan teknikal, pelanggan dan masyarakat.</li> <li>3. Mengatur tugas dan peranan secara berkumpulan dalam konteks proses pembangunan rekabentuk produk yang sistematik.</li> <li>4. Menilai idea reka bentuk produk yang dicadangkan dengan menggunakan kaedah yang sesuai untuk analisis dan membuat keputusan.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Apply appropriate modern methods and tools in developing solutions for product design and development</i></li> <li>2. <i>Prioritize the design objectives and requirements based on the technical requirement, customer and societal needs</i></li> <li>3. <i>Organise tasks and roles as a team within the context of a systematic product design and development process.</i></li> <li>4. <i>Evaluate the ideas of the proposed product design using appropriate tool for analysis and decision making</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Reka Bentuk dan Inovasi Produk adalah kursus unik yang dikembangkan untuk mempersiapkan para pelajar untuk merancang produk dan mengembangkan teknologi untuk keperluan semasa dan masa depan. Kursus ini adalah kursus berasaskan projek yang merangkumi alat dan kaedah moden untuk reka bentuk dan pembangunan produk. Batu penjurus adalah projek di mana pasukan pelajar menguruskan, kejuruteraan, dan perindustrian merancang, merancang dan membuat prototaip produk fizikal. Sesi kelas dijalankan dalam mod bengkel dan menggunakan kes dan latihan langsung untuk mengukuhkan idea utama. Topik termasuk mengenalpasti keperluan pelanggan, penjana konsep, seni bina produk, reka bentuk industri, dan reka bentuk untuk pembuatan.</p>

	<p><i>Product Design and Innovation is a unique course developed to prepare the students to design products and develop technologies for current and future needs. This course is a project-based course that covers modern tools and methods for product design and development. The cornerstone is a project in which teams of management, engineering, and industrial design students conceive, design and prototype a physical product. Class sessions are conducted in workshop mode and employ cases and hands-on exercises to reinforce the key ideas. Topics include identifying customer needs, concept generation, product architecture, industrial design, and design-for-manufacturing</i></p> <p>.</p>
<p>Pemberatan Penilaian <i>Assessment Weightage</i></p>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 100% Peperiksaan Akhir / <i>Final Examination</i>:</p>
<p>Rujukan Utama <i>Main Reference</i></p>	<ol style="list-style-type: none"> <li>1. T., U. K., Eppinger, S. D., &amp; C., Y. M. (2020). Product design and development. New York, NY: McGraw-Hill Education.</li> <li>2. Ullman, D. G. (2018). The mechanical design process. Independence, OR: David G. Ullman.</li> <li>3. Voland, G. (2014). Engineering by design. Harlow: Pearson Education Limited.</li> <li>4. Jamnia, A. (2018). Introduction to Product Design and Development for Engineers. Boca Raton, FL: Taylor &amp; Francis.</li> </ol> <p>Wang, J. X. (2021). Industrial Design Engineering: Inventive problem solving. S.I.: CRC PRESS.</p>

## KIG2017: Reka Bentuk Elemen Mesin / *Design of Machine Elements*

Kod Kursus <i>Course Code</i>	KIG2017
Tajuk Kursus <i>Course Title</i>	Reka Bentuk Elemen Mesin <i>Design of Machine Elements</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menganalisa beban dan tegasan yang diperlukan di dalam elemen mesin berdasarkan kriteria-kriteria kegagalan</li> <li>2. Menganalisa elemen mesin dari aspek saiz dengan mengambil kira faktor keselamatan dalam suatu sistem mekanik</li> <li>3. Menjalankan eksperimen bagi memahami prinsip dan aplikasi suatu elemen mesin</li> <li>4. Menjalankan penilaian ke atas elemen-elemen mesin menggunakan peralatan-peralatan moden berasaskan komputer</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Analyse load and stress in machine elements based on failure criteria</i></li> <li>2. <i>Analyse machine element in the aspect of size with the corresponding to factor of safety in a mechanical system</i></li> <li>3. <i>Perform an experiment in understanding the principles and application of a machine element</i></li> <li>4. <i>Perform evaluation on machine elements using computer-based modern tools.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Pada permulaannya, subjek ini meliputi beban, tekanan dan kegagalan bahan disebabkan oleh beban pegun dan beban berubah-ubah berasaskan teori MSS, DE, Coulomb-Mohr, MNS dan Mohr-diperbaiki untuk bahan kenyal dan rapuh. Seterusnya, teori ini diaplikasi kepada elemen mesin yang penting seperti gear, bering, aci, skrudan kimpalan. Pelajar akan menerokai bagaimana elemen mesin berfungsi dan penentuan saiz berdasarkan pengiraan dengan mangambil kira faktor keselamatan dan jangkahayat.</p> <p><i>In the initial, the subject covers about load, stresses and material failures from static and variable loadings from several theories like MSS, DE, Coulomb-Mohr, MNS and Modified Mohr for ductile and brittle materials. Next, these calculations are applied for most important machine elements such as gear, bearing, shaft, screw and welding. Participants will endeavor into learning how machine elements works</i></p>



	<i>and how sizes are decided based on safety factors and life cycle calculations.</i>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1 Richard G. Budynas, J. Keith Nisbett, Shigley's Mechanical Engineering Design, Tenth Edition, McGraw Hill, 2014</li> <li>2 M.F. Spotts, Design of Machine Elements, Pearson India, 2019</li> <li>3 Wei Jiang, Analysis and Design of Machine Elements, Wiley, 2019</li> <li>4 Robert L Mott, Machine Elements in Mechanical Design, Pearson India, 2019</li> <li>5 Michael Spektor, Machine Design Elements and Assemblies, Pearson India, 2018</li> </ol>

## KIG2018: Termodinamik Kejuruteraan 2 / *Engineering Thermodynamics 2*

Kod Kursus <i>Course Code</i>	KIG2018
Tajuk Kursus <i>Course Title</i>	Termodinamik Kejuruteraan 2 <i>Engineering Thermodynamics 2</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menganalisa pengiraan teori yang mengawal kitaran kuasa wap.</li> <li>2. Menganalisa kitaran termodinamik bagi sistem kuasa gas.</li> <li>3. Menilai sistem penyejukan dan pam haba berdasarkan prinsip kerjanya.</li> <li>4. Menilai tindak balas kimia danimbangan tenaga dalam pembakaran termal</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Analyze theoretical calculation governing the vapor power cycles.</i></li> <li>2. <i>Analyze thermodynamics cycles of gas power systems.</i></li> <li>3. <i>Evaluate refrigeration and heat pump systems based on their working principles.</i></li> <li>4. <i>Evaluate the chemical reactions and energy balance in thermal combustion</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini memperkenalkan aplikasi termodinamik bagi kitaran kuasa, kitaran penyejukan dan proses pembakaran yang digunakan dalam kehidupan seharian kita. Hukum termodinamik Pertama dan Kedua digunakan. Kursus ini juga bertujuan untuk memperkayakan pelajar dengan kemahiran berfikir kritis dan memiliki keupayaan untuk menggunakan hukum termodinamik dengan betul dalam masalah kejuruteraan dan menyelesaikan masalah tenaga.</p> <p><i>This course introduces the applications of thermodynamics for power cycles, refrigeration cycles and combustion processes which are used in our daily life. The First and Second Law of thermodynamic are used. This course is also aimed at enriching students with critical thinking skills and possess the ability to use the thermodynamics laws correctly in engineering problems and solve energy problems</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%

<p>Rujukan Utama <i>Main Reference</i></p>	<ol style="list-style-type: none"><li>1 Moran, M. J., Shapiro, H. N., Boettner, D. D., &amp; Bailey, M. B. (2018). <i>Fundamentals of engineering thermodynamics</i>, 9th Edition. USA: John Wiley &amp; Sons.</li><li>2 Cengel, Y. A., &amp; Boles, M. A. (2019). <i>Thermodynamics: an engineering approach</i>, 9th Edition. New York: McGraw-Hill.</li><li>3 Borgnakke C., Sonntag, R.E. (2019). <i>Fundamentals of Thermodynamics</i>, 10th Edition. USA: John Wiley &amp; Sons.</li></ol>
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**KIG2019: Kaedah Berangka dan Statistik dalam  
Kejuruteraan / Numerical and Statistical Methods  
in Engineering**

Kod Kursus <i>Course Code</i>	KIG2019
Tajuk Kursus <i>Course Title</i>	Kaedah Berangka dan Statistik dalam Kejuruteraan <i>Numerical and Statistical Methods in Engineering</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menyelesaikan masalah Persamaan Pembezaan Biasa dan Persamaan Pembezaan Separa dengan menggunakan kaedah berangka.</li> <li>2. Menganalisa masalah kejuruteraan kompleks menggunakan kaedah berangka yang bersesuaian.</li> <li>3. Menganalisa masalah kejuruteraan kompleks menggunakan kaedah statistik yang bersesuaian.</li> <li>4. Membangunkan satu aturcara komputer untuk menyelesaikan masalah praktik melalui kaedah pengiraan dengan kaedah berangka dan/atau statistik</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Solve Ordinary Differential Equation and Partial Differential Equation problems using numerical methods.</i></li> <li>2. <i>Analyse complex engineering problems using appropriate numerical method.</i></li> <li>3. <i>Analyse complex engineering problems using appropriate statistical method.</i></li> <li>4. <i>Develop a computer program for solving a practical problem via computational methods with numerical and /or statistical methods</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini memperkenalkan pelajar kepada konsep asas, pengiraan, dan analisis data untuk kaedah berangka dan statistic. Ia terdiri daripada pemodelan matematik dengan menggunakan ODE &amp; PDE dengan penyelesaian berangka, menyelesaikan persamaan algebra linear, integrasi &amp; pembezaan berangka, integrasi Monte Carlo, interpolasi &amp; regresi, sekaitan, dan analisis varians. Pelajar akan melaksanakan pengaturcaraan untuk menerapkan kaedah berangka dan statistic, untuk menyelesaikan masalah kejuruteraan tertentu.</p> <p><i>This course introduces students to the basic concepts, calculation, and data analysis of numerical and statistical methods. It consists of</i></p>

	<i>mathematical modelling using ODE &amp; PDE with numerical solutions, solving linear algebraic equations, numerical integration &amp; differentiation, Monte Carlo integration, interpolation &amp; regression, correlation, and analysis of variance. Student will implement the programming for applying the numerical and statistical methods, in order to solve a particular engineering problem</i>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. Chapra, S.C. &amp; Raymond P.C. (2020). Numerical Methods for Engineers, 8th Edition. USA: McGraw Hill.</li> <li>2. Chapra, S.C. (2018). Applied Numerical Methods With Matlab: For Engineers And Scientists. 4th Edition. New York: McGraw-Hill Education.</li> <li>3. Weiss, N. A., &amp; Weiss, C. A. (2017). Introductory statistics. 10th Edition. USA: Pearson.</li> <li>4. Mann, P. S. (2016). Introductory statistics. 9th Edition. USA: Haboken, NJ: John Wiley &amp; Sons.</li> <li>5. Brandt, S. (2014). Statistical and Computational Methods for Scientists and Engineers. Switzerland : Springer International Publishing.</li> </ol>

## KIG2020: Mekatronik 2 / Mechatronics 2

Kod Kursus <i>Course Code</i>	KIG2020
Tajuk Kursus <i>Course Title</i>	Mekatronik 2 <i>Mechatronics 2</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Terangkan operasi semikonduktor, transistor dan diod serta komponen elektronik digital berdasarkan get logik asas.</li> <li>2. Tentukan prestasi litar yang berkaitan dengan transistor dan sebagai litar logik gabungan dan / atau jujukan.</li> <li>3. Membina suatu aplikasi mudah menggunakan kombinasi sistem elektronik dan digital.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Explain the operations of semiconductor, transistor and diode as well as digital electronic components based on basic logic gates</i></li> <li>2. <i>Determine the performance of the circuit related to transistor and aso combinatorial and/or sequential logic circuit</i></li> <li>3. <i>Construct a simple application using a combination of electronic and digital system.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus dimulakan dengan pemahaman asas pembinaan dan prestasi diod dan transistor. Ianya diteruskan dengan litar yang berkaitan dengan transistor seperti 'opamp' (antara lain). Pemahaman asas 'logic gate', 'boolean algebra' serta kombinasi dan litar logik bersusun diterangkan. Pengetahuan mengenai semikonduktor dan litar logik akan diteruskan dengan sistem 'analog to digital' serta sebaliknya. Akhir sekali sistem yang ringkas seperti sistem yang mengambil kira penggunaan motor DC akan diambil kira.</p> <p><i>Course is started with the understanding a basic building and performance of diode and transistor. It is continued with the circuit related to transistor like an opamp (among others). The understanding basic of logic gate, boolean algebra and their combined and sequential logic circuit are explained. Knowledge of semiconductor and logic circuit will proceed with the system of analog to digital and vice versa. Lastly simple system such as the one utilizing DC motor will be employed.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	1. Malvino, A.P. (1999). Electronic Principles, 6th Edition. McGraw-Hill.

	<p>2. Donald A. Neamen. (2001). Electronic Circuit Analysis and Design, 2nd Edition. McGraw- Hill.</p> <p>3. Tokheim, R.L. (1994). Theory and Problems of Digital Principles, 3rd Edition. Mc-Graw- Hill.</p>
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## KIG3007: Reka Bentuk Berintegrasi 1/ *Integrated Design 1*

Kod Kursus <i>Course Code</i>	KIG3007
Tajuk Kursus <i>Course Title</i>	Reka Bentuk Berintegrasi 1 <i>Integrated Design 1</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Mencadang solusi-solusi reka bentuk konseptual bagi masalah reka bentuk kejuruteraan yang kompleks</li> <li>2. Menilai solusi-solusi reka bentuk berdasarkan hasil siasatan dan analisa teknikal yang bersesuaian</li> <li>3. Melaporkan aktiviti, pencapaian dan kejayaan projek melalui laporan bertulis dan pembentangan lisan.</li> <li>4. Membina model CAD 3D secara berkumpulan</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>propose conceptual design solutions of complex engineering design problem</i></li> <li>2. <i>Evaluate design solutions based on the findings of the appropriate technical investigation and analysis</i></li> <li>3. <i>Report project activities, milestones and achievements through written reports and verbal presentations</i></li> <li>4. <i>Build 3D CAD model collaboratively in a team</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus projek reka bentuk berintegrasi I ialah kursus reka bentuk projek peringkat tinggi yang memerlukan pelajar menggunakan semua pengetahuan kejuruteraan mereka untuk menyelesaikan masalah kejuruteraan dunia sebenar atau membangunkan produk yang berdaya maju dengan mengambil kira factor-faktor kemampuan dan sosial.</p> <p><i>The integrated design project I course is a senior-level project design course that require students to use all their engineering knowledge to solve a real-world engineering problem or develop a viable product with considerations of sustainability and social factors.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 100%</p> <p>Peperiksaan Akhir / <i>Final Examination</i>: 0%</p>
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1 David G Ullman, The Mechancial Design Process, 7 th edition, Mc Graw Hill, 2017</li> <li>2 Ulrich, Karl T., Eppinger, Steve D., and Yang, Maria C., Product Design and Development. 7th ed., McGraw-Hill Education, 2020.</li> <li>3 Related reference materials and articles in Books, Journals, Conference Proceedings, Monographs, Manuals, Standards, etc.</li> </ol>



## KIG3008: Instrumentasi dan Teknik Pengukuran / *Instrumentation and Measurement Techniques*

Kod Kursus <i>Course Code</i>	KIG3008
Tajuk Kursus <i>Course Title</i>	Instrumentasi dan Teknik Pengukuran <i>Instrumentation and Measurement Techniques</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Mengenalpasti prinsip-prinsip di sebalik instrumentasi yang terlibat dalam kejuruteraan mekanik dan bahan</li> <li>2. Merekabentuk peranti pengukuran menggunakan instrumen maya untuk menyelesaikan masalah kejuruteraan kompleks</li> <li>3. Menganalisa isyarat dalam domain masa dan frekuensi</li> <li>4. Mengintegrasikan antara teknik pengukuran dan kaedah pengiraan</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Recognize the principles behind instrumentation involved in mechanical and material engineering</i></li> <li>2. <i>Design measurement devices using virtual instruments to solve complex engineering problems</i></li> <li>3. <i>Analyze signal in time and frequency domain</i></li> <li>4. <i>Integrate between measurement techniques and computational method.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini bertujuan mendedahkan pelajar dengan instrumentasi klasik dan semasa, dan juga teknik pengukuran yang digunakan dalam industri. Kursus ini membincangkan aplikasi dan prinsip-prinsip perolehan data dan pemindaharuh, pasca-pemprosesan dan dokumentasi. Kebaikan dan keburukan antara teknik pengukuran dan kaedah pengiraan akan diserlahkan</p> <p><i>The course is aimed at exposing the students the classical and current instrumentations and measurement techniques applied in industries. The course discusses the application and principles of transducers and data acquisition, post- processing and documentation. The advantages and disadvantages between measurement techniques and computational method are highlighted.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	1. Figliola, R. S. & Beasley, D. E. (2019). Theory and Design for Mechanical Measurements (7th Edition). John Wiley & Sons.

	<p>2 Beckwith, T. G., Marangoni, R. D., &amp; Lienhard V, J. H. (2012). Mechanical Measurements. Prentice Hall.</p> <p>3 Polak, T. A. &amp; Pande C. (1999). Engineering Measurements – Methods and Intrinsic Errors (2nd Edition). Professional Engineering Publishing Ltd.</p> <p>4 Placko, D. (2007). Fundamentals of Instrumentation and Measurement. Wiley ISTE.</p>
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## KIG3009: Getaran Mekanikal / *Mechanical Vibrations*

Kod Kursus <i>Course Code</i>	KIG3009
Tajuk Kursus <i>Course Title</i>	Getaran Mekanikal <i>Mechanical Vibrations</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>none</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menerangkan konsep-konsep getaran dalam sistem tak teredam dan teredam.</li> <li>2. Menganalisa masalah getaran bebas atau terpaksa dalam kejuruteraan mekanik.</li> <li>3. Menggunakan kaedah analisis dalam masalah getaran.</li> <li>4. Menjalankan eksperimen mengenai hubungan antarateori dan praktikal dalam masalah getaran.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Explain the concepts of vibration in undamped and damped systems.</i></li> <li>2. <i>Analyse free or forced vibration problems in mechanical engineering.</i></li> <li>3. <i>Apply analytical methods in vibration problems.</i></li> <li>4. <i>Perform an experiment on the relationship between theory and practice in vibration problem</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini bertujuan untuk memperkenalkan asas-asas getaran untuk sistem satu darjah sistem kebebasan, sistem dua darjah kebebasan dalam bidang kejuruteraan. Ini termasuk getaran tak teredam dan teredam dengan bebas dan terpaksa bagi sistem translasi dan putaran. Ini termasuk aplikasi bagi pengasingan getaran, kawalan dan pengukuran getaran.</p> <p><i>Starting with fundamental postulates of electromagnetism, Faradays law is introduced, leading to the discussion on Maxwell's equations. The study of uniform plane wave includes the propagation of time harmonic plane wave in an unbounded homogeneous medium, the concept of pointing vector and the incidence of plane wave. Overview of the transmission lines will be explained. The general transmission-line equations can be derived from a circuit model, and the study of time harmonic steady-state properties of transmission line is facilitated by the use of graphical chart. Waveguides and basic of antennas will be explained.</i></p>

Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	1.Rao, S. S. (2017). Mechanical Vibrations (6th Edition). Pearson. 2.Palm III, W. J. (2007). Mechanical Vibration. John Wiley and Sons. 3 Inman, D. J. (2014). Engineering Vibration (4th Edition). Pearson.

## KIG3010: Bahan Kejuruteraan 2 / *Engineering Materials 2*

Kod Kursus <i>Course Code</i>	KIG3010
Tajuk Kursus <i>Course Title</i>	Bahan Kejuruteraan 2 <i>Engineering Materials 2</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Membincangkan sifat, pemprosesan dan aplikasi bahan seramik, polimer, dan komposit.</li> <li>2. Mengenalpasti langkah-langkah dan amalan pencegahan karatan dan degradasi dalam bahan.</li> <li>3. Menilai mekanisme kegagalan bahan kejuruteraan.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Discuss characteristics, processing and applications of ceramics, polymers, and composites.</i></li> <li>2. <i>Determine measures for the prevention and remediation of corrosion and degradation in engineering materials.</i></li> <li>3. <i>Evaluate the failure mechanisms in engineering materials</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini memberi tumpuan kepada struktur, sifat, pemprosesan, dan aplikasi bahan seramik, polimer, dan komposit. Kemudian, karatan dan degradasi bahan serta kegagalan bahan akan diperkenalkan. Interpretasi dan hubungan di antara bahan, mekanisme dan aplikasi dalam kehidupan nyata diterangkan dan dianalisis dengan menggunakan kajian kes.</p> <p><i>This course focuses on the structures, properties, processing, and applications of ceramics, polymers, and composites. Then, corrosion and degradation of materials as well as failure of materials will be introduced. Interpretation and relation between materials, mechanism, and application in real life are explained and analysed using case studies.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 40% Peperiksaan Akhir / <i>Final Examination</i>: 60%</p>
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. Ashby, M. F., Jones, D. R. H. (2013) <i>Engineering Materials 2: An Introduction to Microstructures and Processing</i>. 4th Edition. Elsevier.</li> <li>2. Ashby, M. F., Jones, D. R. H. (2019) <i>Engineering Materials 1: An Introduction to Properties, Applications and Design</i>. 5th Edition. Elsevier.</li> <li>3. Calister, W. D., Rethwisch, D. G. (2018). <i>Materials Sciences and Engineering: An Introduction</i>. 10th Edition. Wiley.</li> </ol>

## KIG3011: Reka Bentuk Berintegrasi 2 / *Integrated Design 2*

Kod Kursus <i>Course Code</i>	KIG3011
Tajuk Kursus <i>Course Title</i>	Reka Bentuk Berintegrasi 2 <i>Integrated Design 2</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	<i>Tiada None</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menghurai kebolehlaksanaan fungsi reka bentuk yang dicadangkan berdasarkan impak kemampanan.</li> <li>2. Mengaplikasi prinsip dan piawaian kod etika profesional kejuruteraan didalam reka bentuk yang dicadangkan.</li> <li>3. Menjangka kebolehlaksanaan reka bentuk yang dicadangkan berdasarkan daya maju ekonomi.</li> <li>4. Melaporkan aktiviti, pencapaian dan kejayaan projek melalui laporan bertulis dan pembentangan lisan.</li> <li>5. Mengamalkan reka bentuk dan pembangunan yang sistematik sebagai sebahagian daripada pembelajaran sepanjang hayat</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Describe the feasibility of the proposed design functionality based on sustainability impact</i></li> <li>2. <i>Apply the principles and standards of professional engineering code of ethics in the proposed design</i></li> <li>3. <i>Anticipate the feasibility of the proposed design based on economic viability</i></li> <li>4. <i>Report project activities, milestones and achievements through written reports and verbal presentations</i></li> <li>5. <i>Practice systematic design and development approaches as part of lifelong learning</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus reka bentuk berintegrasi 2 ialah kursus reka bentuk projek peringkat tinggi yang memerlukan pelajar menggunakan semua pengetahuan kejuruteraan mereka untuk menyelesaikan masalah kejuruteraan dunia sebenar atau membangunkan produk yang berdaya maju dengan mengambil kira factor-faktor kemampanan dan sosial.</p> <p><i>The integrated design 2 course is a senior-level project design course that require students to use all their engineering knowledge to solve a real-world engineering problem or develop a viable product with consideration of sustainability and social factors.</i></p>

Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> :100% Peperiksaan Akhir / <i>Final Examination</i> :
Rujukan Utama <i>Main Reference</i>	1.Bahan-bahan rujukan yang berkaitan dan artikel dalam buku, jurnal, prosiding persidangan, monograf, manual, piawaian dan lain-lain. Related reference materials and articles in Books, Journals, Conference Proceedings, Monographs, Manuals, Standards, etc. 2.Ulrich, Karl T., Eppinger, Steve D., and Yang, Maria C., Product Design and Development. 7th ed., McGraw-Hill Education, 2020. 3.David G Ullman, The Mechancial Design Process, 7 th edition, Mc Graw Hill, 2017

## KIG3012: Kejuruteraan Kawalan / Control Engineering

Kod Kursus <i>Course Code</i>	KIG3012
Tajuk Kursus <i>Course Title</i>	Kejuruteraan Kawalan <i>Control Engineering</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menerbitkan model matematik, fungsi pemindahan, elektrik, sistem masa pengkamilan mekanikal dan elektrokimia.</li> <li>2. Menilai secara kuantitatif sambutan fana sistem pertama dan kedua dari rangkap pindah.</li> <li>3. Menganalisa kestabilan sistem yang diwakili sebagai fungsi pemindahan dan ralat keadaan mantap untuk sistem suap balik unit</li> <li>4. Merekabentuk kompensator lata menggunakan londa punca untuk memperbaiki ralat keadaan mantan dan sambutan fana.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Derive mathematical models, transfer functions, electrical, mechanical and electrochemical time differential systems</i></li> <li>2. <i>Evaluate quantitatively the transient response of first and second order system from transfer function.</i></li> <li>3. <i>Analyze the stability of a system represented as a transfer function and the steady-state error for a unity feedback system.</i></li> <li>4. <i>Design cascade compensators using root locus to improve both the steady-state error and the transient response.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Untuk memperkenalkan pelajar teori asas dan amalan kejuruteraan kawalan. Matlamat utama adalah untuk membolehkan pelajar untuk menganalisis dan sistem kawalan reka bentuk dalam perwakilan domain frekuensi. Pelajar akan menjadi biasa dengan analisis dan akan didedahkan dengan meluas kepada penggunaan komputer untuk analisis dan rekabentuk sistem kawalan.</p> <p><i>To introduce the student the basic theory and practice of control engineering. The main goal is to enable the student to analyse and design control systems in frequency domain representation. Students will become familiar with analytical and will be exposed extensively to the use of computers for analysis and design of control systems.</i></p>
Pemberatan Penilaian	Penilaian Berterusan / <i>Continuous Assessment</i> : 40%



<i>Assessment Weightage</i>	Peperiksaan Akhir / <i>Final Examination</i> : 60%
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Rujukan Utama <i>Main Reference</i>	1.Nise, N.S. (2017). Control Systems Engineering. Wiley. 2.Dorf, R.C., Bishop, R.H. (2017). Modern Control Systems. Prentice Hall. 3 Ogata, K. (2010). Modern Control Engineering. Pearson 4 Gopal, M. (2008). Control Systems: Principles and Design. McGraw Hill.
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## KIG3013: Pemindahan Haba / Heat Transfer

Kod Kursus <i>Course Code</i>	KIG3013
Tajuk Kursus <i>Course Title</i>	Pemindahan Haba <i>Heat Transfer</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Mengaplikasikan prinsip-prinsip pemindahan haba dalam aplikasi kejuruteraan.</li> <li>2. Menyelesaikan permasalahan pemindahan haba konduksi dalam pelbagai aplikasi kejuruteraan</li> <li>3. Menyelesaikan permasalahan pemindahan haba perolakan dalam pelbagai aplikasi kejuruteraan</li> <li>4. menjalankan eksperimen bagi memahami asas pemindahan haba</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Apply the principles of heat transfer in engineering applications</i></li> <li>2. <i>Solve the conduction heat transfer problems in various engineering applications</i></li> <li>3. <i>Solve the convection heat transfer problems in various engineering applications</i></li> <li>4. <i>Perform experiment for understanding of the fundamental of heat transfer</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini terdiri daripada konsep asas pemindahan haba, konduksi, konveksi dan radiasi. Pengaliran haba sementara, konveksi paksa dalaman &amp; luaran akan diperkenalkan. Selain itu, aplikasi dan konsep pengiraan tenaga dalam sistem pemindahan haba akan diperkenalkan.</p> <p><i>This course consists of the fundamental concepts of heat transfer, conduction, convection and radiation. Transient heat conduction, internal &amp; external forced convections will be introduced. Besides, the applications and concepts of energy calculation.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	1. Yunus Cengel and Afshin Ghajar(2020). Heat and Mass Transfer: Fundamentals and Applications, 6th edition. USA: McGraw-Hill 2. Bergman, T. L., Incropera, F. P., & Lavine, A. S. (2011). Fundamentals of heat and mass transfer, 7th Edition. USA: John Wiley & Sons

	3 Incropera, F.P., DeWitt, D.P., Bergman, T.L. (2011). Introduction to heat transfer, 7th Revised Edition. USA: Wiley
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## KIG3014: Analisis Unsur Terhingga / *Finite Element Analysis*

Kod Kursus <i>Course Code</i>	KIG3014
Tajuk Kursus <i>Course Title</i>	Analisis Unsur Terhingga <i>Finite Element Analysis</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menyelesai masalah mekanik pepejal menggunakan kaedah unsur terhingga dengan pertimbangan had- had kaedah.</li> <li>2. Melakukan analisis unsur terhingga untuk penyelesaian reka bentuk kejuruteraan yang melibatkan masalah mekanik pepejal.</li> <li>3. Membangunkan kaedah penyelesaian reka bentuk kejuruteraan yang optimum dengan menggunakan perisian FEA komersial.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Solve solid mechanics problems using finite element methods with the consideration of the limitations of the method.</i></li> <li>2. <i>Perform finite element analysis for engineering design solutions involving solid mechanics problems.</i></li> <li>3. <i>Develop optimized engineering design solution utilizing commercial FEA software</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus dimulakan dengan pengenalan kepada Analisis Unsur Terhingga, Algebra Matriks dan ANSYS workbench untuk memahami asas kaedah Unsur Terhingga dan perisian komersil FEA yang sedia ada. Ia disambungkan dengan elemen satu dimensi dalam menyelesaikan masalah kekuda, anggota paksi, rasuk, kerangka, Pemodelan unsur terhingga dua dimensi dan tiga dimensi untuk teknik penyelesaian dalam masalah- masalah mekanik pepejal merangkumi analisis tegasan, analisis kegagalan dan analisis dinamik supaya pengoptimuman reka bentuk dicapai juga dirangkumi.</p> <p><i>The course starts with the introduction to Finite Element Analysis, matrix algebra and ANSYS workbench to understand the fundamental of Finite Element Method and available FEA commercial software. It continues with simple one dinsional element in solving trusses, axial members, beams and frame problems. 2D and 3D Finite Element modeling and solution techniques are also covered in solving solid</i></p>

	<i>mechanics problems involving stress analysis, failure analysis, dynamic analysis for design optimization</i>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. Moaveni, S. (2020). Finite Element Analysis: Theory and application with ANSYS, 5th Edition. Upper Saddle River, NJ: Pearson.</li> <li>2. Chen, X., and Liu, Y. (2018). Finite Element Modeling and Simulation with ANSYS Workbench, 2nd Edition. Boca Raton: CRC Press, Taylor &amp; Francis Group.</li> <li>3. Gadala, M. (2020). Finite Elements for Engineers with ANSYS Applications, 1st Edition. Cambridge University Press.</li> </ol>

## KIG3015: Latihan Industri / *Industrial Training*

Kod Kursus <i>Course Code</i>	KIG3015
Tajuk Kursus <i>Course Title</i>	Latihan Industri <i>Industrial Training</i>
Kredit <i>Credit</i>	5
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p><i>Di akhir kursus ini, pelajar dapat:</i></p> <ol style="list-style-type: none"> <li>1. mengaplikasi etika dan amalan professional kejuruteraan dalam persekitaran kerja</li> <li>2. Menyiasat isu-isu kejuruteraan dalam bidang yang berkaitan ke arah pembelajaran sepanjang hayat</li> <li>3. Mengenal pasti isu-isu kesihatan dan keselamatan awam dalam persekitaran kerja kejuruteraan yang berkaitan</li> <li>4. Memaparkan semangat kerja berpasukan.</li> <li>5. Menunjukkan kemahiran komunikasi dan penyampaian yang berkaitan dengan industri</li> <li>6. Merumuskan penyelesaian untuk masalah berkaitan dengan industri</li> <li>7. Menilai kesan penyelesaian kejuruteraan terhadap alam sekitar yang mampan</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Apply ethics and professional engineering practice in working environment</i></li> <li>2. <i>Investigate engineering issues in related field towards lifelong learning</i></li> <li>3. <i>Identify public health and safety issues in relevant engineering working environment</i></li> <li>4. <i>Display team working spirit</i></li> <li>5. <i>Demonstrate industrial related communication and presentation skills</i></li> <li>6. <i>Formulate solutions for industrial related problems</i></li> <li>7. <i>Examine the impact of engineering solution towards sustainable environment</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Program latihan industri ini bertujuan memberikan peserta pandangan mengenai praktis industri sebenar, mengenalpasti skil-skil yang diperlukan dalam industri terkini, mengamalkan keselamatan, bekerjasama, berkomunikasi dan etika kejuruteraan profesional. Tempoh diwajibkan minima 10 minggu untuk memberikan pendedahan

	<p>terhadap kejuruteraan, menyediakan graduan apabila mereka menyertai alam pekerjaan kelak.</p> <p><i>The industrial training program aimed to provide participants with insight of the real industrial practice, identifying of skills required in the current industry, practice safety in workplace, teamwork, communication and learning of professional engineering ethics. A minimum of 10-weeks period is compulsory, to give the students an engineering exposure, to prepare them when they graduate and join the workforce in the next stage.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 100%</p> <p>Peperiksaan Akhir / <i>Final Examination</i>:</p>
Rujukan Utama <i>Main Reference</i>	<p>1. Riordan, D. (2013). Technical report writing today. USA: Cengage Learning</p>



## KIG4052: Pemilihan Bahan Dalam Reka Bentuk Mekanik / *Materials Selection in Mechanical Design*

Kod Kursus <i>Course Code</i>	KIG4052
Tajuk Kursus <i>Course Title</i>	Pemilihan Bahan Dalam Reka Bentuk Mekanik <i>Materials Selection in Mechanical Design</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>None</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Mengaplikasikan prinsip pemilihan bahan dalam rekabentuk mekanikal untuk kegunaan industri</li> <li>2. Menilai hubungan antara keperluan rekabentuk, proses pembuatan dan bahan kejuruteraan</li> <li>3. Mencadangkan bahan yang sesuai untuk memenuhi pelbagai kekangan dan objektif yang bertentangan termasuk eko-kelestarian</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Apply the principles of materials selection in mechanical design for industrial applications</i></li> <li>2. <i>Evaluate the relationship between design requirements, manufacturing processes and engineering materials</i></li> <li>3. <i>Propose suitable materials to satisfy multiple constraints and conflicting objectives including eco-sustainability</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini memberi tumpuan kepada penerapan proses pemilihan bahan dalam reka bentuk kejuruteraan mekanikal. Ini termasuk penggunaan indeks prestasi berdasarkan analisis mekanik dengan carta sifat untuk mengenal pasti bahan yang berpotensi untuk aplikasi tertentu menggunakan teknik manual dan komputer. Pembinaan dan penggunaan carta sifat untuk mengenal pasti sekumpulan kecil bahan yang memenuhi keperluan mekanikal, fizikal dan kos. Pelajar akan menggunakan carta pemrosesan bahan untuk memilih proses fabrikasi yang sesuai dan membina jadual terjemahan untuk masalah yang melibatkan sama ada pelbagai kekangan atau objektif yang bertentangan, dan mengenal pastibahan calon secara sistematik.</p> <p><i>This course focuses on the application of materials selection processes in mechanical engineering design. This includes the use of performance indexes based on mechanics analyses with the material property charts to identify promising materials for specific applications using both manual and computer techniques. The construction and use of material property charts to identify a small set of materials that meets</i></p>

	<i>mechanical, physical, and cost requirements. Students will use material processing charts to select suitable fabrication processes and construct a translation table for problems involving either multiple constraints or conflicting objectives, and systematically identify candidate materials.</i>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	1. Materials Selection in Mechanical Design, M.F. Ashby, 4th Ed. (2011) 2. Engineering Materials: Properties and Selection, K.G. Budinski, 9th Ed. (2010)

## KIG4053: Pengurusan Pengeluaran dan Kendalian / *Production and Operations Management*

Kod Kursus <i>Course Code</i>	KIG4053
Tajuk Kursus <i>Course Title</i>	Pengurusan Pengeluaran dan Kendalian <i>Production and Operations Management</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada None
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. <i>Menggunakan strategi-strategi pengurusan operasi dalam pelbagai aktiviti, proses operasi dan tatacara berkaitan proses transformasi bahan mentah kepada produk akhir.</i></li> <li>2. <i>Mencadangkan pengeluaran dan pengurusan operasi yang lestari bagi mencapai matlamat strategik operasi syarikat.</i></li> <li>3. <i>Menjustifikasi penggunaan teknik dan kaedah pengurusan pengeluaran dan operasi dalam menyelesaikan masalah keperluan sumber berdaya saing di persekitaran pembuatan dan perkhidmatan</i></li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Apply the operational management strategies in various activities, operation processes and procedures related to transformation process of raw materials to end products.</i></li> <li>2. <i>Propose a sustainable production and operations management strategies in achieving operation strategic goals of the companies.</i></li> <li>3. <i>Justify the production and operation management techniques and methods used in solving competing resource requirements problems in manufacturing and services environments</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Pengurusan Operasi adalah salah satu fungsi utama sesebuah firma, fokus kepada aktiviti menghasilkan dan menyampaikan sesuatu produk atau perkhidmatan. Kursus ini akan mendedahkan pelajar kepada aspek merancang, menganalisis dan memperbaiki keseluruhan proses transformasi, termasuk perolehan, pengeluaran dan pengedaran, dengan objektif untuk mewujudkan kelebihan bagi syarikat.</p> <p><i>Operations Management is one of the primary functions of a firm, focusing on the activities of producing and delivering products or services. This course will expose students to the aspect of designing, analyzing and improving the whole transformation process, including</i></p>

	<p><i>procurement, production and distribution, with the objective of creating advantage for the company.</i></p> <p><i>The objective by the end of the course is to provide student with the analytical skills and managerial insights necessary to critically analyze a firm's operations decisions and practices.</i></p>
<p>Pemberatan Penilaian <i>Assessment Weightage</i></p>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 40%</p> <p>Peperiksaan Akhir / <i>Final Examination</i>:60%</p>
<p>Rujukan Utama <i>Main Reference</i></p>	

## KIG4054: Projek Tahun Akhir 1 / *Final Year Project 1*

Kod Kursus <i>Course Code</i>	KIG4054
Tajuk Kursus <i>Course Title</i>	Projek Tahun Akhir 1 <i>Final Year Project 1</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>None</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p><i>Di akhir kursus ini, pelajar dapat:</i></p> <ol style="list-style-type: none"> <li><i>1. Menganalisa secara kritikal literatur ilmiah yang relevan dengan projek penyelidikan</i></li> <li><i>2. Membangun rancangan penyelidikan, objektif dan metodologi yang sesuai dengan projek penyelidikan</i></li> <li><i>3. Mengurus projek penyelidikan dengan berkesan dan beretika dalam batasan teknikal, kewangan, risiko dan masa</i></li> <li><i>4. Melapor secara berkesan tentang penemuan awal melalui laporan bertulis dan pembentangan lisan</i></li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li><i>1. Analyse critically the scientific literature relevant to the research project</i></li> <li><i>2. Construct research plan, objectives and methodology appropriate to the research project</i></li> <li><i>3. Organize research project effectively and ethically within technical, budgetary, risk and time constraints</i></li> <li><i>4. Report effectively preliminary findings via written report and oral presentation.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Di sini pelajar akan mengintegrasikan pengetahuan yang diperoleh dalam program ini dan diaplikasi kepada projek yang menjangkau lebih dua semester. Pada semester pertama, tumpuan harus diberikan kepada melakukan kajian literatur yang berkaitan. Pada semester kedua, pelajar akan terus bekerja dalam projek yang mereka yang telah bermula pada semester pertama. Mereka akan mengikuti metodologi yang dibangunkan sebelum ini dalam melaksanakan sepenuhnya pelan kerja. Dalam setiap semester, mereka akan menyediakan laporan projek akhir dan mengemukakannya.</p> <p><i>Here students will integrate the knowledge obtained in the program and apply it to a project that spans over two semesters. In first semester, focus should be given on doing relevant literature studies. In the second semester, students will continue to work on the project that they started in the first semester. They will follow the methodology</i></p>

	<i>developed earlier in fully executing the work plan. In each semester, they will prepare a final project report and present it.</i>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 100% Peperiksaan Akhir / <i>Final Examination</i> : 0%
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. Steven R. Terrell (2016). <i>Writing a Proposal for your Dissertation: Guidelines and Examples</i>. New York: The Guilford Press</li> <li>2. Andrew Booth, Anthea Sutton and Diana Papaioannou (2013). <i>Systematic Approaches to a Successful Literature Review</i>. Los Angeles: Sage.</li> <li>3. Kothari, C.R. (2004). <i>Research Methodology: Methods and Techniques</i>. New Age International.</li> </ol>

## KIG4055: Projek Tahun Akhir 2 / *Final Year Project 2*

Kod Kursus <i>Course Code</i>	KIG4055
Tajuk Kursus <i>Course Title</i>	Projek Tahun Akhir 2 <i>Final Year Project 2</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menjalankan projek penyelidikan berdasarkan pernyataan masalah, objektif dan metodologi yang telah dikenal pasti</li> <li>2. Merumus kesimpulan dari data yang dianalisis dengan menggunakan teknik moden dan/atau alat IT</li> <li>3. Melapor secara berkesan hasil penemuan, konsep dan analisis melalui laporan bertulis dan pembentangan lisan</li> <li>4. Mengamalkan penyelidikan yang sistematik sebagai sebahagian daripada pembelajaran sepanjang hayat.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Conduct a research project based on the identified problem statement objectives and methodology</i></li> <li>2. <i>Formulate conclusion from analyzed data using modern engineering and/or IT tools</i></li> <li>3. <i>Report effectively the research findings, concepts and analyses via written report and oral presentation</i></li> <li>4. <i>Practice systematic research approaches as part of lifelong learning.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Di sini pelajar akan mengintegrasikan pengetahuan yang diperoleh dalam program ini dan diaplikasi kepada projek yang menjangkau lebih dua semester. Pada semester pertama, tumpuan harus diberikan kepada melakukan kajian literatur yang berkaitan. Pada semester kedua, pelajar akan terus bekerja dalam projek yang mereka yang telah bermula pada semester pertama. Mereka akan mengikuti metodologi yang dibangunkan sebelum ini dalam melaksanakan sepenuhnya pelan kerja. Dalam setiap semester, mereka akan menyediakan laporan projek akhir dan mengemukakannya.</p> <p><i>Here students will integrate the knowledge obtained in the program and apply it to a project that spans over two semesters. In first semester, focus should be given on doing relevant literature studies. In the second semester, students will continue to work on the project that they started in the first semester. They will follow the methodology</i></p>

	<i>developed earlier in fully executing the work plan. In each semester, they will prepare a final project report and present it.</i>
<b>Pemberatan Penilaian Assessment Weightage</b>	Penilaian Berterusan / <i>Continuous Assessment</i> : 100%
<b>Rujukan Utama Main Reference</b>	<ol style="list-style-type: none"> <li>1. Steven R. Terrell (2016). <i>Writing a Proposal for your Dissertation: Guidelines and Examples</i>. New York: The Guilford Press</li> <li>2. Andrew Booth, Anthea Sutton and Diana Papaioannou (2013). <i>Systematic Approaches to a Successful Literature Review</i>. Los Angeles: Sage.</li> <li>3. Kothari, C.R. (2004). <i>Research Methodology: Methods and Techniques</i>. New Age International.</li> </ol>



## KIG4056: Tribology / Tribology

Kod Kursus <i>Course Code</i>	KIG4056
Tajuk Kursus <i>Course Title</i>	Tribology <i>Tribology</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Huraikan hukum geseran, mekanisme geseran, ruang geseran, slip kayu, dan suhu permukaan.</li> <li>2. Menilai pelbagai jenis pakaian: pelekat, penyembunyian, pewarna, kasar, erosif, mengakis.</li> <li>3. Bandingkan jenis pelinciran: sempadan, filem pepejal, hidrodinamik, dan pelinciran hidrostatik.</li> <li>4. Memeriksa aplikasi mengenai hubungan gelongsor, kenalan bergulir, reka bentuk gelas, pemilihan lapisan, dan pelinciran.</li> </ol> <p>At the end of the course, students are able to:</p> <ol style="list-style-type: none"> <li>1. <i>Describe the laws of friction, mechanisms of friction, friction space, stick slip, and surface temperature.</i></li> <li>2. <i>Evaluate various modes of wear: adhesive, delamination, fretting, abrasive, erosive, corrosive.</i></li> <li>3. <i>Compare types of lubrication: boundary, solid-film, hydrodynamic, and hydrostatic lubrication.</i></li> <li>4. <i>Examine the applications of sliding contacts, rolling contacts, bearing designs, coating selection, and lubrication.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini membentangkan pandangan semasa dalam bidang tribologi dalam bentuk pedagogi, dengan memberi tumpuan kepada konsep-konsep asas seperti tenaga permukaan, ubah bentuk elastik dan anjal-plastik, rekahan mikro, dan interaksi permukaan dalam berskala nano. Pertimbangan khas diberikan kepada penggunaan pengetahuan asas untuk mengawal geseran dan haus tingkah laku melalui pelinciran dan pemilihan bahan-bahan dan saduran dalam situasi praktikal. Tambahan pula, kaedah eksperimen moden dibincangkan dan beberapa kajian kes digunakan untuk menunjukkan bagaimana pengetahuan tribologi asas boleh digunakan dalam reka bentuk komponen tribologi dan sistem.</p>

	<p><i>Accordingly, this course presents current insights into tribology in a pedagogical form, focusing on such fundamental concepts as surface energy, elastic and elastoplastic deformation, microfracture, and surface interactions at the micro- and nano-scale. Special considerations are given to the application of fundamental knowledge to control friction and wear behavior through lubrication and the selection of materials and coatings in practical situations. Furthermore, modern experimental methods are discussed and several case studies are used to indicate how fundamental tribology knowledge can be applied in the design of tribological components and systems..</i></p>
<p><b>Pemberatan Penilaian</b> <i>Assessment Weightage</i></p>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 100% Peperiksaan Akhir / <i>Final Examination</i>:</p>
<p><b>Rujukan Utama</b> <i>Main Reference</i></p>	<p>1.Khonsari, M, Booser, R., (2017), Applied Tribology: Bearing design and lubrication, Wiley. 2.Bhushan, B. (2013). Principles and applications of tribology. UK: John Wiley &amp; Sons. 3 Bhushan, B. (2013). Introduction to tribology. UK: John Wiley &amp; Sons. 4Stachowiak, G., &amp;Batchelor, A. W. (2013). Engineering tribology. USA: Butterworth- Heinemann.</p>

**KIG4057: Getaran Jentera dan Pemantauan Keadaan / Machinery Vibration and Condition Monitoring**

Kod Kursus <i>Course Code</i>	KIG4057
Tajuk Kursus <i>Course Title</i>	Getaran Jentera dan Pemantauan Keadaan <i>Machinery Vibration and Condition Monitoring</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Mengkaji instrumentasi getaran dan teknik pemprosesan isyarat digital yang digunakan dalam menghasilkan isyarat getaran yang tepat untuk pemantauan keadaan</li> <li>2. Menganalisa data getaran dalam domain masa, frekuensi dan fasa dalam diagnostik kegagalan umum jentera</li> <li>3. Menilai masalah getaran rumit yang melibatkan isu-isu dinamik jentera dengan menggunakan teknik-teknik analisis getaran termaju</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Examine the vibration instrumentations and digital signal processing techniques used in producing accurate vibration signal for condition monitoring</i></li> <li>2. <i>Analyse vibration data in time, frequency and phase domains for common machinery faults diagnostics</i></li> <li>3. <i>Evaluate complex vibration problem involving machinery dynamics issues using advanced vibration analysis techniques</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus dimulakan dengan asas getaran, had dan piawai getaran. Ia juga merangkumi amalan penyelenggaraan yang berbeza, teknologi terkini yang digunakan dalam skim pemantauan keadaan dan audit kualiti. Instrumentasi getaran yang digunakan dalam pengumpulan isyarat getaran dan pemantauan keadaan pintar juga dirangkumi. Teknik pemprosesan isyarat digital yang berbeza juga dibincangkan untuk memastikan isyarat getaran yang diambil adalah tepat untuk analisis getaran, ini merangkumi analisa domain masa, domain frekuensi dan fasa yang akan digunakan dalam diagnostik kkegagalan jentera. Akhirnya, teknik analisis getaran termaju seperti analisa ragaman, analisa 'ODS', dan aplikasi teknik ini dalam projek industri akan dibincang dan dikongsikan.</p> <p><i>The course starts with the fundamentals of vibration, limits and standards of vibration. It also covers different maintenance practices,</i></p>

	<i>the latest technologies used condition monitoring scheme and Quality Auditing. Vibration instrumentations used in vibration collection and smart condition monitoring are also covered. Different digital signal processing techniques are discussed to ensure accurate vibration signal is acquired for vibration analysis, this includes time domain, frequency domain and phase analyses which are used in machinery faults diagnostics. Lastly, advanced vibration analysis techniques such as Modal Analysis, Operating Deflection Shape Analysis and their real industrial application are covered and shared.</i>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. Daniel J. Inman. (2021). Engineering Vibrations, International Edition (5th ed.). Upper Saddle River, NJ: Pearson.</li> <li>2. Brandt, A. (2011). Noise and vibration analysis : signal analysis and experimental procedures, Chichester: Wiley.</li> <li>3. Robert Bond Randall. (2021). Vibration-based Condition Monitoring: Industrial, Aerospace and Automotive Applications, (2nd ed.). Chichester: Wiley.</li> </ol>

## KIG4058: Kejuruteraan Akustik dan Kawalan Hingar / *Engineering Acoustics and Noise Control*

Kod Kursus <i>Course Code</i>	KIG4058
Tajuk Kursus <i>Course Title</i>	<i>Engineering Acoustics and Noise Control</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menjelaskan konsep-konsep dan istilah-istilah akustik dan kawalan hingar.</li> <li>2. Menganalisa propagasi dan penyerakan bunyi di dalam ruang terbuka dan tertutup.</li> <li>3. Menilai kesan dan tahap pendedahan hingar dalam pelbagai situasi menggunakan pengukuran bunyi dan kawalan yang sesuai.</li> <li>4. Mengaplikasikan kaedah yang sesuai bagi penyelesaian akustik dan kawalan hingar dalam situasi tertentu.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Describes concepts and acoustic and noise control concepts and terms.</i></li> <li>2. <i>Analyzes propagation and scattering of sound in open and closed space.</i></li> <li>3. <i>Evaluate the impact and degree of noise exposure in various situations using appropriate sound and control measurements.</i></li> <li>4. <i>Apply appropriate methods for acoustic and noise control solutions in certain situations.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Objektif utama kursus ini adalah untuk memberi pengetahuan dan kefahaman melibatkan prinsip-prinsip asas dan aplikasi-aplikasi akustik dan kawalan hingar. Kursus ini merangkumi pembelajaran mengenai akustik fizikal, gelombang bunyi di dalam satu, dua dan tiga dimensi, propagasi bunyi di dalam ruang terbuka dan tertutup, penggunaan penghadang bunyi, fisiologi pendengaran, kesan-kesan bunyi terhadap manusia, peralatan untuk mengukur dan menghasilkan bunyi, pengukuran dan analisa bunyi dan pembelajaran prinsip- prinsip kawalan hingar beserta contoh-contoh dan aplikasi- aplikasi.</p>

	<i>The goal of this course is to provide knowledge and understanding concerning the basic principles and applications of acoustics and noise control. This course includes the study of physical acoustics, sound waves in one, two and three dimensions, the propagation of sound in open and enclosed spaces, the use of sound barriers, the physiology of hearing, the effects of sound on humans, instrumentation for measuring and generating sound, the measurement and analysis of sound and the study of noise control principles and examples and its applications</i>
<b>Pemberatan Penilaian Assessment Weightage</b>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
<b>Rujukan Utama Main Reference</b>	<ol style="list-style-type: none"> <li>1 Malcolm J. Crocker, Jorge P. Arenas. (2020). Engineering Acoustics: Noise and Vibration Control (1st ed.): Wiley.</li> <li>2 Bies D., Hansen C., 2017, Engineering Noise Control: Theory and Practice (4th Ed.): SPON Press.</li> <li>3 Moser, M., 2013, Engineering Acoustics – An Introduction to Noise Control (2nd ed.), Verlag Berlin Heidelberg: Springer.</li> </ol>

## KIG4059: Enjin Pembakaran Dalam / *Internal Combustion Engine*

Kod Kursus <i>Course Code</i>	KIG4059
Tajuk Kursus <i>Course Title</i>	Enjin Pembakaran Dalam <i>Internal Combustion Engine</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menghuraikan komponen, prinsip operasi, dan ciri-ciri kecekapan enjin pembakaran dalam.</li> <li>2. Menentukan ciri-ciri pembakaran optimum dari segi nisbah udara-minyak, pembentukan bahan pencemar, sistem pemindahan haba dan parameter lain yang berkaitan</li> <li>3. Membincangkan tenaga haba hilang akibat kesan penyejuk, geseran dan ciri-ciri pelinciran.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Describe components, operating principle and efficiency characteristics of internal combustion engines.</i></li> <li>2. <i>Determine the optimized combustion characteristics in terms of air fuel ratio, pollutant formation, heat transfer systems and other related parameters.</i></li> <li>3. <i>Discuss thermal energy lost due to the effect of coolant, friction and lubrication characteristics</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini memperkenalkan komponen enjin, prinsip operasi untuk standard udara yang ideal, kitaran sebenar dan ciri-ciri kecekapan enjin pembakaran dalaman. Pengoptimuman pada pembakaran akan dicapai menggunakan bahan api baru seperti biofuel, ciri-ciri bahan api, nisbah udara-bahan api, sistem EGR, sistem pengambilan bahan api dan kesannya pada ciri-ciri operasi enjin. Prestasi, pembentukan pencemaran dan mekanisme pemindahan haba bagi kedua-dua SI dan enjin CI akan dikaji. Kursus ini juga akan membincangkan kecekapan haba hilang akibat haba hilang melalui penyejuk, geseran dan ciri-ciri pelinciran.</p> <p><i>This course introduces engine components, operating principle for ideal air standard, real cycles and efficiency characteristics of internal combustion engines. The optimization on combustion will be achieved using new fuels such as biofuels, fuels properties, air-fuel ratio, EGR system, fuel intake system and their effect on engine operating characteristics. The performance, pollution formation and heat transfer mechanism for both SI and CI engines will be studied. This course will</i></p>

	<i>also discuss the thermal efficiency lost due to heat lost through coolant, friction and lubrication characteristics.</i>
<b>Pemberatan Penilaian Assessment Weightage</b>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
<b>Rujukan Utama Main Reference</b>	1. Heywood, J. B. (2018). Internal combustion engine fundamentals. New York: McGraw-hill. 2 Robert Bosch GmbH (2019), Bosch Automotive Handbook, Wiley 2019. 3 James Taylor (2017), Rover V8-The Story of the Engine, Veloce Publishing Ltd 4 Ganesan, V. (2014). Internal combustion engines, 4th Edition. India: McGraw Hill Education.



## KIG4060: Peralatan Penukar Haba / *Heat Exchanger Equipments*

Kod Kursus <i>Course Code</i>	KIG4060
Tajuk Kursus <i>Course Title</i>	Peralatan Penukar Haba <i>Heat Exchanger Equipments</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1 Membandingkan pelbagai jenis penukar haba berdasarkan ciri-cirinya.</li> <li>2 Menilai prestasi operasi penukar haba.</li> <li>3 Merekabentuk penukar haba untuk aplikasi sebenar.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1 <i>Compare different types of heat exchangers based on its characteristics.</i></li> <li>2 <i>Evaluate operation performances of heat exchangers.</i></li> <li>3 <i>Design a heat exchanger for an actual application.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Dalam kursus ini, ciri-ciri pelbagai jenis penukar haba dan keadaan operasinya akan diuraikan. Penilaian prestasi terma penukar haba akan dibincangkan secara terperinci. Ini termasuk penilaian mengenai jenis aliran dan penurunan tekanan dalam penukar haba. Kajian kes untuk pemilihan reka bentuk dan penilaian haba untuk penukar haba akan diselesaikan dalam kursus ini.</p> <p><i>In this course, detailed characteristics of various types of heat exchanger and its operation conditions will be elaborated. Evaluation of the thermal performance of heat exchangers will be discussed in detail. This includes assessment on flow types and pressure drop in a heat exchanger. A case study for a design selection and thermal evaluation of a heat exchanger will be carry out in this course.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 40% Peperiksaan Akhir / <i>Final Examination</i>: 60%</p>
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1 Cengel, Y.A., Ghajar, A.J. ( 2015). Heat and Mass Transfer: Fundamentals and Applications, 5th Edition. New York: McGraw-Hill.</li> <li>2 Kakac, S., Liu, H., Pramuanjaroenkij, A. (2012). Heat Exchangers: Selection, Rating, and Thermal Design, 3th Edition. Broken Sound Tarkway, NW: CRC Press, Taylor &amp; Francis Group.</li> <li>3 Shah, R. K., &amp; Sekulic, D. P. (2003). Fundamental of Heat Exchnager Design, 2th Edition. New Jersey: John Wiley &amp; Sons, Inc.</li> </ol>

## KIG4061: Ciri-ciri dan Aplikasi Pam / *Pump Characteristics and Application*

Kod Kursus <i>Course Code</i>	KIG4061
Tajuk Kursus <i>Course Title</i>	Ciri-ciri dan Aplikasi Pam <i>Pump Characteristics and Application</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Membandingkan pelbagai jenis pam berdasarkan ciri- cirinya.</li> <li>2. Menilai prestasi pam pada keadaan operasinya.</li> <li>3. Merekabentuk sistem pam berdasarkan rangkaian paip dan operasinya dalam aplikasi sebenar.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Compare different types of pumps based on its characteristics.</i></li> <li>2. <i>Evaluate performances of a pump during its operation.</i></li> <li>3. <i>Design pump system based on its piping network and operation conditions in an actual application.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Dalam kursus ini, ciri-ciri pelbagai jenis pam dan keadaan operasinya akan dibincangkan. Ini merangkumi kaedah untuk menilai prestasi pam. Penilaian operasi pam tanpa keadaan berudara untuk operasi berterusan tanpa rosak pra-matang akan dibincangkan. Pengiraan kadar aliran operasi dan perubahan tekanan mengikut sistem hidrauliknya akan dikira. Kajian kes sebenar akan disiasat dalam kursus ini.</p> <p><i>In this course, detailed characteristics of various types of pumps and its operation conditions will be elaborated. This includes methods to evaluation of a pump performance. Assessment of pump operation with no cavitation condition in-order for a continuous running without a premature failure will discussed. The calculation of the operating flowrate and head changes according to its hydraulic system will be calculated. A real case study will be investigated in this course.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 60% Peperiksaan Akhir / <i>Final Examination</i> : 40%
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1 Cengel, Y.A., Cimbala, J.M. ( 2018). Fluid Mechanics: Fundamentals and Applications, 4th Edition. New York: McGraw-Hill.</li> <li>2 Volk, M. (2013). Pump Characteristics and Applications, 3th Edition. Broken Sound Tarkway, NW: CRC Press, Taylor &amp; Francis Group.</li> </ol>

	3 Lobanoff, V. S., & Ross, R. R. (2013). Centrifugal Pumps: Design & Application, 2th Edition. Oxford: Butterworth-Heinemann.
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## KIG4062: Mekanik Bendalir Berkomputer / *Computational Fluid Dynamics*

Kod Kursus <i>Course Code</i>	KIG4062
Tajuk Kursus <i>Course Title</i>	Mekanik Bendalir Berkomputer <i>Computational Fluid Dynamics</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menentukan kesedaran yang kritikal persamaan mekanik bendalir dan sifat-sifat matematik mereka dalam formulasi yang pelbagai.</li> <li>2. Menilai prinsip-prinsip dan batasan teknik alternatif bagi simulasi aliran bergelora dan peralihan.</li> <li>3. Menilai sumber potensi ralat dan ketidakpastian simulasi berangka.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Determine a critical awareness of the governing equations of fluid mechanics, and their mathematical properties, in various formulations.</i></li> <li>2. <i>Appraise the principles and limitations of alternative techniques for the simulation of turbulent and transitional flows.</i></li> <li>3. <i>Evaluate the potential sources of error and uncertainty in numerical simulations.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini akan menyediakan pelajar dengan kefahaman yang jelas terhadap penggunaan simulasi pengiraan dan teknik-teknik pemodelan digunakan untuk masalah kejuruteraan. Ia juga akan menyediakan perspektif struktur data canggih, algoritma dan reka bentuk perisian. Pengenalan kepada kaedah pengkomputeran teragih dan berprestasi tinggi juga akan pelajari.</p> <p><i>The course will provide students with a sound understanding of the use of computational simulation and modeling techniques applied to engineering problems. It will also provide insight into advanced data structures, algorithms and software design. An introduction to distributed and high performance computing methods will also be included.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 100% Peperiksaan Akhir / <i>Final Examination</i> : %

<p>Rujukan Utama <i>Main Reference</i></p>	<ol style="list-style-type: none"><li>1 H.K Versteeg, W. Malalasekera, An Introduction to Computational Fluid Dynamics, Pearson Education, 2nd Edition (2011).</li><li>2 Klaus A. Hoffmann, Steve T Chiang, Computational Fluid Dynamics, Vol 1,2,3, 4th Edition, A Publication of Engineering Education System, 2000.</li><li>3 Joel H. Ferziger, M. Peric, Computational Methods for Fluid Dynamics, World Publishing Corporation, 2012</li><li>4 John Anderson, Computational Fluid Dynamics: An Introduction, 3rd Edition, Springer- Verlag Berlin Heidelberg,2009</li></ol>
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## KIG4063: Pemanas, Pengudaraan, Pendingin Udara dan Penyejukan / Heating, Ventilation, Air Conditioning and Refrigeration

Kod Kursus <i>Course Code</i>	KIG4063
Tajuk Kursus <i>Course Title</i>	Pemanas, Pengudaraan, Pendingin Udara dan Penyejukan <i>Heating, Ventilation, Air Conditioning and Refrigeration</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	KIG2010
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1 Mengenalpasti konsep fizikal asas sistem HVAC dan proses psikrometrik</li> <li>2 Mengaplikasikan dua kaedah yang berbeza untuk mengira beban penyejukan; kaedah keseimbangan haba (HBM) dan kaedah siri masa berseri (RTSM)</li> <li>3 Mengaplikasikan konsep pengiraan tenaga dan simulasi bangunan untuk menganggarkan penggunaan tenaga tahunan dalam sistem HVAC</li> <li>4 Menilai kaedah untuk lokasi dan pemilihan penyebar untuk menyampaikan jumlah udara yang sesuai dengan jumlah tekanan yang diperlukan pada tahap bunyi yang boleh diterima dalam sistem HVAC</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Identify the fundamental physical concepts of HVAC systems and psychrometric processes</i></li> <li>2. <i>Apply two different methods for calculating cooling loads; the heat balance methods (HBM) and the radiant time series methods (RTSM)</i></li> <li>3. <i>Apply the concepts of energy calculations and building simulation for estimating yearly energy consumption in HVAC systems</i></li> <li>4. <i>Evaluate the methods for location and the selection of diffusers to deliver the proper amount of air with the required total pressure at acceptable noise level in HVAC systems</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Konsep-konsep fizikal asas sistem HVAC, pelbagai proses yang melibatkan udara atmosfera lembap dalam sistem HVAC, faktor-faktor yang menyediakan persekitaran yang selesa dan sihat untuk penghuni bangunan, ungkapan pemindahan haba untuk mengira penghantaran haba dalam struktur bangunan, kesan radiasi solar terhadap kedua-dua pertambahan haba dan kehilangan haba bangunan, kaedah untuk mengira beban penyejukan: kaedah baki haba (HBM) dan kaedah siri masa yang berseri (RTSM), konsep pengiraan tenaga dan simulasi bangunan untuk menganggarkan penggunaan tenaga tahunan dalam sistem HVAC, kaedah untuk lokasi dan pemilihan peresap untuk

	<p>menyampaikan jumlah udara yang betul dengan jumlah tekanan yang diperlukan pada tahap bunyi yang boleh diterima dalam sistem HVAC. <i>Fundamental physical concepts of HVAC systems, the various processes involving moist atmospheric air in HVAC systems, factors that provide a comfortable and healthful environment for building occupants, heat transfer expressions to compute heat transmission in building structures, the solar radiation effects on both the heat gain and the heat loss of a building, methods for calculating cooling loads: the heat balance method (HBM) and the radiant time series method (RTSM), the concepts of energy calculations and building simulation for estimating yearly energy consumption in HVAC systems, methods for location and selection of diffusers to deliver the proper amount of air with the required total pressure at acceptable noise level in HVAC systems</i></p>
<p>Pemberatan Penilaian <i>Assessment Weightage</i></p>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 40% Peperiksaan Akhir / <i>Final Examination</i>: 60%</p>
<p>Rujukan Utama <i>Main Reference</i></p>	<ol style="list-style-type: none"> <li>1. Mitchell J.W. and J.E. Braun, Principles of Heating, Ventilation and Air Conditioning in Buildings, John Wiley and Sons, NJ, USA, 2013.</li> <li>2. MCQUISTON, F. C. &amp; PARKER, J. D. 2005. Heating, ventilating, and air conditioning: analysis and design.</li> <li>3. Nihal W.E., Principles of Heating Ventilation and Air Conditioning with Worked Examples, World Scientific, 2015</li> <li>4. ASHRAE Handbook: HVAC Systems and Equipment, ASHRAE, 2020</li> <li>5.</li> <li>6. ASHRAE. HVAC Applications Handbook, Chapter 57: Room air distribution. Atlanta (GA): ASHRAE; 2020.</li> </ol>

## KIG4064: Reka Bentuk Faktor Kemanusiaan / *Human Factors Design*

Kod Kursus <i>Course Code</i>	KIG4064
Tajuk Kursus <i>Course Title</i>	Reka Bentuk Faktor Kemanusiaan <i>Human Factors Design</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menentukan kepentingan faktor kemanusiaan dalam reka bentuk system</li> <li>2. Mencadangkan reka bentuk sistem berdasarkan prinsip dan garis panduan faktor kemanusiaan</li> <li>3. Menilai reka bentuk sistem untuk faktor kemanusiaan menggunakan kaedah-kaedah yang sesuai</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Determine the importance of human factors in system design.</i></li> <li>2. <i>Propose system design based on human factors principles and guidelines.</i></li> <li>3. <i>Asses system design for human factors using appropriate methods</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini memfokuskan pelajar terhadap faktor manusia dalam reka bentuk produk. dalam mana-mana sistem kejuruteraan akan selalu ada keperluan untuk pengendali manusia sama ada dalam kawalan fizikal atau sebagai penyelia kognitif sistem kejuruteraan. Oleh itu, kursus ini bertujuan untuk menanamkan keupayaan para jurutera reka bentuk untuk memahami dan memasukkan elemen faktor manusia dalam reka bentuknya yang sangat penting dalam memastikan sistem yang dibina selamat, selesa dan cekap. dalam kursus ini merangkumi topik dalam pendekatan reka bentuk faktor manusia, antropometri dalam reka bentuk, biomekanik manusia di tempat kerja, kawalan dan paparan untuk interaksi manusia, reka bentuk kognitif dan juga akan melihat aplikasi dan keprihatinan faktor manusia dalam konteks industri.</p> <p><i>This course focuses student towards human factors in product design. in any engineering system there will always be a need for the human operator either in physical control or as a cognitive supervisor of the engineering system. Thus this course is intended to instill design engineers the ability to understand and incorporate the human factors element in their design which is critical in ensuring the system being built is safe, comfortable and efficient. in this course it covers topics in human factors design approaches, anthropometry in design, biomechanics of human at work, control and display for human</i></p>



	<i>interaction, cognitive design and will also look into the application and concerns of human factors within the industrial context.</i>
<b>Pemberatan Penilaian Assessment Weightage</b>	Penilaian Berterusan / <i>Continuous Assessment</i> : 50% Peperiksaan Akhir / <i>Final Examination</i> : 50%
<b>Rujukan Utama Main Reference</b>	<ol style="list-style-type: none"> <li>1. Benjamin Niebel and Andris Freivalds.. <i>Methods, Standards and Work Design</i>. McGraw Hill 2013</li> <li>2. Karl H. E. Kroemer, <i>Fitting the Human: Introduction to Human factors</i>, Sixth Edition, Taylor and Francis, 2017.</li> <li>3. Garviel Salvendy, <i>Handbook of human factors and human factors</i> 3rd ed. John Wiley, 2012.</li> </ol>

## KIG4065: Reka Bentuk Mampan / Sustainable Design

Kod Kursus <i>Course Code</i>	KIG4065
Tajuk Kursus <i>Course Title</i>	Reka Bentuk Mampan <i>Sustainable Design</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Mengenal pasti perkaitan antara model proses pembuatan dan metrik pembuatan lestari untuk peningkatan produk dan proses</li> <li>2. Mengkaji kesan kelestarian proses pembuatan reka bentuk produk, fasa penggunaan produk, dan akhir hayat produk menggunakan kaedah dan alat yang sesuai.</li> <li>3. Mencadang prestasi kelestarian dan penambahbaikan kepada khalayak dalaman dan luaran.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Identify the link between manufacturing process models and sustainable manufacturing metrics for product and process improvement</i></li> <li>2. <i>Examine the sustainable impacts of product design manufacturing processes, product use-phase, and product end-of-life using appropriate methods and tools.</i></li> <li>3. <i>Propose sustainability performance and improvement to internal and external audiences.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Organisasi semakin diperlukan untuk berlanjutan dan permintaan untuk kelestarian ini merangkumi bidang pembuatan. Namun, ada kekaburan dan perbezaan tafsiran yang besar mengenai apa yang dimaksudkan dengan pembuatan lestari. Kursus ini akan memberi asas untuk memahami kesan keperluan kelestarian pada reka bentuk dan pembuatan. Kursus kemudian diteruskan kepada pelajar yang mempunyai kemahiran dalam menilai prestasi yang berterusan. Akhirnya pelajar akan didedahkan dengan pendekatan dalam menyampaikan prestasi berterusan dan cadangan penambahbaikan kepada pihak berkepentingan yang berkaitan.</p> <p><i>Organizations are increasingly required to be sustainable and this call for sustainability extends into the realm of manufacturing. However, there is substantial ambiguity and differences in interpretation regarding what is meant by sustainable manufacturing. This course will provide the basis for understanding on the impact of sustainability requirements on design and manufacturing. The course later proceeds to the enabling students with skills in assessing the sustainable</i></p>

	<i>performance. Finally students will be exposed to approaches in conveying sustainable performance and improvements proposal to relevant stakeholders.</i>
<b>Pemberatan Penilaian Assessment Weightage</b>	Penilaian Berterusan / <i>Continuous Assessment</i> : 50% Peperiksaan Akhir / <i>Final Examination</i> : 50%
<b>Rujukan Utama Main Reference</b>	<p>1.Rainer StarkGünther SeligerJérémy Bonvoisin, Sustainable Manufacturing: Challenges, Solutions and Implementation Perspectives, 2017, Springer Open</p> <p>2Helen Lewis, Product Stewardship in Action, The Business Case for Life-cycle Thinking, 2016, Routledge</p> <p>3.Surendra M. Gupta, Mehmet Ali Ilgin, Multiple Criteria Decision Making Applications in Environmentally Conscious Manufacturing and Product Recovery, 2017 CRC Press</p> <p>4.Günther Seliger, Sustainability in Manufacturing Recovery of Resources in Product and Material Cycles, 2007 Springer</p>

## KIG4066: Teknologi Pembuatan Pantas / *Rapid Manufacturing Technology*

Kod Kursus <i>Course Code</i>	KIG4066
Tajuk Kursus <i>Course Title</i>	Teknologi Pembuatan Pantas <i>Rapid Manufacturing Technology</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p><i>Di akhir kursus ini, pelajar dapat:</i></p> <ol style="list-style-type: none"> <li>1. Mengaplikasi konsep kejuruteraan balikan untuk teknologi pembuatan pantas</li> <li>2. Mengaplikasi penggunaan CAD dalam pembuatan pantas.</li> <li>3. Menjustifikasikan applikasi konsep pembuatan pantas dalam industri.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Apply the concept of reverse engineering for rapid manufacturing technology</i></li> <li>2. <i>Apply the Computer Aided Design in rapid prototyping</i></li> <li>3. <i>Justify the application of rapid manufacturing concept in industry.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Tujuan kursus ini adalah untuk memperkenalkan pelajar mengenai konsep Teknologi Pembuatan Pantas kerana ini merupakan salah satu teknik yang biasa digunakan dalam industri pada masa kini. Konsep utama yang diperkenalkan bagi kursus ini merangkumi proses pendigitalan seperti penjanaan dan manipulasi model 3D dari data yang diimbas, penghasilan objek fizikal melalui penggunaan teknik RP dan penghasilan alat menggunakan teknik perkakas pantas untuk applikasi Teknologi Pembuatan Pantas.</p> <p><i>The aim of this course is to introduce students to the concept of Rapid Manufacturing Technology as it is one of the most common techniques used in the industry today. The main concepts that are introduced for this course include digitization process such as generation and manipulated of 3D model from scanned data, generation of physical object through the use of RP techniques and developing tools using rapid tooling technique for Rapid Manufacturing Technolog application</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 50% Peperiksaan Akhir / <i>Final Examination</i> : 50%
Rujukan Utama <i>Main Reference</i>	1. Ian Gibson, David Rosen, Brent Stucker, Mahyar Khorasani, Springer Nature (2020), Additive Manufacturing Technologies

	<ol style="list-style-type: none"><li>2. Kaushik Kumar, Divya Zindani, J. Paulo Davim, Walter de Gruyter GmbH &amp; Co KG (2020)</li><li>3. - Technology &amp; Engineering Rapid Prototyping, Rapid Tooling and Reverse Engineering: From Biological Models to 3D Bioprinters</li><li>4. Duc Pham, S. S. Dimov, , (2012) Rapid Manufacturing : The Technologies and Applications of Rapid Prototyping and Rapid Tooling</li><li>5. 1.Raja, V, Fernandes, K.J. Reverse Engineering: An Industrial Perspective, Springer- Verlag, London, 2008</li><li>6. Neil Hopkinson, Richard Hague, Philip Dickens, John Wiley &amp; Sons (Feb 2006), Rapid Manufacturing: An Industrial Revolution for the Digital Age</li></ol>
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## KIG4067: Strategi Pembuatan / *Manufacturing Strategy*

Kod Kursus <i>Course Code</i>	KIG4067
Tajuk Kursus <i>Course Title</i>	Strategi Pembuatan <i>Manufacturing Strategy</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Mengenalpasti impak strategik bagi strategi operasi pembuatan ke atas daya saing syarikat.</li> <li>2. Menilai pendekatan strateji-strateji pembuatan yang berbeza bagi setiap suasana pembuatan dan perkhidmatan.</li> <li>3. Mengemukakan strategi-strateji pembuatan untuk konteks perniagaan yang berbeza.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Recognise the impact of manufacturing operational strategy for company competitiveness.</i></li> <li>2. <i>Evaluate different manufacturing strategies used in various manufacturing and service environment</i></li> <li>3. <i>Propose manufacturing strategies for different business context.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Tujuan kursus ini ialah untuk meningkatkan kefahaman pelajar akan peranan strategik fungsi pembuatan di dalam konteks keseluruhan perniagaan. Tema terpenting sepanjang kursus ini untuk menunjukkan betapa pentingnya bahagian pembuatan dan operasi di masukkan ke dalam pelaksanaan strategi perniagaan dan korporat untuk syarikat pembuatan. Pelajar akan didedahkan dengan pelbagai proses membuat keputusan didalam bahagian pembuatan kerana ianya akan memberi kesan kepada kebolehan syarikat untuk mencapai tujuan-tujuan dan untuk melaksanakan strategi-strategi secara keseluruhan.</p> <p><i>The aim of this course is to raise the students' understanding of the strategic role of the manufacturing function within the wider business context. A major theme throughout the course is the primary importance of manufacturing and operations in the formulation and implementation of business and corporate strategy in manufacturing-based companies. The student will be exposed to various strategic decisions within manufacturing as they affect the ability of the firm to achieve its goals and carry out its strategies</i></p>

Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1 Manufacturing Operations Strategy (3rd edition) by Alex Hill and Terry Hillrentice Hall, 2020</li> <li>2 Operations Strategy by Nigel Slack and Michael Lewis, Pearson, 2014</li> <li>3 Roberta S. Russel, and Bernard W. Taylor. (2017). Operations Management, 9th Edition, Wiley</li> </ol>

## KIG4068: Pembelajaran Mesin / *Machine Learning*

Kod Kursus <i>Course Code</i>	KIG4068
Tajuk Kursus <i>Course Title</i>	Pembelajaran Mesin <i>Machine Learning</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menerangkan prinsip asas pembelajaran mesin dan penerapan algoritma pembelajaran mesin terhadap pelbagai jenis data dan masalah bersamaan dengan kekuatan dan batasannya.</li> <li>2. Menganalisa hasil yang diperolehi daripada pelbagai algoritma pembelajaran mesin.</li> <li>3. membangunkan aturcara pembelajaran mesin melalui satu perisian yang sesuai untuk menyelesaikan masalah praktik.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Explain the fundamental principles of machine learning and the applicability of the machine learning algorithms to different types of data and problems along with their strengths and limitation.</i></li> <li>2. <i>Analyse the outcome obtained from various machine learning algorithms.</i></li> <li>3. <i>Develop machine learning program via a suitable software for solving practical problem.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Pembelajaran mesin adalah komponen penting dalam sistem kejuruteraan yang baru muncul di industri 4.0. Ia memberi kemampuan komputer untuk mempelajari sesuatu tugas tanpa diaturcarakan secara ekstensif untuk melakukannya. Ini dapat dicapai melalui mengajar komputer untuk mencari corak dalam data sendiri melalui algoritma pembelajaran mesin. Kursus ini memperkenalkan algoritma pembelajaran yang diselia dan tanpa diselia untuk menyelesaikan masalah praktikal. Algoritma pembelajaran mesin tersebut boleh belajar daripada data untuk membuat ramalan baru mengenai data baru. Sebagai balasnya, jurutera dapat menggunakan teknik pembelajaran mesin untuk pemodelan sistem yang kompleks, untuk meramalkan hasil yang diinginkan yang sukar untuk dimodelkan menggunakan teknik pemodelan konvensional.</p>



	<p><i>Machine learning is an essential component of emerging engineering systems in industry 4.0. It gives the computer ability to learn a task without being specifically programmed to do so. This can be accomplished through teaching computers how to find patterns in data on their own via machine learning algorithms. This course introduces the supervised and unsupervised learning algorithms to solve practical problem. Those machine learning algorithms can learn from data to make new prediction about new data. In return, engineer can use the machine learning technique for complex system modelling, in order to predict the desired outcome that is difficult to be modelled using conventional modelling technique.</i></p>
<p>Pemberatan Penilaian <i>Assessment Weightage</i></p>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 40% Peperiksaan Akhir / <i>Final Examination</i>: 60%</p>
<p>Rujukan Utama <i>Main Reference</i></p>	<ol style="list-style-type: none"> <li>1 Phil, K. (2017). MATLAB Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence. California: Apress.</li> <li>2 Michael, P., Stephanie, T. (2017) MATLAB Machine Learning. California: Apress.</li> <li>3 Abhishek, K.P., Pramod, S.R., Balamurugan, S. A. (2019). Practical Approach for Machine Learning and Deep Learning Algorithms: Tools and Techniques Using MATLAB and Python. India: BPB Publications</li> <li>4 MathWorks (2020). MATLAB Statistics and Machine Learning Toolbox™ Users Guide. Natick, MA: The MathWorks.</li> </ol>

## KIG4069: Kejuruteraan Seramik / Ceramic Engineering

Kod Kursus <i>Course Code</i>	KIG4069
Tajuk Kursus <i>Course Title</i>	Kejuruteraan Seramik <i>Ceramic Engineering</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1 Menilai sifat-sifat bahan seramik berdasarkan struktur atom dan struktur mikro.</li> <li>2 Memilih kaedah pemprosesan untuk mendapatkan bahan seramik dengan sifat yang diinginkan.</li> <li>3 Menggunakan bahan seramik dalam reka bentuk kejuruteraan.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Evaluate the properties of a ceramic material based on its atomic structure and microstructure.</i></li> <li>2. <i>Choose a processing method to obtain a ceramic material with desired properties.</i></li> <li>3. <i>Use ceramic materials in engineering design.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini akan dimulakan dengan melihat secara terperinci struktur atom dan struktur mikro seramik. Hubungan ini dengan sifat material akan dibincangkan. Perhatian akan diberikan kepada pengembangan struktur mikro semasa pemprosesan seramik. Akhirnya, pertimbangan reka bentuk akan dibincangkan, yang membolehkan para jurutera menggunakan seramik dalam reka bentuk kejuruteraan.</p> <p><i>This course will start with a detailed look at the atomic structure and the microstructure of ceramics. The relation of these with the material properties will be discussed. Attention will be given to the development of the microstructure during the processing of the ceramic. Finally, design considerations will be discussed, allowing engineers to make use of ceramics in engineering design.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. Richerson, D. W., Lee, W. E. (2018) Modern Ceramic Engineering: Properties, Processing, and Use in Design. Boca Raton: CRC Press</li> <li>2. Reed, J. S. (1995) Principles of Ceramics Processing. New York: John Wiley &amp; Sons.</li> <li>3.</li> </ol>

	4. Barsoum, M. (2020) Fundamentals of Ceramics. Boca Raton: CRC Press
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## KIG4070: Pemodelan Konstitutif Bahan / *Constitutive Modeling of Materials*

Kod Kursus <i>Course Code</i>	KIG4070
Tajuk Kursus <i>Course Title</i>	Pemodelan Konstitutif Bahan <i>Constitutive Modeling of Materials</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>None</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menilai tindak balas mekanikal bahan termasuk keanjalan, likat-anjal, keplastikan anjal dan likat-plastik</li> <li>2. Menentukan persamaan konstitutif yang relevan untuk tindak balas tekanan bahan kejuruteraan</li> <li>3. Menganalisa tekanan komponen menggunakan model konstitutif yang sesuai</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Evaluate mechanical responses of materials including elasticity, viscoelasticity, elasto-plasticity and viscoplasticity</i></li> <li>2. <i>Determine relevant constitutive equations for the stress- strain response of engineering materials</i></li> <li>3. <i>Analyse stress of components using suitable constitutive models</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini bermula dengan gambaran ringkas mengenai peranan pemodelan juzuk dalam pelbagai aplikasi kejuruteraan. Perbincangan mengenai vektor dan algebra tegang akan mengikuti dengan penekanan yang diberikan terhadap operasi matematik mereka yang berkaitan. Ciri- ciri umum tekanan dan tegang terikan akan diterokai. Notion persamaan konstitutif yang berkaitan dengan tekanan tegang kepada tegang terikan akan diperkenalkan. Empat jenis tingkah laku mekanikal yang diperhatikan dalam bahan-bahan akan dibincangkan termasuk keanjalan linear, hiperelasticity, viscoelasticity dan elasto-plasticity. Model-model juzuk yang berkaitan dengan setiap tingkah laku bahan akan diperolehi dan dibincangkan.</p> <p><i>The course starts with a brief overview of the role of constitutive modeling in various engineering applications. The discussion on vector and tensor algebra will follow with emphasis given on their relevant mathematical operations. The general features of stress and strain tensors will be explored. The notion of constitutive equations relating the stress tensor to strain tensor will be introduced. Four types of mechanical behavior observed in materials will be discussed including linear elasticity, hyperelasticity, viscoelasticity and elasto-plasticity. The</i></p>

	<i>constitutive models relevant to each material behavior will be derived and discussed.</i>
<b>Pemberatan Penilaian Assessment Weightage</b>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
<b>Rujukan Utama Main Reference</b>	<ol style="list-style-type: none"> <li>1. Vladimir Buljak and Gianluca Ranzi. <i>Constitutive Modeling of Engineering Materials. Theory, Computer Implementation, and Parameter Identification</i>. Elsevier. 2021.</li> <li>2. Gerhard A. Holzapfel. <i>Nonlinear Solid Mechanics. A Continuum Approach for Engineering</i>. John Wiley. 2000.</li> <li>3. N. E. Dowling. <i>Mechanical Behavior of Materials: Engineering Methods for Deformation, Fracture and Fatigue</i>. Pearson Prentice Hall. 2018.</li> </ol>

## KIG4071: Pembungkusan Elektronik / *Electronic Packaging*

Kod Kursus <i>Course Code</i>	KIG4071
Tajuk Kursus <i>Course Title</i>	Pembungkusan Elektronik <i>Electronic Packaging</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1 Membincang aspek teknikal dan ekonomi pembuatan pembungkusan elektronik</li> <li>2 Memilih teknologi dan bahan pembungkusan yang sesuai untuk aplikasi yang berbeza</li> <li>3 Mencadangkan penyelesaian untuk masalah pembungkusan yang berkaitan dengan pengurusan haba dan kebolehpercayaan</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Discuss the technical and economic aspects of electronic packaging manufacturing</i></li> <li>2. <i>Choose appropriate packaging technology and materials for different applications</i></li> <li>3. <i>Propose solutions to packaging problems related to thermal management and reliability</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini memperkenalkan asas-asas elektronik, memberi gambaran keseluruhan proses fabrikasi cip bersepadu (IC) dan kepentingan pembuatan elektronik kepada ekonomi negara dan dunia. Dalam kursus ini, hierarki pembungkusan (pembungkusan tahap pertama, kedua, dan ketiga), taksonomi pembungkusan, teknologi pemasangan IC (penyediaan cip IC untuk pembungkusan, kepilan cip, ikatan wayar, ikatan pita automatik dan ikatan pembalikan cip), papan litar bercetak dan bahan-bahan substrat lain, pematerian dan penyambungan akan diperkenalkan. Di samping itu, pengurusan haba dalam pembungkusan, kebolehpercayaan pembungkusan elektronik, dan kemajuan terkini dalam pembungkusan elektronik juga akan diperkenalkan dalam kursus ini</p> <p><i>This course reviews the basics of electronics, overview of integrated chip (IC) fabrication process and the importance of electronic manufacturing to the national and world economy. In this course, the packaging hierarchy (first, second, and third level packaging), packaging taxonomy, IC assembly technologies (preparation of IC chip for packaging, die attach, wire bonding, tape automated bonding and flip chip bonding), printed circuit boards and substrates, soldering, and</i></p>

	<i>interconnection materials will be covered. In addition, thermal management in packaging, reliability of electronic packages, and recent advances in packaging will also be covered.</i>
<b>Pemberatan Penilaian Assessment Weightage</b>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
<b>Rujukan Utama Main Reference</b>	-

## KIG4072: Analisis dan Pencegahan Kegagalan / *Failure Analysis and Prevention*

Kod Kursus <i>Course Code</i>	KIG4072
Tajuk Kursus <i>Course Title</i>	Analisis dan Pencegahan Kegagalan <i>Failure Analysis and Prevention</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1 Mengenal pasti punca dan mekanisme kegagalan kejuruteraan</li> <li>2 Mencadangkan strategi mitigasi yang sesuai untuk cara kegagalan yang berbeza</li> <li>3 Menunjukkan pemilihan bahan berdasarkan mitigasi kegagalan menggunakan perisian yang sesuai</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Identify root causes and mechanisms of engineering failures</i></li> <li>2. <i>Suggest appropriate mitigation strategies for different modes of failure</i></li> <li>3. <i>Demonstrate the selection of materials based on failure mitigation using appropriate software</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kandungan kursus dirancang untuk memberi pemahaman mengenai pelbagai aspek yang berkaitan dengan kegagalan seperti sumber kegagalan asas, alat kejuruteraan yang berkaitan dengan kegagalan dan analisis kegagalan, prosedur umum analisis kegagalan melalui pengumpulan sampel, penyediaan dan pemeliharaan, pengujian, pemerhatian makro dan mikroskopik terhadap fraktur, mod gagal, prosedur metallografi dan analisis gambar, penggunaan mekanik fraktur dan prinsip ketahanan fraktur dalam analisis kegagalan dan penemuan analisis dan penulisan laporan / cadangan. Kajian kes mengenai kegagalan kejuruteraan juga akan disertakan untuk menyampaikan konsep dan prosedur dengan berkesan.</p> <p><i>The course content is designed to provide understanding on various aspects related with failure such as fundamental sources of failure, engineering tools relevant to failure and failure analysis, general procedure of failure analysis through sample collection, preparation and preservation, testing, macro and microscopic observation of fracture, mode of fracture, metallographic procedure and image analysis, use of fracture mechanics and fracture toughness principles in failure analysis and analysis findings and report/recommendation</i></p>



	<i>writing. Case studies on engineering failures will also be included to communicate concepts and procedures effectively.</i>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. ASM International (2021) ASM Handbook Volume 11: Failure Analysis and Prevention</li> <li>2. Aquil Ahmad and Leonard J. Bond (2018) ASM Handbook, Volume 17: Nondestructive Evaluation of Materials</li> <li>3. Abdel Salam Hamdy Makhlouf , Mahmood Aliofkhaezrai (2012) Handbook of Materials Failure Analysis With Case Studies from the Construction Industries</li> </ol>

## KIG4073: Logam dan Aloi Kejuruteraan / *Metals and Alloys Engineering*

Kod Kursus <i>Course Code</i>	KIG4073
Tajuk Kursus <i>Course Title</i>	Logam dan Aloi Kejuruteraan <i>Metals and Alloys Engineering</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menghuraikan sifat-sifat logam dan aloi komersil yang penting.</li> <li>2. Mengaplikasikan amalan rawatan haba pada besi dan keluli dan aloi bukan ferus.</li> <li>3. Menganalisa kesan pemprosesan kepada struktur mikro dan struktur mikro terhadap sifat-sifat</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Describe the nature of important commercial metals and alloys.</i></li> <li>2. <i>Apply the practice of heat treatment in iron and steel and non-ferrous alloys.</i></li> <li>3. <i>Analyze the effect of processing on microstructure and that of microstructure on the properties</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini akan memperkenalkan beberapa logam komersial dan aloi penting dari segi ciri fizikal dan mekanikalnya. Tumpuan akan diberikan kepada hubungan pemprosesan-struktur mikro-sifat dalam logam. Amalan rawatan haba dan termal yang akan mempengaruhi struktur mikro dan sifat aloi keluli dan bukan ferus juga akan dibincangkan secara terperinci.</p> <p><i>This course will introduce several important commercial metals and alloys in terms of their physical and mechanical characteristic. The focus will be upon the processing- microstructure-properties relationship in metals. The thermal and heat treatment practice that will affect the microstructure and properties of steel and non-ferrous alloys will also be discuss in detail.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. Anil Kumar Sinha (2003). PHYSICAL METALLURGY HANDBOOK. Location: Publisher.</li> <li>2. V. RAGHAVAN (2012). PHYSICAL METALLURGY: Principles and Practice, New York: McGraw-Hill</li> </ol>

	3. Reza Abbaschian, Lara Abbaschian, Robert E. Reed-Hill. (2009). PHYSICAL METALLURGY PRINCIPLES. United State of America: Cengage Learning
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## KIG4074: Bahan nano/Nanomaterials

Kod Kursus <i>Course Code</i>	KIG4074
Tajuk Kursus <i>Course Title</i>	Bahan nano <i>Nanomaterials</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Membincang sifat fizikal dan kimia bahan struktur nano dan proses yang terlibat dalam pemasangan bahan tersebut.</li> <li>2. Membincang pelbagai kaedah sintesis bahan nano secara atas ke bawah dan bawah ke atas.</li> <li>3. Merekabentuk bahan-bahan struktur nano untuk digunakan dalam aplikasi kejuruteraan lanjutan.</li> <li>4. Mentafsir data pencirian bahan bagi bahan berstruktur nano.</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Discuss the physical and chemical properties of nanostructured materials and the processes involved in their assembly.</i></li> <li>2. <i>Discuss the various top-down and bottom-up synthesis methods of nanomaterials.</i></li> <li>3. <i>Design nanostructured materials for use in advanced engineering applications.</i></li> <li>4. <i>Interpret materials characterization data of nanostructured materials.</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini akan meliputi kaedah sintesis bahan berstruktur nano dan sifat fizikal dan kimia mereka. Penekanan adalah pada reka bentuk bahan berstruktur nano untuk digunakan dalam pelbagai aplikasi kejuruteraan lanjutan. Selain itu, para pelajar juga akan mengetahui kaedah pencirian bahan berstruktur nano.</p> <p><i>This course will cover the synthesis methods of nanostructured materials and their physical and chemical properties. The emphasis is on the design of nanostructured materials for use in various advanced engineering applications. Besides this, the students are also acquainted with characterization methods for nanostructured materials.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 40%</p> <p>Peperiksaan Akhir / <i>Final Examination</i>: 60%</p>
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1 Kuno, M. (2012). <i>Introductory Nanoscience: Physical and Chemical Concepts</i>. New York: Garland Science</li> <li>2 Johal, M. S., Johnson, L. E. (2018). <i>Understanding Nanomaterials</i>. Boca Raton: CRC Press</li> </ol>

## KIG4075: Kejuruteraan Polimer dan Getah / *Polymer and Rubber Engineering*

Kod Kursus <i>Course Code</i>	KIG4075
Tajuk Kursus <i>Course Title</i>	Kejuruteraan Polimer dan Getah <i>Polymer and Rubber Engineering</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Mengenalpasti dan mengelaskan pelbagai jenis bahan kejuruteraan polimer untuk aplikasi tertentu</li> <li>2. Menganalisa cara pemprosesan yang sesuai untuk bahan polimer</li> <li>3. Mengaplikasikan pengetahuan mengenai keanjalan getah untuk reka bentuk dan penilaian komponen getah</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Identify and classify various types of polymer engineering materials for specific applications</i></li> <li>2. <i>Analyze a suitable processing method for polymer materials</i></li> <li>3. <i>Apply the theory of rubber elasticity for the design and evaluation of rubber components</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini menyediakan asas-asas polimer dan getah. Ini merangkumi topik yang melibatkan teori makromolekul polimer, bahan tambah, pemprosesan hingga tingkah laku mekanikal. Teori asas keanjalan getah akan dibincangkan dan penerapannya untuk reka bentuk komponen getah akan ditunjukkan.</p> <p><i>This course provides basic fundamentals of polymers and rubbers. It covers topics which span from macromolecular theory of polymers, additive, processing to mechanical behavior. Basic theory of rubber elasticity will be discussed and its application for design of rubber components will be shown.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	<p>Penilaian Berterusan / <i>Continuous Assessment</i>: 40%</p> <p>Peperiksaan Akhir / <i>Final Examination</i>: 60%</p>
Rujukan Utama <i>Main Reference</i>	<ol style="list-style-type: none"> <li>1. Mariam Al-Maadeed Deepalekshmi Ponnamma Marcelo Carignano. (2020). Polymer Science and Innovative Applications 1st Edition</li> <li>2. Materials, Techniques, and Future Developments. Location: Elsevier.I.</li> <li>3. Anil Kumar, Rakesh K. Gupta. (2018). Title of work: Fundamentals of Polymer Engineering, Third Edition. Location: CRC Press Taylor &amp; Francis.</li> </ol>

	<ol style="list-style-type: none"><li>4.</li><li>5. George Youssef. (2021). Title of work: Applied Mechanics of Polymers Edition 1st. Location: Elsevier.</li><li>6. Sabu Thomas Janusz Datta Jozef Haponiuk Arunima Reghunadhan. (2017). Polyurethane Polymers: Blends and Interpenetrating Polymer Networks</li><li>7. 1st Edition. Elsevier</li></ol>
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## KIG4076: Proses dan Teknologi Pembuatan Semikonduktor/Semiconductor Manufacturing Process and Technology

Kod Kursus <i>Course Code</i>	KIG4076
Tajuk Kursus <i>Course Title</i>	Proses dan Teknologi Pembuatan Semikonduktor <i>Semiconductor Manufacturing Process and Technology</i>
Kredit <i>Credit</i>	3
Bahasa Pengantar <i>Medium of Instruction</i>	Bahasa Inggeris <i>English</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/ Minimum Requirement(s)</i>	Tiada <i>No</i>
Hasil Pembelajaran Kursus <i>Course Learning Outcomes</i>	<p>Di akhir kursus ini, pelajar dapat:</p> <ol style="list-style-type: none"> <li>1. Menerangkan urutan proses dalam pembuatan semikonduktor dan kepentingan industri semikonduktor dalam ekonomi dunia dan Malaysia</li> <li>2. Menganalisa prinsip-prinsip asas dalam proses pembuatan semikonduktor yang berbeza</li> <li>3. Menilai kesesuaian bahan dan proses yang berlainan untuk pelbagai proses dalam fabrikasi dan pembungkusan litar bersepadu (IC)</li> </ol> <p><i>At the end of the course, students are able to:</i></p> <ol style="list-style-type: none"> <li>1. <i>Explain the process sequence in semiconductor manufacturing and the importance of semiconductor industry in global and Malaysian economy</i></li> <li>2. <i>Analyze the fundamental principles underlying different semiconductor manufacturing processes</i></li> <li>3. <i>Assess the suitability of different materials and processes for various steps in integrated circuit (IC) fabrication and packaging</i></li> </ol>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	<p>Kursus ini memperkenalkan industri semikonduktor dan kepentingannya dalam ekonomi global dan Malaysia dan memberi gambaran keseluruhan peranti semikonduktor dan proses pembuatan semikonduktor keseluruhan. Kursus ini juga menerangkan perincian proses pertumbuhan kristal dan penyediaan wafer, teknik dan bahan litografi, pengoksidaan dan proses termal, implantasi ion, etsa basah dan plasma, pemendapan filem tipis dan metalisasi, penggiliran mekanikal kimia, ujian dan pembungkusan, dan dasar dan protokol bilik bersih.</p> <p><i>This course introduces semiconductor industry, its importance in global and Malaysian economy, and provides an overview of semiconductor devices and overall semiconductor manufacturing processes. This course then provides details on crystal growth processes and wafer preparation, lithographic techniques and materials, oxidation and thermal processes, ion implantation, wet and plasma etching, thin film deposition and metallization, chemical mechanical polishing, testing and packaging, and clean room basics and protocol.</i></p>
Pemberatan Penilaian <i>Assessment Weightage</i>	Penilaian Berterusan / <i>Continuous Assessment</i> : 40% Peperiksaan Akhir / <i>Final Examination</i> : 60%

<p>Rujukan Utama <i>Main Reference</i></p>	<ol style="list-style-type: none"><li>1 Xiao, Hong. (2012). Introduction to Semiconductor Manufacturing Technology, 2nd Edition. Prentice Hall, International Edition.</li><li>2 Geng, Hwaiyu. (2017). Semiconductor Manufacturing Handbook, 2nd Edition. McGraw- Hill Education.</li><li>3 Zant, Peter Van (2014). Microchip Fabrication, Sixth Edition. McGraw-Hill Education.</li> <li>4 May, Gary S. and Spanos, Costas J. (2006). Fundamentals of Semiconductor Manufacturing and Process Control. Wiley-IEEE Press.</li><li>5 Michael, Quirk and Julian, Serda (2000). Semiconductor Manufacturing Technology. Prentice Hall, International Edition.</li></ol>
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# GETTING AROUND

Here are some quick guide/tips on getting around the Engineering faculty for Mechanical Engineering students:

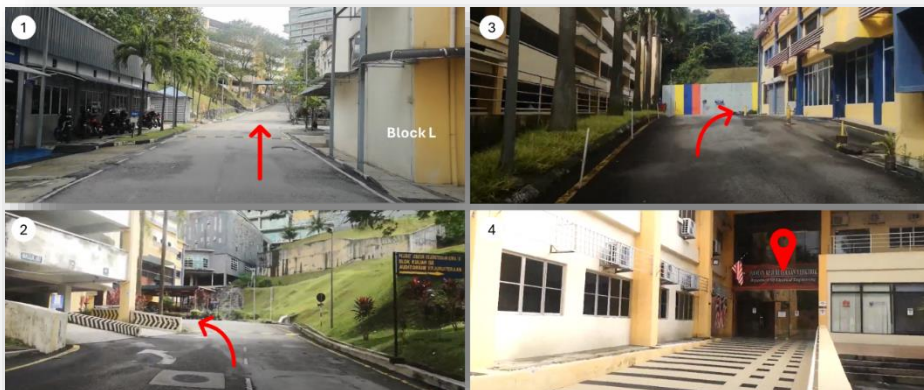
1. Lecture halls (DK4, DK5, DK6) are in Block L or so called the Engineering Tower:



2. Other lecture halls (DK2, DK3, rooms with BK, Auditorium) are in Block U:



3. Lecture halls (DK7, DK8, and computer labs ECC6, ECC7, ECC8) are in Block Y:



4. Engineering Library is in Block M (just next to Block L), at Level 6:



5. Common places to eat include Cafeteria (Level 4, Block L) and outside Block J (non-air-conditioned):



6. Labs are usually in Block C or Block M, depending on the subject:



7. Computer lab ECC2 is in Block J (Level 2 and Level 3), whereas computer lab ECC3 is in Block R (Level 5):



Alternatively, please visit <http://www.youtube.com/@engineeringunimalaya> for more information.

## MechE Lounge

There is also a student lounge for MechE students at Block Q, Faculty of Engineering that is accessible anytime. It's an alternative air-conditioned place to chill and unwind (other than the Engineering Library at Block M), especially during free slots or in between lectures.





## Facilities

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- PS5
- Board Games
- Television
- Table Tennis Area
- Whiteboard
- Beanbags
- Tables, power outlets and chairs



### How to Access:

1. The lounge can be accessed at any time if there are students who'd like to use it.
2. You may contact your class representative to inform them you'd like to use the lounge. The class representative will then contact someone with a fingerprint access to unlock the lounge padlock.
3. If no one with their fingerprint saved is available and there is an **\*URGENT\*** use for the lounge, you may contact someone from the department office to unlock the lounge for you.

### Ground Rules:

1. Once unlocked, make sure you **store the padlock safely**.
2. Ensure that you always keep the lounge **clean and neat**.
3. Whatever items that are in the lounge **must never** be taken out of the lounge.
4. If food and beverages are brought into the lounge, eat them at the tables provided and avoid dirtying or spilling your food and beverages in the lounge.
5. Do not perform/conduct **risky or dangerous** activities within the lounge.
6. Vaping/Smoking is **prohibited** in the lounge.
7. **Switch off** all electrical outlets and appliances before leaving the lounge.
8. Before leaving the lounge, ensure all personal belongings are taken with you and lock the lounge with the padlock.

# FACILITIES

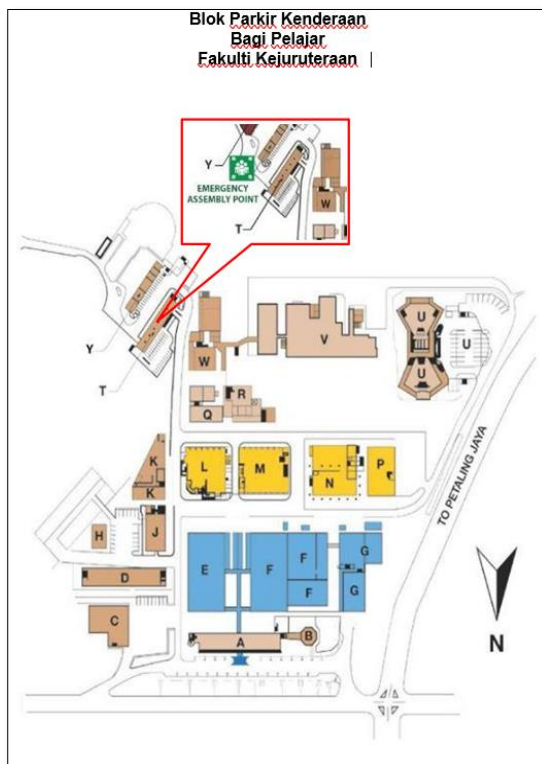
## Vehicle Parking for Students

Students are only allowed to park in designated student parking areas which is at parking Block T. If you park outside the designated areas, you may be fine and clamp. For any inquiries, please e-mail/contact:

**Deputy Dean (Development) Office**

Email: [fk\\_tdp@um.edu.my](mailto:fk_tdp@um.edu.my)

Tel: +603 7967 7621



BLOK T	
Gambar	Aras
	3(B) (Pelajar)
	Masuk dari Blok Y
	3(A) (Pelajar)
	4(B) (Pelajar)
	4(A) (Pelajar)

BLOK T	
Gambar	Aras
	5(B) (Pelajar)
	5(A) (Pelajar)

# CAMPUS MAP



## CAMPUS MAP



# FACULTY MAP



- |   |   |   |  |
|---|---|---|--|
| A | Department of Biomedical Engineering    | M | Engineering Tower (Research Wing)          |
| B | Lecturer Hall 1 (DK1)                   | N | Hydraulic Lab (Mechanical)                 |
| C | Industry and Research Labs              | P | Public Health Engineering Lab (Civil)      |
| D | Lecture Rooms and IR Cube               | Q | Metallurgy Lab (Mechanical)                |
| E | Research Labs                           | R | Mechanical and Electrical Engineering Labs |
| F | Civil Engineering Labs                  | T | Multiple Storey Parking Block              |
| G | Advanced Structured Labs (Civil)        | U | Lecture Halls                              |
| J | Department of Mechanical Engineering    | V | Department of Chemical Engineering         |
| K | Department of Mechanical Engineering    | W | Department of Chemical Engineering         |
| L | Engineering Tower (Administration Wing) | Y | Department of Electrical Engineering       |

# CONTACT US

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