UNIVERSITI MALAYA

FAKULTI KEJURUTERAAN
Faculty of Engineering

PROGRAMME GUIDEBOOK

BACHELOR OF BIOMEDICAL ENGINEERING

SECOND INTAKE : MARCH 2025/2026

DEPARTMENT OF BIOMEDICAL ENGINEERING

TABLE OF CONTENTS

UNIVERSITI MALAYA

VISION

A global university impacting the world.

MISSION

Pushing the boundaries of knowledge and nurturing aspiring leaders.

CORE VALUES

P	O	I	S	E
PASSION	ONENESS	INTEGRITY	SINCERITY	EMPATHY

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, behave ours 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

Dean

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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Deputy Dean (Undergraduate)

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Deputy Dean (Postgraduate)

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Deputy Dean (Research)

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Deputy Dean (Student Affairs)

PROFESSOR IR. DR. NIK NAZRI NIK GHAZALI
(Dean)

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Deputy Dean (Development)

MADAM VIGNESHREE KING
MANAGER

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SCHOLARSHIPS
bptajaan_aasd@um.edu.my

VISA
Kindly submit application to:
Faculty: https;//shorturl.at/5EdMR
Central: bpvisa_aasd@um.edu.my

STUDENT CONFIRMATION LETTER – ACTIVE STUDENTS
Kindly submit application to Faculty:
https://shorturl.at/jxEOe

PROBLEM WITH MAYA SYSTEM
Kindly lodge your enquiry/complaint via httpa://helpdesk.um.edu.my

TRANSCRIPT APPLICATION & ACADEMIC VERIFICATION
verify_um@um.edu.my

INTERNSHIP HIRING/PLACEMENT
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Schools & local Universities:
study@um.edu.my

International Universities:
study@um.edu.my

RENTAL OF SPACES IN UM
Make your booking at
https://umpoint.um.edu.my

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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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.
Tel: +603 7967 7621

STUDENT ENGAGEMENT DEPARTMENT

Biomedical Engineering Student Club (BMESC)

Biomedical Engineering Student Club (BMESC) is a student-run organization under the Department of Biomedical Engineering, University of Malaya. It was established in the 2018/2019 academic session and brought to life through the dedication of our seniors who set forth to accomplish specific goals through the activities organized.

Over the past few years, BMESC has orchestrated several notable events, such as the BME Interaction Day and BME Night, which have successfully strengthened the bonding among members within the Biomedical Engineering Department. Additionally, BMESC has organized industrial talks, industry visits, and career fairs, providing students with valuable insights into potential career paths within the realm of Biomedical Engineering and expanding their knowledge in this field.

Objectives

- ➢ Connect all Biomedical Engineering lecturers and students.
- ➢ Organize activities for Biomedical Engineering undergraduate.
- ➢ Expose Biomedical Engineering undergraduates to industry.

Motto

Break More Extremities

BMESC is dedicated to exploring new opportunities and embracing challenges, in line with its motto. It does not just work with student organizations from other universities, but it also partners with various industries in different areas of Biomedical Engineering across Malaysia and other countries.

Social Media

- ➢ Instagram: bmesc_um
- ➢ Facebook: Biomedical Engineering Student Club University of Malaya
- ➢ Email: bmesc.um@gmail.com

Activities Highlights

Throughout the academic year, the Department of Biomedical Engineering hosts and supports several activities designed to engage students in professional development, technical exploration, and community-building activities. Some of the key events include:

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-2025-2026

ACADEMIC CALENDAR

SEMESTER I				
Orientation Week	1 week	05.10.2025	-	12.10.2025
Lectures	6 weeks*	13.10.2025	-	23.11.2025
Mid-Semester I Break	1 week	24.11.2025	-	30.11.2025
Lectures	8 weeks*	01.12.2025	-	25.01.2026
Revision Week	1 week*	26.01.2026	-	01.02.2026
Semester I Final Examination	3 weeks*	02.02.2026	-	22.02.2026
Semester I Break	2 weeks	23.02.2026	-	08.03.2026
	22 weeks			

SEMESTER II				
Lectures	7 weeks*	09.03.2026	-	26.04.2026
Mid-Semester II Break	1 week	27.04.2026	-	03.05.2026
Lectures	7 weeks*	04.05.2026	-	21.06.2026
Revision Week	1 week*	22.06.2026	-	28.06.2026
Semester II Final Examination	3 weeks*	29.06.2026	-	19.07.2026
Semester II Break	4 weeks	20.07.2026	-	16.08.2026
	23 weeks			

SPECIAL SEMESTER				
Lectures	7 weeks*	27.07.2026	-	13.09.2026
Special Semester Final Examination	1 week*	14.09.2026	-	20.09.2026
Special Semester Break	1 week	21.09.2026	-	28.09.2025
	9 weeks			

Notes:

(1) The Module Registration and Examination Schedule can be referred to at https://umsitsguide.um.edu.my. All information is subject to change.

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

Deepavali	20 October 2025 (Monday)
Christmas Day	25 December 2025 (Thursday)
New Year	01 January 2026 (Thursday)
Thaipusam	01 February 2026 (Sunday)
Federal Territory Day	01 February 2026 (Sunday)
Chinese New Year	17 & 18 February 2026 (Tuesday & Wednesday)
Nuzul Al-Quran	07 March 2026 (Saturday)
Eidul Fitri	20 & 21 March 2026 (Friday & Saturday)
Labour Day	01 May 2026 (Friday)
Eidul Adha	27 May 2026 (Wednesday)
Wesak Day	31 May 2026 (Sunday)
His Majesty the King's Birthday	01 June 2026 (Monday)
Awal Muharram	16 June 2026 (Tuesday)
Prophet Muhammad's (Maulidur Rasul)	25 August 2026 (Tuesday)
National Day	31 August 2026 (Monday)
Malaysia Day	16 September 2026 (Wednesday)

(*) UM UG iFest 2026   09 - 11 June 2026 (Tuesday - Thursday)

*Senate August 28, 2025

BACHELOR OF BIOMEDICAL ENGINEERING

Introduction

The Department of Biomedical Engineering was formed in 2001. Currently, it is offering Biomedical Engineering undergraduate Programme. The department has also established two research centers namely Centre for Applied Biomechanics (CAB) and Center for Innovation in Medical Engineering (CIME) to enhance research activities and to provide consultancy to the public and private sectors.


Programme Synopsis

Universiti Malaya was the first institute to offer a biomedical engineering undergraduate programme in Malaysia, having commenced the intake in 1997. Having been formed as a department in the year 2001, our flagship undergraduate programme is accredited by the Engineering Accreditation Council (EAC) of Malaysia. The past years, beginning from the late 1990's to the early 2000's, where the challenging ones as the various changes have taken place within the education system in Malaysia. Thus, in a short span of a few years, the Biomedical Engineering programme went through six accreditation exercises, namely in years of 2003, 2004, 2006, 2010, 2012, 2015 with the last accreditation exercise took place in 2021 with full 6 years accreditation. Biomedical Engineering involves the application of the latest advances in engineering and scientific knowledge for biomedical use. Our undergraduate programme prepares students for positions in biomedical engineering industries or to pursue advanced postgraduate studies. Currently, the department offers one undergraduate engineering programme, with two minoring in Biomedical Engineering and Prosthetics and Orthotics Engineering. The undergraduate degree programme is recognised and accredited by EAC. The programme implements Outcome Based Evaluation (OBE) in all its courses. The approach emphasises the outcomes of each course and students are informed of these outcomes in the beginning of their studies and the evaluation of its effectiveness at the end of the course. The department has links of collaboration from the industries such as Universiti Malaya Medical Centre (UMMC), SIEMENS Healthineers Malaysia, Association of Malaysian Medical Industries (AMMI), Columbia Asia Sdn Bhd, OGAWA Sdn Bhd, Ossur and SeliaTek Sdn Bhd. Together with our comprehensive curriculum content, dedicated academic and support staff in teaching and learning, excellent facilities, and with the strong support from these industries, the department strives to provide quality education to prepare students for professional position and to meet the challenges of tomorrow in the industry, commerce and academia in line with UM's mission and vision.

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.
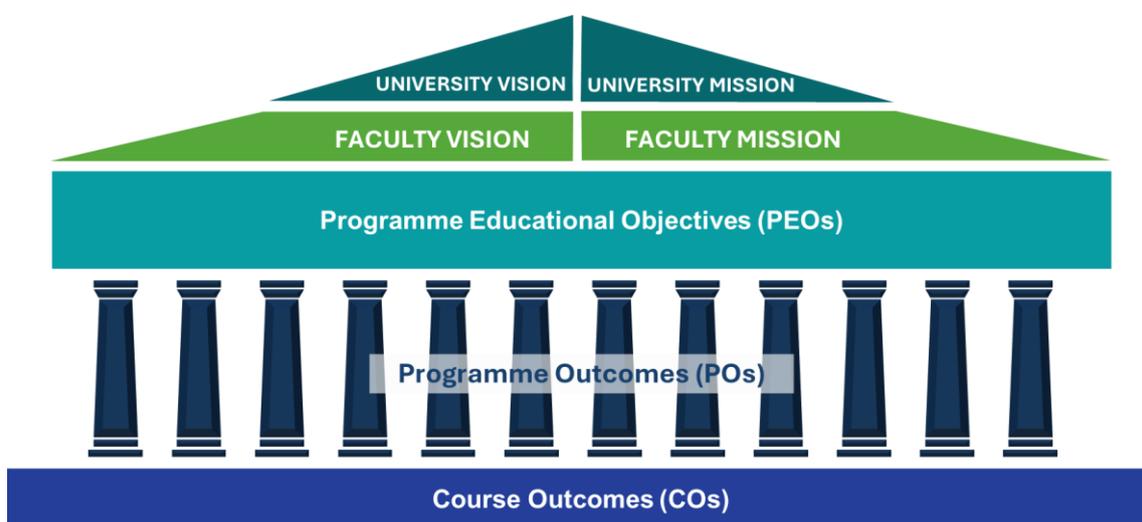
PROGRAMME STRUCTURE

COURSES COMPONENT	CONTENT		CREDIT
University	GIG1012: Philosophy and Current Issues (Local) GLT1049: Bahasa Melayu Komunikasi (International)		2
	GIG1013: Appreciation of Ethics and Civilization 2		2
	GIG1003: Basic Entrepreneurship Enculturation		2
	English – GLT 1. English I 2. English II		4
	Student Holistic Empowerment (SHE) – 4 Courses Cluster:		8
	Cluster 1	Thinking Matters: Mind and Intellect	
	Cluster 2	Emotional, Physical, and Spiritual Intelligence: Mind, Body & Soul [**GQX0056 KIAR is a compulsory course**]	
	Cluster 3	Technology/Artificial Intelligence and Data Analytics: i-Techie	
	Cluster 4	Global Issues and Community Sustainability: Making the World a Better Place	
	Co-curriculum		2
	Sub-total Credit		**20**
Core	Faculty Core Courses		12
	Department Core Courses		81
	Sub-total Credit		**93**
Elective	Department Open Elective Courses		8
	Specialization Elective Courses		27
	Sub-total Credit		**35**
	TOTAL CREDIT		**148**

YEAR	SEMESTER	COURSES COMPONENT	CODE	MODULE		CREDIT	TOTAL SEMESTER CREDIT
ONE (1)	01	UNIVERSITY: FIS/PEP/APK	GIG1012 / GLT1049	FALSAFAH DAN ISU SEMASA (WARGANEGARA) BAHASA MELAYU ASAS (PELAJAR ANTARABANGSA SAHAJA)	PHILOSOPHY AND CURRENT ISSUES (MALAYSIAN) BASIC MALAY LANGUAGE (INTERNATIONAL)	2	19
		UNIVERSITY: LANGUAGE	GLTXXXX	KURSUS BAHASA INGGERIS II	ENGLISH II	2	
		UNIVERSITY: KO-K	XXXX	KO-KURIKULUM	CO-CURRICULUM	2	
		FACULTY CORE	KIX2005	UNDANG-UNDANG, ETIKA DAN KEMAMPANAN UNTUK JURUTERA	LAW, ETHICS AND SUSTAINABILITY FOR ENGINEERS	3	
		DEPARTMENT CORE	KIB1009	STATISTIK UNTUK KEJURUTERAAN BIOPERUBATAN	STATISTICS FOR BIOMEDICAL ENGINEERING	3	
		DEPARTMENT CORE	KIB1012	TEORI LITAR	CIRCUIT THEORY	3	
		DEPARTMENT CORE	KIB1013	MAKMAL KEJURUTERAAN BIOPERUBATAN 1	BIOMEDICAL ENGINEERING LAB 1	2	
		DEPARTMENT CORE	KIB1014	SISTEM RANGKA OTOT MANUSIA	HUMAN MUSCULOSKELETAL SYSTEM	2	
	02	UNIVERSITY: LANGUAGE	GLTXXXX	KURSUS BAHASA INGGERIS I	ENGLISH I	2	18
		UNIVERSITY: FIS/PEP/APK	GIG1003	ASAS PEMBUDAYAAN KEUSAHAWANAN	BASIC ENTREPRENEURSHIP ENCULTURATION	2	
		FACULTY CORE	KIX1001	MATEMATIK KEJURUTERAAN 1	ENGINEERING MATHEMATICS 1	3	
		DEPARTMENT CORE	KIB1010	ANATOMI DAN FISIOLOGI	ANATOMY AND PHYSIOLOGY	3	
		DEPARTMENT CORE	KIB1011	STATIK DAN MEKANIK BAHAN	STATICS AND MECHANICS OF MATERIALS	3	
		DEPARTMENT CORE	KIB1016	ALAT ELEKTRONIK	ELECTRONIC DEVICES	3	
		DEPARTMENT CORE	KIB2012	REKA BENTUK KEJURUTERAAN BIOPERUBATAN 1	BIOMEDICAL ENGINEERING DESIGN 1	2	
TWO (2)	03	UNIVERSITY: SHE	GQX0056	SHE (KLUSTER 2) - KIAR	SHE (CLUSTER 2) - KIAR	2	19
		FACULTY CORE	KIX1002	MATEMATIK KEJURUTERAAN 2	ENGINEERING MATHEMATICS 2	3	
		DEPARTMENT CORE	KIB1015	DINAMIK	DYNAMICS	3	
		DEPARTMENT CORE	KIB2017	ELEKTROMAGNETISME DAN PERANTI BIOPERUBATAN	ELECTROMAGNETISM AND BIOMEDICAL DEVICES	3	
		DEPARTMENT CORE	KIB2018	BIOMEKANIK GERAKAN MANUSIA	BIOMECHANICS OF HUMAN MOTION	3	
		DEPARTMENT CORE	KIB2020	REKA BENTUK KEJURUTERAAN BIOPERUBATAN 2	BIOMEDICAL ENGINEERING DESIGN 2	2	
		DEPARTMENT CORE	KIB3015	KELESTARIAN DAN AMALAN DALAM KEJURUTERAAN BIOPERUBATAN	SUSTAINABILITY AND PRACTICE IN BIOMEDICAL ENGINEERING	3	
	04	UNIVERSITY: FIS/PEP/APK	GIG1013	PENGHAYATAN ETIKA DAN PERADABAN	APPRECIATION OF ETHICS AND CIVILISATIONS	2	18
		FACULTY CORE	KIX2006	EKONOMI KEJURUTERAAN DAN PENGURUSAN PROJEK	ENGINEERING ECONOMICS AND PROJECT MANAGEMENT	3	
		DEPARTMENT CORE	KIB2009	MAKMAL KEJURUTERAAN BIOPERUBATAN 2	BIOMEDICAL ENGINEERING LAB 2	2	
		DEPARTMENT CORE	KIB2010	KEJURUTERAAN BIOPERUBATAN, PENJAGAAN KESIHATAN DAN ETIKA	BIOMEDICAL ENGINEERING, HEALTHCARE AND ETHICS	3	
		DEPARTMENT CORE	KIB2011	BIOBAHAN	BIOMATERIALS	3	
		DEPARTMENT CORE	KIB2013	ASAS DALAM KEJURUTERAAN PROSTETIK DAN ORTOTIK	FUNDAMENTALS OF PROSTHETICS AND ORTHOTICS ENGINEERING	3	
		DEPARTMENT CORE	KIB2014	KAEDAH PERANGKAAN DAN PENGATURCARAAN	NUMERICAL METHODS AND PROGRAMMING	2	

THREE (3)	**05**	DEPARTMENT CORE	KIB2015	KESELAMATAN DAN PIAWAIAN DALAM KEJURUTERAAN BIOPERUBATAN	SAFETY AND STANDARDS IN BIOMEDICAL	2	**15**
		DEPARTMENT CORE	KIB2016	MEKANIK BENDALIR DAN PROSES PENGANGKUTAN DALAM KEJURUTERAAN BIOPERUBATAN	FLUID MECHANICS AND TRANSPORT PROCESSES IN BIOMEDICAL ENGINEERING	3	
		DEPARTMENT CORE	KIB2019	MAKMAL KEJURUTERAAN BIOPERUBATAN 3	BIOMEDICAL ENGINEERING LAB 3	2	
		DEPARTMENT CORE	KIB3017	PENGIMEJAN PERUBATAN	MEDICAL IMAGING	3	
		OPEN ELECTIVE	KIB4XXX	KURSUS ELEKTIF TERBUKA 1	OPEN ELECTIVE COURSE 1	2	
		OPEN ELECTIVE	KIB4XXX	KURSUS ELEKTIF TERBUKA 2	OPEN ELECTIVE COURSE 2	2	
	06	DEPARTMENT CORE	KIB3016	PEMPROSESAN ISYARAT BIOPERUBATAN	BIOMEDICAL SIGNAL PROCESSING	3	**17**
		DEPARTMENT CORE	KIB3018	EKSPERIMEN DAN KOMPUTASI BIOMEKANIK	EXPERIMENTAL AND COMPUTATIONAL BIOMECHANICS	3	
		DEPARTMENT CORE	KIB3019	PROJEK REKA BENTUK BERSEPADU BIOPERUBATAN 1	BIOMEDICAL INTEGRATED DESIGN PROJECT 1	3	
		SPECIALIZATION ELECTIVE		KURSUS ELEKTIF PENGKHUSUSAN 1	SPECIALIZATION ELECTIVE COURSE 1	9	
		SPECIALIZATION ELECTIVE		KURSUS ELEKTIF PENGKHUSUSAN 2	SPECIALIZATION ELECTIVE COURSE 2		
		SPECIALIZATION ELECTIVE		KURSUS ELEKTIF PENGKHUSUSAN 3	SPECIALIZATION ELECTIVE COURSE 3		
SPECIAL SEMESTER	**SS**	DEPARTMENT CORE		LATIHAN INDUSTRI	INDUSTRIAL TRAINING	5	**5**
FOUR (4)	**07**	DEPARTMENT CORE	KIB4020	PROJEK PENGIJAZAHAN (P)	FINAL YEAR PROJECT (P)	2	**20**
		DEPARTMENT CORE	KIB3030	PROJEK REKA BENTUK BERSEPADU BIOPERUBATAN 2	BIOMEDICAL INTEGRATED DESIGN PROJECT 2	3	
		SPECIALIZATION ELECTIVE		KURSUS ELEKTIF PENGKHUSUSAN 1	SPECIALIZATION ELECTIVE COURSE 1	15	
		SPECIALIZATION ELECTIVE		KURSUS ELEKTIF PENGKHUSUSAN 2	SPECIALIZATION ELECTIVE COURSE 2		
		SPECIALIZATION ELECTIVE		KURSUS ELEKTIF PENGKHUSUSAN 3	SPECIALIZATION ELECTIVE COURSE 3		
		SPECIALIZATION ELECTIVE		KURSUS ELEKTIF PENGKHUSUSAN 4	SPECIALIZATION ELECTIVE COURSE 4		
		SPECIALIZATION ELECTIVE		KURSUS ELEKTIF PENGKHUSUSAN 5	SPECIALIZATION ELECTIVE COURSE 5		
	08	UNIVERSITY: SHE	SHE	SHE (KLUSTER 1/3/4)	SHE (CLUSTER 1/3/4)	2	**17**
		UNIVERSITY: SHE	SHE	SHE (KLUSTER 1/3/4)	SHE (CLUSTER 1/3/4)	2	
		UNIVERSITY: SHE	SHE	SHE (KLUSTER 1/3/4)	SHE (CLUSTER 1/3/4)	2	
		DEPARTMENT CORE	KIB4020	PROJEK PENGIJAZAHAN	FINAL YEAR PROJECT	4	
		SPECIALIZATION ELECTIVE		KURSUS ELEKTIF PENGKHUSUSAN 1	SPECIALIZATION ELECTIVE COURSE 1	3	
		OPEN ELECTIVE	KIB4XXX	KURSUS ELEKTIF TERBUKA 3	OPEN ELECTIVE COURSE 3	4	
		OPEN ELECTIVE	KIB4XXX	KURSUS ELEKTIF TERBUKA 4	OPEN ELECTIVE COURSE 4		
					TOTAL CREDITS FOR THE PROGRAMME		**148**

DEPARTMENT ELECTIVE COURSES

CODE	COURSE NAME	CREDIT HOURS
PROGRAMME ELECTIVE COURSES IN BIOMEDICAL		
KIB3020	Electrical Safety Design of Medical Devices and System	3
KIB3021	Photonics In Biomedical Engineering	3
KIB3022	Biomedical Control System	3
KIB3023	Microcomputer And Digital System	3
KIB3024	Medical Electronics	3
KIB4014	Instrumentation And Measurement	3
KIB4015	Computational Modelling in Biomedical Engineering	3
KIB4016	Healthcare Technology and Clinical Management	3
KIB4021	Artificial Intelligence in Biomedical Engineering	3
PROGRAMME ELECTIVE COURSES IN PROSTHETICS AND ORTHOTICS		
KIB3025	Biomechanics in Prosthetics and Orthotics	3
KIB3026	Below Knee Prosthetics	3
KIB3027	Principles of Upper Limb Prosthetics and Orthotics Design	3
KIB3028	Principles of Lower Limb Orthotics Design	3
KIB3029	Above Knee Prosthetics	3
KIB4017	Industrial Prosthetics Design	3
KIB4018	Industrial Orthotics Design	3
KIB4019	Practice Management in Prosthetic and Orthotics	3
KIB4022	Advanced Prosthetics and Orthotics Engineering	3
OPEN PROGRAMME ELECTIVE COURSES		
KIB4023	Sports Biomechanics and Rehabilitation	2
KIB4024	Assistive Technology in Rehabilitation	2
KIB4025	Mechanical Circulatory and Respiratory Support	2
KIB4026	Biomechatronics	2
KIB4027	Pattern And Image Analysis	2
KIB4028	Micro Technologies for Biomedical Engineering	2
KIB4029	Medical IT and Telemedicine	2
KIB4030	Clinical Prosthetics	2
KIB4031	Clinical Orthotics	2
KIB4032	Spinal Orthoses	2
KIB4033	Tissue Engineering	2
KIB4034	Advanced Biomaterials	2
KIB4035	Biochemistry And Analytical Techniques	2
KIB4036	Wireless Power Transfer in Biomedical Engineering	2

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 () 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) *(KURSUS BAHASA INGGERIS KOMUNIKASI - KURSUS UNIVERSITI)* LIST OF COURSES TO BE COMPLETED BY ALL STUDENTS (NEW COHORT)			
PATH 1	**PATH 2**	**PATH 3**	**PATH 4**

• **MUET Band 2 *(2008-2020)**
 • **MUET Band 2 & 2.5 (2021)**
 • **IELTS Band 4.0**
 • **TOEFL Paper – Based Test (437 – 473)**
 • **TOEFL Computer – Based Test (123 – 150)**
 • **TOEFL Internet – Based Test (41 – 52)**
 • **PTE (Academic) – (10 – 28)**
 • **TOEFL Essentials (Online)**
 • **Cambridge English Qualifications & Tests**
    i. B1 Preliminary, B2 First, C1 Advanced, C2 Proficiency;
    ii. B2 Business Vantage, C1 Business Higher;
    iii. Linguaskill Online;
    iv. Cambridge English: First (FCE)
 • **ELS**
    i. Certified Intensive English Programme Level (CIEP)
	• **MUET Band 3 (2008-2020)**
	 • **MUET Band 3 & 3.5 (2021)**
	 • **IELTS Band 4.5 – 5.0**
	 • **TOEFL Paper–Based Test (477 – 510)**
	 • **TOEFL Computer–Based Test (153 – 180)**
	 • **TOEFL Internet – Based Test (53 – 64)**
	 • **PTE (Academic) – (29 - 41)**
	 • **TOEFL Essentials (Online)**
	 • **Cambridge English Qualifications & Tests**
	    i. B1 Preliminary, B2 First, C1 Advanced, C2 Proficiency;
	    ii. B2 Business Vantage, C1 Business Higher;
	    iii. Linguaskill Online;
	    iv. Cambridge English: First (FCE)
	 ELS
	    i. Certified Intensive English Programme Level (CIEP)
		• **MUET Band 4 (2008 – 2020)**
		 • **MUET Band 4 & 4.5 (2021)**
		 • **IELTS Band 5.5 – 6.0**
		 • **TOEFL Paper – Based Test (513 – 547)**
		 • **TOEFL Computer – Based Test (183 – 210)**
		 • **TOEFL Internet – Based Test (65- 78)**
		 • **PTE (Academic) – (42 – 57)**
		 • **FCE (B & C)**
		 • **GCE A Level (English) (Minimum C)**
		 • **IGCSE/GCSE (English) (A, B & C)**
		 • **Cambridge English Qualifications & Tests**
		    i. B1 Preliminary, B2 First, C1 Advanced, C2 Proficiency;
		    ii. B2 Business Vantage, C1 Business Higher;
		    iii. Linguaskill Online;
		    iv. Cambridge English: First (FCE)
		 • **ELS**
		    i. Certified Intensive English Programme Level (CIEP)
			• **MUET Band 5 & Band 6 (2008-2020)**
			 • **MUET Band 5 & 5+ (2021)**
			 • **IELTS Band 6.5 – 9.0**
			 • **TOEFL Paper–Based Test (550 – 677)**
			 • **TOEFL Computer – Based Test (213 – 300)**
			 • **TOEFL Internet – Based Test (79 – 120)**
			 • **PTE (Academic) (58 – 90)**
			 • **FCE (A)**
			 • **GCE A Level (English) (B & A)**
			 • **Cambridge English Qualifications & Tests**
			    i. B1 Preliminary, B2 First, C1 Advanced, C2 Proficiency;
			    ii. B2 Business Vantage, C1 Business Higher;
			    iii. Linguaskill Online;
			    iv. Cambridge English: First (FCE)
			 • **ELS**
			    i. Certified Intensive English Programme Level (CIEP)

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
COMPULSORY • GLT1018 – Proficiency in English I	**COMPULSORY** • GLT1021 – Proficiency in English II	**COMPULSORY** • GLT1024 – Proficiency in English III	• GLT1027– Advanced Oral Communication* • GLT1028 – Advanced Business Writing* * (Students can only register for one course per semester) **Note:** Path 4 students have the option to choose between a **Communication English course** <u>or</u> a **Foreign Language course** (GLT-coded courses).
** CHOOSE ONE: • **GLT1019 – Let's Speak** • **GLT1020 – Fundamental Writing**	**** CHOOSE ONE:** • **GLT1022 – Speak Up** • **GLT1023 – Effective Workplace Writing**	**** CHOOSE ONE:** • **GLT1025 – Effective Oral Communication** • **GLT1026 – Writing at the Workplace**	

** 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
** *Kursus ini mempunyai Pra Syarat dan hanya boleh didaftar selepas pelajar LULUS kursus WAJIB mengikut Path yang ditetapkan.*

LIST OF FOREIGN LANGUAGE COURSES

Alternative Courses for Path 4

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

COURSE INFORMATION

University Courses

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

Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Melayu *Malay*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menjelaskan isu semasa berlandaskan ilmu falsafah, Falsafah Pendidikan Kebangsaan dan Rukun Negara. 2. Menerangkan isu semasa berdasarkan aliran pemikiran utama dalam pelbagai aliran falsafah. 3. Menghuraikan isu semasa melalui perspektif perbandingan falsafah sebagai asas bagi menjalinkan dialog antara budaya. *At the end of the course, students are able to:* 1. *Explain current issues based on philosophy, the Philosophy of National Education and the Rukunegara.* 2. *Explain current issues based on the main of thoughts from the various streams of philosophy.* 3. *Explain current issues through a comparative perspective of philosophy as a basis for establishing inter-cultural dialogue.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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. *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.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 70% Peperiksaan Akhir / *Final Examination*: 30%

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

Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Melayu (pelajar warganegara) / Bahasa Inggeris (pelajar bukan warganegara) *Malay (local students) and English (international students)*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menjelaskan konsep etika dari peradaban yang berbeza. 2. Membandingkan sistem, tahap perkembangan, kemajuan sosial dan kebudayaan merentas bangsa. 3. Membincangkan isu kontemporari berkaitan ekonomi, politik, sosial, budaya dan alam sekitar daripada perspektif etika dan peradaban. *At the end of the course, students are able to:* *1. Explain the ethical concepts of different civilizations.* *2. Compare systems, levels of development, social progress and culture across nations.* *3. Discuss contemporary issues related to economic, political, social, cultural and environmental from the perspective of ethics and civilization.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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 isuisu 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 menghubungkaitkan etika dan kewarganegaraan berminda sivik. *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.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 70% Peperiksaan Akhir / *Final Examination*: 30%

GIG1003: Asas Pembudayaan Keusahawanan / *Basic Entrepreneurship Enculturation*

Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menerangkan konsep asas keusahawaan. 2. Menghasilkan idea keusahawanan yang kreatif dan inovatif. 3. Membangunkan kerangka rancangan perniagaan. *At the end of the course, students are able to:* *1. Explain the basic concepts of entrepreneurship.* *2. Producing creative and innovative entrepreneurial ideas.* *3. Develop a business plan framework.*
Sinopsis Kandungan Kursus / *Synopsis of Course Contents*	Kursus ini menerapkan elemen asas pembudayaan keusahawanan kepada semua pelajar. Inisiatif ini diambil untuk membuka minda dan merangsang semangat keusahawanan kepada kumpulan sasar 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. *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.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 100% Peperiksaan Akhir / *Final Examination*: 0%

English Communication Programme (Path 1)

GLT1018: Proficiency in English I

Credit	2
Course Pre-requisite(s) / Minimum Requirement(s)	CEFR A2+ • MUET BAND 2 • IELTS Band 4.0 • TOEFL Paper-Based Test (437 – 473) • TOEFL Computer-Based Test (123 – 150) • TOEFL Internet-Based Test (41 – 52) • PTE (Academic) – (10 – 28)
Course Learning Outcomes	At the end of the course, students are able to: 1. Identify information in short, simple reading texts. 2. Present ideas related to everyday topics. 3. Use grammar correctly to express ideas.
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: 1. Organise a speech in stages. 2. Apply appropriate skills and strategies when delivering a short speech. 3. Present a short speech.
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 • MUET BAND 3 • IELTS Band 4.5 – 5.0 • TOEFL Paper-Based Test (477 – 510) • TOEFL Computer-Based Test (153 – 180) • TOEFL Internet-Based Test (53 – 64) • PTE (Academic) – (29 - 41)
Course Learning Outcomes	At the end of the course, students are able to: 1. Write clear connected texts on a wide range of topics. 2. Present ideas and opinions clearly and coherently. 3. Interpret information from texts on various topics.
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: 1. Present ideas clearly and accurately. 2. Employ appropriate communication strategies to converse effectively.
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 • MUET BAND 4 • IELTS Band 5.5 – 6.0 • TOEFL Paper – Based Test (513 – 547) • TOEFL Computer – Based Test (183 – 210) • TOEFL Internet – Based Test (65-78) • PTE (Academic) – (42 – 57) • FCE (B & C) • GCE A Level (English) (Minimum C) • IGCSE/GCSE (English) (A, B & C)
Course Learning Outcomes	At the end of the course, students are able to: 1. Demonstrate an understanding of complex texts on concrete topics. 2. Write clear, detailed texts on a wide range of subjects. 3. Share opinions fluently and spontaneously.
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: 1. Write relevant outlines for presentations. 2. Present an impromptu speech. 3. Adhere to appropriate strategies in oral communication.
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 • MUET BAND 5 & BAND 6 • IELTS Band 6.5 – 9.0 • TOEFL Paper – Based Test (550 – 677) • TOEFL Computer – Based Test (213 – 300)	• TOEFL Internet – Based Test (79 – 120) • PTE (Academic) (58 – 90) • FCE (A) • GCE A Level (English) (B & A)
Course Learning Outcomes	At the end of the course, students are able to: 1. Integrate the effective use of language structures in communication 2. Present a persuasive speech 3. Develop appropriate interpersonal communication skills.	
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 • MUET BAND 5 & BAND 6 • IELTS Band 6.5 – 9.0 • TOEFL Paper – Based Test (550 – 677) • TOEFL Computer – Based Test (213 – 300)	• TOEFL Internet – Based Test (79 – 120) • PTE (Academic) (58 – 90) • FCE (A) • GCE A Level (English) (B & A)
Course Learning Outcomes	At the end of the course, students are able to: 1. Apply appropriate features of effective business writing. 2. Prepare documents common in business writing. 3. Produce a report for workplace purposes.	
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 *Course Code*	KIX1001
Tajuk Kursus *Course Title*	Matematik Kejuruteraan 1 *Engineering Mathematics 1*
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Rujukan Utama *Main Reference*	1. Glyn James, "Modern Engineering Mathematics", 5th Edition, 2015, Pearson. 2. K.A. Stroud and D.J. Booth, "Engineering Mathematics", 8th Edition, 2020, Red Globe Press. 3. Glyn James, "Advanced Modern Engineering Mathematics", 5th Edition, 2018, Pearson. 4. K.A. Stroud and D.J. Booth, "Advanced Engineering Mathematics", 6th Edition, 2020, Red Globe Press. 5. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition International Student Version, 2011, John Wiley & Sons Ltd.
Strategi Pembelajaran *Learning Strategies*	Kuliah, tutorial, tugasan *Lectures, tutorial, and assignment*
Masa Pembelajaran Pelajar *Student Learning Time*	Bersemuka / *Face to face* : 46 jam/*hours* Tidak Bersemuka / *Non Face to face*: 16 jam/*hour* Masa Persediaan Pelajar / *Student Preparation Time*: 58 jam/*hours*
Kemahiran Boleh Pindah Transferable Skills	Pengaturcaraan MATLAB *MATLAB Programming*
Pensyarah / *Lecturer* Bilik / *Room* Telefon/e-mel *Telephone/e-mail*	Rujuk jadual waktu fakulti *Refer to the faculty's timetable*
Sesi Kuliah / *Lecture Session:* Hari/Masa / *Day/Time* Tempat / *Venue*	Rujuk kepada myum.um.edu.my. *Refer to* myum.um.edu.my.
Sesi Tutorial/Amali: *Tutorial/Practical Session:* Hari/Masa / *Day/Time* Tempat / *Venue*	Rujuk jadual waktu fakulti *Refer to the faculty's timetable*
Perincian Pemberatan Penilaian *Detail of Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment* : 40% Peperiksaan Akhir / Final Examination : 60%

KIX1001: Matematik Kejuruteraan 1 / *Engineering Mathematics 1*

Week	Topic & Activities
1.	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. *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.*
2.	Derivatif separa: Konsep asas dan definasi. 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. *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.*
3.	Vektor Algebra 1: Konsep asas, komponen kartesian, vektor dalam ruang, kecerunan, capahan, derivative arah curl. *Vector Algebra I: Basic concepts, Cartesian components, Vectors in space, Gradient, Divergence, Curl Directional derivatives.*
4.	Vektor Algebra II: Hasil darab skalaan dan hasil darab vektor, hasil darab trirangkap. *Vector Algebra II: Scalar Product and Vector Product, Triple Product.*
5.	Aplikasi kejuruteraan vektor algebra, Aplikasi kejuruteraan analisa vector. *Engineering Applications of Vector Algebra, Engineering Applications of Vector Analysis.*
6.	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 Separa Pangsi; Bentuk Baris Eselon; Pengurangan Bentuk Baris Eselon; Pangkat; Pengantungan Lelurus; Aplikasi Kejuruteraan Sistem Persamaan Lelurus Tidak Homogen. *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, & Linear Dependency; Engineering Application of Non-Homogeneous System of Linear Equations.*
7.	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. *Matrix Algebra for Homogeneous Linear Algebraic System: Solving Non – Homogeneous System of Linear Equations; Eigenvalue/ Eigenvector Problem; Engineering Application of Eigenvalue/ Eigenvector Problem; Diagonalization & Its Extension; Cayley-Hamilton Theorem; Engineering Application of Solving Homogeneous System of Linear Equations.*
8.	Pengamilan: Konsep asas dan definisi, keedah pengamilan: kaedah penggantian, mengikut bahagian, pecahan separa.

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

KIX1002: Matematik Kejuruteraan 2 / *Engineering Mathematics 2*

Kod Kursus *Course Code*	KIX1002
Tajuk Kursus *Course Title*	Matematik Kejuruteraan 2 *Engineering Mathematics 2*
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Rujukan Utama *Main Reference*	1. Glyn James, "Modern Engineering Mathematics", 5th Edition, 2015, Pearson. 2. K.A. Stroud and D.J. Booth, "Engineering Mathematics", 8th Edition, 2020, Red Globe Press. 3. Glyn James, "Advanced Modern Engineering Mathematics", 5th Edition, 2018, Pearson. 4. K.A. Stroud and D.J. Booth, "Advanced Engineering Mathematics", 6th Edition, 2020, Red Globe Press. 5. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th EditionInternational Student Version, 2011, John Wiley & Sons Ltd.
Strategi Pembelajaran *Learning Strategies*	Kuliah, Tutorial, dan Perbincangan Kumpulan *Lectures, Tutorial and Group Discussion*
Masa Pembelajaran Pelajar *Student Learning Time*	Bersemuka / *Face to face* : 46 jam/*hours* Tidak Bersemuka / *Non Face to face*: 12 jam/*hour* Masa Persediaan Pelajar / *Student Preparation Time*: 62 jam/*hours*
Kemahiran Boleh Pindah Transferable Skills	-
Pensyarah / *Lecturer* Bilik / *Room* Telefon/e-mel *Telephone/e-mail*	Rujuk jadual waktu fakulti *Refer to the faculty's timetable*
Sesi Kuliah / *Lecture Session:* Hari/Masa / *Day/Time* Tempat / *Venue*	Rujuk kepada myum.um.edu.my. *Refer to* myum.um.edu.my.
Sesi Tutorial/Amali: *Tutorial/Practical Session:* Hari/Masa / *Day/Time* Tempat / *Venue*	Rujuk jadual waktu fakulti *Refer to the faculty's timetable*
Perincian Pemberatan Penilaian *Detail of Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment* : 40% Peperiksaan Akhir / *Final Examination* : 60%

KIX1002: Matematik Kejuruteraan 2 / *Engineering Mathematics 2*

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

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

Kod Kursus *Course Code*	KIX2005
Tajuk Kursus *Course Title*	Undang-undang, Etika dan Kemampanan untuk Jurutera *Law, Ethics and Sustainability for Engineers*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menghurai implikasi undang-undang, terhadap tingkah laku jurutera. 2. Menggunapakai keperluan praktikal kod-kod etika untuk mengawal selia amalan kejuruteraan. 3. Menilai implikasi kemampanan dalam kerja-kerja kejuruteraan. *At the end of the course, students are able to:* *1. Describe the implication of law for engineers' behaviour.* *2. Apply the practical needs of the codes of ethics to regulate engineering practices.* *3. Assess the implication of sustainability in engineering works.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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. *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.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%

Rujukan Utama *Main Reference*	1. Martin Peterson, Ethics for Engineers, Oxford University Press, 2020. 2. Mitcham, C. Duval, R.S, Engineering Ethics, Prentice Hall, 2012. 3. Registration of Engineers Act 1967 (REA), 2016. 4. Code of Conduct of Registered Person, Board of Engineers Malaysia (BEM), 2016. 5. Law of torts in Malaysia, 2nd Ed., Norchaya Haji Talib, Petaling Jaya, Selangor, Sweet & Maxwell Asia, 2003. 6. Prinsip-prinsip asas tort, Norchaya Haji Talib, Petaling Jaya, Selangor, Sweet & Maxwell Asia, 2003. 7. Undang-undang kontrak di Malaysia, 2nd Ed., Salleh Buang, Kuala Lumpur, Central Law Book Co., 1995. 8. Robert Brinkmann, Introduction to Sustainability, Wiley, 2nd Edition 2020.

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

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

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

Kod Kursus *Course Code*	KIX2006
Tajuk Kursus *Course Title*	Ekonomi Kejuruteraan dan Pengurusan Projek *Engineering Economics and Project Management*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menghurai prinsip-prinsip, konsep-konsep asas dan kaedah dalam analisa ekonomi kejuruteraan dan pengurusan projek. 2. Mengaplikasi kaedah-kaedah analisa ekonomi kejuruteraan dalam memilih rekabentuk penyelesaianyang bersaing. 3. Mengaplikasi kaedah-kaedah pengurusan projek dalam melaksanakan dan mencapai matlamat-matlamat strategik organisasi. 4. Menilai kesan keputusan-keputusan ekonomi kejuruteraan dan pengurusan projek ke atas organisasi dan masyarakat. *At the end of the course, students are able to:* *1. Decsribe the principles, basic concepts, and methodology of engineering economy analysis and project management.* *2. Apply engineering economics analysis methods on choosing competing design solutions.* *3. Apply project management methods in implementing and achieving strategic goals of the organization.* *4. Evaluate implications of both engineering economy and project management decisions on organisationand society.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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 keputusaan 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. *This course provides students with the concepts of physically realizable and economically affordable engineering project. This course deals 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.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. William G. Sullivan, Elin M. Wicks and Patrick Koelling, Engineering Economy, 17th Ed., Prentice Hall, 2020 2. Leland Blank and Anthony Tarquin, Engineering Economy, 8th Ed., McGraw-Hill, 2018 3. Erik W Larson and Clifford F Gray, Project Management the Managerial Process, 2018, 7th Edition, McGraw-Hill.

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

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

COURSE INFORMATION

Department Courses

KIB1009: Statistik untuk Kejuruteraan Bioperubatan / *Statistics for Biomedical Engineering*

Kod Kursus *Course Code*	KIB1009
Tajuk Kursus *Course Title*	Statistik untuk Kejuruteraan Bioperubatan *Statistics for Biomedical Engineering*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menilai konsep asas, dan teori statistik yang digunakan dalam kejuruteraan bioperubatan. 2. Mengaplikasikan statistik dalam kejuruteraan bioperubatan menggunakan data praktikal atau eksperimen untuk mengesahkan pendapatan. 3. Menyelesaikan masalah Kejuruteraan Bioperubatan menggunakan operasi statistik secara manual dan menggunakan perisian. 4. Memperihalkan data statistik kejuruteraan bioperubatan untuk memberikan maklumat yang berkualiti dalam membuat keputusan penilaian impak sosial. 5. Memilih kaedah statistik yang berpatutan untuk menganalisa set data eksperimen. *At the end of the course, students are able to:* 1. *Evaluate the fundamental concepts and theories of statistics used in biomedical engineering.* 2. *Apply statistics in biomedical engineering problems using practical or experimental data to validate a finding.* 3. *Solve Biomedical Engineering problems using manual statistical operation and computational tool.* 4. *Describe biomedical engineering statistical data to provide quality information in social impact assessment decision-making.* 5. *Choose the appropriate statistical method to analyze a set of experimental data.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan bioperubatan mengenai penggunaan statistik. Walaupun kursus ini tidak mempunyai prasyarat, asas matematik yang kuat adalah penting. Kursus ini mengajar cara menganalisis dan memvisualisasikan data kejuruteraan bioperubatan. Kursus ini memberikan pemahaman intuitif mengenai konsep asas statistik, dengan fokus menyelesaikan masalah kejuruteraan bioperubatan. Pelajar akan belajar bagaimana memahami konsep statistik deskriptif dan inferensi, menganalisis data dan memilihujian hipotesis yang sesuai untuk menjawab soalan yang

	diberikan, mengira dan melakukan analisis statistik menggunakan perisian komputer. Pelajar yangberjaya menamatkan kursus ini dapat menggunakan statistik untuk menganalisa data kejuruteraan bioperubatan. Pengetahuan ini sangat penting untuk kursus makmal/eksperimen dan projek tahun akhir.
	This course aims to teach biomedical engineering students the application of statistics. Although this course does not have pre-requisite, a strong fundamental in mathematics is important. This course teaches how to analyze and visualize biomedical engineering data. This course provides an intuitive understanding of the basic concepts of statistics, with afocus on solving biomedical engineering problems. Students will learn the concepts of descriptive and inferential statistics, analyze data and select appropriatehypothesis tests to answer given questions, calculate statistical measures and perform statistical analysis using computer software. Students who have successfully completed this course will be able to apply statistical analyses on biomedical engineering data. This knowledge is extremely important for laboratory/experimental type of courses and final yearproject.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. King, A., & Eckersley, R. (2019). Statistics for Biomedical Engineers and Scientists: How to Visualize and Analyze Data (1st ed.). Academic Press. (2019). 2. Weiss, N. A. (2012). Introductory Statistics: International Edition (9th ed.). Pearson Addison Weasley. 3. Montgomery, D. C., & Runger, G. C. (2010). Applied Statistics and Probability for Engineers (5th ed.). Wiley. 4. Aschengrau, A., & Seage, G. R. (2007). Essentials of Epidemiology in Public Health (2nd ed.). 5. Friis, R. H., & Sellers, T. (2014). Epidemiology for Public Health Practice. Jones & Bartlett Publishers.

KIB1010: Anatomi dan Fisiologi / *Anatomy and Physiology*

Kod Kursus *Course Code*	KIB1010
Tajuk Kursus *Course Title*	Anatomi dan Fisiologi *Anatomy and Physiology*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menghuraikan konsep asas anatomi dan fisiologi sistem tubuh manusia yang berbeza. 2. Menerangkan kefungsian dan kesesuaian peranti bioperubatan berdasarkan prinsip asas anatomi and fisiologi manusia. 3. Menilai masalah berkaitan kejuruteraan bioperubatan menggunakan pengetahuan asas anatomi dan fisiologi manusia. 4. Menganalisa input berkaitan kejuruteraan bioperubatan dari perspektif anatomi dan fisiologi manusia. 5. Mengaitkan idea mengenai topik terpilih berkenaan anatomi dan fisiology manusia kepada aplikasi dalam kejuruteraan bioperubatan. *At the end of the course, students are able to:* *1. Describe the basic concept of anatomy and physiology of different human body systems.* *2. Explain the functionality and suitability of biomedical device based on basic principles of human anatomy and physiology.* *3. Evaluate biomedical engineering related problem using fundamental knowledge of human anatomy and physiology* *4. Analyse input related to biomedical engineering from the perspective of human anatomy and physiology.* *5. Relate ideas on selected topics on human anatomy and physiology to biomedical engineering application.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan pengetahuan asas mengenai anatomi dan fisiologi di dalam kejuruteraan bioperubatan. Walaupun kursus ini tidak mempunyai pra-syarat, pengetahuan asas yang baik mengenai tubuh manusia dan fungsi fisiologinya adalah penting. Pengetahuan di dalam anatomi manusia (struktur badan) dan fisiologi (fungsi badan) diperlukan untuk kursus ini. Kursus ini mengajar para pelajar mengenai anatomi dan fungsi sistem organ tubuh manusia dengan memberi tumpuan kepada bagaimana struktur dan pengfusian berfungsi bersama di dalam homeostasis dan juga di dalam mekanisme penyakit. Pengetahuan dari ini dapat diterapkan di dalam membentuk penyelesaian dari aspek kejuruteraan bioperubatan untuk aplikasi bioperubatan dan klinikal. Pelajar yang berjaya mengikuti kursus ini akan dapat mengemukakan idea dan membentuk penyelesaian kejuruteraan bioperubatan dari

| | aspek anatomi dan fisiologi. Pengetahuan ini sangat penting untuk pelbagai kursusdan projek kejuruteraan bioperubatan.

This course aims to teach engineering students the fundamentals used of anatomy and physiology in biomedical engineering. Although this course does not have pre-requisite, a strong fundamental in the human body and its physiological function is important. Knowledge in human anatomy (body structure) and physiology (body function) is required for this course. This course teaches the students the anatomy and functionality of the organ systems of the human body that focuses on how structures and functions work together in homeostasis and in disease mechanism. The knowledge from this is applied into developing biomedical engineering solutions for biomedical and clinical application. Students who have successfully competed this course will be able to present biomedical engineering ideas and solutions from the aspect of anatomy and physiology. This knowledge is extremely important for various biomedical engineering courses and projects. |
|---|---|
| Pemberatan Penilaian
Assessment Weightage | Penilaian Berterusan / *Continuous Assessment*: 40%
Peperiksaan Akhir / *Final Examination*: 60% |
| Rujukan Utama
Main Reference | 1. Marieb, E., & Hoehn, K. (2018). Human Anatomy & Physiology (11th ed.). Pearson.
2. Md, F. N. H. (2018). Atlas of Human Anatomy (Netter Basic Science) (7th ed.). Elsevier.
3. Wise, E. (2017). Laboratory Manual for Saladin's Anatomy & Physiology (8th ed.). McGraw-Hill Education.
4. Alberts, B., Johnson, A. D., Lewis, J., Morgan, D., Raff, M., Roberts, K., & Walter, P. (2014). Molecular Biology of the Cell (Sixth ed.). W. W. Norton & Company. |

KIB1011: Statik dan Mekanik Bahan / *Statics and Mechanics of Materials*

Kod Kursus *Course Code*	KIB1011
Tajuk Kursus *Course Title*	Statik dan Mekanik Bahan *Statics and Mechanics of Materials*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menggunakan gambarajah jasad bebas dalam analisa keseimbangan pelbagai struktur. 2. Menyelesaikan masalah berkenaan jasad di bawah tindakan daya paksi, lenturan dan kilasan. 3. Menggunakan analisa berdasarkan momen dan inersia untuk penyelesaian masalah berikutan bebanan bersepadu. 4. Menilai tekanan dan perubahan bentuk peranti biomedikal. 5. Berfungsi dengan berkesan sebagai satu pasukan dalam menganalisis kes sebenar objek statik dibawah bebanan. *At the end of the course, students are able to:* *1. Use free body diagrams to perform equilibrium-based analysis for various structures.* *2. Solve problems involving a body under the action of axial, bending and torsional load.* *3. Employ moment and inertia-based analysis for problem solving due to compound load.* *4. Evaluate stress and deformation of biomedical devices.* *5. Perform effectively as a team in analysing real-life case of static objects under loading.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar prinsip-prinsip asas statik dan mekanik bahan serta aplikasinya dalam objek seharian. Pengetahuan dalam fizik, vektor dan kalkulus mudah diperlukan untuk memahami kursus ini dengan berkesan. Kursus ini membincangkan keadaan struktur dan bahan yang dalam keadaan keseimbangan statik, melalui kaedah gambarajah jasad bebas; serta perilaku yang dialami oleh sesuatu bahan apabila daya dan tekanan diberi dari arah paksi atau arah kilasan. Melalui kursus ini juga, pelajar belajar menggunakan analisis momen dan inersia untuk menyelesaikan masalah berkaitan dengan beban pelbagai yang bersepadu. Daya luaran juga dapat memberi tekanan dan mengubah bentuk sesuatu bahan, oleh itu teknik pengiraan dan analisa tekanan dan perubahan bentuk bahan juga perlu dapat dinilai oleh pelajar. Di akhir kursus ini, pelajar akan dapat menilai kes objek sebenar di sekitar mereka dari sudut statik dan

	mekanik bahan, melalui kerja berkumpulan. Kursus ini penting untuk pelajar mampu membuat rekaan mekanik untuk alatan biomedikal. *This course aims to teach the fundamental principles of statics and mechanics of materials and its applications in everyday objects. Knowledge in physics, vectors and simple calculus is required to effectively understand this course. This course discusses the state of structures and materials that are in a static equilibrium, through the method of free-body diagrams; as well as the behavior experienced by a material when forces and pressures are applied from an axial or torsional direction. Through this course, students learn to use moment and inertia-based analysis to solve problems related to compound loads. External forces exert pressure and could deform the shape of a material; therefore, the analysis of stress and material deformation could be evaluated. At the end of this course, students will be able to evaluate real-life cases of static objects around them in terms of its static structure and mechanics of materials, through group work. This course is important for students to be able to produce mechanical designs for biomedical devices.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Hibbeler, R. (2014). Statics & Mechanics of Materials (4th ed.). Pearson Education. 2. Hibbeler, R. C. (2018). Statics and Mechanics of Materials in SI Units (5th edition). Pearson. 3. Beer, F., Johnston, E., DeWolf, J., & Mazurek, D. (2020). Statics and Mechanics of Materials (3rd ed.). McGraw-Hill Education. 4. Beer, F., Johnston, E., DeWolf, J., & Mazurek, D. (2016). Statics and Mechanics of Materials (2nd ed.). McGraw-Hill Education.

KIB1012: Teori Litar / *Circuit Theory*

Kod Kursus *Course Code*	KIB1012
Tajuk Kursus *Course Title*	Teori Litar *Circuit Theory*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menyelesaikan litar-litar DC menggunakan teorem analisis litar. 2. Menerangkan konsep dalam model matematik yang digunakan dalam penerangan sambutan fana bagi litar RC, RL dan RLC. 3. Menentukan kelakuan litar AC yang mengandungi elemen penyimpanan tenaga. 4. Mengesahkan kelakuan litar elektrik dengan menggunakan perisian simulasi litar. 5. Melaporkan secara efektif aplikasi teorem-teorem analisis litar melalui laporan bertulis. *At the end of the course, students are able to:* 1. *Solve DC circuits using theorems of circuit analysis.* 2. *Explain concepts in the mathematical model used for description of transient response in RL, RC and RLC circuits* 3. *Determine behavior of AC circuit containing energy storage elements* 4. *Verify behavior of electrical circuit using circuit simulator software.* 5. *Report effectively the application of circuit analysis theorems via written report.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini merangkumi teorem-teorem analisis litar yang termasuk hukum Kirchoff, analisis-analisis nodal dan jejaring, teorem Thevenin dan Norton, hukum superposisi dan hukum transformasi kuasa. Mengira arus, voltan dan kuasa didalam litar arus ulangalik menggunakan pendekatan fasa. Pelajar juga akan didedahkan kepada saling aruhan dan sambutan fana di dalam litar RC, RL dan juga RLC. *This course covers the theorems of circuit analysis which include Kirchhoff's law, nodal and mesh analyses, Thevenin's and Norton's theorems, superposition's and power transformation laws. Calculate current, voltage and power in ac circuits using phasor approach. Study the mutual Inductance and transient response in RC, RL and RLC circuits.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%

Rujukan Utama	1. Ergul, O. (2017). Introduction to Electrical Circuit Analysis: Wiley.
Main Reference	2. Alexander, C. K., & Sadiku, M. (2020). ISE Fundamentals of Electric Circuits: McGraw-Hill Education.
	3. Bakshi, U. A., & Bakshi, L. A. V. (2020). Electrical Circuit Analysis: UNICORN Publishing Group.
	4. Salam, M. A., & Rahman, Q. M. (2018). Fundamentals of Electrical Circuit Analysis: Springer Singapore.
	5. Irwin, J. D., & Nelms, R. M. (2019). Basic Engineering Circuit Analysis: John Wiley & Sons, Limited.

KIB1013: Makmal Kejuruteraan Bioperubatan 1 / *Biomedical Engineering Lab 1*

Kod Kursus *Course Code*	KIB1013
Tajuk Kursus *Course Title*	Makmal Kejuruteraan Bioperubatan 1 *Biomedical Engineering Lab 1*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menunjukkan penggunaan peralatan makmal dan prosedur dengan betul untuk memperoleh data operasi unit asas peranti kejuruteraanbioperubatan 2. Mengatur data yang diperoleh dari hasil kajian operasi unit asas peranti kejuruteraan bioperubatan menggunakan peralatan IoT untuk dilaporkan 3. Mematuhi piawaian keselamatan dan piawaian unit asas peranti kejuruteraan bioperubatan. 4. Mengatur pasukan yang berkesan untuk menyiapkan laporan teknikal dalam format yang tepat untuk penemuan eksperimen operasi unit asas peranti kejuruteraan bioperubatan *At the end of the course, students are able to:* *1. Demonstrate proper usage of laboratory equipment and procedures to obtain data on the operation of basic units of biomedical engineering devices* *2. Organize data obtained from the experimental findings of the operation of basic units of biomedical engineering devices using IoT tools for reporting.* *3. Adhere to the code of safety and standards of the basic units of biomedical engineering devices* *4. Organize an effective team to prepare technical report in a proper format for the experimental findings of the operation of basic units of biomedical engineering devices*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan bioperubatan tentang penggunaan peralatan makmal dan prosedur yang betul untuk memperoleh data unit asas peranti perubatan. Walaupun kursus ini tiada pra-syarat, pengetahuan asas dalam kejuruteraan mekanikal, elektrikal dan bioperubatan yang kukuh adalah diperlukan. Kursus ini mengajar pelajar tentang pengunaan peralatan makmal dan prosedur dengan betul, mengurus data menggunakan peralatan kejuruteraan moden IoT, prosedur keselamatan dan protokol untuk mneggunakan mesin serta cara

	penulisan laporan teknikal. Pengetahuan ini akan digunapakai dalam eksperimen dan analisis peranti bioperubatan untuk mencapai prestasi terbaik sambil memastikan keselamatan dalam operasi. Pelajar yang berjaya menjalani kursun akan mampu untuk menggunakan, memperoleh data, menyediakan eksperimen, mengenalpasti protocol keselamatan, menganalisa data dan menyediakan laporan teknikal. Pengetahuan ini adalah penting untuk penyambungan penggunaan peralatan makmal dan prosedur yang betul.
	This course aims to teach biomedical engineering students the proper usage of laboratory equipment and procedures to obtain data on the operation of basic units of biomedical engineering devices. Although this course does not have pre-requisite, a strong fundamental in mechanical, electrical and biomedical engineering knowledge are needed. This course teaches the students on how is the proper usage of laboratory equipment and procedures, organizing a data using the modern engineering tools IOT, safety procedure and protocol to use the machine and technical way of written report. The knowledge from this is applied into the experiment and analysis of biomedical devices in order to achieve the best performance and yet is still safe during operation. *Students who have successfully completed this course will be able to used, obtain data, setup experiment, identify the safety protocol, analyze data and prepare a technical report. This knowledge is extremely important for the continuation of proper usage of laboratory equipment and procedures.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 100% Peperiksaan Akhir / *Final Examination*: 0%
Rujukan Utama *Main Reference*	1. Antony, J. (2014). Design of experiments for engineers and scientists. Elsevier. 2. Atman, C. J., Eris, O., McDonnell, J., Cardella, M. E., & Borgford-Parnell, J. L. (2015, January). Cambridge Handbook of Engineering Education Research. In Cambridge University Press. 3. Silyn-Roberts, H. (2012). Writing for science and engineering: Papers, presentations and reports. Newnes. 4. Berendsen, H. J. (2011). A student's guide to data and error analysis. Cambridge University Press. 5. Raimes, A., & Jerskey, M. (2012). Keys to Successful Writing: A Handbook for College and Career. Nelson Education.

KIB1014: Sistem Rangka Otot Manusia / *Human Musculoskeletal System*

Kod Kursus *Course Code*	KIB1014
Tajuk Kursus *Course Title*	Sistem Rangka Otot Manusia *Human Musculoskeletal System*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menghuraikan konsep asas sistem muskuloskeletal badan manusia. 2. Mengenalpasti jenis dan aktiviti otot manusia dengan menggunakan alat pengukur yang sesuai. 3. Mengaitkan pengetahuan sistem muskuloskeletal manusia di dalam amalan kejuruteraan bioperubatan dan masyarakat. 4. Menjalankan pengkajian semula gangguan-gangguan sistem muskuloskeletal manusia. *At the end of the course, students are able to:* *1. Describe the basic concept of the musculoskeletal system of the human body.* *2. Identify human muscle types and activities using appropriate measurement devices.* *3. Relate the human musculoskeletal system knowledge towards the application of biomedical engineering practices and society.* *4. Perform a review on the disorders of the human musculoskeletal system.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan bioperubatan mengenai penegetahuan asas sistem muskuloskeletal manusia. Walaupun kursus ini tidak mempunyai pra-syarat, penegtahuan asas yang kuat dalam sistem otot dan rangka adalah penting. Pengetahuan dalam anatomi dan fisiologi manusia diperlukan untuk kursus ini. Kursus ini mengajar para pelajar mengenai sistem muskuloskeletal manusia termasuk jenis penyakit yang boleh berlaku di dalam sistem ini. Pengetahuan dari ini dapat diterapkan ke dalam analisis biomekanik bagi memahami tubuh manusia berkaitan dengan struktur, reka bentuk, fungsi / pergerakan dan corak kecederaan. Pelajar yang berjaya menamatkan kursus ini akan dapat mengemukakan idea dan membentuk penyelesaian kejuruteraan bioperubatan dari aspek sistem muskuloskeletal manusia. Pengetahuan ini sangat penting untuk pelbagai kursus dan projek kejuruteraan bioperubatan.

	This course aims to teach biomedical engineering students the fundamentals of human musculoskeletal system. Although this course does not have *pre-requisite, a strong fundamental in muscular and skeletal system is important. Knowledge in human anatomy and physiology is required for this course. This course teaches the students the basics of the human musculoskeletal system including the types related disorder that can occur in this system. The knowledge from this is applied into analysis of biomechanics in order to understand human body in relation to structure, design, function/movement and patterns of injury.* *Students who have successfully completed this course will be able to present biomedical engineering ideas and solutions from the aspect of human musculoskeletal system. This knowledge is extremely important for various biomedical engineering courses and projects.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Marieb, E., & Hoehn, K. (2018). Human Anatomy & Physiology (11th ed.). Pearson. 2. Md, F. N. H. (2018). Atlas of Human Anatomy (Netter Basic Science) (7th ed.). Elsevier. 3. Wise, E. (2017). Laboratory Manual for Saladin's Anatomy & Physiology (8th ed.). McGraw-Hill Education. 4. Whiting, W. C., & Zernicke, R. F. (2008). Biomechanics of Musculoskeletal Injury, Second Edition (Second Edition). Human Kinetics. 5. Hall, S. (2018). Basic Biomechanics (8th ed.). McGraw-Hill Education.

KIB1015: Dinamik / *Dynamics*

Kod Kursus *Course Code*	KIB1015
Tajuk Kursus *Course Title*	Dinamik *Dynamics*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menyelesaikan masalah kinematik dan kinetik jasad tegar dalam pergerakan 2D. 2. Menyelesaikan masalah berkaitan kinematik dan kinetik mekanisma gelangsar dan mekanisma pautan 4 bar. 3. Analisa prestasi kinetik dan kinematik peranti bioperubatan. 4. Tentukan prestasi kinematik optimal untuk peranti bioperubatan. 5. Cadangkan suatu peranti bioperubatan untuk memenuhi keperluan kinematik dan kinetik. *At the end of the course, students are able to:* *1. Solve kinematics and kinetics problems for rigid bodies in 2D motion.* *2. Solve problems involving kinematics and kinetics of slider mechanisms and four-bar mechanisms.* *3. Analyze the kinetics and kinematics performance of a biomedical device.* *4. Determine the optimal kinematic performance of a biomedical device.* *5. Propose a biomedical device that fulfills certain kinematics and kinetics requirements.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini mengajar pelajar tentang kinetik dan kinematik jasad tegar dalam 2D. Pengetahuan ini akan diapplikasi dalam rekabentuk dan analisis peranti bioperubatan untuk mencapai prestasi yang terbaik tetapi masih selamat semasa dalam operasi. Prestasi pautan akan dikaji untuk membolehkan pelajar untuk merekabentuk pelbagai mekanisma untuk memenuhi keperluan kinetik dan kinematik peranti bioperubatan. *This course teaches the students the kinematics and kinetics of rigid bodies in 2D. The knowledge from this is applied into the design and analysis of biomedical devices in order to achieve the best performance and yet is still safe during operation. The performance of linkages will also be studied to enable student to design various mechanism to fulfill the kinetics and kinematics requirements of the biomedical device.*

Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Hibbeler, R. (2016). Engineering Mechanics: Dynamics (14th ed.). Pearson.) 2. Myszka, D. H. (2012). Machines & Mechanisms: Applied Kinematic Analysis (4th ed.). Pearson Education. 3. Meriam, J. L., Kraige, L. G., & Bolton, J. N. (2018). Engineering Mechanics: Dynamics (9th ed.). 4. Uicker J. J., Pennock, G. R., & Shigley, J. E. (2016). Theory of Machines and Mechanisms (5th ed.).

KIB1016: Alat Elektronik / *Electronic Devices*

Kod Kursus *Course Code*	KIB1016
Tajuk Kursus *Course Title*	Alat Elektronik *Electronic Devices*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Terangkan persimpangan P-N, litar diod, penerus gelombang separuh, penerus gelombang penuh dan aplikasinya. 2. Menganalisa fungsi gunting, penjepit, bekalan kuasa dan pengatur voltan. 3. Menganalisa litar BJT dan FET, garis bebannya, konfigurasi bias dalam analisis DC dan AC. 4. Demonstrasi reka bentuk litar BJT & FET menggunakan perisian simulasi. 5. Melaporkan litar penguat isyarat kecil dan besar untuk pelbagai aplikasi penjagaan kesihatan. *At the end of the course, students are able to:* *1. Describe P-N junction, diode circuit, half-wave rectifier, full-wave rectifier and their applications.* *2. Analyze the functionality of clippers, clampers, power supply and voltage regulators.* *3. Analyze BJT and FET circuits, its load lines, bias configurations in DC and AC analysis.* *4. Demonstrate BJT & FET circuit designs using simulation software.* *5. Report small and large signal amplifier circuits for various healthcare applications.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk memperkenalkan kepada pelajar kejuruteraan bioperubatan asas analisis peranti elektrik dan elektronik dan aplikasinya. Walaupun kursus ini tidak mempunyai prasyarat, asas yang kuat dalam fizik dan matematik adalah penting. Kursus ini mengajar para pelajar bahan separa konduktor, bahan jenis p dan n termasuk proses dopingnya, dan penerapan persimpangan p-n sebagai elemen litar. Pengetahuan dari kursus ini diterapkan ke dalam reka bentuk dan analisis clipper, clamper, dan regulator bekalan kuasa. Analisis litar juga merangkumi litar setara diod dan aplikasinya, analisis setara DC dan AC BJT dan FET termasuk konfigurasi biasnya. Pelajar yang berjaya menamatkan kursus ini akan dapat menganalisis dan merekabentuk peranti Bioperubatan dari aspek elektrikal dan elektronik.

	This course aims to introduce biomedical engineering students the fundamentals of electrical and electronics devices analysis and their applications. Although this course does not have pre-requisite, a strong fundamental in physics and mathematics is important. This course teaches the students the semi-conductors materials, the p and n type materials including its doping processes, and the application of p-n junction as circuit elements. The knowledge from this is applied into the design and analysis of clipper, clamper, and power supply regulator. The circuit analysis also covered the diode equivalent circuits and its application, DC and AC equivalent analysis of BJT and FET including their bias configurations. Students who have successfully completed this course will be able to analyze and design Biomedical devices from the aspect of electrical and electronics.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Boylestad R. L., & Nashelsky L. (2006). Electronic Devices and Circuit Theory (9th Ed.) Pearson, Prentice Hall. 2. Neaman D. (2001). Electronic Circuit Analysis and Design", (2nd Ed). McGraw Hill. 3. Alexander C. K, & Sadiku M. (2006) Fundamental of Electric Circuits (6th ed.), McGraw Hill. 4. Floyd. (2020) Principles of Electric Circuits: Conventional Current Version, 10th Edition, Seventh Edition, 2020.

KIB2009: Makmal Kejuruteraan Bioperubatan 2 / *Biomedical Engineering Lab 2*

Kod Kursus *Course Code*	KIB2009
Tajuk Kursus *Course Title*	Makmal Kejuruteraan Bioperubatan 2 *Biomedical Engineering Lab 2*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menunjukkan penggunaan peralatan makmal dan prosedur yang betul untuk memperoleh data tentang operasi, peristiwa kerosakan dan penyelanggaraan pembetulan peranti kejuruteraan bioperubatan 2. Menggabungkan data yang diperoleh daripada hasil kajian operasi, kerosakan dan penyelengaraan pembetulan peranti kejuruteraan bioperubatan menggunakan peralatan IoT untuk dilaporkan. 3. Mematuhi piawaian keselamatan, standard dan peraturan untuk peranti kejuruteraan bioperubatan. 4. Mengaturkan (A4) pasukan yang berkesan untuk menyiapkan laporan teknikal dalam format yang tepat untuk penemuan eksperimen operasi, kejadian kerosakan, dan penyelenggaraan pembetulan peranti kejuruteraan bioperubatan *At the end of the course, students are able to:* *1. Demonstrate proper usage of laboratory equipment and procedures to obtain data on the operation, breakdown event, and corrective maintenance of the biomedical engineering devices* *2. Integrate data obtained from the experimental findings of the operation, breakdown event, and corrective maintenance of biomedical engineering devices using IoT tools for reporting.* *3. Adhere to the code of safety, standards and regulations of biomedical engineering devices* *4. Organize an effective team to prepare technical report in a proper format for the experimental findings of the operation, breakdown event, and corrective maintenance of biomedical engineering devices.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan bioperubatan tentang penggunaan peralatan makmal dan prosedur yang betul untuk memperoleh data unit asas peranti perubatan. Walaupun kursus ini tiada pra-syarat, pengetahuan asas dalam kejuruteraan mekanikal, elektrikal dan bioperubatan yang kukuh adalah diperlukan. Kursus ini mengajar pelajar tentang pengunaan peralatan makmal dan prosedur dengan betul, mengurus data

	menggunakan peralatan kejuruteraan moden IoT, prosedur keselamatan dan protocol untuk mneggunakan mesin serta cara penulisan laporan teknikal. Pengetahuan ini akan digunapakai dalam eksperimen dan analisis peranti bioperubatan untuk mencapai prestasi terbaik sambil memastikan keselamatan dalam operasi. Pelajar yang berjaya menjalani kursun akan mampu untuk menggunakan, memperoleh data, menyediakan eksperimen, mengenalpasti protocol keselamatan, menganalisa data dan menyediakan laporan teknikal. Pengetahuan ini adalah penting untuk penyambungan penggunaan peralatan makmal dan prosedur yang betul. *This course aims to teach biomedical engineering students the proper usage of laboratory equipment and procedures to obtain data on on the operation, breakdown event, and corrective maintenance of the biomedical engineering devices. Although this course does not have pre-requisite, a strong fundamental in mechanical, electrical and biomedical engineering knowledge are needed. This course teaches the students on how is the proper usage of laboratory equipment and procedures, findings of the operation, breakdown event, and corrective maintenance of biomedical engineering devices using IoT tools for reporting. safety procedure and protocol to use the machine and technical way of written report. The knowledge from this is applied into the experiment and analysis of biomedical devices in order to achieve the best performance and yet is still safe during operation. Students who have successfully completed this course will be able to used, obtain data, setup experiment, identify the safety protocol, analyze data operation, breakdown event, and corrective maintenance of biomedical engineering devices and prepare a technical report. This knowledge is extremely important for the continuation of proper usage of laboratory equipment and procedures.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 100% Peperiksaan Akhir / *Final Examination*: 0%
Rujukan Utama *Main Reference*	1. Antony, J. (2014). Design of experiments for engineers and scientists. Elsevier. 2. Atman, C. J., Eris, O., McDonnell, J., Cardella, M. E., & Borgford-Parnell, J. L. (2015, January). Cambridge Handbok of Engineering Education Research. In Cambridge University Press. 3. Silyn-Roberts, H. (2012). Writing for science and engineering: Papers, presentations and reports. Newnes. 4. Berendsen, H. J. (2011). A student's guide to data and error analysis. Cambridge University Press. 5. Raimes, A., & Jerskey, M. (2012). Keys to Successful Writing: A Handbook for College and Career. Nelson Education.

KIB2010: Kejuruteraan Bioperubatan, Penjagaan Kesihatan dan Etika / *Biomedical Engineering, Healthcare and Ethics*

Kod Kursus *Course Code*	KIB2010
Tajuk Kursus *Course Title*	Kejuruteraan Bioperubatan, Penjagaan Kesihatan dan Etika *Biomedical Engineering, Healthcare and Ethics*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menerangkan peranan jurutera bioperubatandalam merekabentuk peranti bioperubatan berdasarkan keperluan anatomi dan fisiologi manusia normal. 2. Mengkaji semula alatan dan prinsip asas kejuruteraan bioperubatan yang diperlukan bagi menganalisa masalah dalam penjagaankesihatan dan etika. 3. Merumuskan tanggungjawab etika dan profesional seorang jurutera bioperubatan dalam menilai impak sebarang keputusanyang dibuat. 4. Menerangkan bagaimana keperluan masyarakat mampu dipenuhi dengan mengaplikasi amalan kejuruteraan bioperubatan yang profesional. 5. Menerangkan prinsip etika yang digunapakaidi dalam kejuruteraan bioperubatan. *At the end of the course, students are able to:* *1. Explain the role of biomedical engineer in designing biomedical devices based on the anatomical and physiological needs of normal humans.* *2. Review the tools required in analysing the problem using fundamental principles of biomedical engineering with respect to healthcare and ethics.* *3. Summarise the ethical and professional responsibility of biomedical engineer in appraising the impact of their decision making.* *4. Describe how societal needs can be met by applying professional biomedical engineeringpractices.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mendedahkan pelajar bagaimana teknologi bioperubatan dibangunkan dan digunakan di dalam persekitaran klinikal. Walaupun kursus ini tidak mempunyai sebarang pra-syarat, pelajar digalakkan untuk mempunyai fikiran yang terbuka dan sifat ingin tahu dalam menerokan kerjaya sebagai seorang jurutera bioperubatan. Pelajar akan diperkenalkan kepada peranan profesional dan kemasyarakatan sebagai seorang jurutera bioperubatan, termasuklah komponen etika dan komunikasi. Pendedahan kepada

	pelbagai senario persekitaran kerja dan klinikal sebagai seorang jurutera bioperubatan juga akan diberi, bagi meningkatkan kefahaman pelajar mengenai disiplin kejuruteraan bioperubatan. Pelajar yang berjaya menamatkan kursus ini akan mempunyai pengetahuan asas di dalam peranan seorang juruteran bioperubatan yang beretika dan profesional.
	This course aims to provide the students with an overview of how biomedical technologies are developed and translated into clinical practice. Although this coursedoes not have any pre-requisite, having an open and inquisitive mind to start exploring the career of a biomedical engineer is highly encouraged. Students will be introduced to the professional and societal roles of a biomedical engineer, including ethics and communications. Exposures to the clinical and industrialworking environments as a biomedical engineer will alsobe provided, to enhance student's understanding of the biomedical engineering discipline. Students who have successfully completed this course will have a foundational knowledge of the ethical and professional roles of a biomedical engineer.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Bronzino JD, Peterson DR (2015) The Biomedical Engineering Handbook, Fourth Edition: Four Volume Set, CRC Press. 2. Enderle JD, Bronzino JD (2012) Introduction to Biomedical Engineering, Third Edition, Academic Press. 3. Saltzman WM (2015) Biomedical Engineering: Bridging Medicine and Technology, Second Edition, Cambridge University Press. 4. Street LJ (2017) Introduction to Biomedical Engineering Technology, Third Edition, Taylor & Francis/CRC Press.

KIB2011: Biobahan / *Biomaterials*

Kod Kursus *Course Code*	KIB2011
Tajuk Kursus *Course Title*	Biobahan *Biomaterials*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Mengkaji asas bahan dalam kejuruteraan bioperubatan. 2. Huraikan struktur dan sifat pelbagai biobahan yang digunakan dalam kejuruteraan Bioperubatan. 3. Menganalisa hubungan antara struktur mekanikal dan kimia biobahan dengan fungsi dan tindak balas biologi. 4. Mengaitkan prinsip kelestarian dalam biobahan kepada matlamat pembangunan lestari Badan Bersatu 5. Mengatur informasi daripada pelbagai sumber utntuk memilih biobahan yang bersesuaian untuk aplikasi tertentu dalam kejuruteraan bioperubatan. *At the end of the course, students are able to:* *1. Review the fundamentals of material principles in biomedical engineering.* *2. Describe the structure and properties of the different biomaterials used in biomedical engineering.* *3. Analyze the relationship between mechanical and chemical structure of biomaterials to functional properties and biological response* *4. Relate the sustainability principles in biomaterials to the United Nations sustainable development goals.* *5. Organize information from multiple sources to select the appropriate biomaterials for specific applications in biomedical engineering.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini memberi pengenalan kepada Sains Bahan, dengan penekanan pada bahan dan aplikasi yang berkaitan dengan Kejuruteraan Bioperubatan. Latar belakang asas statik dan mekanik sebelumnya akan berguna untuk kursus ini. Kursus ini menekankan hubungan antara struktur dan sifat bahan, dengan fokus pada sifat mekanik, biologi, dan permukaannya.Kelas bahan yang akan diberi perhatian merangkumi logam, polimer, seramik, gel, dan komposit. Kursus inijuga akan merangkumi pengenalan mengenai keserasian bio dan tindak balas badan asing. Pada akhir kursus ini, pelajar akan dapat untuk mereka bentuk biobahan untuk aplikasi tertentu dalam Kejuruteraan Bioperubatan.

	This course provides an introduction to Materials Science, with an emphasis on the materials and applications relevant to Biomedical Engineering. A previous basic background on statics and mechanics will be useful for the course. The course emphasizes the relationships between the structure and properties of materials, with a focus on their mechanical, biological, and surface properties. Classes of materials to be addressed include metals, polymers, ceramics, gels, and composites. The course will also cover an introduction to biocompatibility and the foreign body response. In the end of the course, students will be able to design biomaterials for specific applications in Biomedical Engineering.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Basu, B. (2017). Biomaterials science and tissue engineering: principles and methods. Cambridge University Press. 2. Barbosa, M., & Martins, M. C. L. (Eds.). (2017). Peptides and proteins as biomaterials for tissue regeneration and repair. Woodhead Publishing. 3. Tripathi, A., & Melo, J. S. (Eds.). (2017). Advances in biomaterials for biomedical applications (Vol. 66). Dordrecht, The Netherlands: Springer. 4. Tanzi, M. C., Farè, S., & Candiani, G. (2019). Foundations of biomaterials engineering. Academic Press. 5. Li, B., & Webster, T. (2018). Orthopedic Biomaterials. Springer International Publishing, Cham.

KIB2012: Reka Bentuk Kejuruteraan Bioperubatan 1 / Biomedical Engineering Design 1

Kod Kursus *Course Code*	KIB2012
Tajuk Kursus *Course Title*	Reka Bentuk Kejuruteraan Bioperubatan 1 / *Biomedical Engineering Design 1*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menentukan spesifikasi reka bentuk peranti bioperubatan berdasarkan maklumat daripada pelbagai sumber. 2. Formulasi eksperimen untuk mevalidasikan pencapaian reka bentuk peranti bioperubatan 3. Menghasilkan bahagian mekanikal dengan menggunakan peralatan mesin seperti penggerudian, penggilingan dan pelarik. 4. Demonstrasi penggunaan perisisan untuk mereka bentuk aspek mekanikal peranti bioperubatan. 5. Melakukan analisa kitaran hidup untuk peranti bioperubatan yang mudah. *At the end of the course, students are able to:* *1. Determine the design specifications of a biomedical device based on multiple sources of information* *2. Formulate experiments to validate the performance of the biomedical device design* *3. Recreate a mechanical part using machining tools such as drilling, milling and lathe.* *4. Demonstrate the usage of software to design the mechanical aspects of biomedical devices.* *5. Perform a life cycle analysis on a simple biomedical device.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini mengajar pelajar kejuruteraan asas reka bentuk kejuruteraan daripada perspektif mekanikal. Walaupun kursus ini tidak mempunyai pra syarat, kursus seperti statik, dinamik dan mekanik bahan adalah penting. Pengetahuan dalam kestabilan, tegasan, terikan, kinetik, kinematik diperlukan untuk kursus ini. Kursus ini mengajar pelajar keseluruhan proses reka bentuk. Penekanan diberi pada spesifikasi reka bentuk yang merupakan kaedah yang pertama dan paling penting dalam reka bentuk kejuruteraan. Pelajar kemudian perlu reka bentuk eksperimen untuk menguji kesahihan reka bentuk untuk memenuhi keperluan reka bentuk. Kemahiran penting seperti penggunaan mesin untuk menghasilkan prototaip yang berfungsi serta lukisan kejuruteraan dan simulasi untuk mendapat model reka bentuk akan diajar kepada pelajar.

	Analisis Kitaran hidup reka bentuk juga akan dilakukan untuk mendedahkan pelajar kepada impak reka bentuk kepada alam sekitar. Pelajar juga akan terlibat dalam reka bentuk dan pengujian peranti kejuruteraan bioperubatan yang mudah. Pelajar yang berjaya menamatkan kursus ini akan berupaya mereka bentuk dan menguji peranti kejuruteraan bioperubatan daripada aspek mekanikal.Pengetahuan ini amatlah penting untuk kursus reka bentuk yang akan datang serta kursus yang mempunyai projek reka bentuk. *This course aims to teach engineering students the fundamentals of engineering design from the mechanical aspects. Although this course does not have pre-requisite, courses such as statics, dynamics and mechanics of materials are important. Knowledge in stability, stress, strain, kinetics and kinematics is required for this course. This course teaches the students the whole design process. Special emphasis will be on design specification which is the first and most important step of engineering design. The students will then be able to design experiments to test the validity of their design to meet the design requirements. Important skills such as machining in order to get a working prototype as well as engineering drawing and simulation to get a model of the final design are also taught to the student. A Life Cycle Analysis of the design will also be conducted to expose the students to the impact of the design to the environment. The students will also be involved in the design of the mechanical aspects of a simple biomedical engineering device. Students who have successfully completed this course will be able to design and test a simple biomedical engineering device from the mechanical aspects. This knowledge is critical for the later design courses as well as courses that havedesign projects.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 100% Peperiksaan Akhir / *Final Examination*: 0%
Rujukan Utama *Main Reference*	1. King, P. H., Fries, R. C., & Johnson, A. T. (2018). Design of Biomedical Devices and Systems, 4th edition (4th ed.). CRC Press. 2. Budynas, N. G. K. R. J. (2021). Shigley's Mechanical Engineering Design (11th ed.). McGraw Hill. 3. A. W. Boundy. (2011) Engineering Drawing (8th Edition). McGraw Hill.

KIB2013: Asas dalam Kejuruteraan Prostetik dan Ortotik / *Fundamentals of Prosthetics and Orthotics Engineering*

Kod Kursus *Course Code*	KIB2013
Tajuk Kursus *Course Title*	Asas dalam Kejuruteraan Prostetik dan Ortotik *Fundamentals of Prosthetics and Orthotics Engineering*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menerangkan pelbagai daya yang telibat dalam penggunaan prostetik dan ortotik. 2. Membezakan jenis-jenis soket dan falsafah reka bentuknya. 3. Menentukan peranti yang sesuai untuk pengguna prostetik dan ortotik. 4. Menganalisa spesifikasi alat prostetik dan ortotik yang sesuai untuk pengguna berdasarkan kes sebenar. 5. Menerangkan pertimbangan kelestarian dalam pembuatan alatan prostetik dan ortotik. *At the end of the course, students are able to:* *1. Describe the various forces involved in prosthetics and orthotics application.* *2. Distinguish different socket types and their design philosophies.* *3. Suggest appropriate devices for the prosthetics and orthotics user.* *4. Analyze the specification of suitable prosthetics and orthotics device for users based on real cases.* *5. Describe sustainable consideration in fabricating prosthetics and orthotics devices.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk memperkenalkan asas kepada kejuruteraan prostetik dan ortotik. Pengetahuan daripada kursus-kursus mekanikal, serta biomekanik dan anatomi manusia diperlukan untuk kursus ini. Prostetik dan ortotik adalah teknologi bantuan untuk pemulihan anggota badan seperti tangan dan kaki. Kursus ini menerangkan pelbagai jenis komponen prostetik dan ortotik dan implikasi biomekanikal setiap alatan kepada pengguna. Di akhir kursus ini, pelajar akan dapat memilih pelbagai jenis peranti untuk menangani ketidakupayaan dan keadaan patologi yang berbeza. *This course aims to introduce the students to the fundamentals of prosthetics and orthotics engineering. Knowledge from mechanical courses as well as biomechanics and human anatomy is required for this course. Prosthetics and Orthotics are assistive technologies for*

	limbs rehabilitation such as the arms and the legs. This course describes the various types ofprosthetics and orthotics components and their biomechanical implications to the users. At the end of this course, students will be able to choose different types of devices to address different disabilities and pathological conditions.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Chui K., Jorge M., Yen S. C.,& Lusardi M. (2019). Orthotics and Prosthetics in Rehabilitation Elsevier eBook on VitalSource (Retail Access Card) (4th ed.). Saunders. 2. Standards for Prosthetics and Orthotics. (2017). World Health Organization. 3. Hilliard, J. E., Chui, K. K., Galindo, T. D., & Lusardi, M. M. (2020). Evidence-Based Approach to Orthotic and Prosthetic Rehabilitation. Orthotics and Prosthetics in Rehabilitation, 71–101. https://doi.org/10.1016/b978-0-323-60913-5.00004-0 4. Jorge, M. (2020). Orthotics and Prosthetics in Rehabilitation: Multidisciplinary Approach. Orthotics and Prosthetics in Rehabilitation, 2–13. https://doi.org/10.1016/b978-0-323-60913-5.00001-5

KIB2014: Kaedah Perangkaan dan Pengaturcaraan / *Numerical Methods and Programming*

Kod Kursus *Course Code*	KIB2014
Tajuk Kursus *Course Title*	Kaedah Perangkaan dan Pengaturcaraan *Numerical Methods and Programming*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Terapkan kemahiran pengaturcaraan komputer untuk menyelesaikan sistem persamaan linear. 2. Reka bentuk pengkodan untuk menyelesaikan sistem bukan linier menggunakan pelbagai kaedah berangka seperti regresi kuadrat paling sedikit, Newton-Raphson. 3. Selesaikan sistem persamaan pembezaan biasa menggunakan teknik Runge-Kutta atau Predictor-Corrector di MATLAB. 4. Mencadangkan teknik numerik yang paling sesuai untuk pemodelan biosystem berdasarkan data pengukuran. *At the end of the course, students are able to:* 1. *Apply computer programming skills to solve systems of linear equations.* 2. *Design coding to solve nonlinear systems using various numerical methods such as least squares regression, Newton-Raphson.* 3. *Solve systems of ordinary differential equations using Runge-Kutta or Predictor-Corrector techniques in MATLAB.* 4. *Propose the most appropriate numerical techniques for modelling biosystems based on measurement data.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan kemahiran pengaturcaraan yang diperlukan dan aplikasinya dalam analisis berangka. Walaupun kursus ini tidak mempunyai prasyarat, pengetahuan dalam kalkulus diperlukan. Kursus ini mengajar para pelajar bagaimana menerapkan kemahiran pengaturcaraan komputer untuk menyelesaikan sistem persamaan linear dan tidak linear, serta persamaan pembezaan biasa menggunakan pelbagai kaedah berangka. Pelajar yang berjaya menamatkan kursus ini akan dapat mengaplikasikan kemahiran pengaturcaraan dan analisis berangka mereka dalam memodelkan biosistem berdasarkan data pengukuran. *This course aims to teach engineering students necessary programming skills and their applications in numerical analysis. Although this course does not havepre-requisite, knowledge in calculus*

	is required. This course teaches the students how to apply computer programming skills to solve systems of linear and nonlinear equations, as well as ordinary differential equations using various numerical methods. Students who have successfully completed this course will be able to apply their programming and numerical analysis skills in modelling biosystems based on measurement data.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Ph.D., D. S., Constantinides, A., & Ph.D., M. P. (2005). Numerical Methods in Biomedical Engineering (1st ed.). Academic Press. 2. Kong, Q., Siauw, T., & Bayen, A. (2020). Python Programming and Numerical Methods: A Guide for Engineers and Scientists (1st ed.). Academic Press. 3. Otto, S., & Denier, J. P. (2005). An Introduction to Programming and Numerical Methods in MATLAB (2005th ed.). Springer. 4. Young T., & Mohlenkamp M. J.(2021) Introduction to Numerical Methods and Matlab Programming for Engineers.

KIB2015: Keselamatan dan Piawaian dalam Kejuruteraan Bioperubatan / *Safety and Standards in Biomedical Engineering*

Kod Kursus *Course Code*	KIB2015
Tajuk Kursus *Course Title*	Keselamatan dan Piawaian dalam Kejuruteraan Bioperubatan *Safety and Standards in Biomedical Engineering*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menganalisa amalan keselamatan mekanikal dan elektrikal dalam kejuruteraan bioperubatan 2. Menunjukkan penggunaan IoT dalam memantau keselamatan alat perubatan 3. Terangkan piawaian dan kod keselamatan peranti perubatan kebangsaan dan antarabangsa dalam kejuruteraan bioperubatan. 4. Mengaitkan kelestarian peranti bioperubatan dengan piawaian dan peraturan keselamatan. 5. Mengaitkan peranti penilaian bioperubatan risiko dengan piawaian kod amalan profesional. *At the end of the course, students are able to:* *1. Analyze safety practices of mechanical andelectrical in biomedical engineering* *2. Demonstrate the usage of IoT in monitoring the safety of medical devices* *3. Explain the national and International medical device safety standard and codes in biomedical engineering.* *4. Relate the sustainability of the biomedical devices based on the standard and safety regulation.* *5. Relate the risk assesment biomedical devices to the standard of code of professional practices.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar keselamatan danpiawaian kepada pelajar dalam bidang kejuruteraan bioperubatan. Walaupun kursus ini tidak mempunyai prasyarat, pengetahuan yang mendalam tentang penggunaan peranti sebagai jurutera bioperubatan adalah penting. Pengetahuan dalam keselamatan dan piawaian mekanikal dan elektrikal yang digunakan dalam bidang kejuruteraan bioperubatan. Kursus ini mengajar para pelajar keselamatan yang diperlukan ketika berurusan dengan alat bioperubatan, mesin, piawaian elektrik dan elektronik, reka bentuk alat perubatan dan kod etika amalan sebagai jurutera bioperubatan. Pengetahuan dari ini diterapkan ke dalam reka bentuk dan analisis peranti bioperubatan untuk mencapai prestasi terbaik namun masih selamatsemasa operasi. Pelajar yang berjaya

	menamatkan kursus ini akan dapat mengetahui keselamatan yang diperlukan dalam menangani alat dan piawaian bioperubatan yang digunakan dalam industri bioperubatan. Pengetahuan ini sangat penting untuk kesinambungan tahap piawaian lain yang lebih tinggi dalam kursus alat perubatan. *This course aims to teach biomedical engineeringstudents the safety and standards in biomedical engineering. Although this course does not have pre-requisite, a strong knowledge about the usage of devices as biomedical engineer is important. Knowledgein both mechanical and electrical safety and standards that being used in biomedical engineering field. This course teaches the students the safety required when dealing with biomedical devices, machine, electrical and electronics standards, design of medical devices and ethical codes of practice as biomedical engineer. The knowledge from this is applied into the design and analysis of biomedical devices in order to achieve the best performance and yet is still safe during operation. Students who have successfully completed this course will be able to know the safety require in dealing with biomedical devices and standards that used in the biomedical industry. This knowledge is extremely important for continuation of other higher level of standards learn in medical devices courses.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. King, P. H., Fries, R. C., & Johnson, A. T. (2019). Design of Biomedical Devices and Systems (3rd ed.). CRC Press. 2. Cromwell L, Weibell F.J., Pfeiffer E.A. (2004) Biomedical Instrumentation and Measurements. 3. Bronzino J. D. (2006) The Biomedical Engineering Handbook, Fourth Edition Series Editor: Taylor and Francis. 4. Fries R.C (2000). Handbook of Medical Device Design. CRC Press

KIB2016: Mekanik Bendalir dan Proses Pengangkutan dalam Kejuruteraan Bioperubatan / *Fluid Mechanics and Transport Processes in Biomedical Engineering*

Kod Kursus *Course Code*	KIB2016
Tajuk Kursus *Course Title*	Mekanik Bendalir dan Proses Pengangkutan *Fluid Mechanics and Transport Processes in Biomedical Engineering*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menganalisa masalah statik bendalir, seperti tekanan dan daya hidrostatik, serta masalah dinamik seperti pemuliharaan jisim, persamaan Bernoulli dan tenaga. 2. Selesaikan masalah aliran bendalir dengan mengambil kira kehilangan tenaga dalam sistem paip. 3. Tentukan prestasi sistem aliran bendalir berdasarkan analisis perbezaan aliran bendalir. 4. Menganalisa data eksperimen atau hasil simulasi model berdasarkan penerapan prinsip pemindahan massa pada sistem biologi. 5. Mengemukakan idea mengenai topik terpilih dalam proses pengangkutan yang diterapkan dalam bidang kejuruteraan bioperubatan *At the end of the course, students are able to:* 1. *Analyze fluid statics such as pressure and hydrostatic force, and dynamics such as conservation of mass, Bernoulli and energy equations problems.* 2. *Solve fluid flow problem by taking into account energy losses in a piping system.* 3. *Determine the performance of a fluid flow system based on differential analysis of fluid flow.* 4. *Analyze experimental data or model simulation results based on the application of mass transfer principles on biological systems.* 5. *Present ideas on selected topics in transport processes applied in the biomedical engineering field.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar teknik asas mekanik bendalir. Walaupun kursus ini tidak mempunyai prasyarat, asas yang kuat dalam mekanik kejuruteraan adalah penting. Pengetahuan dalam matematik (kalkulus dan vektor sederhana), keupayaan untuk melukis rajah dan dinamik badan bebas (hubungan pecutan daya) diperlukan untuk kursus ini. Kursus ini mengajar pelajar statik bendalir (tekanan dan daya hidrostatik), dinamika (pemuliharaan jisim, persamaan Bernoulli dan tenaga) dan kehilangan tenaga dalam sistem paip. Sebagai tambahan, analisis pembezaan aliran bendalir dan fenomena

	pengangkutan, khususnya pemindahan jisim melalui penyebaran dan perolakan, juga akan dikaji. Pelajar yang berjaya menamatkan kursus ini akan dapat menyelesaikan masalah aliran bendalir dan pengangkutan massa yang berkaitan dengan tubuh manusia (e.g., saluran darah) dan alat bioperubatan (e.g., penghantaran ubat dari stent).
	This course aims to teach engineering students the fundamentals of fluid mechanics. Although this coursedoes not have pre-requisite, a strong fundamental in engineering mechanics is important. Knowledge in mathematics (simple calculus and vectors), ability to draw free body diagram and dynamics (force-acceleration relationship) is required for this course. This course teaches the students fluid statics (pressure and hydrostatic force), dynamics (conservation of mass, Bernoulli and energy equations)and energy losses in a piping system. In addition, differential analysis of fluid flow and transport phenomena, in particular mass transfer through diffusion and convection, will also be studied. Students who have successfully completed this course will be able to solve fluid flow and mass transport problem related to human body (e.g., blood vessel) and biomedical devices (e.g., drug delivery from stents).
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%

KIB2017: Elektromagnetisme dan Peranti Bioperubatan / *Electromagnetism and Biomedical Devices*

Kod Kursus *Course Code*	KIB2017
Tajuk Kursus *Course Title*	Elektromagnetisme dan Peranti Bioperubatan *Electromagnetism and Biomedical Devices*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menghuraikan Hukum Coulomb, Hukum Gauss, Hukum Bio-Savart dan Hukum Ampere dalam medan elektrostatik dan magnetostatik. 2. Menyelesaikan masalah berkaitan Hukum Faraday dalam medan elektromagnetik yangberubah dengan masa. 3. Mendemostrasikan prinsip operasi asas mesin elektrik dalam jenis arus terus dan arus ulang-alik yang kebiasaanya digunakan dalambidang kejuruteraan bioperubatan. 4. Menjalankan pengkajian semula atas kegunaan elektromagnetisme dan mesin elektrik dalam kejuruteraan bioperubatan. 5. Menerangkan prinsip kerja peralatan teknologi bioperubatan dalam penjagaan kesihatan. *At the end of the course, students are able to:* *1. Descibe Coulomb's Law, Gauss's Law, Bio-Savart's Law, and Ampere's Law in electrostatic and magnetostatic fields.* *2. Solve problems regarding Faraday's Law in time-varying electromagnetic fields.* *3. Demonstrate basic operational principles of AC and DC electrical machines typically employed in biomedical engineering field.* *4. Perform a review on the usage of electromagnetism and electric machines in biomedical engineering.* *5. Explain working principles of biomedical technology equipment in healthcare.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan tentang asas elektromagnetik dan teknologi peranti perubatan. Walaupun kursus ini tidak mempunyai prasyarat, tetapi asas kuat dalam analisa vektor adalah penting. Kursus ini mengajar tentang teori elektromagnetik seperti medan elektrostatik dan magnetostatik, Hukum Gauss, Hukum Ampere, Hukum Faraday dengan medan berubah, motor arus terus dan arus ulang-alik, peranti-peranti perubatan yang digunakan dalam hospital seperti elektrokardiograf, peranti mengukur tekanan fisiologi, peralatan pernafasan, elektroensefalograf dan instrumentasi perubatan makmal. Pelajar-pelajar yangberjaya melengkapkan kursus

	ini dapat memahami asas penting elektromagnetik dan teknologi untuk peralatan perubatan di hospital. *This course aims to teach engineering students the fundamentals of electromagnetics and technology of thebiomedical devices. Although this course does not havepre-requisite, a strong fundamental in vector analysis is important. The course teaches the students the theory of electromagnetics such as electrostatic field, magnetostatic field, Gauss's law, Ampere's law, Faraday's law with time varying fields, ac and dc motor and biomedical devices used in hospital such as electrocardiograph, physiological pressure measurement devices, respiratory equipment, electroencephalograph, medical laboratory instrumentation. Students who have successfully completed this course will be able to understand the important fundamentals of electromagnetics and technology for biomedical devices in hospital.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Sadiku, M.N.O. (2018). "Elements of Electromagnetics". 7th Edition. New York: Oxford University Press. 2. Notaros, B.N. (2014). "Matlab based Electromagnetics". 1st Edition. New Jersey: Pearson-Prentice Hall. 3. Wildi, Theodore. (2006). "Electrical Machines, Drivers and Power Systems". 6th Edition. New Jersey: Pearson-Prentice Hall. 4. Anthony Chan, Y.K. (2016). "Biomedical Device Technology: Principles and Design". Charles C Thomas, Illinois, USA. 5. Carr, J.J. and Brown, J.M. (2001). "Introduction to Biomedical Equipment Technology". Prentice Hall, New Jersey, USA.

KIB2018: Biomekanik Gerakan Manusia / *Biomechanics of Human Motion*

Kod Kursus *Course Code*	KIB2018
Tajuk Kursus *Course Title*	Biomekanik Gerakan Manusia *Biomechanics of Human Motion*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Terangkan konsep dan teori sistem muskuloskeletal manusia dari segi perspektif biomekanik. 2. Menganalisa masalah biomekanikal berkaitan dengan kinetik dan kinematik pergerakan manusia. 3. Mengesahkan peralatan yang digunakan untuk analisis pergerakan manusia. 4. Menghubungkaitkan kelestarian rehabilitasi biomekanik. 5. Memaparkan komunikasi berkesan di dalam analisis kes-kes gaya berjalan. *At the end of the course, students are able to:* 1. *Describe the concept and theory of human musculoskeletal systems from the biomechanics perspective.* 2. *Analyse biomechanical problems related to kinetics and kinematics of the human motion.* 3. *Validate the instrumentation used for the analysis of human motion.* 4. *Relate the sustainability of biomechanics rehabilitation.* 5. *Display effective communications in the analysis of gait cases.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Biomekanik pergerakan manusia adalah sains yang merujuk kepada analisis kepada bagaimana dan mengapa pergerakan badan berlaku. Kursus ini akan mengenalkan kepada pelajar prinsip mekanikal yang boleh diaplikasikan kepada struktur dan fungsi manusia yang membolehkan kepada analisis pergerakan manusia dan sistem muskuloskeletal. Tajuk termasuk mekanik asas (kinetik dan kinematik) di dalam pergerakan manusia, biomekanik gaya berjalan dan berlari termasuk gaya berjalan patologikal, dan biomekanik rehabillitasi. Kesedaran terhadap tisu mekanik di dalam sistem muskuloskeletal akan diperkenalkan untuk aplikasi peskripsi senaman dan kecederaan. Daya dan momen sendi ketika pergerakan manusia akan disiasat. Asas teoritikal kepada cara menilai pergerakan melalui cara kualitatif dan kuantitatif akan juga diperkenalkan bagi membolehkan analisis praktikal asas terhadap pergerakan umum dijalankan.

	Biomechanics of human motion is the science that is concerned with analysing how and why human bodies move in the way they do. This course will introduce students to the mechanical principles that can be applied to human structure and function allowing analysis of human movement and the musculoskeletal system. Topics include basic mechanics (kinetics and kinematics) in human movement, the biomechanics of human gait in walking and running including pathological gaits, and rehabilitation biomechanics. An awareness of the mechanics of tissues in the musculoskeletal system will be introduced as applied toexercise prescription and injury. The forces and moments in joints during human movement will be investigated. The theoretical basis of methods for assessing movement, both quantitative and qualitative,will also be introduced enabling basic practical analysis of common movements to be performed.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. PhD, H. J., PhD, K. K., & Derrick, T. (2014). Biomechanical Basis of Human Movement (Fourth, North American ed.). LWW. 2. Levine, D. (2012). Whittle's Gait Analysis (5th ed.). Churchill Livingstone. 3. Winter, D. A. (2009). Biomechanics and Motor Control of Human Movement (4th ed.). Wiley. 4. Whiting, W. C., & Zernicke, R. F. (2008). Biomechanics of Musculoskeletal Injury, Second Edition (Second Edition). Human Kinetics. 5. MSc, D. B. M., MSc, B. G. M., & PhD, R. P. (1999). Functional Human Movement: Measurement and Analysis (1st ed.). Butterworth-Heinemann

KIB2019: Makmal Kejuruteraan Bioperubatan 3 / *Biomedical Engineering Lab 3*

Kod Kursus *Course Code*	KIB2019
Tajuk Kursus *Course Title*	Makmal Kejuruteraan Bioperubatan 3 *Biomedical Engineering Lab 3*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menunujukkan penggunaan peralatan makamal dan prosedur yang betul untuk memperoleh data operasi, persitiwa kerosakan dan penyelenggaraan pembetulan sistem kejuruteraan bioperubatan. 2. Membina pangkalan data dari hasil kajian operasi, peristiwa kerosakan dan penyelenggaraan pembetulan sistem kejuruteraan bioperubtan menggunakan peralatan IoT. 3. Mematuhi piawaian keselamatan dan piawaian sistem kejuruteraan bioperubatan. 4. Mengaturkan pasukan yang berkesan untuk menyiapkan dokumentasi teknik Bioperubatan teknikal untuk penemuan eksperimen operasi, peristiwa kerosakan, dan penyelenggaraan pembetulan sistem kejuruteraan bioperubatan. *At the end of the course, students are able to:* *1. Demonstrate proper usage of laboratory equipment and procedures to obtain data on the operation, breakdown event and corrective maintenance of the biomedical engineering systems.* *2. Build a database from the experimental findings of the operation, breakdown event, and corrective maintenance of biomedical engineering systems using IoT tools.* *3. Adhere to the code of safety and standards of biomedical engineering systems.* *4. Organize an effective team to prepare a technical Biomedical Engineering documentation for the experimental findings of the operation, breakdown event, and corrective maintenance of biomedical engineering systems.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan bioperubatan tentang penggunaan peralatan makmal dan prosedur yang betul untuk memperoleh data unit asas peranti perubatan. Walaupun kursus ini tiada pra-syarat, pengetahuan asas dalam kejuruteraan mekanikal, elektrikal dan bioperubatan yang kukuh adalah diperlukan. Kursus ini mengajar pelajar tentang pengunaan peralatan makmal dan prosedur dengan betul, mengurus data

	menggunakan peralatan kejuruteraan moden IoT, prosedur keselamatan dan protokol untuk mneggunakan mesin serta cara penulisan laporan teknikal. Pengetahuan ini akan digunapakai dalam eksperimen dan analisis peranti bioperubatan untuk mencapai prestasi terbaik sambil memastikan keselamatan dalam operasi. Pelajar yang berjaya menjalani kursun akan mampu untuk menggunakan, memperoleh data, menyediakan eksperimen, mengenalpasti protokol keselamatan, menganalisa data dan menyediakan laporan teknikal. Pengetahuan ini adalah penting untuk penyambungan penggunaan peralatan makmal dan prosedur yang betul. *This course aims to teach biomedical engineering students the proper usage of laboratory equipment and procedures to obtain data on the operation, breakdown event and corrective maintenance of the biomedical engineering systems. Although this course does not have pre-requisite, a strong fundamental in mechanical, electrical and biomedical engineering knowledge are needed. This course teaches the students on how is theproper usage of laboratory equipment and procedures, operation, breakdown event, and corrective maintenance of biomedical engineering systems using IoT tools, safety procedure and protocol to use the machine and technical way of written report. The knowledge from this is applied into the experiment and analysis of biomedical devices in order to achieve the best performance and yet is still safe during operation. Students who have successfully completed this course will be able to used, operation, breakdown event, and corrective maintenance of biomedical engineering systems, identify the safety protocol, and prepare a technical report. This knowledge is extremely importantfor the continuation of proper usage of laboratory equipment and procedures.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 100% Peperiksaan Akhir / *Final Examination*: 0%
Rujukan Utama *Main Reference*	1. Antony, J. (2014). Design of experiments for engineers and scientists. Elsevier. 2. Atman, C. J., Eris, O., McDonnell, J., Cardella, M. E., & Borgford-Parnell, J. L. (2015, January). Cambridge Handbook of Engineering Education Research. In Cambridge University Press. 3. Silyn-Roberts, H. (2012). Writing for science and engineering: Papers, presentations and reports. Newnes. 4. Berendsen, H. J. (2011). A student's guide to data and error analysis. Cambridge University Press. 5. Raimes, A., & Jerskey, M. (2012). Keys to Successful Writing: A Handbook for College and Career. Nelson Education.

KIB2020: Reka Bentuk Kejuruteraan Bioperubatan 2 / *Biomedical Engineering Design 2*

Kod Kursus *Course Code*	KIB2020
Tajuk Kursus *Course Title*	Reka Bentuk Kejuruteraan Bioperubatan 2 *Biomedical Engineering Design 2*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menentukan spesifikasi reka bentuk subsistem peranti bioperubatan berasakan elektrikal berdasarkan pelbagai sumber maklumat (Contohnya input dan penanda aras pihak berkepentingan). 2. Merumuskan eksperimen untuk mengesahkan prestasi rekabentuk peranti bioperubatan dalam aspek elektrikal. 3. Membina litar elektrik yang melibatkan pengujian dan pengesahan pemasangan litar menggunakan Papan Litar Bercetak (PCB) atau papan projek, dan menggunakan alat pengujian seperti multimeter atau osiloskop. 4. Demonstrasi penggunaan perisian untuk merancang dan mensimulasi peranti bioperubatan merangkumi aspek electrikal. 5. Melakukan analisis kitaran hidup pada alat bioperubatan ringkas dengan mempertimbangkan aspek elektrikal. *At the end of the course, students are able to:* *1. Determine the design specifications of subsystem of electrical based biomedical device based on multiple sources of information (E.g. stakeholders input and benchmarking).* *2. Formulate experiments to validate the performance of the biomedical device design in electrical aspect.* *3. Recreate an electric circuit which involve circuit assembly testing and validation using Printed Circuit Board (PCB) or project board, and using testing tools such as multimeter or oscilloscope.* *4. Demonstrate the usage of software to design and simulate the electrical aspects of biomedical devices.* *5. Perform a life cycle analysis on a simple biomedical device considering electrical aspect.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan asas rekabentuk kejuruteraan dari aspek elektrik. Walaupun kursus ini tidak mempunyai prasyarat, walaubagaimanapon kursus-kursus seperti teori litar, dan peranti elektronik adalah penting.

	Pengetahuan mengenai undang-undang Ohm, undang-undang Kirchhoff, dan peranti elektrik aktif seperti diod, transistor dan op-amp diperlukan untuk kursus ini. Kursus ini mengajar para pelajar proses rekabentuk litar elektrik yang penting. Penekanan khas akan diberikan pada spesifikasi rekabentuk yang merupakan langkah pertama dan terpenting dalam reka bentuk kejuruteraan. Pelajar kemudian dapat merancang eksperimen untuk menguji kesahan reka bentuk mereka untuk memenuhi spesifikasi reka bentuk. Kemahiran penting seperti pemasangan litar dan ujian untuk mendapatkan prototaip yang berfungsi serta lukisan dan simulasi kejuruteraan untuk mendapatkan model reka bentuk akhir juga akan diajar kepada pelajar. Analisis kitaran hidup reka bentuk juga akan dilaksanakan untuk memberi pendedahan kepada pelajar mengenai kesan reka bentuk terhadap persekitaran. Pelajar juga akan terlibat dalam reka bentuk aspek elektrik peranti kejuruteraan bioperubatan. Pelajar yang berjaya menamatkan kursus ini dapat merancang dan mengujialat kejuruteraan bioperubatan mudah dari aspek elektrik. Pengetahuan ini sangat penting sebagai persediaan untuk kursus-kursus melibatkan reka bentuk. *This course aims to teach engineering students the fundamentals of engineering design from the electrical aspects. Although this course does not have any pre-requisite, courses such as circuit theory, and electronic devices are important. Knowledge in Ohm's las, Kirchhoff's laws, and active electrical devices such as diodes, transistors and op-amps are required for this course. This course teaches the students the essential electric circuit design process. Special emphasis will be on design specification which is the first and most important step of engineering design. The students will then be able to design experiments to test the validity of their design to meet the design requirements. Important skills such as circuit assembly and testing in order to get a working prototype as well as engineering drawing and simulation to get a model of the final design are also taught to the student. A life cycle analysis of the design will also be conducted to expose the students to the impact of the design to the environment. The students will also be involved in the design of the electrical aspects of a simple biomedical engineering device.* *Students who have successfully completed this course will be able to design and test a simple biomedical engineering device from the electrical aspects. This knowledge is critical for the later design courses.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 100% Peperiksaan Akhir / *Final Examination*: 0%

Rujukan Utama *Main Reference*	1. Alexander, C. K., & Sadiku, M. (2020). ISE Fundamentals of Electric Circuits: McGraw-Hill Education.
	2. King P. H., Fries R. C, Johnson A. T. (2019). Design of Biomedical Devices and Systems
	3. Rafiquzzaman M. (2014) Fundamentals of Digital Logic and Microcontrollers (6th ed), John Wiley & Sons.
	4. IEEE TRANSACTIONS ON BIOMEDICAL CIRCUITS AND SYSTEMS, IEEE, accessible through IEEE explore, 2021
	5. Webster, J. G., & Nimunkar, A. J. (2020). Medical Instrumentation: Application and Design (Fifth ed.). Wiley.

KIB3015: Kelestarian dan Amalan dalam Kejuruteraan Bioperubatan / *Sustainability and Practice in Biomedical Engineering*

Kod Kursus *Course Code*	KIB3015
Tajuk Kursus *Course Title*	Kelestarian dan Amalan dalam Kejuruteraan Bioperubatan *Sustainability and Practice in Biomedical Engineering*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Mengesahkan model penyelesaian yang dicadangkan menggunakan pengetahuan kejuruteraan. 2. Menghubungkaitkan strategi yang bersesuaian untuk memastikan projek kejuruteraan adalah terancang, dilaksanakan dan beroperasi secara lestari. 3. Menjalankan analisis kitaran hidup untuk menggambarkan kesan peranti hipotetikal terhadap alam sekitar secara menyeluruh. 4. Menerapkan kaedah perundingan untuk mencapai hasil yang sesuai. 5. Mentafsir konsep kelestarian dalam konteks reka bentuk dan operasi kejuruteraan bioperubatan *At the end of the course, students are able to:* *1. Validate the proposed model solution using engineering knowledge.* *2. Relate suitable strategies to ensure engineering projects are planned, implemented and operated sustainably.* *3. Perform a life cycle analysis to visualize the overall environmental impacts of a hypothetical device.* *4. Implement methods of negotiation in order to achieve an appropriate outcome.* *5. Intepret sustainability concept in the context of biomedical engineering design and operation*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan membolehkan pelajar didedahkan dengan lebih meluas akan keadaan, teknologi, dan infrastuktur berkaitan dunia kejuruteraan bioperubatan di hospital. Pengetahuan berkenaan keselamatan, piawaian dan etika kejuruteraan bioperubatan diperlukan untuk kursus ini. Para pelajar didedahkan dengan kemudahan teknologi terkini yang digunapakai oleh hospital masakini dengan menerapkan konsep kelestarian. Di akhir kursus ini, pelajar-pelajar mampu menjelaskan protokol dan langkah-langkah yang diperlukan untuk mengendalikan sesuatu masalah berkaitan klinikal.

	This course aims to offer the student to exposure with the environment, technology and the infrastructures within the Biomedical Engineering Practices in Hospital Environment. Knowledge in safety, standards and ethics in Biomedical Engineering are required for this course. The students will be exposed with the current technology being used by the hospital with the application of sustainability concept. At the end of the course, students will be able to explain protocol and ways that are needed in handling clinical-related problems.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 100% Peperiksaan Akhir / *Final Examination*: 0%
Rujukan Utama *Main Reference*	1. Bronzino J.D (2011) Biomedical Engineering Handbook, Volumes 1 and 2, CRC Press. 2. Buchbinder S. B.,& Shanks N.H (2019) Introduction To Health Care Management 4th Ed, Jones & Bartlett Learning. 3. Buchbinder S. B., Shanks N.H, & Buchbinder D (2013), Cases In Health Care Management, Jones & Bartlett Learning 4. Sachs, J. D. (2014) The Age of Sustainable Development. Columbia University Press, New York 5. Robertson, M. (2014) Sustainability principles and practice. Routledge, UK.

KIB3016: Pemprosesan Isyarat Bioperubatan / *Biomedical Signal Processing*

Kod Kursus *Course Code*	KIB3016
Tajuk Kursus *Course Title*	Pemprosesan Isyarat Bioperubatan *Biomedical Signal Processing*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada None
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menganalisa isyarat fisiologi manusia yang sihat menggunakan analisis domain masa dan frekuensi. 2. Menganalisia prestasi kaedah pemprosesan isyarat dalam mencapai hasil yang diinginkan 3. Menyesuaikan teknik pemerolehan isyarat yang ada untuk memperoleh data fisiologi yang diinginkan. 4. Memformulasikan isyarat fisiologi menggunakan algoritma pemprosesan isyarat 5. Mengamalkan sudut pandangan tanpa diskriminasi terhadap ahli pasukan dalam tetapan pelbagai disiplin. *At the end of the course, students are able to:* *1. Analyse healthy human physiological signals using time and frequency domain analysis* *2. Analyze the performance of the signal processing methods in achieving the desired results* *3. Adapt the available signal acquisition techniques to acquire the desired physiological data.* *4. Formulate the physiological signals using signal processing algorithms.* *5. Practice a non-discriminatory approach to team members in a multidisciplinary setting.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan mengenai pemprosesan isyarat bioperubatan. Walaupun kursus ini tidak mempunyai prasyarat, asas yang kuat dalam fizik dan matematik adalah penting. Pengetahuan dalam analisis siri Fourier diperlukan dalam kursus ini. Kursus ini memperkenalkan asas pemprosesan isyarat fisiologi manusia yang sihat menggunakan analisis domain masa dan kekerapan. Kursus ini menerangkan kepada pelajar mengenai kaedah pemprosesan isyarat dalam mencapai hasil yang diinginkan. Kursus ini melatih pelajar untuk membuat penyesuaian teknikal untuk pemerolehan isyarat yang ada untuk mendapatkan data fisiologi yang diinginkan. Pelajar yang berjaya menamatkan kursus ini akan dapat menganalisis isyarat fisiologi dalam memperoleh hasil yang diinginkan.

	This course aims to teach engineering students about the biomedical signal processing. Although this course does not have pre-requisite, a strong fundamental in physics and mathematics is important. Knowledge in Fourier series analysis is required in this course. This course introduces the basics of healthy human physiological signal processing using time and frequency domain analysis. This course explains to students about signal processing methods in achieving the desired results. This course trains students to make technical adaptations for the acquisition of existing signals to obtain the desired physiological data. *Students who have successfully completed this course will be able to analyse the physiological signal in obtaining the desired results.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Bruce, E. N. (2000). Biomedical Signal Processing and Signal Modeling (1st ed.). Wiley-Interscience. 2. Naik, G. (2019). Biomedical Signal Processing: Advances in Theory, Algorithms and Applications (Series in BioEngineering) (1st ed. 2020 ed.). Springer. 3. Bajaj, V., Sinha, G. R., & Chakraborty, C. (2021). Biomedical Signal Processing for Healthcare Applications (Emerging Trends in Biomedical Technologies and Health informatics) (1st ed.). CRC Press. 4. Obeid, I., Selesnick, I., & Picone, J. (2021). Biomedical Signal Processing: Innovation and Applications (1st ed. 2021 ed.). Springer.

KIB3017: Pengimejan Perubatan / *Medical Imaging*

Kod Kursus *Course Code*	KIB3017
Tajuk Kursus *Course Title*	Pengimejan Perubatan *Medical Imaging*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Membezakan prinsip kerja yang mendasari operasi pelbagai peralatan pengimejan perubatan. 2. Mencadangkan tetapan klinikal atau susun atur alatan pengimejan perubatan di hospital. 3. Menyepadukan alat yang sesuai untuk menilai kualiti imej perubatan. 4. Menerangkan perlindungan sinaran dan isu-isu keselamatan dalam operasi peralatan pengimejan perubatan. 5. Membincangkan kelebihan dan batasan kaedah pengimejan perubatan. *At the end of the course, students are able to:* *1. Differentiate the working principles underlyingthe operation of various medical imaging equipment.* *2. Propose the clinical settings or layout for themedical imaging devices at the hospital* *3. Integrate appropriate tool for assessing medicalimage quality.* *4. Explain radiation protection and safety issuesin the operation of medical imaging equipment.* *5. Discuss the strengths and limitations of medical imaging modalities.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar prinsip asas dan reka bentuk peralatan pengimejan diagnostik perubatan. Walaupun kursus ini tidak mempunyai prasyarat, asas fizik yang kuat adalah penting. Kursus ini memperkenalkan pelajar kepada teknologi pengimejan perubatan termasuk radiografi unjuran, mamografi, fluoroskopi, tomografi berkomputer, pengimejan resonans magnetik, ultrasound, tomografi komputasi pelepasan foton tunggal, tomografi pelepasan positron (PET), dan pengimejan optik. Kursus ini juga memberi pendedahan kepada pelajar mengenai kawalan mutu dalam radiologi diagnostik dan keselamatan radiasi. Pelajar yang berjaya menamatkan kursus ini akan dapat memahami mekanisme kerja dan reka bentuk pelbagai peralatan pengimejan diagnostik perubatan, kelebihan dan kelemahan, artifak gambar serta penilaian kualiti peralatan-peralatan ini.

	This course aims to teach the basic principles and design of medical diagnostic imaging equipment. Although this course does not have pre-requisite, a strong fundamental in physics is important. This course introduces students to medical imaging technologies including projection radiography, mammography, fluoroscopy, computed tomography, magnetic resonance imaging, ultrasound, single photon emission computed tomography, positron emission tomography (PET), and optical imaging. The course also exposes the students to the quality control in diagnostic radiologyand radiation safety. Students who have successfully completed this course will be able to understand the working mechanism and design of various medical diagnostic imaging equipment, the strengths and weaknesses, image artifacts as well as quality assessment of these equipment.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Bushberg, J. T Seibert, J.A., Leidholdt, E. M. & Boone, J. M. (2020). The 2. Essential Physics of Medical Imaging (4th edition). Lippincott Williams & Wilkins. 3. Haidekker, M.A. (2013) Medical Imaging Technology. Springer Science & Business Media. 4. Farncombe, T., & Iniewski, K. (Eds.). (2013). Medical Imaging: Technology and Applications. CRC Press. 5. Smith, N. B., & Webb, A. (2010). Introduction to Medical Imaging: Physics, Engineering and Clinical Applications. Cambridge university press. 6. Flower, M. A. (Ed.). (2012). Webb's Physics of Medical Imaging. CRC Press

KIB3018: Eksperimen dan Komputasi Biomekanik / *Experimental and Computational Biomechanics*

Kod Kursus *Course Code*	KIB3018
Tajuk Kursus *Course Title*	Eksperimen dan Komputasi Biomekanik *Experimental and Computational Biomechanics*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Terangkan pelbagai elemen terdiri daripada model pengiraan sistem neuromuskuloskeletalmanusia. 2. Merumuskan model-model sistem neuromuskuloskeletal manusia yang mudahdan integratif. 3. Menunjukkan kompetensi di dalam mengumpul, menganalisa, dan mentafsir datamenggunakan kaedah-kaedah eksperimentasiyang berbeza di dalam biomekanik. 4. Menyelesaikan persamaan perbezaan yang mempengaruhi pergerakan lingkaran-segmental jasad tegar sistem dinamikal menggunakan perisian. 5. Menggunakan model-model pengiraan badan manusia untuk mengkaji fungsi-fungsimuskuloskeletal ketika pergerakan. *At the end of the course, students are able to:* *1. Describe the various elements comprising of a computational model of the human neuromusculoskeletal system.* *2. Formulate simple, integrative models of the human neuromusculoskeletal system.* *3. Demonstrate competency in collecting, analysing and interpreting data using different experimental methods in biomechanics.* *4. Solve differential equations that govern the motion of segmental-linked rigid-body dynamical systems using software.* *5. Use computational models of the human body to study musculoskeletal functions during movement.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk menyediakan pelajar dengan kemahiran "hands-on" dan praktikal menggunakan pakej pengiraan dan teknik-teknik eksperimentasi dalam menyelesaikan masalah-masalah biomekanikal. Pengetahuan di dalam dinamik, biomekanik, matematik dan pengaturcaraan adalah amat penting untuk kursus ini. Di dalam kursus ini, pelajar sepatutnya mendapat pemahaman struktur dan fungsi skeletal, otot dan sistem sensori badan manusia. Pelajar juga sepatutnya berupaya untuk merumuskan model mudah dan integeratif sistem neuromuskuloskeletal manusia; dan untuk menggunakan model pengiraan badan manusia di dalam analisis fungsi

	muskuloskeletal ketika aktiviti-aktiviti seperti berdiri, berjalan, berlari dan melompat. Pelajar juga sepatutnya dapat membina kemahiran untuk secara bebas menjalankan analisa biomekanik ke atas teknik-teknik eksperimental dan untuk membina kemahiran lanjut di dalam menilai secara kritikal penemuan-penemuan penyelidikan di dalam bidangbiomekanik. *This course aims to prepare students with hands-on and practical skills using computational packages and experimental techniques to solve biomechanical problems. Knowledge in dynamics, biomechanics, mathematics and programming is important for this course. In this course, students should gain an understanding of the structure and function of the skeletal, muscular, and sensory systems of the human body. Students should also be able to formulate simple, integrative models of the human neuromusculoskeletal system; and to use computational models of the human body to analyse musculoskeletal function during activities like standing, walking, running and jumping. The students should also develop an ability to independently conduct biomechanical analysis based on experimental techniques and to build further skill to critically evaluate research findings in the area of biomechanics.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 60% Peperiksaan Akhir / *Final Examination*: 40%
Rujukan Utama *Main Reference*	1. Challis, J. H. (2021). Experimental Methods in Biomechanics, Springer International Publishing 2. Robertson, G., Caldwell, G., Hamill, J., Kamen, G., & Whittlesey, S. (2004). Research Methods in Biomechanics (1st ed.). Human Kinetics. 3. Zhang, M., & Fan, Y. (2015). Computational Biomechanics of the Musculoskeletal System (1st ed.). CRC Press. 4. Tanaka, M., Wada, S., & Nakamura, M. (2012). Computational Biomechanics: Theoretical Background and Biological/Biomedical Problems. Springer Japan. 5. Jin, Z., Li, J., & Chen, Z. (2020). Computational Modelling of Biomechanics and Biotribology in the Musculoskeletal System. Woodhead Publishing.

KIB3019: Projek Reka Bentuk Bersepadu Bioperubatan 1 / Biomedical Integrate Design Project 1

Kod Kursus *Course Code*	KIB3019
Tajuk Kursus *Course Title*	Projek Reka Bentuk Bersepadu Bioperubatan 1 *Biomedical Integrate Design Project 1*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Mengintegrasikan pengetahuan asasmengenai anatomi dan fisiologi manusia dengan prinsip kejuruteraan mekanikal dan elektrikal dalam merancang alat bioperubatan 2. Reka bentuk prototaip fungsional atausimulasi peranti bioperubatan untuk ujian pengesahan prestasi. 3. Menunjukkan komunikasi yang berkesandengan pihak berkepentingan 4. Sahkan bahawa reka bentuk memenuhi standard Malaysia dan antarabangsa yang berkaitan. 5. Mencadangkan pengurusan projek ketahap pengkomersialan alat bioperubatan. *At the end of the course, students are able to:* *1. Integrating fundamental knowledge of human anatomy and physiology with mechanical and electrical engineering principles in designing a biomedical device* *2. Design functional or simulated prototypes of biomedical devices for performance verification testing.* *3. Display effective communication with stakeholders* *4. Verify that the design meets with the relevant Malaysian and inetrnational standards.* *5. Proposed the project management to the commercialization stage of the biomedical device.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan bioperubatan mengenai integrasi aspek asas kejuruteraan asas dalam mekanikal, elektrikal dan bioperubatan dalam merancang projek. Walaupun kursus ini tidak mempunyai prasyarat, asas dan pengetahuan yang kuat dalam aspek kejuruteraan mekanikal, elektrik dan bioperubatan diperlukan. Kursus projek reka bentuk bersepadu adalah kursus reka bentuk projek peringkat kanan yang memerlukan pelajar menggunakan semua pengetahuan kejuruteraan mereka untuk menyelesaikan masalah kejuruteraan dunia nyata atau mengembangkan produk yang dapat dilaksanakan dengan mempertimbangkan faktor kelestarian dan sosial.

	Pelajar yang berjaya menamatkan kursus ini akan dapat menganalisis dan merekabentuk alat bioperubatan dari semua aspek kejuruteraan termasuk berurusan dengan masyarakat, pengurusan, dan bekerja dalam satu kumpulan. Pengetahuan ini sangat penting untuk projek reka bentuk kejuruteraan. *This course aims to teach biomedical engineering students about the integration of main fundamental engineering aspect in mechanical, electrical and biomedical in design a project. Although this course does not have pre-requisite, a strong fundamental in and knowledge in mechanical, electrical and biomedicalengineering aspect are needed. The integrated design project course is senior-level project design courses thatrequire 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. Students who have successfully completed this course will be able to analyze and design biomedical devices from the all aspect of engineering including dealing with society, management, and working in a group. This knowledge is extremely important for engineering design projects.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 100% Peperiksaan Akhir / *Final Examination*: 0%
Rujukan Utama *Main Reference*	1. Silyn-Roberts, H. (2012). Writing for Science and Engineering: Papers, Presentations and Reports: Elsevier Science. 2. Leong, E. C., Heah, C. L. H., & Ong, K. K. W. (2015). Guide to Research Projects for Engineering Students: Planning, Writing and Presenting: CRC Press. 3. Hamid, M. E. (2013). How to Write a Research Proposal and Thesis: A Manual for Students and Researchers: Createspace Independent Pub.

KIB3020: Reka Bentuk Keselamatan Elektrik Peranti dan Sistem Perubatan / *Electrical Safety Design of Medical Devices and System*

Kod Kursus *Course Code*	KIB3020
Tajuk Kursus *Course Title*	Reka Bentuk Keselamatan Elektrik Peranti dan Sistem Perubatan *Electrical Safety Design of Medical Devices and System*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Merumus isu dan cabaran dalam merekabentuk keselamatan peranti perubatan menggunakan prinsip asas kejuruteraan bioperubatan. 2. Melaksana pemerolehan data melalui ujian keselamatan perubatan bagi mengenalpasti prestasi peranti. 3. Mencadang kaedah ujian pengukuran keselamatan elektrikal yang bersesuaian untuk peranti perubatan yang relevan dengan piawaian Malaysia dan antarabangsa. 4. Menilai cabaran berkaitan keselamatan elektrikal dan menguruskan penyelesaian dalam merekabentuk peranti perubatan. 5. Melengkapkan penilaian impak sosial untuk sesebuah peranti perubatan. *At the end of the course, students are able to:* *1. Summarize medical device safety design issues and challenges using fundamental principles in biomedical engineering.* *2. Implement data acquisition from the medical safety test to identify the medical device performance.* *3. Propose a suitable electrical safety measurement tests for medical devices that are relevant to Malaysian and international standards.* *4. Appraise electrical safety challenges and manage potential solutions in designing medical devices.* *5. Complete a social impact assessment of a medical device.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan bioperubatan piawai keselamatan peranti perubatan dan ujian pengukuran dalam bidang kejuruteraan bioperubatan. Kursus ini adalah kesinambungan KIB2015 dan memerlukan pengetahuan mengenai KIB1016 Alat Elektronik dan KIB1012 Teori Litar. Kursus ini merangkumi pengetahuan mengenai isu dan cabaran reka bentuk keselamatan peranti perubatan menggunakan prinsip asas dalam kejuruteraan

	bioperubatan. Laksanakan pemerolehan data dari ujian keselamatan perubatan untuk mengenal pasti prestasi peranti perubatan. Mencadangkan reka bentuk ujian pengukuran keselamatan elektrik yang sesuai untuk peranti perubatan. Menganalisis ujian keselamatan peranti perubatan yang digunakan di hospital. Tentukan cabaran keselamatan elektrik dan cadangkan penyelesaian yang berpotensi dalam merancang peranti perubatan. Lengkapkan penilaian impak sosial alat perubatan. Pelajar yang berjaya menamatkan kursus ini akan memperolehi pemahaman dan pengetahuan umum tentang bagaimana menjalankan ujian keselamatan elektrik peranti perubatan. Pengetahuan mereka sangat penting untuk kesinambungan reka bentuk, analisis alat perubatan ke arah industri. *This course aims to teach biomedical engineering students the medical devices safety standards and measurement tests in biomedical engineering field. This course is continunity of the KIB2015 and require the knowledge of the course KIB1016 Electronic Devices and KIB1012 Circuit Theory. This course covers the knowledge of medical device safety design issues and challenges using fundamental principles in biomedical engineering. Implement data aquisition from the medical safety test to identify the medical device performance.* *Propose a suitable design of electrical safety measurement tests for medical devices. Analyze safety testing of medical devices used in hospitals. Appraise electrical safety challenges and propose potential solutions in designing medical devices. Complete a social impact assessment of a medical device. Students that have successfully completed this course will be able to provide the general understanding and knowledge on how to conduct electrical safety test of medical devices. Their knowledge is extremely important for continuation of design, analysis medical devices towards the industry.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Cromwell L, Weibell FJ, Pfeiffer EA (1980) Biomedical Instrumentation and Measurements, Prentice-Hall, 2. Fries RC (Ed.) (2001) Handbook of Medical Device Design, CRC Press 3. El-Haik B, Mekki KS (2011) Medical Device Design for Six Sigma: A Road Map for Safety and Effectiveness, John Wiley. 4. King PH, Fries RC, Johnson AT (2018) Design of Biomedical Devices and Systems, 4th edition, CRC Press.

KIB3021: Fotonik dalam Kejuruteraan Bioperubatan / *Photonics in Biomedical Engineering*

Kod Kursus *Course Code*	KIB3021
Tajuk Kursus *Course Title*	Fotonik dalam Kejuruteraan Bioperubatan *Photonics in Biomedical Engineering*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menerangkan prinsip asas dan aplikasi peranti fotonik dalam isyarat fisiologi. 2. Menganalisa penggunaan prinsip asas fotonik dalam menyelesaikan masalah kejuruteraan bioperubatan. 3. Membangun eksperimen asas menggunakan alat fotonik untuk isyarat psikologi manusia. 4. Mematuhi kod standard tingkah lakuprofesional BEM dalam keselamatan menggunakan peranti laser 5. Mempengaruh hasil yang sesuai dalam sesuatu aktiviti projek menggunakan kaedah perundingan. *At the end of the course, students are able to:* *1. Explain the fundamental principles and application of photonic device in human physiological signals.* *2. Analyse the the use of photonic fundamental principles in solving the biomedical engineering problem.* *3. Develop fundamental experiment using photonic devices for human psychological signal.* *4. Adhere to the standard code of professional conduct of BEM in safety using the laser devices.* *5. Influence an appropriate outcome in a project activity using methods of negotiation.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan asas dan aplikasi peranti fotonik dalam isyarat fisiologi. Walaupun kursus ini tidak mempunyaiprasyarat, asas fizik yang kuat adalah penting. Kursusini akan mengajar pelajar mengenai asas spektrum gelombang optik, cahaya dan elektromagnetik, perambatan gelombang, laser dan jirim. Pelajar akan didedahkan dengan cara membuat analisis penerapan prinsip asas fotonik dalam menyelesaikan masalah kejuruteraan bioperubatan. Aktiviti seperti merancang eksperimen asas menggunakan alat fotonik untuk isyarat psikologi manusia juga akan diberikan kepada pelajar. Kursus ini juga akan memberi pengenalan kepada bagaimana mematuhi kod tingkah laku profesional BEM dalam keselamatan menggunakan peranti laser. Pelajar yang berjaya

	menamatkan kursus ini akan dapat menganalisis dan merancang kaedah penyelesaian masalah isyarat psikologi manusia dengan menggunakan alat fotonik. This course aims to teach engineering students the basic principles and applications of photonic devices in physiological signals. Although this course does not have pre-requisite, a strong fundamental in physics is important. The course will teach student about the fundamental of optic, light and electromagnetic wave spectrum, wave propagation, laser and matter. Students will be exposed to how to make an analysis of the application of basic principles of photonics in solving biomedical engineering problems. Activities such as designing basic experiments using photonic devices for human psychological signals will also be provided to students. This course will also provide an introduction to how to comply with BEM's standard code of professional conduct in safety using laser devices. Students who have successfully completed this course will be able to analyse and design the human psychological signals' problem-solving method using photonics devices.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Vo-Dinh, T. (2014). Biomedical Photonics Handbook: Therapeutics and Advanced Biophotonics (The Biomedical Photonics Handbook) (2nd ed.). CRC Press. 2. Ho, A. H., Kim, D., & Somekh, M. G. (2017). Handbook of Photonics for Biomedical Engineering (1st ed. 2017 ed.). Springer. 3. Saleh, B. E. A., & Teich, M. C. (2019). Fundamentals of Photonics, 2 Volume Set (Wiley Series in Pure and Applied Optics) (3rd ed.). Wiley. 4. Andrews, D. L. (2015). Photonics, Volume 4: Biomedical Photonics, Spectroscopy, and Microscopy (A Wiley-Science Wise Co-Publication) (1st ed.). Wiley.

KIB3022: Sistem Kawalan dalam Bioperubatan / *Biomedical Control System*

Kod Kursus *Course Code*	KIB3022
Tajuk Kursus *Course Title*	Sistem Kawalan dalam Bioperubatan *Biomedical Control System*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Mengaplikasikan konsep-konsep penting bagi struktur system kawalan. 2. Merumuskan satu set persamaan domain masa yang memodelkan sistem fizikal ke dalam bentuk yang lebih mudah, untuk menafsirkan sistem-sistem elektrik dan mekanikal yang berbeza. 3. Menyesuaikan analisis domain masa untuk meramal dan mendiagnosiskan parameter prestasi sementara sistem untuk fungsi input standard bagi memastikan tindakbalas dan prestasi dinamik yang diperlukan dari sistem. 4. Menilai pelbagai jenis analisis dalam domain frekuensi untuk menjelaskan sifat kestabilan sistem. 5. Merekabentuk sistem kawalan mudah menggunakan kawalan jenis P, PI, dan PID. *At the end of the course, students are able to:* *1. Apply important concepts of control system structures in Biomedical Engineering.* *2. Formulate a set of time domain equations thatmodel physical systems into a more simplifiedform, in order to interpret different electrical and mechanical systems.* *3. Adapt time domain analysis in order to predict and diagnose transient performance parameters of the system for standard input functions to ascertain therequired dynamic response and performance from the system.* *4. Evaluate different types of analysis in frequency domain to explain the nature ofstability for the system.* *5. Design a simple control system using P, PI,and PID modes of controls.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan asas-asas sistem kawalan. Walaupun kursus ini tidak mempunyai mata pelajaran pra-syarat, asas yang kuat dalam fizik dan matematik diperlukan. Subjek ini memperkenalkan konsep sistem kawalan, sistem pemodelan menggunakan fungsi pemindahan sistem lata dan parameternya. Kursus ini juga mengajar para pelajar pendekatan

	strategi kawalan seperti P, PI, dan PID. Ini termasuk menganalisis kestabilan sistem menggunakan kaedah Routh-Hurwitz, membuat lakaran dan memplot teknik domain frekuensi, dan juga untuk melengkapkan pelajar dengan peralatan analisis yang diperlukan dalam menyelesaikan masalah kawalan kejuruteraan bioperubatan. Pelajar yang berjaya menamatkan kursus ini akan dapat menganalisis dan merekabentuk sistem kawalan kejuruteraan bioperubatan yang mudah dari aspek teori kawalan. Pengetahuan ini sangat penting untuk merancang sistem kawalan bioperubatan yang boleh dipercayai dan cekap. *This course aims to teach engineering students the fundamentals of control systems. Although this course does not have any pre-requisite subjects, a strong fundamental in physics and mathematics is required. This subject introduces the concept of control system, modelling system using transfer functions of cascaded systems and their parameters. This course also teaches the students control strategy approaches such as P, PI, and PID. This include analyzing system stability using Routh-Hurwitz's method, sketching frequency domain techniques and plotting are also included to equip students with necessary analytical tools in solving biomedical engineering control problems. Students who have successfully completed this course will be able to analyze and design simple biomedical engineering control system from the aspect of control theories. This knowledge is extremely important to design a reliable and efficient biomedical control system.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Ogata, K. (2010) Modern Control Engineering (5th Ed). Upper Saddle River, Prentice Hall. 2. R. C. Dorf. (2010) Modern Control Systems (11th ed.), Pearson. 3. Nise N. S. (2011) Control Systems Engineering (6th Ed) Wiley. 4. Franklin, G. F., Powell, J. D., & Emami-Naeini, A. (2014). Feedback Control of Dynamic Systems. Prentice Hall. 5. M. Gopal. (2009) Control Systems: Principles and Design, 2e, McGraw-Hill Education.

KIB3023: Mikrokomputer dan Sistem Digital / *Microcomputer and Digital System*

Kod Kursus *Course Code*	KIB3023
Tajuk Kursus *Course Title*	Mikrokomputer dan Sistem Digital *Microcomputer and Digital System*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Merekabentuk litar mikro atau sistem litar digital untuk memperoleh atau memproses isyarat fisiologi manusia. 2. Menilai litar logik untuk rekabentuk optimal melibatkan sistem penomboran seperti K-Map atau Quine-McCluskey. 3. Membina sistem menggunakan peranti logic seperti PLDs, FPLDs, selak, CPU, Ingatan dan masukan/keluaran. 4. Menilai reka bentuk sistem digital and mikropengawal untuk alat bioperubatan praktikal menggunakan alat moden seperti Logisim and AtmelStudio bagi menyusun dan menyahpepijat. 5. Mensintesis secara berkesan aplikasi reka bentuk litar digital dalam aplikasi bioperubatan. *At the end of the course, students are able to:* *1. Design of a microcomputer circuit or digital circuit system to acquire/process human physiological signal.* *2. Evaluate for an optimal logical circuits design involving numbering system such as K-Map or Quine-McCluskey.* *3. Built a system using logic devices such as PLDs, FPLDs, latches, CPU, Memory and I/O.* *4. Evaluate digital and microcontroller designs for a practical biomedical device using modern tools such as Logisim and AtmelStudio that compile and debug the design.* *5. Synthesize effectively the application of digital circuit design in biomedical application.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Matlamat kursus ini adalah untuk mengajar pelajar kejuruteraan bioperubatan asas-asas sistem komputer mikro dan digital. Walaupun kursus ini tidak mempunyai prasyarat, kursus seperti teori litar, alat elektronik dan pengaturcaraan adalah penting. Pengetahuan dalam analisis litar, alat elektronik seperti diod dan transistor diperlukan untuk kursus ini. Kursus ini mengajar para pelajar reka bentuk sistem digital dan aplikasi komputer mikro. Asas peranti logik, pengoptimuman aljabar logik dan litar logik akan diterokai. Ini akan membolehkan pelajar merancang rangkaian logik gabungan dan berurutan pada peranti logik yang dapat diprogramkan (PLD). Pelajar kemudian akan

	meneroka seni bina dan penggunaan Mikroprosesor moden seperti (ATMEGA (Arduino IC) / PIC). Konsep dan aplikasi mod pengalamatan, arahan pergerakan data, aritmetik dan petunjuk logik, kawalan program, antara muka memori, antara muka Input / Output, sampuk, subrutin akan diterokai. Pelajar yang berjaya menamatkan kursus ini akan dapat merancang dan menguji sub sistem peranti kejuruteraan bioperubatan digital. Pengetahuan ini penting untuk kursus reka bentuk yang memerlukan pemerolehan isyarat dan pengkomputeran di mana-mana. *This course aims to teach biomedical engineering students the fundamentals of microcomputer dan digital system. Although this course does not have pre-requisite, courses such as circuit theory, Electronic devices and programming are important. Knowledge in circuit analysis, electronic devices such as diodes and transistors are required for this course. This course teaches the students the design of digital system and application of microcomputer. The fundamentals of logic devices, optimization of logic algebra and logic circuit will be explored. This will allow student to design combinational and sequential logic circuits on programmable logic devices (PLDs). Students will then explore the architecture and the usage of modern Microprocessor such as (ATMEGA (Arduino IC) / PIC). The concept and the application of addressing mode, data movement instructions, arithmetic and logic instructions, program control, memory interface, Input/Output interface, interrupts, subroutines will be explored. Students who have successfully completed this course will be able to design and test sub system of a digital biomedical engineering device. This knowledge is essential for the later design courses that requires signal acquisition and ubiquitous computing.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Rafiquzzaman M. (2014) Fundamentals of Digital Logic and Microcontrollers (6th Edition), John Wiley & Sons. 2. IEEE TRANSACTIONS ON BIOMEDICAL CIRCUITS AND SYSTEMS, IEEE, accessible through IEEE explore, 2021. 3. Floyd T. (2015) Digital Fundamentals (11th Edition), USA: Prentice-Hall. 4. Tocci R. J., Widmer N., Moss G. (2013) "Digital Systems: Principles and Applications (11th Edition)" 5. Dally W. J, Poulton J. W. (2012) Digital Systems Engineering, https://doi.org/10.1017/CBO9781139166980

KIB3024: Elektronik Perubatan / *Medical Electronics*

Kod Kursus *Course Code*	KIB3024
Tajuk Kursus *Course Title*	Elektronik Perubatan *Medical Electronics*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Merekabentuk peranti elektronik untuk aplikasi kejuruteraan bioperubatan. 2. Mengaplikasikan prinsip-prinsip ADC dan DAC dalam pembangunan sistem pencerapan data bioperubatan. 3. Membina sistem penguat bioperubatan menggunakan perisian simulasi elektronik. 4. Mengenalpasti tanggungjawab jurutera dalam mereka bentuk transduser bioperubatan. 5. Menerangkan prinsip-prinsip penderia bioperubatan dan elektrod bioperubatan untuk penilaian elektrofisiologi. *At the end of the course, students are able to:* *1. Design basic electronic device for biomedical engineering application.* *2. Apply ADC and DAC principles in development of biomedical data acquisition system.* *3. Construct bioamplifier system using electronic simulation software.* *4. Identify responsibility of engineers in designing biomedical devices.* *5. Explain principles of biosensor and bioelectrode for electrophysiological assessment.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan bioperubatan mengenai aplikasi elektronik di bidang kejuruteraan bioperubatan. Pengetahuan dalam litar elektrik dan peranti elektronik penting untuk subjek ini. Subjek ini memperkenalkan kepada pelajar teori asas biosensor, biotransducer dan bioelectrodes. Ia merangkumi rangkaian elektronik dan komponen yang berkaitan untuk aplikasi bioperubatan. Pelajar juga terdedah kepada saringan, pengayun dan litar ADC & DAC. Litar khusus untuk sistem ECG, EMG dan EEG juga dijelaskan dalam kursus ini. Pelajar yang berjaya menamatkan kursus ini dapat merekabentuk peranti bioperubatan yang merangkumi litar elektrik dan pengetahuan elektronik untuk aplikasi bioperubatan. Pengetahuan ini penting untuk kesinambungan mata pelajaran berasaskan elektrik lain terutamanya dalam instrumentasi bioperubatan

	This course aims to teach biomedical engineering students the application of electronics in biomedical engineering field. *Knowledge in electrical circuit and electronic device is important for this subject. This subject introduces to students the basic theory of biosensors, biotransducers and bioelectrodes. It covers the related electronic circuits and components for biomedical applications. The students are also exposed to filters, oscillators and ADC & DAC circuits. The specific circuit for ECG, EMG and EEG systems are also explained in this course. Students who have successfully completed this course will be able to design biomedical device incorporating electrical circuit and electronic knowledge for biomedical application.* *This knowledge is important for continuation of other electrical-based subjects especially in biomedical instrumentation.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Webb, A. G. (2018). Principles of Biomedical Instrumentation: Cambridge University Press. 2. Fitzpatrick, D. (2014). Implantable Electronic Medical Devices: Elsevier Science. 3. Floyd, T. L. (2017). Electronic Devices, Global Edition: Pearson Education Limited. 4. Boylestad, R. L., & Nashelsky, L. (2013). Electronic Devices and Circuit Theory: Pearson New International Edition PDF eBook: Pearson Education. 5. Webb, A. G. (2018). Principles of Biomedical Instrumentation: Cambridge University Press.

KIB3025: Biomekanik dalam Prostetik dan Ortotik / *Biomechanics in Prosthetics and Orthotics*

Kod Kursus *Course Code*	KIB3025
Tajuk Kursus *Course Title*	Biomekanik dalam Prostetik dan Ortotik *Biomechanics in Prosthetics and Orthotics*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menggunakan prinsip biomekanik dalam bidang prostetik dan ortotik. 2. Mengukur tahap tekanan yang dikenakan pada komponen prostetik dan ortotik pada kedudukan tertentu. 3. Mengukur gaya berjalan pemakai prostesis dan ortosis menggunakan alatan kejuruteraan yang bersesuaian. 4. Mengesahkan kesan biomekanik daripada kecacatan fizikal dan penggunaan prostesis dan ortosis berdasarkan maklumat keseimbangan badan pengguna. 5. Menilai pergerakan pemakai prostesis dan ortosis bagi menentukan daya dan tekanan yang terlibat. *At the end of the course, students are able to:* *1. Apply biomechanics principles in prostheticsand orthotics field.* *2. Measure pressure level imposed on prosthetics and orthotics component at certain placement.* *3. Measure prosthesis and orthosis user's gait using appropriate engineering tools.* *4. Verify the biomechanical effects of physical deformity and use of prosthetics or orthotics device based on information about the users' body balance.* *5. Evaluate the movement of prosthetics and orthotics users to determine the forces and pressure involved.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk menunjukkan kepada pelajar prinsip-prinsip biomekanik dalam peranti prostetik dan ortotik dengan pemerhatian terperinci mengenai implikasinya dari sudut biomekanik. Pengetahuan dari kursus-kursus mekanikal serta biomekanik dan anatomi manusia diperlukan untuk kursus ini. Biomekanik dalam Prostetik dan Ortotik menerangkan berkenaan kepelbagaian daya dan tekanan yang bertindak ke atas tubuh badan pengguna amputi dan pesakit berkeperluan ortosis. Daya ini bertindakbalas antara peranti prostetik dan ortotik dengan anggota badan pemakai serta mengubah biomekanik keseluruhan tubuh badan pengguna, terutamanya keseimbangan badan mereka dan cara mereka berjalan dengan

	menggunakan peranti dan alatan moden. Melalui kursus ini, pelajar akan dapat mengesahkan dan membincangkan prinsip-prinsip biomekanik ini dari sudut pandangan pengguna prostesis dan ortosis yang sebenar. *This course aims to demonstrate to the students the biomechanics principles in prosthetics and orthotics devices with detailed insights into its biomechanical implications. Knowledge from mechanical courses as well as biomechanics and human anatomy is required for this course. Biomechanics in Prosthetics and Orthotics describes the various forces and pressures acting on the body of amputee and orthosis users.* *These forces are applied between the prosthetic and orthotic devices with their limbs as well as alter the whole body biomechanics, particularly their body balance and gait using modern gait analysis and balance measurement tools and devices. Through this course, students will be able to justify and discusses the biomechanics principles from the perspective of real prostheses and orthoses users.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Pitkin, M. R. (2010). Biomechanics of Lower Limb Prosthetics. Springer. 2. Postema, K. & Berjalan (Rotterdam). (2018). Pedorthic Footwear. Berjalan. 3. Hilliard, J. E., Chui, K. K., Galindo, T. D., & Lusardi, M. M. (2020). Evidence-Based Approach to Orthotic and Prosthetic Rehabilitation. Orthotics and Prosthetics in Rehabilitation, 71–101. https://doi.org/10.1016/b978-0-323-60913-5.00004-0 4. Jorge, M. (2020). Orthotics and Prosthetics in Rehabilitation: Multidisciplinary Approach. Orthotics and Prosthetics in Rehabilitation, 2–13. https://doi.org/10.1016/b978-0-323-60913-5.00001-5

KIB3026: Prostetik Bawah Lutut / *Below Knee Prosthetics*

Kod Kursus *Course Code*	KIB3026
Tajuk Kursus *Course Title*	Prostetik Bawah Lutut *Below Knee Prosthetics*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Memeriksa penilaian objektif dan penilaian subjektif pada amputi untuk fabrikasi prostetik bawah lutut. 2. Merancang alat prostetik yang sesuai untuk bahagian bawah lutut. 3. Mengubahsuai masalah intervensi prostetik dari segi proses teknik menggunakan teknologi terkomputasi untuk preskripsi prostetik. 4. Menilai campur tangan alat prostetik dari kes yang diamputasi sebenar. 5. Melaporkan proses pemasangan dan penyempurnaan alat prostetik berdasarkan praktis berpandukan bukti. *At the end of the course, students are able to:* *1. Examine the amputees objective and subjective assessments for below knee prosthetics fabrication.* *2. Design appropriate prosthetics devices for below knee part.* *3. Modify prosthetics interventions problems in term of technichal process using computerized technology for prosthetics presription.* *4. Explain the intervention of prosthetics devices from the real amputated cases.* *5. Report the fitting and finishing process of prosthetics device based on evidence-based practice.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan bioperubatan asas-asas yang digunakan dalam dalam kejuruteraan prostetik dan ortotik. Walaupun kursus ini tidak mempunyai prasyarat, asas yang kuat dalam mekanik dan biomekanik adalah penting. Pengetahuan dalam biomekanik (gait, keseimbangan) dan kejuruteraan mesin dan alatan diperlukan dalam membuat alat prostetik dan ortotik untuk bahagian bawah lutut. Kursus ini mengajar para pelajar proses membuat prostetik bawah lutut yang merangkumi teknik penilaian, tahap K, pengubahsuaian menggunakan alatan dan mesin, pembentukan dan penamat termoplastik. Pengetahuan dari ini diterapkan ke dalam reka bentuk dan analisis alat prostetik bawah lutut untuk mencapai prestasi terbaik namun masih selamat semasa operasi bersama dengan amputee sebenar. Prestasi

	penghubung juga akan dikaji untuk membolehkan pelajar merancang pelbagai mekanisma menggunakan sistem CAD / CAM Biosculptor. Pelajar yang berjaya menamatkan kursus ini akan dapat menganalisis dan merancang alat prostetik bawah lutut dari aspek mekanik dan biomekanik. Pengetahuan ini sangat penting untuk kesinambungan peranti prostetik lain. *This course aims to teach biomedical engineering students the fundamentals used of engineering in prosthetics and orthotics. Although this course does not have pre-requisite, a strong fundamental in mechanical and biomechanics is important. Knowledge in biomechanics (gait, balance) and engineering machine and tools are needed in fabricating the prosthetics and orthotics devices for below knee part. This course teaches the students the process of fabricating the below knee prosthetic which include the assessment technique, K-level, modification using tools and machine, thermoplastic forming and finishing. The knowledge from this is applied into the design and analysis of below knee prosthetic devices in order to achieve the best performance and yet is still safe duringoperation together with the real amputee. The performance of linkages will also be studied to enable student to design various mechanism using Biosculptor CAD/CAM system. Students who have successfully completed this course will be able to analyze and design below knee prosthetic devices from the aspect of mechanics and biomechanics. This knowledge is extremely important for continuation of other prostheticdevices.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Krajbich, J. I., Pinzur, M. S., Potter, B. K., & Stevens, P. M. (2016). Atlas of Amputations and Limb Deficiencies (4th ed.). American Academy of Orthopaedic Surgeons. 2. Chui K.C., et al. (2020). Orthotics and Prosthetics in Rehabilitation, (4th Edition). St. Louis, MO; Elsevier. 3. May B.J. and Lockard M.A. (2001) Prosthetics and Orthotics in Clinical Practice. (1st Edition). Philadelphia, PA.: E.A. Davis Company. 4. Lusardi M. M. and Nielsen C. C. (eds.) (2007) Orthotics and Prosthetics in Rehabilitation. (2nd Edition). St Louis, Mo.: Saunders/Elsevier. 5. Carroll K. and Edelstein J. E. (eds.) (2006). Prosthetics and Patient Management: A Comprehensive Clinical Approach. Thorofare, NJ: SLACK Inc.

KIB3027: Prinsip Reka Bentuk Prostetik dan Ortotik Anggota Atas / *Principles of Upper Limb Prosthetics and Orthotics Design*

Kod Kursus *Course Code*	KIB3027
Tajuk Kursus *Course Title*	Prinsip Reka Bentuk Prostetik dan Ortotik Anggota Atas *Principles of Upper Limb Prosthetics and Orthotics Design*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti masalah berkaitan prostesis dan ortosis bahagian atas anggota badan. 2. Merumuskan protokol ujikaji dan klinikal untuk intervensi ortosis bahagian atas anggota badan 3. Mengaitkan amalan klinikal prostetik dan ortotik dengan kod etika profesional yang bersesuaian 4. Mencadangkan penyelesaian prostesis dan ortosis bahagian atas anggota badan dengan mempertimbangkan aspek klinikal dan teknikal 5. Menghasilkan prosthesis bahagian atas anggota badan dengan menggunakan teknik laminasi *At the end of the course, students are able to:* *1. Identify problems related to upper limb prostheses and orthoses.* *2. Formulate experimental and clinical protocol for upper limb orthosis intervention* *3. Relate clinical prosthetics and orthotics practice to appropriate ethical professional code* *4. Propose upper limb prosthesis and orthosis solutions considering clinical and technical aspects* *5. Fabricate upper limb prosthesis using lamination technique*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan memperkenalkan prinsip reka bentuk prostetik dan ortotik dari semua aspek anggotabadan atas. Pengetahuan berkenaan anatomi biomekanik dan bahan diperlukan untuk kursus ini. Ia akan merangkumi topik mengenai bagaimana prostesis dan orthosis direkabentuk, bagaimana mereka berinteraksi dengan badan untuk mengawal pergerakan, dan kemahiran yang berkaitan dengan penilaian dan pembuatan peranti. Pelajar akan belajar tentang, memerhatikan, dan kemudian melakukan aspek penting prostetik dan ortotik anggota badan atas termasuk: penilaian dan komunikasi pesakit, cadangan reka bentuk peranti, pengukuran dan pengambilan acuan, pemilihan komponen dan bahan, pengoptimuman model positif, fabrikasi peranti, aplikasi dan prinsip pemasangan peranti dan latihan

	peranti pesakit. Contoh peranti termasuk ortosis untuk bahu, siku, lengan bawah, pergelangan tangan, tangan, ibu jari, dan jari. Sebagai tambahan untuk prostesis, kursus ini merangkumi pengurusan pesakit dengan tangan separa, disartikulasi bahu dan amputasi interscapulothoracic. Kursus ini merangkumi prinsip dan mekanik reka bentuk antara muka asas dan progresif; asas strategi pengendalian kabel, fungsiharnes dan kawalan hibrid. Di akhir kursus ini, pelajar boleh mengenalpasti penyelesaian prostetik dan ortotik yang bersesuaian untuk pengguna yang mengalami kecacatan anggota atas badan.
	This course aims to introduce principles of prosthetic and orthotic design of all aspects of the upper limb. Knowledge on anatomy, biomechanics and materials are required for this course. It will cover topics on how prostheses and orthoses are designed, how they interact with the body to control movement, and skills related to the assessment of and manufacture of a device.Students will learn about, observe, and then perform essential aspects of upper limb prosthetic and orthotic care including: patient assessment and communication, device design recommendation, measurement and casting, component and material selection, positive model optimization, device fabrication, device application and fitting principles and patient device training. Examples of devices include orthoses for the shoulder, elbow, forearm, wrist, hand, thumb, and fingers. Additionally for the prostheses, thecourse addresses the management of patients presenting with partial hand, shoulder disarticulation and interscapulothoracic amputations. The course delves into foundational and progressive interface design principles and mechanics; foundations of cable actuated, functional harnessing and hybrid control strategies. At the end of this course, students should be able to identify appropriate prosthetic and orthotics solutions for the user with upper limbs deformity.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 60% Peperiksaan Akhir / *Final Examination*: 40%
Rujukan Utama *Main Reference*	1. Michael, J. W., & Bowker, J. H. (Eds.). (2016). Atlas of amputations and limb deficiencies: surgical, prosthetic, and rehabilitation principles (Vol. 4). Rosemont, IL: American Academy of Orthopaedic Surgeons. 2. Hsu, Michael & Fisk (Eds.), (2008). Atlas of Orthoses and Assistive Devices, 4th Ed. Rosemont, IL: American Academy of Orthopaedic Surgeons. 3. Muzumdar, A. (2004). Powered Upper Limb Prostheses: Control, Implementation and Clinical Application; 11 Tables. Springer Science & Business Media. 4. Atkins, D. J., & Robert III, H. (Eds.). (2012). Comprehensive management of the upper-limb amputee. Springer Science & Business Media. 5. Meier III, R. H., & Atkins, D. J. (2004). Functional restoration of adults and children with upper extremity amputation. Demos Medical

KIB3028: Prinsip Reka Bentuk Ortotik Anggota Bawah / *Principles of Lower Limb Orthotics Design*

Kod Kursus *Course Code*	KIB3028
Tajuk Kursus *Course Title*	Prinsip Reka Bentuk Ortotik Anggota Bawah *Principles of Lower Limb Orthotics Design*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Integrasi pengetahuan berkaitan anatomi dan fisiologi dalam rekabentuk ortosis bahagian bawah anggota badan. 2. Rekabentuk ortosis bahagian bawah anggota badan 3. Mengubahsuai model ortosis bahagian bawah anggota badan dengan menggunakan teknologi berkomputer 4. Mengenalpasti kesan ortosis bahagian bawah anggota badan terhadap prestasi biomekanik pengguna dengan mengunakan kaedah ujikaji 5. Mengaitkan amalan klinikal prostetik dan ortotik dengan kod amalan yang bersesuaian *At the end of the course, students are able to:* *1. Integrate relevant knowledge in anatomy and physiology in the design of lower limb orthosis.* *2. Design lower limb orthosis using evidence-based practice knowledge.* *3. Modify lower limb orthosis model using computerized technology* *4. Identify the effects of orthosis to the biomechanics performance of the user using experimental approach.* *5. Relate prosthetics and orthotics practice to appropriate code of practice.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk merangkumi pengurusan ortotik semua aspek anggota bawah. Pengetahuan berkenaan anatomi, biomekanik dan bahan diperlukan untuk kursus ini. Peranti yang diterokai secara mendalam merangkumi sejumlah besar varian ortosis kaki, pergelangan kaki, lutut, lutut-pergelangan kaki, pinggul, pinggul-lutut-pergelangan kaki dan pinggul. Anatomi tulang dan otot, anatomi permukaan dan fisiologi otot yang berkaitan dengan anggota bawah dibincangkan. Pelajar akan belajar, mengamati, dan kemudian melakukan aspek penting dalam penilaian ortotik kaki dan pergelangan kaki termasuk penilaian dan komunikasi pesakit, cadangan reka bentuk peranti, pengukuran dan penghasilan acuan, pemilihan komponen dan bahan, pengoptimuman model positif, fabrikasi peranti, aplikasi peranti dan prinsip pemasangan,

	pengesanan dan diagnosis kelainan gait dan latihan peranti pesakit. Di akhir kursus ini, pelajar boleh mengenalpasti penyelesaian ortotik yang bersesuaian untuk pengguna yang mengalami kecacatan anggota bawah badan. *This course aims to cover the orthotic management of all aspects of the lower limb. Knowledge on anatomy, biomechanics and materials are required for this course. explored in depth include the large number of variants of foot, ankle-foot, knee, knee-ankle-foot, hip, hip-knee-ankle-foot and hip orthoses. Bony and muscular anatomy, surface anatomy and muscle physiology related to the lower limbs are discussed. Students will learn about, observe, and then perform essential aspects of foot and ankle orthotic evaluation including patient assessment and communication, device design recommendation, measurement and casting, component and material selection, positive model optimization, device fabrication, device application and fitting principles, gait deviation detection and diagnosis and patient device training. At the end of this course, students should be able to identify appropriate orthotics solutions for the user with lower limbs deformity.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Hsu, Michael & Fisk (Eds.), (2008). Atlas of Orthoses and Assistive Devices, 4th Ed. Rosemont, IL: American Academy of Orthopaedic Surgeons. 2. Lusardi MM & Nielsen CC (Eds.), (2007).Orthotics and prosthetics in rehabilitation (2nd ed.). St. Louis, Missouri: Saunders Elsevier. 3. Edelstein JE & Bruckner J (2002) Orthotics: a comprehensive clinical approach. Thorofare, NJ: SLACK Incorporated. 4. Standards for Prosthetics and Orthotics: Part 1 & 2 (2017), WHO. Geneva, Switzerland.

KIB3029: Prostetik Atas Lutut / *Above Knee Prosthetics*

Kod Kursus *Course Code*	KIB3029
Tajuk Kursus *Course Title*	Prostetik Atas Lutut *Above Knee Prosthetics*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Memeriksa penilaian objektif dan penilaian subjektif terhadap amputasi untuk fabrikasi prostetik atas lutut 2. Memasang alat prostetik yang sesuai untuk bahagian atas lutut. 3. Merumus protokol ujikaji untuk menyiasat hasil campur tangan dari kes-kes amputasi prostetik yang sebenar 4. Merancang alat prostetik dari segi proses teknik menggunakan teknologi terkomputasi dalam prostetik. 5. Mencadangkan proses pemasangan dan proses penamat alat prostetik *At the end of the course, students are able to:* *1. Examine the amputees objective and subjective assessments for above knee prosthetics fabrication.* *2. Assemble appropriate prosthetics devices for above knee part.* *3. Formulate experimental protocol to investigate the outcome of the prosthetic intervention from real amputated cases.* *4. Design prosthetics devices in term of technical process using computarized technology in prosthetics.* *5. Propose the fitting and finishing process of prosthetics devices.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan bioperubatan asas-asas yang digunakan dalam dalam kejuruteraan prostetik dan ortotik. Walaupun kursus ini tidak mempunyai prasyarat, asas yang kuat dalam mekanik dan biomekanik adalah penting. Pengetahuan dalam biomekanik (gait, keseimbangan) dan kejuruteraan mesin dan alatan diperlukan dalam membuat alat prostetik dan ortotik untuk bahagian atas lutut. Kursus ini mengajar para pelajar proses membuat prostetik atas lutut yang merangkumi teknik penilaian, tahap K, pengubahsuaian menggunakan alatan dan mesin, pembentukan dan penamat termoplastik. Pengetahuan dari ini diterapkan ke dalam reka bentuk dan analisis alat prostetik atas lutut untuk mencapai prestasi terbaik namun masih selamat semasa operasi bersama dengan amputee sebenar. Prestasi penghubung juga akan dikaji untuk membolehkan pelajar merancang pelbagai mekanisme menggunakan sistem CAD / CAM Biosculptor. Pelajar yang berjaya menamatkan kursus ini akan dapat menganalisis dan merancang alat prostetik atas

	lutut dari aspek mekanik dan biomekanik. Pengetahuan ini sangat penting untuk kesinambungan peranti prostetik lain. *This course aims to teach biomedical engineering students the fundamentals used of engineering in prosthetics and orthotics. Although this course does not have pre-requisite, a strong fundamental in mechanical and biomechanics is important. Knowledge in biomechanics (gait, balance) and engineering machine and tolls are needed in fabricating the prosthetics and orthotics devices for above knee part. This course teaches the students the process of fabricating the above knee prosthetic which include the assessment technique, K-level, modification using tolls and machine,thermoplastic forming and finishing. The knowledge from this is applied into the design and analysis of above knee prosthetic devices in order to achieve the best performance and yet is still safe during operation together with the real amputee. The performance of linkages will also be studied to enable student to design various mechanism using Biosculptor CAD/CAM system. Students who have successfully completed thiscourse will be able to analyze and design above knee prosthetic devices from the aspect of mechanics and biomechanics. This knowledge is extremely important for continuation of other prosthetic devices.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 60% Peperiksaan Akhir / *Final Examination*: 40%
Rujukan Utama *Main Reference*	1. Krajbich, J. I., Pinzur, M. S., Potter, B. K., & Stevens, P. M. (2016). Atlas of Amputations and Limb Deficiencies (4th ed.). American Academy of Orthopaedic Surgeons. 2. Chui K.C., et al. (2020) Orthotics and Prosthetics in Rehabilitation (4th Edition). St. Louis, MO; Elsevier. 3. May B.J. and Lockard M.A. (2011) Prosthetics and Orthotics in Clinical Practice. (1st Ed.). Philadelphia, PA.: E.A. Davis Company. 4. Lusardi M. M. and Nielsen C. C. (eds.). (2007) Orthotics and Prosthetics in Rehabilitation. 2nd Edition. St Louis, Mo.: Saunders/Elsevier. 5. Carroll K. and Edelstein J. E. (eds.). (2006). Prosthetics and Patient Management: A Comprehensive Clinical Approach. Thorofare, NJ: SLACK Inc.

KIB3030: Projek Reka Bentuk Bersepadu Bioperubatan 2 / *Biomedical Integrate Design Project 2*

Kod Kursus *Course Code*	KIB3030
Tajuk Kursus *Course Title*	Projek Reka Bentuk Bersepadu Bioperubatan 2 *Biomedical Integrate Design Project 2*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Membangunkan protokol eksperimenmenggunakan pengetahuan kejuruteraan untuk memperoleh data yang sah menguji prestasi reka bentuk 2. Mengintegrasikan alat kejuruteraan moden yang sesuai untuk membantu proses reka bentuk dan pembangunan. 3. Lakukan analisis kitaran hidup untuk menggambarkan kesan persekitaran keseluruhan alat bioperubatan. 4. Mempamerkan kerja berpasukan yang berkesan dengan ahli pasukan dari pelbagai latar belakang 5. Lakukan penilaian impak sosial untuk menggambarkan kesan sosial, keselamatan dan budaya alat bioperubatan. *At the end of the course, students are able to:* *1. Develop an experimental protocol using engineering knowledge to acquire valid datatotest the performance of the design* *2. Integrate appropriate modern engineering tools to assist in the design and developmentprocess.* *3. Perform a life cycle analysis to visualize the overall environmental impacts of the biomedicaldevice.* *4. Display effective team work with team members from diverse background* *5. Perform a social impact assessment to visualize the societal, health safety and cultural impact of the biomedical device.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan bioperubatan mengenai integrasi aspek asas kejuruteraan asas dalam mekanikal, elektrikal dan bioperubatan dalam merancang projek. Walaupun kursus ini tidak mempunyai prasyarat, asas dan pengetahuan yang kuat dalam aspek kejuruteraan mekanikal, elektrik dan bioperubatan diperlukan. Kursus projek reka bentuk bersepadu adalah kursus reka bentuk projek peringkat kanan yang memerlukan pelajar menggunakan semua pengetahuan kejuruteraan mereka untuk menyelesaikan masalah kejuruteraan dunia nyata atau mengembangkan produk yang dapat

	dilaksanakan dengan mempertimbangkan faktor kelestarian dan sosial. Pelajar yang berjaya menamatkan kursus ini akan dapat menganalisis dan merekabentuk alat bioperubatan dari semua aspek kejuruteraan termasuk berurusan dengan masyarakat, pengurusan, dan bekerja dalam satu kumpulan. Pengetahuan ini sangat penting untuk projek reka bentuk kejuruteraan. *This course aims to teach biomedical engineering students about the integration of main fundamental engineering aspect in mechanical, electrical and biomedical in design a project. Although this course does not have pre-requisite, a strong fundamental in and knowledge in mechanical, electrical and biomedicalengineering aspect are needed. The integrated design project course is senior-level project design courses thatrequire 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. Students who have successfully completed this course will be able to analyze and design biomedical devices from the all aspect of engineering including dealing with society, management, and working in a group. This knowledge is extremely important for engineering design projects*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 100% Peperiksaan Akhir / *Final Examination*: 0%
Rujukan Utama *Main Reference*	1. Silyn-Roberts, H. (2012). Writing for Science and Engineering: Papers, Presentations and Reports: Elsevier Science. 2. Leong, E. C., Heah, C. L. H., & Ong, K. K. W. (2015). Guide to Research Projects for Engineering Students: Planning, Writing and Presenting: CRC Press. 3. Hamid, M. E. (2013). How to Write a Research Proposal and Thesis: A Manual for Students and Researchers: Createspace Independent Pub.

KIB3031: Latihan Industri / *Industrial Training*

Kod Kursus *Course Code*	KIB3031
Tajuk Kursus *Course Title*	Latihan Industri *Industrial Training*
Kredit *Credit*	5
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menganalisa masalah kejuruteraan bioperubatan untuk mencapai kesimpulan yang kukuh dengan cadangan penyelesaiannya 2. Mengaitkan masalah sosial, kesihatan, keselamatan, undang-undang dan budaya dengan amalan kejuruteraan profesional. 3. Mengaitkan penyelesaian kejuruteraan dengan matlamat pembangunan kelestarian UN 4. Mematuhi perlakuan profesional BEM 5. Memaparkan komunikasi yang berkesan dengan rakan sekerja dan profesional penjagaan kesihatan melalui pelbagai kaedah komunikasi 6. Memaparkan kerja berpasukan yang berkesan dengan rakan sekerja dalam persekitaran pelbagai disiplin 7. Mensintesiskan maklumat yang akan digunakan dalam persekitaran kerja semasa. *At the end of the course, students are able to:* 1. *Analyse biomedical engineering problems toreach substantiated conclusions with recommendation for its solutions* 2. *Relate societal, health, safety, legal and cultural issues with professional engineering practice.* 3. *Relate the engineering solution to the UN sustainable development goals* 4. *Adhere to the coe of professional conduct of BEM* 5. *Display effective communication with colleagues and healthcare professionals through numerous modes of communication* 6. *Display effective team work with colleagues in a multidisciplinary setting* 7. *Synthesize the information to be used in the current working environment.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini memberi peluang kepada pelajar untuk mengaplikasikan dan mengamalkan pengetahuan yang dipelajari dalam teori untuk membangunkan kemahiran mereka dalam bekerja secara berdikari. Dalam tempoh latihan pelajar dapat membiasakan diri dengan pengkhususan dalam sesuatu bidang selain daripada program ijazah. Latihan itu memperdalam pengetahuan pelajar, melatih mereka untuk tugas-tugas profesional danmelengkapkan pelajaran mereka.

	This course gives the student a possibility to apply and practice the knowledge learnt in theory to develop their skills in working independently. During the training period the student gets familiar with a specific area of the specialisation alternatives of the degree programme. The training deepens student's knowledge, trains them for the professional tasks and complements their studies.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 100% Peperiksaan Akhir / *Final Examination*: 0%
Rujukan Utama *Main Reference*	1. Riordan, D. (2013). Technical report writing today. USA: Cengage Learning. 2. Manuele, F. A. (2013). On the practice of safety. USA: John Wiley & Sons. 3. Goetsch, David L. (2011). Occupational Safety and Health for Technologists, Engineers, and Managers, 7th eds. N.J.: Pearson Prentice Hall

KIB4014: Instrumentasi Bioperubatan dan Pengukuran / *Biomedical Instrumentation and Measurement*

Kod Kursus *Course Code*	KIB4014
Tajuk Kursus *Course Title*	Instrumentasi Bioperubatan dan Pengukuran *Biomedical Instrumentation and Measurement*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menilai struktur binaan instrumen perubatan dalam mengukur isyarat fisiologi manusia. 2. Menganalisa spesifikasi reka bentuk dan batasan prinsip penderia dan transduksi untuk pengukuran isyarat fisiologi manusia. 3. Merumus pendekatan yang sesuai untuk membolehkan intergrasi IOT untuk peranti bioperubatan. 4. Mencadangkan sistem instrumentasi bioperubatan yang mematuhi prinsip etika dalam Kejuruteraan Bioperubatan. 5. Menjalankan penanda aras pada reka bentuk instrumen dan pengukuran peranti bioperubatan. *At the end of the course, students are able to:* *1. Assess the architecture of medical instrumentation in measuring human physiological signals.* *2. Analyze the design specification and limitations of sensing and transduction principles for measurement of human physiological signal.* *3. Formulate appropriate approach to enable IOT intergration for biomedical device.* *4. Propose a biomedical instrumentation system that complies with ethical principles in Biomedical Engineering.* *5. Perform benchmarking on the design of biomedical instrumentation and measurement devices.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan bioperubatan asas-asas Instrumentasi dan pengukuran bioperubatan. Walaupun kursus ini tidak mempunyai prasyarat, kursus seperti teori litar, Perisian elektronik, pengaturcaraan, dan komputer mikro adalah penting. Pengetahuan dalam analisis litar, alat elektronik seperti op-amp ADC dan DAC diperlukan untuk kursus ini. Kursus ini mengajar para pelajar mengenai seni bina instrumentasi perubatan, penderia dan prinsip transduksi untuk pengukuran isyarat fisiologi manusia. Instrumentasi dan pengukuran untuk potensi Bio, kardiovaskular, pernafasan dan parameter fisiologi penting yang lain dirangkumkan dalam kursus ini.

	Pelajar juga diminta untuk merancang alat instrumen bioperubatan asas dan memahami pematuhan prinsip etika dalam Kejuruteraan Bioperubatan. Aspek integrasi dan kemajuan IOT untuk peranti bioperubatan juga didedahkan kepada para pelajar. Pelajar yang berjaya menamatkan kursus ini akan dapat merancang dan menguji sub sistem peranti instrumentasi bioperubatan untuk pengukuran isyarat fisiologi manusia. Pengetahuan ini penting untuk kursus kemudian seperti Kepintaran dalam Kejuruteraan Bioperubatan. *This course aims to teach biomedical engineering students the fundamentals of biomedical instrumentation and measurement. Although this course does not have pre-requisite, courses such as circuit theory, Electronic devices, programming, and microcomputer are important. Knowledge in circuit analysis, electronic devices such as op-amps, ADC and DAC are required for this course. This course teaches the students the architecture of medical instrumentation, sensing and transduction principles for measurement of human physiological signal. Instrumentation and measurement for Bio-potentials, cardiovascular, respiratory and other important physiological parameters are covered in this course. Students are also required to design a basic biomedical instrumentation device and understand the compliance with ethical principles in Biomedical Engineering. Aspects of IOT integration and advancement for biomedical devices are also exposedto the students. Students who have successfully completed this course will be able to design and test sub system of a biomedical instrumentation device for measurement of human physiological signal. This knowledge is essential for the later course such as Intelligence in Biomedical Engineering.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Webster, J. G., & Nimunkar, A. J. (2020). Medical Instrumentation: Application and Design (Fifth ed.). Wiley. 2. Natarajan, A. R. (2015). BIOMEDICAL INSTRUMENTATION AND MEASUREMENTS. PHI Learning. 3. Chan, A. Y. K. (2014). Biomedical Device Technology: Principles and Design. Charles C. Thomas Publisher. 4. Lay-Ekuakille, A. (2010). Advances in Biomedical Sensing, Measurements, Instrumentation and Systems. Springer. 5. IEEE transactions on industrial electronics : a publication of the IEEE Industrial Electronics Society 2021 (accessible through IEEE explore)

KIB4015: Komputasi dalam Kejuruteraan Bioperubatan / *Computational Modeling in Biomedical Engineering*

Kod Kursus *Course Code*	KIB4015
Tajuk Kursus *Course Title*	Komputasi dalam Kejuruteraan Bioperubatan *Computational Modeling in Biomedical Engineering*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Merumuskan sistem persamaan pembezaan biasa untuk menyelesaikan masalah kejuruteraan bioperubatan. 2. Menilai prestasi alat bioperubatan atau pendekatan rawatan menggunakan kemahiran menyelesaikan persamaan pembezaan separa. 3. Kembangkan model elemen hingga untuk menyelesaikan masalah mekanik pepejal, mekanik bendalir dan biotransport. 4. Mencadangkan model komputasi untuk menyelesaikan masalah kejuruteraan bioperubatan. 5. Mengintegrasikan maklumat dari literatur untuk menentukan sifat bahan dan keadaan sempadan yang paling sesuai untuk masalah pemodelan. *At the end of the course, students are able to:* 1. *Formulate systems of ordinary differential equations to solve biomedical engineeringproblems.* 2. *Evaluate the performance of biomedical devices or treatment approaches using partialdifferential equations solving skills.* 3. *Develop finite element models to solve solid mechanics, fluid mechanics and biotransportproblems.* 4. *Propose a computational model to solve a biomedical engineering problem.* 5. *Integrate information from the literature to determine the most appropriate material properties and boundary conditions for a modelling problem.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar teori dan teknik pemodelan komputasi pelajar kejuruteraan. Walaupunkursus ini tidak mempunyai prasyarat, pengetahuan dalam matematik (kalkulus dan vektor sederhana), kaedah berangka, mekanik kejuruteraan dan mekanik bendalir diperlukan. Kursus ini mengajar para pelajar teknik numerik yang digunakan untuk menyelesaikan sistem persamaan pembezaan biasa, serta teknik perbezaan hingga dan elemen hingga yang digunakan untuk menyelesaikan persamaan pembezaan separa. Pelajar yang berjaya menamatkan kursus ini akan dapat menyelesaikan pelbagai model yang biasa digunakan dalam

	bioengineering, khususnya yang berkaitan dengan mekanisme penyebaran, pepejal dan bendalir. *This course aims to teach engineering students computational modelling theories and techniques. Although this course does not have pre-requisite, knowledge in mathematics (simple calculus and vectors), numerical methods, engineering mechanics and fluid mechanics is required. This course teaches the students numerical techniques used to solve systems of ordinary differential equations, as well as finite-difference and finite-element techniques used to solve partial differential equations. Students who have successfully completed this course will be able to solvea broad range of models commonly used in bioengineering, in particular those related to diffusion, solid and fluid mechanics.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 60% Peperiksaan Akhir / *Final Examination*: 40%
Rujukan Utama *Main Reference*	1. Lee, H. (2020). Finite Element Simulations with ANSYS Workbench 2020. SDC Publications. 2. Zimmerman, W. B. J. (2006). Multiphysics Modeling with Finite Element Methods (Stability, Vibration and Control of Systems, Series A) (1st ed.). World Scientific Publishing Company. 3. Tabatabaian, M. (2014). COMSOL for Engineers (Multiphysics Modeling) (HAR/CDR ed.). Mercury Learning and Information. 4. Chen, X., & Liu, Y. (2014). Finite Element Modeling and Simulation with ANSYS Workbench (1st ed.). CRC Press. 5. Rieg F. (2014) Finite Element Analysis for Engineers

KIB4016: Teknologi Penjagaan Kesihatan dan Pengurusan Klinikal / *Healthcare Technology and Clinical Management*

Kod Kursus *Course Code*	KIB4016
Tajuk Kursus *Course Title*	Teknologi Penjagaan Kesihatan dan Pengurusan Klinikal *Healthcare Technology and Clinical Management*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Merumus tetapan pengurusan klinikal yang bersesuaian bagi merekabentuk kemudahan penjagaan kesihatan menggunakan keperluan, prinsip, dan amalan asas. 2. Membandingkan kod amalan profesional yang relevan sebagaimana digunapakai di dalam tetapan pengurusan klinikal di Malaysia. 3. Mengenalpasti teknologi penjagaan kesihatan terkini bagi membantu pembangunan profesional sebagai seorang jurutera bioperubatan 4. Mencadangkan strategi pengurusan risiko yang bersesuaian di dalam pengurusan klinikal. 5. Menganalisa penyelesaian berasaskan IR4.0 dalam pengemukaan solusi yang berkait dengan cabaran dan peluang di dalam kejuruteraan bioperubatan. *At the end of the course, students are able to:* *1. Formulate a suitable clinical management setting for designing a healthcare facility using basic concerns, principles, and practices.* *2. Compare the relevant codes of professional conduct as applied in Malaysian clinical management setting.* *3. Discriminate current healthcare technologies to help in identifying professional development as biomedical engineer* *4. Propose suitable risk management strategies for clinical management.* *5. Analyse IR4.0 challenges and opportunities in proposing suitable biomedical engineering-related recommendations and solutions.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk membekalkan pelajar dengan gambaran keseluruhan dalam pengurusan teknologi penjagaan kesihatan sedia ada dan inovatif, berserta isu dan cabaran pengurusan klinikal yang relevan. Walaupun kursus ini tidak mempunyai sebarang pra-syarat, pengetahuan asas dalam elektronik perubatan dan sistem digital bioperubatan, adalah amat digalakkan. Fokus akan diberi kepada beberapa topik tertentu, termasuklah tetapan klinikal dalam

	merekabentuk kemudahan penjagaan kesihatan, pengurusan risiko, dan kod amalan profesional.
	Pelajar yang berjaya menamatkan kursus ini akan mempunyai kemahiran asas dalam menguruskan inovasi penjagaan kesihatan pada masahadapan, terutamanya kemampuan mengenalpasti peluang yang tiba melalui Revolusi Industri (IR) 4.0
	This course aims to provide the students with an overview of managing current and innovative healthcare technologies, along with the relevant issues and challenges in clinical management. Although this course does not have any pre-requisite, a strong foundation in medical electronics and biomedical digital systems is highly preferred. Particular focus will be given on clinical settings for designing a healthcare facility, risk management, and codes of professional conduct.
	Students who have successfully completed this course will have foundational capabilities for managing healthcare innovation in the future, specifically in recognising opportunities provided by the Industrial Revolution (IR) 4.0
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Bronzino JD, Peterson DR (Eds.) (2017) Medical Devices and Human Engineering, CRC Press. 2. Dyro J (Ed.) (2004) Clinical Engineering Handbook, Academic Press. 3. Mantas J, Hasman A (Eds.) (2013) Informatics, Management and Technology in Healthcare, IOS Press. 4. Saltzman WM (2015) Biomedical Engineering: Bridging Medicine and Technology, Second Edition, Cambridge University Press.

KIB4017: Reka Bentuk Prostetik Industri / *Industrial Prosthetics Design*

Kod Kursus *Course Code*	KIB4017
Tajuk Kursus *Course Title*	Reka Bentuk Prostetik Industri *Industrial Prosthetics Design*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menilai peranti prostetik dengan kes amputasi sebenar berdasarkan penilaian, fabrikasi dan komponen yang digunakan. 2. Mereka bentuk peranti prostetik menggunakan proses fabrikasi teknikal konvensional. 3. Menunjukkan dalam persekitaran kerja sebenar disiplin prostetik dalam keadaan klinikal menggunakan teknologi terkomputasi untuk prostetik. 4. Melaporkan amalan klinikal prostetik yang mematuhi dengan etika profesional dan akta peranti perubatan yang sesuai. 5. Mencadangkan peranti prostetik yang bersesuaian untuk pesakit kepada pasukan rehabilitasi. *At the end of the course, students are able to:* *1. Evaluate prosthetics devices with the real amputated cases based on assessment, fabrication and components used.* *2. Design prosthetics devices using the conventional technical fabrication process.* *3. Demonstrate in the real working environment of the prosthetics discipline in clinical settings using computerized technology for prosthetics.* *4. Report the related clinical prosthetics practice which adhere to appropriate ethical professional conduct and medical device act.* *5. Propose a suitable prosthetics device for a patient to a rehabilitation team.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan bioperubatan asas-asas kejuruteraan dalam prostetik dan ortotik terhadap industri. Walaupun kursus ini tidak mempunyai prasyarat, asas yang kuat dalam reka bentuk alat mekanikal, biomekanik, alat prostetik adalah penting untuk diterapkan dalam industri. Pengetahuan dalam biomekanik (gait, keseimbangan) dan mesin kejuruteraan dan alatan diperlukan dalam membuat alat prostetik untuk anggota bawah dan bahagian atas anggota badan. Kursus ini mengajar para pelajar proses membuat prostetik yang merangkumi teknik penilaian, tahap K, pengubahsuaian menggunakan tol dan mesin, pembentukan dan penamat termoplastik.

	Pengetahuan dari ini diterapkan ke dalam reka bentuk dan analisis peranti prostetik untuk mencapai prestasi terbaik dan masih selamat semasa operasi bersama dengan amputee yang sebenarnya. Prestasi penghubung juga akan dikaji untuk membolehkan pelajar merancang pelbagai mekanisme menggunakan sistem CAD / CAM Biosculptor. Pelajaryang berjaya menamatkan kursus ini akan dapat menganalisis dan merekabentuk alat prostetik dari aspek mekanik dan biomekanik. Pengetahuan ini sangat penting untuk kesinambungan peranti prostetik lain. *This course aims to teach biomedical engineering students the fundamentals used of engineering in prosthetics and orthotics in the industry. Although this course does not have pre-requisite, a strong fundamental in mechanical, biomechanics, design of prosthetic devices is important to be applied in the industry. Knowledge in biomechanics (gait, balance) and engineering machine and tools are needed in fabricating the prosthetics devices for lower limb and above limb part. This course teaches the students the process of fabricating the prosthetics which include the assessment technique, K-level, modification using tools and machine, thermoplastic forming and finishing. The knowledge from this is applied into the design and analysis of prosthetic devices in order to achieve the best performance and yet is still safe during operation together with the real amputee. The performance of linkages will also be studied to enable student to design various mechanism using Biosculptor CAD/CAM system. Students who have successfully completed thiscourse will be able to analyze and design of prosthetic devices from the aspect of mechanics and biomechanics. This knowledge is extremely important for continuation of other prosthetic devices.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 60% Peperiksaan Akhir / *Final Examination*: 40%
Rujukan Utama *Main Reference*	1. Krajbich, J. I., Pinzur, M. S., Potter, B. K., & Stevens, P. M. (2016). Atlas of Amputations and Limb Deficiencies (4th ed.). American Academy of Orthopaedic Surgeons. 2. Chui K.C., et al. (2020) Orthotics and Prosthetics in Rehabilitation (4th Edition). St. Louis, MO; Elsevier. 3. May B.J. and Lockard M.A. (2011) Prosthetics and Orthotics in Clinical Practice. (1st Ed.). Philadelphia, PA.: E.A. Davis Company. 4. Lusardi M. M. and Nielsen C. C. (eds.). (2007) Orthotics and Prosthetics in Rehabilitation. 2nd Edition. St Louis, Mo.: Saunders/Elsevier. 5. Carroll K. and Edelstein J. E. (eds.). (2006). Prosthetics and Patient Management: A Comprehensive Clinical Approach. Thorofare, NJ: SLACK Inc

KIB4018: Reka Bentuk Ortotik Industri / *Industrial Orthotics Design*

Kod Kursus *Course Code*	KIB4018
Tajuk Kursus *Course Title*	Reka Bentuk Ortotik Industri *Industrial Orthotics Design*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Mereka bentuk peranti ortotik menggunakan proses termoplastik teknikal konvensional. 2. Mengubahsuai peranti ortotik menggunakan teknologi pengkomputeran untuk ortotik. 3. Memerihalkan penglibatan peranti ortotik dari kes amputasi yang sebenar. 4. Melaporkan amalan klinikal ortotik yang mematuhi dengan perlakuan etika profesional dan akta peranti perubatan yang bersesuaian 5. Menyemak semula peranti ortotik untuk pesakit kepada pasukan rehabilitasi. *At the end of the course, students are able to:* *1. Design orthotics devices using the conventional technical thermoplastic process.* *2. Modify the orthotic devices using computerized technology for orthotics.* *3. Describe the intervention of orthotics devices from real amputated cases.* *4. Report the related clinical orthotics practice which adhere to appropriate ethical professional conduct and medical device act.* *5. Revise an orthotics device for a patient to a rehabilitation team.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan bioperubatan asas-asas kejuruteraan ortotik dalam industri. Walaupun kursus ini tidak mempunyai prasyarat, asas yang kuat dalam reka bentuk alat mekanik, biomekanik, ortotik adalah penting untuk diterapkan dalam industri. Pengetahuan dalam biomekanik (gaya berjalan, keseimbangan) dan mesin kejuruteraan dan alatan diperlukan dalam membuat alat ortotik untuk anggota bawah dan bahagian atas anggota badan. Kursus ini mengajar para pelajar proses membuat ortotik yang merangkumi teknik penilaian, tahap K, pengubahsuaian menggunakan alatan dan mesin, pembentukan dan penamat termoplastik. Pengetahuan dari ini diterapkan ke dalam reka bentuk dan analisis peranti ortotik untuk mencapai prestasi terbaik dan masih selamat

	semasa operasi bersama dengan amputee yang sebenarnya. Prestasi penghubung juga akan dikaji untuk membolehkan pelajar merancang pelbagai mekanisme menggunakan sistem CAD / CAM Biosculptor. Pelajar yang berjaya menamatkan kursus ini akan dapat menganalisis dan merekabentuk alat ortotik dari aspek mekanik dan biomekanik. Pengetahuan ini sangat penting untuk penerusan peranti ortotik lain. *This course aims to teach biomedical engineering students the fundamentals used of engineering in orthotics in the industry. Although this course does not have pre-requisite, a strong fundamental in mechanical, biomechanics, design of orthotic devices is important to be applied in the industry. Knowledge in biomechanics (gait, balance) and engineering machine and tools are needed in fabricating the orthotic devices for lower limb and above limb part. This course teaches the students the process of fabricating the orthotic which include the assessment technique, K-level, modification using tools and machine, thermoplastic forming and finishing. The knowledge from this is applied into the design and analysis of orthotic devices in order to achieve the best performance and yet is still safe during operation together with the real amputee. The performance of linkages will also be studied to enable student to design various mechanism using Biosculptor CAD/CAM system. Students who have successfully completed this course will be able to analyze and design of orthotic devices from the aspect of mechanics and biomechanics. This knowledge is extremely important for continuation of other orthotic devices.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 60% Peperiksaan Akhir / *Final Examination*: 40%
Rujukan Utama *Main Reference*	1. Md, W. J., & Md, M. D. (2019). Atlas of Orthoses and Assistive Devices (4th ed.). Elsevier. 2. May B.J. and Lockard M.A.. (2011)Prosthetics and Orthotics in Clinical Practice. (1st Edition). Philadelphia, PA.: E.A. Davis Company. 3. Chui K.C., et al. (2020) Orthotics and Prosthetics in Rehabilitation (4th Edition). St. Louis, MO; Elsevier. 4. Edelstein J.E. and Moroz A. (2011) Lower-Limb Prosthetics and Orthotics: Clinical Concept. Thorofare, NJ; SLACK Incorporated. 5. Lusardi M. M., and Nielsen C. C. (eds.) (2007) Orthotics and Prosthetics in Rehabilitation. (2nd Edition). St Louis, Mo.: Saunders/Elsevier.

KIB4019: Pengurusan Amalan dalam Prostetik dan Ortotik / *Practice Management in Prosthetic and Orthotics*

Kod Kursus *Course Code*	KIE4021
Tajuk Kursus *Course Title*	Rekabentuk Elektronik Analog *Practice Management in Prosthetic and Orthotics*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menjelaskan elemen utama di dalam peruntukkan perkhidmatan prostetik dan ortotik. 2. Membandingkan etika profesional dalam peruntukkan dan pentadbiran prostetik dan ortotik di beberapa negara. 3. Menilai polisi, standard dan yang berkaitan dengan amalan prostetik dan ortotik. 4. Mencadangkan strategi pengurusan risiko untuk amalan prostetik dan ortotik. 5. Mencadangkan penyelesaian bersesuaian berdasarkan cabaran dan peluang di dalam pengurusan prostetik dan ortotik. *At the end of the course, students are able to:* *1. Explain the main elements in provision ofprosthetics and orthotics services.* *2. Compare professional ethics in prosthetics and orthotics provision and management invarious countries.* *3. Appraise related international and local policies,standards and regulatories in relation to prosthetics and orthotics practices* *4. Propose the risk management strategy forprosthetics and orthotics practice.* *5. Propose suitable solutions based on challenges and opportunities in prostheticsand orthotics management.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan memberi kesedaran mengenai aspek sistematik yang mempengaruhi amalan profesional ortotik dan prostetik dan memberi peluang untuk memahami kesan maklumat ini dalam persekitaran pembelajaran bersepadu kerja. Pengetahuan mengenai asas keusahawanan dan etika adalah penting untuk kursus ini. Pelajar akan meneroka sifat undang-undang dan etika pendanaan, dokumentasi, perundangan, dasar dan adat yang mempengaruhi amalan klinikal prostetik dan ortotik. Kursus ini akan membantu pelajar untuk memahami di luar peranan langsung sebagai jurutera prostetik atau ortotik. Pelajar akan terlibat dalam perbincangan mengenai profesionalisme, tatakelakuan, masalah etika, pengaruh peribadi dan sosial yang menyumbang kepada ketidaksamaan dalam penjagaan kesihatan. Di akhir kursus ini, pelajar boleh mempraktiskan

	kemahiran komunikasi yang berkesan, masalah etika, profesionalisme dan tatakelakuan dan mengaitkannya dengan amalan penjagaan kesihatan. *This course aims to provides an awareness of systematic aspects impacting orthotic and prosthetic professional practice and provide the opportunity to understand the impact of this information within the work integrated learning environment. Knowledge on basic entrepreneurship and ethics are essentials for thiscourse. Students will explore the legal and ethical nature of funding, documentation, legislation, policies and customs that affect prosthetic and orthotic clinical practice. This course will help students to understand beyond the immediate role of being a prosthetic or orthotic engineers. Students will engage in discussions on professionalism, codes of conduct, ethical issues, personal and social influences contributing to inequalities in health care. At the end f the course, students can apply effective communication skills, ethical issues, professionalism and codes of conduct and relate these to health care practice.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Code of Practice for Prosthetics & Orthotics Device, Malaysian Standard (2021) 2. Prosthetics and Orthotics Job Profile (L3, L4, L5) Department of Skills Development, Ministry of Human Resources, Malaysia. 3. International Organization for Standardization. (2006). ISO 10328: Prosthetics: Structural testing of lower-limb prostheses: requirements and test methods. Geneva, Switzerland. 4. International Organization for Standardization. (1989a). ISO 8549-2: Prosthetics and orthotics-Vocabulary, Part 2: Terms relating to external limb prostheses and wearers of these prostheses. Geneva Switzerland. 5. International Organization for Standardization. (1989b). ISO 8549-1: Prosthetics and orthotics-vocabulary, Part 1: General terms for external limb prostheses and external orthoses. Geneva, Switzerland. 6. tandards for Prosthetics and Orthotics: Part 1 & 2 (2017), WHO. Geneva, Switzerland.

KIB4020: Projek Pengijazahan / *Final Year Project*

Kod Kursus *Course Code*	KIB4020
Tajuk Kursus *Course Title*	Projek Pengijazahan *Final Year Project*
Kredit *Credit*	6
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Merangka objektif kajian yang sesuai berdasarkan kajian ilmiah yang komprehensif dan pengetahuan kejuruteraan bioperubatan yang asas. 2. Menyelesaikan masalah kejuruteraan bioperubatan yang kompleks dengan menggunakan teknik, sumber, dan alat kejuruteraan moden atau IT yang sesuai. 3. Mengurus data yang diperoleh dari pemasalahan kajian kejuruteraan dalam mencapai objektif kajian. 4. Memaparkan kemahiran penilaian kendiri dalam membina kesimpulan yang bernas dan saranan untuk kerja-kerja pada masa hadapan. 5. Mengamalkan komunikasi yang efektif tentang dapatan kajian berdasarkan pengetahuan kejuruteraan bioperubatan melalui mod komunikasi yang pelbagai. *At the end of the course, students are able to:* *1. Formulate appropriate research objectives based on comprehensive literature review and fundamental biomedical engineering knowledge.* *2. Solve complex biomedical engineering problems using appropriate techniques, resources, and modern engineering or IT tools.* *3. Manage thoroughly investigated data of an engineering research problem in addressing research objectives.* *4. Display skills of self-reflection in constructing sound conclusions and recommendations for future works.* *5. Practice effective communication of the research findings based on biomedical engineering knowledge through numerous modes of communication.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini memerlukan pelajar untuk menjalankan projek penyelidikan mengenai topik yang dipilih dalam Kejuruteraan Bioperubatan di bawah pengawasan staf akademik. Pelajar akan mengikuti kursus ini di Tahun 4 pengajian mereka dan setelah mengikuti sebahagian besar subjek kejuruteraan bioperubatan teras pada semester 1 dan 2. Pengetahuan mengenai asas kejuruteraan serta pengetahuan kejuruteraan bioperubatan khusus adalah penting untuk kursus ini. Pelajar akan

	menggunakan pengetahuan yang telah mereka pelajari sepanjang program ini dengan menerapkannya dalam projek penyelidikan yang dijalankan selama dua semester. Sepanjang kedua-dua semester, tumpuan diberikan pada kerja projek (eksperimen, simulasi, dll), analisis hasil dan penulisan laporan akhir. Pelajar diharapkan dapat menyiapkan kerja projek mengikut jadual yang dirancang. Pelajar yang berjaya menamatkan kursus ini akan dapat melakukan penyelidikan secara bebasdalam aspek kejuruteraan bioperubatan. *This course requires students to undertake a research project on a chosen topic in Biomedical Engineering under the supervision of an academic staff. Students will take this course at Year 4 of their study and after taking most of core biomedical engineering subjects in semesters 1 and 2. Knowledge in engineering fundamental as well as specialized biomedical engineering knowledge are essential for this course. Students will be applying the knowledge they have learned throughout this programme by implementing them in the research project which is carried out for two semesters. During both semester, focus is given on the project work (experiments, simulations, etc), analysis of results and final report writing. Students are expected to complete project work according to the planned schedule. Students who have successfully completed this course will be able to perform independent researchin the aspect of biomedical engineering.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 100% Peperiksaan Akhir / *Final Examination*: 0%
Rujukan Utama *Main Reference*	1. Final Year Project Guideline 2. Silyn-Roberts, H. (2012). Writing for Science and Engineering: Papers, Presentations and Reports: Elsevier Science. 3. Leong, E. C., Heah, C. L. H., & Ong, K. K. W. (2015). Guide to Research Projects for Engineering Students: Planning, Writing and Presenting: CRC Press. 4. Hamid, M. E. (2013). How to Write a Research Proposal and Thesis: A Manual for Students and Researchers: Createspace Independent Pub.

KIB4021: Kecerdasan Buatan dalam Kejuruteraan Perubatan / *Artificial Inteligence in Biomedical Engineering*

Kod Kursus *Course Code*	KIB4021
Tajuk Kursus *Course Title*	Kecerdasan Buatan dalam Kejuruteraan Perubatan / Artificial Inteligence in Biomedical Engineering
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Nilaikan konsep dan teori AI yang digunakan dalam Kejuruteraan Bioperubatan. 2. Menyesuaikan teknik kecerdasan buatan dalam menyelesaikan masalah dalam perubatan. 3. Laksanakan alat yang membolehkan AI dalam masalah Kejuruteraan Bioperubatan. 4. Mengesahkan aplikasi AI untuk menyelesaikan masalah Kejuruteraan Bioperubatan. 5. Nilaikan reka bentuk litar yang digunakan untuk pelaksanaan AI dalam peranti Bioperubatan. *At the end of the course, students are able to:* 1. *Evaluate the concepts and theories of AI used in Biomedical Engineering.* 2. *Adapt suitable Artificial Intelligence techniques in solving medical problems.* 3. *Implement AI-enabled tools in Biomedical Engineering problems.* 4. *Validate an AI application to solve Biomedical Engineering problems.* 5. *Evaluate the circuit design used for AI implementation in Biomedical devices.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk memperkenalkan konsep, kaedah, dan potensi sistem pintar dalam Kejuruteraan Bioperubatan. Walaupun kursus ini tidak mempunyai prasyarat, pengetahuan Matematik yang kuat dan kemahiran analisis yang baik diperlukan untuk kursus ini. Kursus ini mengajar para pelajar kaedah asas dalam kecerdasan buatan (AI) dengan penekanan yang lebih besar pada pembelajaran mesin dan perwakilan pengetahuan dan penaakulan dan menerapkannya ke bidang tertentu dalam bidang Kejuruteraan Bioperubatan termasuk, tetapi tidak terhad kepada, analisis morfologi tisu dan lain-lain aplikasi pengimejan perubatan, stratifikasi risiko klinikal, pemodelan perkembangan penyakit, dan ramalan hasil pesakit. Pelajar yang berjaya menamatkan kursus ini dapat membincangkan model pengkomputeran kecerdasan buatan;

	memahami koleksi model pembelajaran mesin; dan mengenal pasti dan mengaplikasikan model sistem pintar dan alat komputasi yang sesuai untuk masalah tertentu dalam bidang Kejuruteraan Bioperubatan dan menganalisis persembahan mereka. *This course aims to introduce the underlying concepts, methods, and the potential of intelligent systems in Biomedical Engineering. Although this course does not have pre-requisite, a strong knowledge of Mathematics and good analytical skills are required for this course. This course teaches the students the foundational methods in artificial intelligence (AI) with greater emphasis on machine learning and knowledge representation and reasoning and apply them to specific areas in the field of Biomedical Engineering including, but not limited to, analysis of tissue morphology and other medical imaging applications, clinical risk stratification, disease progression modeling, and patient outcome prediction. Students who have successfully completed this course will be able to discuss the computational models of artificial intelligence; comprehend a collection of machine learning models; and identify and apply the appropriate intelligent system models and computational tools to specific problems in the field of Biomedical Engineering and analyze their performances.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Russell S., & Norvig P. (2009). Artificial Intelligence: A Modern Approach (3rd ed.). Prentice Hall Press, Upper Saddle River, NJ, USA. 2. Cleophas, T. J., & Zwinderman, A. H. (2015). Machine Learning in Medicine - a Complete Overview (2015th ed.). Springer. 3. Gollapudi S, S. (2016). Practical Machine Learning. Packt Publishing Ltd. 4. Ciaburro G. (2017). MATLAB for Machine Learning. Packt Publishing. 5. Selected seminal and contemporary readings from peer-reviewed literature such as Proceedings of Machine Learning in Healthcare, Artificial Intelligence in Medicine, IEEE Transactions on Biomedical and Health Informatics, and other relevant venues

KIB4022: Kejuruteraan Prostetik dan Ortotik Lanjutan / *Advanced Prosthetics and Orthotics Engineering*

Kod Kursus *Course Code*	KIB4022
Tajuk Kursus *Course Title*	Kejuruteraan Prostetik dan Ortotik Lanjutan *Advanced Prosthetics and Orthotics Engineering*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menerangkan penggunaan alat elektrik dan elektronik dalam mereka bentuk peranti prostetik dan ortotik. 2. Menilai komponen mekanikal dan komponen elektronik yang digunakan dalam alat prostetik dan ortotik. 3. Menyatakan penggunaan mekatronik dalam alat prostetik dan ortotik. 4. Mengukur perbezaan penggunaan Augmented dan Virtual reality dalam pemulihan untuk pengguna prostetik dan ortotik. 5. Menerangkan penggunaan teknologi exoskeleton sebagai teknik pemulihan bantu *At the end of the course, students are able to:* *1. Explain the use of electrical and electronics tools in designing the prosthetics and orthotics devices.* *2. Evaluate the mechanical components and electronics components used in prosthetic and orthotic devices.* *3. Specify the use of mechatronics in prosthetics and orthotics devices.* *4. Measure the different use of Augmented and Virtual reality in rehabilitation for prosthetics and orthotics user.* *5. Explain the use of exoskeleton technologies as an assistive rehabilitation technique*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk memperkenalkan, dalam pendekatan multidisiplin dan interaktif, pelbagai cara di mana bahagian badan yang cacat dapat diganti atau ditambah dengan alat buatan. Kursus ini mengajar para pelajar untuk menggambarkan bagaimana teknologi kejuruteraan bioperubatan moden menangani penyakit, trauma, prostetik dan ortotik. Kemajuan perubatan dengan teknologi ini dibincangkan bersama dengan isu-isu falsafah dan etika yang berkaitan. Walaupun kursus ini tidak mempunyai prasyarat, pengetahuan yang kuat tentang penggunaan alat prostetik dan ortotik sebagai jurutera bioperubatan adalah penting. Pengetahuan dari ini diterapkan ke dalam reka bentuk dan analisis alat prostetik dan ortotik untuk mencapai prestasi terbaik

	namun masih selamat semasa operasi ke arah pesakit dan amputee. Pelajar yang berjaya menamatkan kursus ini akan dapat mengetahui teknologi terkini yang digunakan dalam industri prostetik dan ortotik. Pengetahuan ini sangat penting untuk kesinambungan melayani Industri di kemudian hari. *This course aims to introduce, in a multidisciplinary and interactive approach, the various ways through which defective body parts can be replaced or augmented by artificial devices. This course teaches the students to illustrate how modern biomedical engineering technologies deal with diseases, trauma, prosthetics and orthotics. These technology-enabled medical advancements are discussed along with the associated philosophical and ethical issues. Although this course does not have pre-requisite, a strong knowledge about the usage of prosthetics and orthotics devices as biomedical engineer is important. The knowledge from this is applied into the design and analysis of prosthetic and orthotic devices in order to achieve the best performance and yet is still safe during operation towards the patient and amputee. Students who have successfully completed this course will be able to know the newest advance technology used in prosthetics and orthotics industry. This knowledge is extremely important for continuation of serving the Industry later on.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 60% Peperiksaan Akhir / *Final Examination*: 40%
Rujukan Utama *Main Reference*	1. Koops, B. J., Lüthy, C. H., Nelis, A., Sieburgh, C., Jansen, J. P. M., & Schmid, M. S. (2013). Engineering the Human. Springer Publishing. 2. Barfield, W. (2015). Cyber-Humans: Our Future with Machines (1st ed. 2015 ed.). Copernicus. 3. Lin, P., Abney, K., & Bekey, G. A. (2011). Robot Ethics: The Ethical and Social Implications of Robotics (Intelligent Robotics and Autonomous Agents series). The MIT Press. 4. Gunkel, D. J. (2012). The Machine Question: Critical Perspectives on AI, Robots, and Ethics. The MIT Press. 5. Johnson, F. E., & Virgo, K. S. (2005). The Bionic Human: Health Promotion for People with Implanted Prosthetic Devices. Human Press.

KIB4023: Biomekanik Sukan dan Rehabilitasi / *Sports Biomechanics and Rehabilitiation*

Kod Kursus *Course Code*	KIE4026
Tajuk Kursus *Course Title*	Rangkaian Komunikasi Data *Sports Biomechanics and Rehabilitiation*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti faktor-faktor yang menentukan dan mengekang pergerakan manusian di dalam aktiviti sukan. 2. Mengenalpasti mekanisma kecederaan di dalam aktiviti sukan terpilih. 3. Analisa kecederaan dan kemahiran di dalam sukan menggunakan teknik-teknik kualitatif dan kuantitatif. 4. Merancang strategi pencegahan kecederaan yang berkemungkinan besar akan mengelakkan atau mengurangkan faktor risiko kecederaan. *At the end of the course, students are able to:* *1. Identify factors that govern and constrain human movement in sports activities* *2. Identify the mechanisms of injuries in defined sports activities* *3. Analyse injury and skill in sport using qualitative and quantitative techniques* *4. Plan injury prevention strategies that most likely will prevent or minimise the injury risk factors.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini memperkenalkan pelajar kepada prinsip-prinsip asas pemahaman biomekanik prestasi sukan dan kecederaan sukan menuju kepada rehabilitasi. Pelajar akan mempelajari topik topik kecederaan dan pencegahan sukan seperti faktor risiko kecederaan sukan serta pengurangan risiko, model-model punca kecederaan, mekanisme kejadian sukan, dan penganggaran daya dalam struktur biologikal. Pada bahagian prestasi sukan, pelajar akan mempelajari bagaimana untuk melakukan analisis kualitatif dan kuantitatif, mengumpul, menjalankan analisis, dan menterjemahkan data yang diperolehi daripada teknik-teknik pengukuran tersebut. Daripada kerja-kerja analisis tersebut, pelajar akan memeriksa hubungan antara prestasi dan sistem motor manusia. Pelajar akan mendapat peluang memahami proses-proses yang terlibat di dalam pergerakan di dalam sukan serta penggunaan maklumbalas untuk meningkatkan prestasi sukan. Pada akhir kursus, pelajar akan mendapat lebih

	pemahaman bagaimana sains biomekanikal boleh digunakan untuk mencapai matlamat pencegahan kecederaan sukan dan peningkatan prestasi sukan secara bersama.
	This course introduces the fundamental principles on the understanding of the biomechanics of sports performance and sports injury and the goal for rehabilitation. Students will learn topics on sports injury and its prevention as such the risk factors for injury and risk reduction in sports, models of injury causations, the mechanisms of injury occurrence, and the estimation of forces in biological structures. On the sports performance side, students will learn how to design a quantitative and qualitative analysis, collect, analyze and interpret data obtained from the measurement techniques. From the analysis work, student will be expected to examine the relationship between performance measure and human motor system.
	Student will have the opportunity to explore the underlying processes that is involved in the production of movement in sports and the use of feedback to enhance sports performance. At the end of the course, students will have better understanding how contemporary biomechanical science can be used to meet both of those goals (injury prevention and sport performance enhancement) simultaneously.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Watkins, J. (2014). Fundamental Biomechanics of Sport and Exercise (1st ed.). Routledge. 2. McGinnis, P. M. (2013). Biomechanics of Sport and Exercise (Third ed.). Human Kinetics. 3. Bussey, M. (2011). Sports Biomechanics: Reducing Injury Risk and Improving Sports Performance (2nd ed.). Routledge. 4. Bartlett, R. (2007). Introduction to Sports Biomechanics: Analysing Human Movement Patterns (Volume 2) (2nd ed.). Routledge. 5. Blazevich, A. (2010). Sports Biomechanics: The Basics: Optimizing Human Performance (2nd ed.). A&C Black.

KIB4024: Teknologi Bantu dalam Rehabilitasi / *Assistive Technology in Rehabilitation*

Kod Kursus *Course Code*	KIB4024
Tajuk Kursus *Course Title*	Teknologi Bantu dalam Rehabilitasi *Assistive Technology in Rehabilitation*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Memerihalkan kebaikan-kebaikan dan kelemahan-kelemahan untuk rekabentuk universal bagi pengguna kurang upaya 2. Membentuk satu pendekatan holistik bagi mempertimbangakan pengguna, tugas, persekitaran dan peralatan dalam meningkatkan keputusan-keputusan bagi individu-individu kurang upaya 3. Menganalisa isu-isu peralatan dalam meningkatkan penggunaan terbaik bersama dengan pertimbangan-pertimbangannya 4. Berkomunikasi secara berkesan melalui penulisan laporan teknikal untuk penaakulan klinikan dan proses terapi pekerjaan untuk mengukur standard prestasi dan kedudukan yang sesuai, isu-isu etika yang berhubungkait dengan penggunaan teknologi bagi individu *At the end of the course, students are able to:* *1. Describe the advantages and limitations of universal design for people with disabilities.* *2. Formulate a holistic approach that considers client, task, environment and device in improving the outcomes for individuals with disabilities.* *3. Analyze the equipment issues to make the best of technology along with considerations.* *4. Communicate effectively through technical report writing on the clinical reasoning and occupational therapy process to measuring standards of performance and proper positioning, ethical issues related to use of technology for people with disabilities.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Subjek ini akan memperkenalkan kepada pelajar-pelajar tentang reka bentuk universal, kegunaannya, dan penilaian alat-alat teknologi bantu pada keselesaan pesakit-pesakit seperti di sekolah, kerja, komuniti dan di rumah. Subjek ini akan melaksanakan konsep teknologi alat bantu, iaitu sebarang barang, kepingan peralatan atau sistem untuk meningkatkan, mengekalkan atau memperbaik kebolehan berfungsi oleh individu kurang upaya. Satu pandangan menyeluruh untuk maklumat, komunikasi, manipulasi, ambulasi, pergerakan, dan

	teknologi-teknologi alam sekitar yang digunakan untuk meningkatkan akses bagi pengguna-penguna kurang upaya. Perhatian khusus diberi kepada isu-isu etika yang berhubungkait dengan kedudukan yang betul semasa menggunakan teknologi peralatan-peralatan teknologi bantu dan mengukur dan menilai hasil-hasil prestasi. *This subject will expose the students to the universal design, its usage, and the evaluation of assistive devices to make the most effective use of rehabilitation technology at the comfort of patients such as in school, at work, in the community and at home. The subject will implement the concept of assistive technology, which is any item, piece of equipment or system to increase, maintain or improve functional capabilities of individualswith disabilities. An overview of information, communication, manipulation, ambulation, locomotion, and environmental technologies that enhance access for people with disabilities. Particular attention is given to ethics issues related to proper positioning when usingassistive technology devices and to measuring and evaluating performance outcomes.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Cook, A. M., & Polgar, J. M. (Eds.). (2008). Cook and Hussey's assistive technologies principles and practice (3rd ed.). St Louis: Mosby. 2. Dell, A., Newton, D., & Petroff, J. (2008). Assistive technology in the classroom: Enhancing the school experience of students with disabilities. Upper Saddle River. Pearson Merrill Prentice Hall. 3. Bryant, D., & Bryant B. (2003). Assistive technology for people with disabilities. Boston. Allyn and Bacon. 4. Suryadevara, N.K., & Mukhopadhyay, S.C. (2020). Assistive Technology for the Elderly. Elsevier Science Publishing Co Inc. 5. Ai, Q., Liu, Q., Meng, W., & Xie, S.Q. (2018). Advanced Rehabilitative Technology : Neural Interfaces and Devices. Elsevier Science Publishing Co Inc.

KIB4025: Sokongan Peredaran dan Pernafasan Mekanikal / *Mechanical Circulatory and Respiratory Support*

Kod Kursus *Course Code*	KIB4025
Tajuk Kursus *Course Title*	Sokongan Peredaran dan Pernafasan Mekanikal *Mechanical Circulatory and Respiratory Support*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Pilih sistem sokongan peredaran darah atau pernafasan mekanikal yang paling sesuai berdasarkan keadaan pesakit. 2. Menilai reka bentuk pam mekanikal dari aspek reka bentuk hidraulik dan reka bentuk motor. 3. Kembangkan model komputasi untuk mengkaji interaksi fisiologi antara alat bantu mekanikal dan pesakit. 4. Kenali pendekatan pengurusan implan dan perubatan yang paling sesuai untuk pesakit. *At the end of the course, students are able to:* 1. *Select the most appropriate mechanical circulatory or respiratory support systems based on patients' conditions.* 2. *Evaluate mechanical pump designs from the aspects of hydraulic design and motor design.* 3. *Develop computational models to study physiological interaction between mechanical assist devices and patients.* 4. *Identify the most appropriate surgical implantation and medical management approach for patients.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan pelbagai sistem sokongan peredaran dan pernafasan mekanikal. Walaupun kursus ini tidak mempunyai prasyarat, pengetahuan mengenai mekanik bendalir dan fenomena pengangkutan, dan pemodelan komputasi diperlukan. Kursus ini mengajar para pelajar bagaimana memilih sistem sokongan peredaran mekanikal atau pernafasan yang paling sesuai berdasarkan keadaan pesakit, reka bentuk pam mekanikal yang berkaitan dengan sistem sokongan peredaran dan pernafasan mekanikal, penilaian interaksi fisiologi antara alat bantu mekanikal dan pesakit yang menggunakan model komputasi, serta pendekatan pengurusan implan dan perubatan untuk pesakit yang dibantu oleh alat. Pelajar yang berjaya menamatkan kursus ini dapat mengaplikasikan pengetahuan kejuruteraan mereka dalam pemilihan, reka bentuk dan pengurusan sistem sokongan peredaran mekanikal dan pernafasan yang paling sesuai.

	This course aims to teach engineering students various mechanical circulatory and respiratory support systems. Although this course does not have pre-requisite, knowledge in fluid mechanics and transport phenomena, and computational modelling is required. This course teaches the students how to select the most appropriate mechanical circulatory or respiratory support systems based on patients' conditions, mechanical pump designs related to mechanical circulatory and respiratory support systems, evaluation of the physiological interaction between mechanical assist devices and patients using computational models, as well as surgical implantation and medical management approach for device-assisted patients. *Students who have successfully completed this course will be able to apply their engineering knowledge in the selection, design and management of the most appropriate mechanical circulatory and respiratory support systems.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Gregory, S., Stevens, M., & Fraser, J. F. (2017). Mechanical Circulatory and Respiratory Support (1st ed.). Academic Press. 2. Morgan, J. A., Civitello, A. B., & Frazier, O. H. (2017). Mechanical Circulatory Support for Advanced Heart Failure: A Texas Heart Institute/Baylor College of Medicine Approach (1st ed. 2018 ed.). Springer. 3. Md, J. K. K., & Md, J. R. G. (2019). Mechanical Circulatory Support: A Companion to Braunwald's Heart Disease: Expert Consult: Online and Print (2nd ed.). Elsevier. 4. Shelledy, D. C., & Peters, J. (2019). Mechanical Ventilation (3rd ed.). Jones & Bartlett Learning. 5. Hess, D., & Kacmarek, R. (2018). Essentials of Mechanical Ventilation, Fourth Edition (4th ed.). McGraw-Hill Education / Medical.

KIB4026: Biomekatronik / *Biomechatronics*

Kod Kursus *Course Code*	KIB4026
Tajuk Kursus *Course Title*	Biomekatronik *Biomechatronics*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Mengintegrasikan pelbagai pengetahuan bidang kejuruteraan dengan anatomi dan fungsi manusia untuk reka bentuk peranti biomekatronik. 2. Menentukan kebolehgunaan sensor biomekatronik yang diimplan dan dipasangkan pada badan yang digunakan untuk memantau dan / atau merangsang proses fisiologi berdasarkan prinsip operasi mereka. 3. Menentukan kemungkinan pelbagai bentuk maklum balas bio untuk diagnostik dan pemulihan. 4. Berfungsi dengan berkesan sebagai satu pasukan untuk mencadangkan peranti biomekatronik untuk populasi pengguna tertentu. *At the end of the course, students are able to:* *1. Integrate multiple engineering field knowledge with human anatomy and function for the design of biomechatronics devices.* *2. Appraise the viability of different implanted and attachable biomechatronics sensors used to monitor and/or stimulate physiological processes based on their operational principles.* *3. Determine the feasibility of different forms of biofeedback for diagnostics and rehabilitation.* *4. Perform effectively as a team to propose a biomechatronics device for a particular user population.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini mendedahkan para pelajar kepada bidang biomekatronik dan aplikasinya. Pengetahuan dari kursus-kursus mekanikal, elektrikal, dan sistem kawalan serta anatomi manusia diperlukan untuk menghayati kursus ini. Bahagian pertama dalam subjek ini adalah memahami komponen kerja secara umum sesebuah sistem biomekatronik, termasuk sensor dan transduser, pemprosesan isyarat, actuator dan system mekanikal. Bahagian kedua pula meliputi bidang utama aplikasi dalam biomekatronik, termasuk prostetik anggota aktif dan pasif, pendengaran dan prostesis visual, pengesan gentian, jantung buatan dan system respirasi serta pembedahan robotik. Pelajar yang berjaya menamatkan kursus ini akan dapat menganalisis dan mereka bentuk peranti Biomechatronik dalam pasukan pelbagai disiplin.

	This course aims to expose the students to the field of biomechatronics and its applications. Knowledge from mechanical, electrical, and control courses as well as human anatomy is required to fully appreciate this course. The first part of the course covers the understanding of the general working components of a biomechatronics system, including sensors and transducers, signal processing, actuators and mechanical systems. Second part of the course describes major fields of biomechatronics applications, including active and passive prosthetic limbs and joints,hearing and visual prosthesis, sensory substitution, artificial heart and respiration system and robotic surgery. Students who have successfully completed thiscourse will be able to analyze and design Biomechatronics devices in a multidisciplinary team.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Popovic, M. B. (2019). Biomechatronics (1st ed.). Academic Press. 2. Kaiyu, R. T. (2011). Biomechatronics in Medicine and Healthcare (1st ed.). Jenny Stanford Publishing. 3. Brooker, G. (2012). Introduction to Biomechatronics. Institution of Engineering and Technology. 4. Hu, X. (2019). Intelligent Biomechatronics in Neurorehabilitation (1st ed.). Academic Press.

KIB4027: Analisa Pola dan Imej / *Pattern and Image Analysis*

Kod Kursus *Course Code*	KIB4027
Tajuk Kursus *Course Title*	Analisa Pola dan Imej *Pattern and Image Analysis*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Mencadangkan teknik-teknik pemprosesan imej bagi aplikasi bioperubatan. 2. Menilai prestasi algorithma pemprosesan imej. 3. Membezakan teknik-teknik pengecaman pola. 4. Mengaplikasikan teknik-teknik pengecaman pola untuk masalah kejuruteraan bioperubatan. *At the end of the course, students are able to:* *1. Propose image processing techniques forbiomedical application.* *2. Assess the performance of image processing algorithms.* *3. Differentiate pattern recognition techniques.* *4. Apply pattern recognition techniques to biomedical engineering problems.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar konsep dan algoritma asas untuk pemprosesan imej perubatan dan pengecaman pola. Kursus ini tidak mempunyai prasyarat, tetapi pemahaman asas mengenai pengaturcaraan adalah penting. Pelajar akan belajar tentang pelbagai teknik pemprosesan gambar termasuk penambahbaikan gambar, penapisan, peruasan, pemprosesan morfologi dan pemampatan imej yang berguna untuk analisis imej perubatan. Selain itu, pelajar akan diperkenalkan dengan teknik untuk mengenali pola dalam data seperti regresi, pengelas linear, pengelas tak linear, pemadanan templat dan pengelompokan. Pelajar yang berjaya menamatkan kursus ini akan dapat menerapkan teknik memproses gambar dan pengecaman pola pada data pengimejan perubatan yang berkaitan dengan bidang bioperubatan. *This course aims to teach the fundamental concepts and algorithms for medical image processing and pattern recognition. This course does not have* *pre-requisite, but basic understanding of programming is important. Students will learn about various image processing techniques including image enhancement, filtering, segmentation, morphological processing and compression which is useful for medical image analysis. Besides, students will be introduced to techniques for recognition of pattern in data such as*

	regression, linear classifiers, non-linear classifiers, template matching and clustering. Students who have successfully completed this course will be able to apply image processing and pattern recognition techniques to medical imaging data relevant to biomedical field.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Birkfellner, W. (2016). Applied Medical Image Processing: A Basic Course: CRC Press. 2. Gonzalez, R. C., & Woods, R. E. (2011). Digital Image Processing: Pearson Education. 3. Murty, M. N., & Devi, V. S. (2015). Introduction to pattern recognition and machine learning (Vol. 5). World Scientific. 4. de Mendonça Braga-Neto, U. (2020). Fundamentals of Pattern Recognition and Machine Learning. Springer International Publishing. 5. Paluszek, M., & Thomas, S. (2016). MATLAB machine learning. Apress.

KIB4028: Teknologi Mikro Untuk Kejuruteraan Bioperubatan / *Micro Technologies for Biomedical Engineering*

Kod Kursus *Course Code*	KIB4028
Tajuk Kursus *Course Title*	Teknologi Mikro Untuk Kejuruteraan Bioperubatan *Micro Technologies for Biomedical Engineering*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Membanding teknik mikrofabrikasi asas untuk peranti mikro silikon, kaca, dan polimer. 2. Menilai reka bentuk, fabrikasi, dan operasi sensor, penggerak, dan alat peranti mikro berasaskan MEMS. 3. Menyepadu prinsip sains dan kejuruteraan antara disiplin untuk memahami mikrosistem bioperubatan untuk diagnosis dan rawatan penyakit manusia 4. Mengabung prinsip kejuruteraan yang relevan untuk merancang mikrosistem yang inovatif untuk penjagaan kesihatan yang lebih baik. *At the end of the course, students are able to:* *1. Compare the basic microfabrication techniques for silicon, glass, and polymer microdevices.* *2. Evaluate the design, fabrication, and operation of MEMS-based sensors, actuator, and fluidic microdevices.* *3. Integrate interdisciplinary principles of sciences and engineering to understand biomedical microsystems for diagnosis and treatment of human diseases* *4. Combine the relevant engineering principles to design innovative microsystems for better healthcare.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar kejuruteraan tentang teknologi mikro dalam Kejuruteraan Bioperubatan. Walaupun kursus ini tidak mempunyai prasyarat, asas yang kuat dalam fizik dankejuruteraan adalah penting. Pengetahuan dalam bahan (seperti silikon dan polimer), kimia, biologi dan perubatan diperlukan untuk kursus ini. Kursus ini mengajar para pelajar mengenai teknik asas mikrofabrikasi untuk peranti mikro silikon, kaca, dan polimer. Reka bentuk asas dan prinsip kerja sensor, penggerak dan peranti mikro bendalir juga diajarkan dalam kursus ini. Pengetahuan bersepadu dari semua bidang ini akan digunakan untuk memahami mikrosistem bioperubatan untuk diagnosis dan rawatan penyakit manusia. Pelajar yang berjaya menamatkan kursus ini akan dapat menganalisis dan merancang mikrosistem bioperubatan yang inovatif untuk penjagaan kesihatan yang lebih baik. *This course aims to teach engineering students about the Micro Technologies in Biomedical Engineering.*

	Although this course does not have pre-requisite, a strong fundamental in physics and engineering is important. Knowledge in materials (such as silicon and polymer), chemistry, biology and medicine is required for this course. This course teaches the students about the basic microfabrication techniques for silicon, glass, and polymer microdevices. The basic design and working principle of sensor, actuator and fluidic microdevices are also teach in this course. The integrated knowledge from all this field will be applied to understand biomedical microsystems for diagnosis and treatment of human diseases. Students who have successfully completed this course will be able to analyze and design the innovative Biomedical microsystem for better healthcare.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Meng, E. (2010). Biomedical Microsystems (1st ed.). CRC Press. 2. Luttge, R. (2016). Nano- and Microfabrication for Industrial and Biomedical Applications (Micro and Nano Technologies) (2nd ed.). William Andrew. 3. Folch, A. (2019). Introduction to Biomems. CRC Press. 4. Badilescu, S., & Packirisamy, M. (2019). BioMEMS: Science and Engineering Perspectives (1st ed.). CRC Press. 5. Bhansali, S., & Vasudev, A. (2012). Mems for Biomedical Applications (Woodhead Publishing Series in Biomaterials) (1st ed.). Woodhead Publishing.

KIB4029: IT Perubatan danTeleperubatan / *Medical IT and Telemedicine*

Kod Kursus *Course Code*	KIB4029
Tajuk Kursus *Course Title*	IT Perubatan danTeleperubatan *Medical IT and Telemedicine*
Kredit *Credit*	3
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Menerangkan fungsi, kandungan, komponen, format, dan agensi yang terlibat dalam rekod kesihatan dalam pelbagai tetapan penjagaan kesihatan. 2. Menilai evolusi rekod kesihatan elektronik (EHR) dan kelebihannya berbanding rekod berdasarkan kertas; keadaan semasa penggunaan EHR dan teknologi yang membantu peralihan ke EHR; dan cabaran EHR dan peranan sokongan profesional pengurusan maklumat kesihat 3. Kenal pasti konsep yang berlaku untuk rangkaian komputer, protokol komunikasi lain, dan seni bina Internet dan aplikasi kejuruteraan bioperubatan yang berkaitan. 4. Mencadangkan penyelesaian untuk masalah komunikasi berkaitan kejuruteraan bioperubatan. *At the end of the course, students are able to:* *1. Describe the functions, content, components, format, and agencies involved in the health record in various healthcare settings.* *2. Evaluate the evolution of the electronic health records (EHR) and its advantages over paper-based records; the current state of EHR adoption and the technologies that help transition to the EHR; and the EHR challenges and the supporting roles of health in* *3. Identify the concepts applicable to computer networking, other communications protocols, and architecture of Internet and relevant biomedical engineering applications.* *4. Propose solutions to biomedical engineering-related communications problems.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar teknik asas Teknologi Maklumat Kesihatan dan Telemedicine. Walaupun kursus ini tidak mempunyai prasyarat, asas yang kuat dalam komunikasi data dan tahap literasi komputer sederhana diperlukan untuk kursus ini. Kursus ini mengajar pelajar konsep, tujuan, fungsi, kandungan, format, evolusi, dan agensi yang terlibat dalam rekod kesihatan elektronik. Juga, ia memberikan maklumat berharga mengenai rangkaian komputer dan seni bina Internet yang digunakan dalam aplikasi kejuruteraan bioperubatan. Lebih penting lagi, ia menyoroti Perkaitan antara Teknologi Maklumat Kesihatan dan Telemedicine. Pelajar yang berjaya menamatkan kursus ini akan dapat membincangkan cabaran rekod kesihatan dan peranan sokongan profesional pengurusan maklumat kesihatan dalam

	mengatasinya; dan untuk menganalisis pelbagai amalan telemedicine dan langkah berjaga-jaga yang relevan. *This course aims to teach engineering students the fundamentals of Health Information Technology and Telemedicine. Although this course does not have pre-requisite, a strong fundamental in data communication and a medium level of computer literacy is required for this course. This course teaches the students the concepts, purpose, functions, content, format, evolution, and agencies involved in the electronic health records. Also, it provides valuable information about computer networking and architecture of Internet being used in biomedical engineering applications. More importantly, it highlights the Interrelationship between Health Information Technology and Telemedicine. Students who have successfully completed this course will be able to discuss the health record challenges and the supporting roles of health information management professionals in addressing them; and to analyze the different practices of telemedicine and relevant precautions.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Gogia, S. (2019). Fundamentals of Telemedicine and Telehealth (1st ed.). Academic Press. 2. Fong, B., Fong, A. C. M., & Li, C. K. (2010). Telemedicine Technologies: Information Technologies in Medicine and Telehealth (1st ed.). Wiley. 3. Davis N. A., LaCour M. (2014) Health Information Technology, 3rd Edition, Elsevier Health Sciences. 4. Johns, M. (2010). Health Information Management Technology: An Applied Approach (3r ed). Amer Health Info Management As.

KIB4030: Prostetik Klinikal / *Clinical Prosthetics*

Kod Kursus *Course Code*	KIB4030
Tajuk Kursus *Course Title*	Prostetik Klinikal *Clinical Prosthetics*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Kaji semula intervensi semasa dalam alat prostetik dari amalan berasaskan bukti 2. Merekabentuk peranti prostetik kompleks menggunakan pengetahuan kejuruteraan bioperubatan 3. Menghasilkan peranti prostetik kompleks 4. Menentukan kaedah terbaik bagi mengenakan peranti prostetik di dalam suasana pelbagai-disiplin *At the end of the course, students are able to:* *1. Review current intervention in prosthetics device from evidence-based practice* *2. Design complex prosthetics devices using substantial Biomedical Engineering knowledge* *3. Produce complex prosthetics and orthotics devices* *4. Determine the best method to prescribe prosthetics devices in a multi-disciplinary environment*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini menyediakan pengalaman latihan persediaan pelajar untuk mengembangkan kemahiran, sikap dan pengetahuan profesional yang akan diperlukan untuk pengalaman pembelajaran bersepadu-kerja masa depan. Dengan menggunakan pengetahuan dan kemahiran psikomotor sebelumnya yang dipelajari mengenai rawatan prostetik, pelajar akan belajar berkenaan penilaian klinikal seseorang secara sistematik dan mentafsirkan data yang dinilai untuk membuat rancangan rawatan berasaskan bukti holistik, baik untuk individu mahupun di pelbagai komuniti untuk meningkatkan akses dan penjagaan. Pelajar belajar mengenai reka bentuk antara muka soket, jenis kaki dan lutut prostetik, dan menilai kesesuaian dan fungsi prostesis pada amputees. Pada akhir kursus ini, pelajar akan memahami dan menghayati pelbagai patologi yang terdapat pada pesakit yang memerlukan alat prostetik dan bagaimana mempertimbangkan komorbiditi yang mungkin mempengaruhi rekabentuk prostesis. *This course provides a preparatory practice education experience for students to develop emerging professional skills, attitudes and knowledge that will be required for future work-integrated-learning experiences. Using previous knowledge and psychomotor skills learnt regarding prosthetic treatment, student will learn how to approach the clinical assessment of an individual in a systematic manner and interpret the data assessed to create*

	holistic *evidence-based treatment plans, both for an individual and across various communities to improve access and care. Students learn about the design of socket interfaces, prosthetic foot and knee types, and evaluate the fit and function of a prosthesis on amputees. At the end of the course, student will understand and appreciate the different pathologies that present in patients requiring a prosthetic device and how to take into consideration comorbidities that may influence the design of a prosthesis.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 60% Peperiksaan Akhir / *Final Examination*: 40%
Rujukan Utama *Main Reference*	1. Michael, J. W., & Bowker, J. H. (Eds.). (2016). Atlas of amputations and limb deficiencies: surgical, prosthetic, and rehabilitation principles (Vol. 4). Rosemont, IL: American Academy of Orthopaedic Surgeons. 2. Pitkin, MR (2010) Biomechanics of Lower Limb Prosthetics Springer-Verlag Berlin Heidelberg 3. Atkins, D. J., & Robert III, H. (Eds.). (2012). Comprehensive management of the upper-limb amputee. Springer Science & Business Media. 4. Lusardi MM & Nielsen CC (Eds.), (2013).Orthotics and prosthetics in rehabilitation (3rd.). St. Louis, Missouri: Saunders Elsevier.

KIB4031: Ortotik Klinikal / *Clinical Orthotics*

Kod Kursus *Course Code*	KIB4031
Tajuk Kursus *Course Title*	Ortotik Klinikal *Clinical Orthotics*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Kaji semula intervensi semasa dalam alat ortotik dari amalan berasaskan bukti 2. Merekabentuk peranti ortotik kompleks menggunakan pengetahuan kejuruteraan bioperubatan 3. Menghasilkan peranti ortotik kompleks 4. Menentukan kaedah terbaik bagi mengenakan peranti ortotik di dalam suasana pelbagai-disiplin *At the end of the course, students are able to:* *1. Review current intervention in orthotics device from evidence-based practice* *2. Design complex orthotics devices using substantial Biomedical Engineering knowledge* *3. Produce complex orthotics devices* *4. Determine the best method to prescribe orthotics devices in a multi-disciplinary environment*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini menyediakan pengalaman latihan persediaan pelajar untuk mengembangkan kemahiran, sikap dan pengetahuan profesional yang akan diperlukan untuk pengalaman pembelajaran bersepadu-kerja masa depan. Dengan menggunakan pengetahuan dan kemahiran psikomotor sebelumnya yang dipelajari mengenai rawatan ortotik, pelajar akan belajar berkenaan penilaian klinikal seseorang secara sistematik dan mentafsirkan data yang dinilai untuk membuat rancangan rawatan berasaskan bukti holistik, baik untuk individu mahupun di pelbagai komuniti untuk meningkatkan akses dan penjagaan. Pelajar belajar mengenai bagaimana ortosis direka, bagaimana interaksinya dengan pergerakan pesakit dan kemahiran berkaitan penilaian dan pembuatan ortosis. Pelajar juga akan meningkatkan kemahiran psikomotor dan kebiasaan dengan bahan/teknik yang digunakan didalam ortotik menerusi ortosis yang sedia ada dan ortosis yang direka khas. Pada akhir kursus ini, pelajar akan memahami dan menghayati pelbagai patologi yang terdapat pada pesakit yang memerlukan alat ortotik dan bagaimana mempertimbangkan komorbiditi yang mungkin mempengaruhi rekabentuk ortotik. *This course provides a preparatory simulated practice education experience for students to develop emerging professional skills, attitudes*

	and knowledge that will be required for future work-integrated-learning experiences. Using previous knowledge and psychomotor skills learnt regarding orthotic treatment, student will learn how to approach the clinical assessment of an individual in a systematic manner and interpret the data assessed to create holistic *evidence-based treatment plans, both for an individual and across various communities to improve access and care. Students learn how orthoses are designed, how they interact with the body to control movement, and skills related to the assessment of and manufacture of an orthosis. Students will also enhance psychomotor skills and familiarity with materials/techniques used in orthotics through the fitting of prefabricated and custom-fabricated orthoses. At the end of the course, student will understand and appreciate the different pathologies that present in patients requiring a orthotic device and how to take into consideration comorbidities that may influence the orthotic design.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 60% Peperiksaan Akhir / *Final Examination*: 40%
Rujukan Utama *Main Reference*	5. Michael, J. W., & Bowker, J. H. (Eds.). (2016). Atlas of amputations and limb deficiencies: surgical, prosthetic, and rehabilitation principles (Vol. 4). Rosemont, IL: American Academy of Orthopaedic Surgeons. 6. Pitkin, MR (2010) Biomechanics of Lower Limb Prosthetics Springer-Verlag Berlin Heidelberg 7. Atkins, D. J., & Robert III, H. (Eds.). (2012). Comprehensive management of the upper-limb amputee. Springer Science & Business Media. 8. Lusardi MM & Nielsen CC (Eds.), (2013).Orthotics and prosthetics in rehabilitation (3rd.). St. Louis, Missouri: Saunders Elsevier.

KIB4032: Ortosis Tulang Belakang / *Spinal Orthoses*

Kod Kursus *Course Code*	KIB4032
Tajuk Kursus *Course Title*	Ortosis Tulang Belakang *Spinal Orthoses*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/* *Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Mereka bentuk alat ortotik tulang belakang menggunakan proses termoplastik teknikal konvensional 2. Membina Model CAD / CAM dan mensimulasikan masalah kejuruteraan yang kompleks dengan menggunakan alat Kejuruteraan Bioperubatan moden. 3. Menilai campur tangan alat ortotik tulang belakang dari kes yang diamputasi sebenar 4. Menerangkan secara berkesan dalam konteks profesional dan pasukan pemulihan dengan pesakit semasa menetapkan alat ortotik tulang belakang *At the end of the course, students are able to:* *1. Design spinal orthotics devices using the conventional technical thermoplastic process* *2. Build CAD/CAM Model and simulate complex engineering problems using modern Biomedical Engineering tools.* *3. Evaluate the intervention of spinal orthotic devices from the real amputed cases* *4. Describe effectively in the professional context and rehabilitation team with patients during prescribing the spinal orthotic devices*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar ortotik tulang belakang kepada pelajar kejuruteraan bioperubatan. Walaupun kursus ini tidak mempunyai prasyarat, konsep dan asas yang kuat dari fabrikasi prostetik dan ortotik adalah penting. Subjek ini memberi pelajar prinsip dan pengalaman praktikal dalam preskripsi, reka bentuk, fabrikasi, pemasangan, dan penilaian alat ortotik tulang belakang. Subjek ini secara progresif mengintegrasikan kajian kesihatan dan kejuruteraan, yang telah diambil oleh para pelajar sebagai sebahagian daripada kajian akademik mereka yang terdahulu, dan yang menjadi asas bagi penentuan prinsip ilmiah yang digunakan dalam praktik klinikal ortotik tulang belakang. Pelajar yang berjaya menamatkan kursus ini akan dapat menganalisis dan merancang alat ortotik tulang belakang dari aspek mekanik dan biomekanik. Pengetahuan ini sangat penting untuk kesinambungan pembuatan ortotik terhadap industri. *This course aims to teach biomedical engineering students the spinal orthotics. Although this course does not have pre-requisite, a strong*

	fundamental and basic concept of prosthetics and orthotics fabrication is important. This subject provides students with the principles and practical experiences in the prescription, design, fabrication, fitting, and evaluation of spinal orthotic devices. The subject progressively integrates the health and engineering studies, which the students have taken as part of their earlier academic studies, andwhich form the basis for the derivation of the scientific principles used in the clinical practice of spinal orthotics.Students who have successfully completed this course will be able to analyze and design spinal orthotic devices from the aspect of mechanics and biomechanics. This knowledge is extremely important for continuation of orthotics fabrication towards the industry.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 60% Peperiksaan Akhir / *Final Examination*: 40%
Rujukan Utama *Main Reference*	1. Md, J. H. D., Michael, J., & Md, F. J. (2008). AAOS Atlas of Orthoses and Assistive Devices (4th ed.). Mosby. 2. Lusardi, M. M., & Nielsen, C. C. (2000). Orthotics and Prosthetics in Rehabilitation. Butterworth-Heinemann. 3. Seymour, R. (2002). Prosthetics and Orthotics: Lower Limb and Spine (1st ed.). Lippincott Williams & Wilkins. 4. Shurr, D. G., & Michael, J. W. (2001). Prosthetics and Orthotics (2nd Edition). Prentice. Hall,2002.

KIB4033: Kejuruteraan Tisu / *Tissue Engineering*

Kod Kursus *Course Code*	KIB4033
Tajuk Kursus *Course Title*	Kejuruteraan Tisu *Tissue Engineering*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti interaksi sel-ECM dan biobahan 2. Menerangkan komponen dan teknik Kejuruteraan Tisu 3. Mencadangkan idea mengenai penyelesaian Kejuruteraan Tisu untuk tisu/organ 4. Menerangkan pelbagai strategi Kejuruteraan Tisu yang berbeza *At the end of the course, students are able to:* *1. Identify cell-ECM and biomaterial interactions* *2. Explain Tissue Engineering components and techniques* *3. Propose ideas on Tissue Engineering solutions for specific tissues/organs* *4. Describe different Tissue Engineering strategies*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini mengajar pelajar mengenai asas-asas Kejuruteraan Tisu. Walaupun kursus ini tidak mempunyai prasyarat, asas yang kuat dalam biobahanpenting. Kursus ini merangkumi prinsip asas kejuruteraan tisu bertumpu kepada kombinasi sel, perancah, komponen-komponen matriks sel luar dan stimulasi sesuai. Dan juga ulasan semasa mengenai strategi dan penggunaan kejuruteraan tisu. Pada akhirkursus, pelajar seharusnya dapat merancang perancah Kejuruteraan Tisu dan juga melakukan kultur sel di makmal Kejuruteraan Tisu. *This course teaches students on the fundamentals of Tissue Engineering. Although this course does not havepre-requisite, a strong fundamental in biomaterials would be essential. This course covers the basic principles of tissue engineering focused upon the combination of cells, scaffolds, components of extracellular matrix and appropriate stimulation. Also reviews current strategies and usage of tissue engineering applications. In the end of the course, students should be able to design Tissue Engineering scaffolds and also perform cell culture in the Tissue Engineering lab.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Lanza, R., Langer, R., Vacanti, J. P., & Atala, A. (Eds.). (2020). Principles of tissue engineering. Academic press.

	2. Reis, R. L. (2019). Encyclopedia of tissue engineering and regenerative medicine. Academic Press.
	3. Grumezescu, A. (Ed.). (2016). Nanobiomaterials in soft tissue engineering: applications of nanobiomaterials. William Andrew.
	4. Birla, R. (2014). Introduction to tissue engineering: applications and challenges. John Wiley & Sons.

KIB4034: Biobahan Lanjutan / *Advanced Biomaterials*

Kod Kursus *Course Code*	KIB4034
Tajuk Kursus *Course Title*	Biobahan Lanjutan *Advanced Biomaterials*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Bincangkan konsep antara mukabiobahan-tisu dalam implan 2. Mewajarkan kaedah digunakan untuk meningkatkan kesesuaian biologi bahan 3. Mengenal pasti bahan lestari baru untuk aplikasi kejuruteraan Bioperubatan 4. Mencadangkan reka bentuk baru untuk menangani had terapi sedia ada *At the end of the course, students are able to:* *1. Discuss concepts of biomaterial-tissueinterfaces in an implant* *2. Justify methods to improve materials biocompatibility* *3. Identify novel sustainable materials for Biomedical engineering applications* *4. Propose novel designs to address the limitations of existing therapies*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini memberi tumpuan kepada pengembangan biobahan baru sebagai alat baru untuk mengkaji dan mengarahkan tingkah laku dan fungsi sel untuk aplikasi bioperubatan. Pengetahuan yang kuat mengenai biobahanl sangat penting. Kursus ini mengajar topik yang berkaitan dengan pelbagai bahanyang digunakan di dalam aplikasi biobahan. Pelajar juga akan belajar mengenai bahan lestari untuk aplikasi bioperubatan Kursus ini memberi pendedahan kepada pelajar tentang teknologi terkini yang digunakan dalam fabrikasi, pengubahsuaian dan pencirian biobahan. Melalui kursus ini, pelajar mempelajari teknik-teknik yang diperlukan untuk mengesahkan kesesuaian biologi bahan. Pada akhir kursus, pelajar akan dapat merancang biobahan maju untuk aplikasi kejuruteraan bioperubatan. *This course focuses on the development of novel biomaterials both as new tools to study and direct cell behavior and function for biomedical applications. A strong knowledge on biomaterials is essential. The course teaches topics related to a wide range of novel materials used in the application of biomaterials. This course exposes students to up-to-date technologies used in the fabrication, modification and characterization of biomaterials. Students will also learn on recycling materials for biomedical applications.* *Through the course, students learn necessary techniques to validate the biocompatibility of a material. Moreover, this course will have in-depth discussions on recent findings and publications in biomaterials. In the end of*

	the course, students will be able to design novel advanced biomaterials for biomedical engineering applications.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Zhang, X., & Williams, D. (Eds.). (2019). Definitions of biomaterials for the twenty-first century. Elsevier. 2. Tekade, R. K. (2019). Biomaterials and Bionanotechnology. Academic Press. 3. Antoniac, I. (Ed.). (2012). Biologically responsive biomaterials for tissue engineering (Vol. 1). Springer Science & Business Media. 4. Park, J. B. (2012). Biomaterials science and engineering. Springer Science & Business Media.

KIB4035: Biokimia dan Teknik Analisa / *Biochemistry and Analytical Techniques*

Kod Kursus *Course Code*	KIB4035
Tajuk Kursus *Course Title*	Biokimia dan Teknik Analisa *Biochemistry and Analytical Techniques*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Terapkan prinsip dan teknik biokimia untuk mengenal pasti pelbagai jenis biomolekul dalam tubuh manusia 2. Selesaikan masalah / penyakit yang berkaitan dengan biomolekul dalam tubuh manusia menggunakan prinsip biokimia dan teknik analisis yang sesuai 3. Mencadangkan eksperimen menggunakan prinsip biokimia dan teknik analisis yang sesuai untuk menghasilkan penyelesaian yang berkaitan dengan masalah kejuruteraan bioperubatan yang memenuhi keperluan tertentu mengenai kesihatan dan keselamatan awam. 4. Menerangkan secara berkesan dalam konteks profesional dengan masyarakat mengenai masalah kejuruteraan bioperubatan/penyakit yang berkaitan dengan biomolekul *At the end of the course, students are able to:* *1. Apply biochemistry principles and techniques to identify different types of biomolecules in the human body* *2. Solve problems/diseases associated with biomolecules in the human body using biochemistry principles and appropriate analytical techniques* *3. Propose an experiment using biochemistry principles and appropriate analytical techniques to produce solutions related to biomedical engineering problems that meet specified needs regarding public health and safety.* *4. Explain effectively in the professional context with the community on biomedical engineering problems/diseases associated with biomolecules*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini bertujuan untuk mengajar pelajar Kejuruteraan Bioperubatan latar belakang teori dari pelbagai kaedah analisis biokimia kepada aplikasi praktikal instrumen yang digunakan untuk menganalisis biomolekul yang terdapat dalam sistem biologi. Pengetahuan dalam anatomi dan fisiologi manusia adalah kelebihan untuk kursus ini. Kursus ini mengajar para pelajar jenis molekul yang terdapat dalam sistem biologi (biomolekul), strukturnya, sifat kimia, fungsinya, bagaimana ianya berinteraksi, dan reaksi yang dialaminya. Ini juga merangkumi semua teknik utama untuk menentukan penentuan makromolekul biologi dan analisis eksperimental, termasuk protein, karbohidrat, lipid, dan asid nukleik dengan aplikasi

	bioperubatan yang berkaitan. Pelajar yang telah menyelesaikan kursus ini akan dapat menjelaskan prinsip teknik bio-analitik yang diliputi, mempunyai kesedaran tentang aplikasi teknik ini dalam penyelidikan bioperubatan, dan menafsirkan data eksperimen yang diperoleh menggunakan teknikyang dipelajari. *This course aims to teach Biomedical Engineering students the theoretical background of the various biochemical analytical methods to the practical application of instruments used to analyse the biomolecules found in biological systems. Knowledge in human anatomy and physiology is an advantage for this course. This course teaches the students the types of molecules found in biological systems (biomolecules), their structure, their chemical properties, their function, how they interact, and what reactions they undergo. It also covers all primary techniques for determining biological macromolecules' determination and experimental analysis, including proteins, carbohydrates, lipids, and nucleic acids with associated biomedical applications. Students who have completed this course will be able to explain the principles of the bio-analytical techniques covered, have an awareness of the applications of these techniques in biomedical research, and interpret experimental data obtained using the covered techniques.*
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%
Rujukan Utama *Main Reference*	1. Bettelheim, F. A., Brown, W. H., Campbell, M. K., Farrell, S. O., Torres, O. (2019) Introduction to General, Organic, and Biochemistry. Cengage Learning, 12th edition. ISBN-10: 1337571350, ISBN-13: 978-1337571357. 2. Lottspeich, F. and Engels, J. W. (2018). Bioanalytics: Analytical Methods and Concepts in Biochemistry and Molecular Biology. Wiley. ISBN: 978-3-527-69446-4. 3. Denniston, K., Topping, J. and Dorr, D. Q. (2020). General, Organic, and Biochemistry. McGraw Hill, 10th edition. ISBN10: 126014895, ISBN13: 9781260148954 4. Katoch, R. (2011). Analytical Techniques in Biochemistry and Molecular Biology. Springer. ISBN 978-1-4419-9785-2

KIB4036: Pemindahan Tenaga Tanpa Wayar dalam Kejuruteraan Bioperubatan / *Wireless Power Transfer in Biomedical Engineering*

Kod Kursus *Course Code*	KIB4036
Tajuk Kursus *Course Title*	Pemindahan Tenaga Tanpa Wayar dalam Kejuruteraan Bioperubatan *Wireless Power Transfer in Biomedical Engineering*
Kredit *Credit*	2
Bahasa Pengantar *Medium of Instruction*	Bahasa Inggeris *English*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/ Minimum Requirement(s)*	Tiada *No*
Hasil Pembelajaran Kursus *Course Learning Outcomes*	Di akhir kursus ini, pelajar dapat: 1. Terangkan konsep pemindahan kuasa tanpa wayar dalam kejuruteraan bioperubatan. 2. Bezakan teknik pemindahan kuasa tanpa wayar yang berlainan untuk alat perubatan. 3. Menilai teknik sesuai pemindahan kuasa tanpa wayar untuk jenis alat perubatan yang berbeza keadaan operasinya. 4. Kumpulkan pemindahan kuasa tanpa wayar sederhana yang berpotensi digunakan dalam aplikasi kejuruteraan bioperubatan. *At the end of the course, students are able to:* *1. Explain the concept of wireless power transfer in biomedical engineering.* *2. Differentiate different techniques of wireless power transfer that is sustainable for medical devices.* *3. Assess suitable techniques of wireless power transfer for different types of medical device.* *4. Assemble a simple wireless power transfer that can potentially be used in biomedical engineering application.*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Matlamat kursus ini adalah untuk mengajar pelajar kejuruteraan bioperubatan asas-asas pemindahan kuasa tanpa wayar dalam peranti bioperubatan. Walaupun kursus ini tidak mempunyai prasyarat, kursus-kursus seperti teori litar, peranti elektronik, pengaturcaraan, elektromagnetisme dan mikrokomputer adalah penting. Pengetahuan dalam analisis litar, alat elektronik, dan aruhan elektromagnetik diperlukan untuk kursus ini. Kursus ini mengajar pelajar konsep pemindahan kuasa tanpa wayar dalam kejuruteraan bioperubatan. Ini merangkumi pelbagai teknik pemindahan kuasa tanpa wayar untuk pelbagai jenis alat perubatan. Pelajar akan berpeluang untuk membina sistem pemindahan kuasa tanpa wayar sederhana yang berpotensi digunakan dalam aplikasi kejuruteraan bioperubatan. Pelajar yang berjaya menamatkan kursus ini akan dapat menilai dan menggunakan pemindahan kuasa tanpa wayar dalam alat perubatan. Pengetahuan ini berguna untuk pelajar yang merancang untuk menambah kemampuan reka bentuk mereka terutamanya berkaitan sistem berasaskan tanpa wayar dalam Kejuruteraan Bioperubatan.

	This course aims to teach biomedical engineering students the fundamentals of wireless power transfer inbiomedical devices. Although this course does not havepre-requisite, courses such as circuit theory, Electronic devices, programming, electromagnetism and microcomputer are important. Knowledge in circuit analysis, electronic devices, and electromagnetic induction are required for this course. This course teaches the students the concept of wireless power transfer in biomedical engineering. It covers different techniques of wireless power transfer for different typesof medical device. Student will have opportunity to assemble a simple wireless power transfer that can potentially be used in biomedical engineering application. Students who have successfully completedthis course will be able to assess and utilize wireless power transfer in medical devices. This knowledge is useful for student who plan to add-on in their design capability especially with wireless based system in Biomedical Engineering.
Pemberatan Penilaian *Assessment Weightage*	Penilaian Berterusan / *Continuous Assessment*: 40% Peperiksaan Akhir / *Final Examination*: 60%

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
Tel: +603 7967 7621
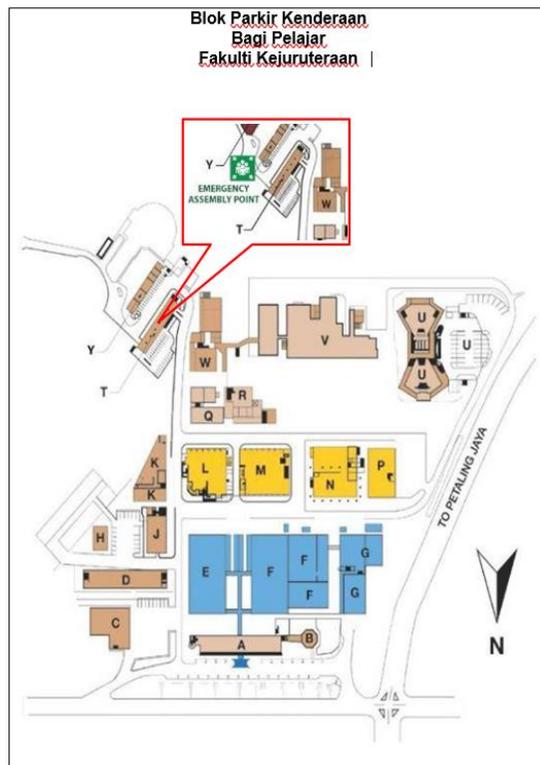
BLOK T	
Gambar	Aras
	3(B) (Pelajar)
	Masuk dari Blok Y
	3(A) (Pelajar)
	4(B) (Pelajar)
	4(A) (Pelajar)

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

CAMPUS MAP

UNIVERSITY OF MALAYA
CAMPUS MAP

Zones / Legend:
- CHANCELLERY ZONE
- RIMBA ILMU ZONE
- LIBRARY ZONE
- ● FACULTY/ INSTITUTE/ CENTRE
- ● RESIDENTIAL COLLEGES
- ● FACILITIES/ ADMINISTRATION

Gates and Roads:
- JALAN ILMU GATE
- SEC 16 GATE
- KL GATE
- DAMANSARA GATE
- PI GATE
- UNIVERSITY ROAD
- PANTAI BARU ROAD
- SPRINT HIGHWAY
- PERSIARAN ELMU
- PERSIARAN BERNAS
- PERSIARAN AKAL
- PERSIARAN GAGASAN
- LENGKOK CENDEKIA
- LINGKUNGAN BUDI
- LINGKARAN WAWASAN
- SUSUR DAMANSARA

Buildings / Locations:
- Tadika UM
- 9th College
- Economics & Administration
- Education
- Business & Accountancy
- Arts & Social Sciences
- Centre for Civilisational Dialogue
- UM Specialist Centre
- Museum of Asian Art
- Geology
- 3rd College
- 4th College
- Main Library
- Languages & Linguistics
- 7th College
- Science
- ICT Services (PTM)
- Kompleks Perdanasiswa/ ISC
- Engineering
- Museum of Zoology
- Malay Studies
- 8th College
- 10th College
- UM LAKE
- 2nd College
- Bulit Environment
- Dewan Tunku Canselor (DTC)
- High Impact Research (HIR)
- Computer Science & Information Technology
- Dentistry
- Medical
- 6th College
- Examination Building
- Security Office/ Cultural Centre
- RIMBA ILMU (Botanical Garden)
- ROTU Training Site
- 1st College
- Chancellery
- UM Press
- Islamic Studies
- UM Sports Ground
- Centre for Foundation Science (PASUM)
- Rimba Ilmu
- UM Medical Centre
- Law
- Ambang Asuhan Jepun
- Kong-Zi
- Sports Centre
- UM Arena
- Graduate Studies
- 5th College
- Swimming Pool
- Research Management & Innovation Complex
- Asia-Europe
- 12th College
- 11th College
- Reserve Office Training Unit (ROTU)
- Department of Development and Asset Maintenance (JPPHB)

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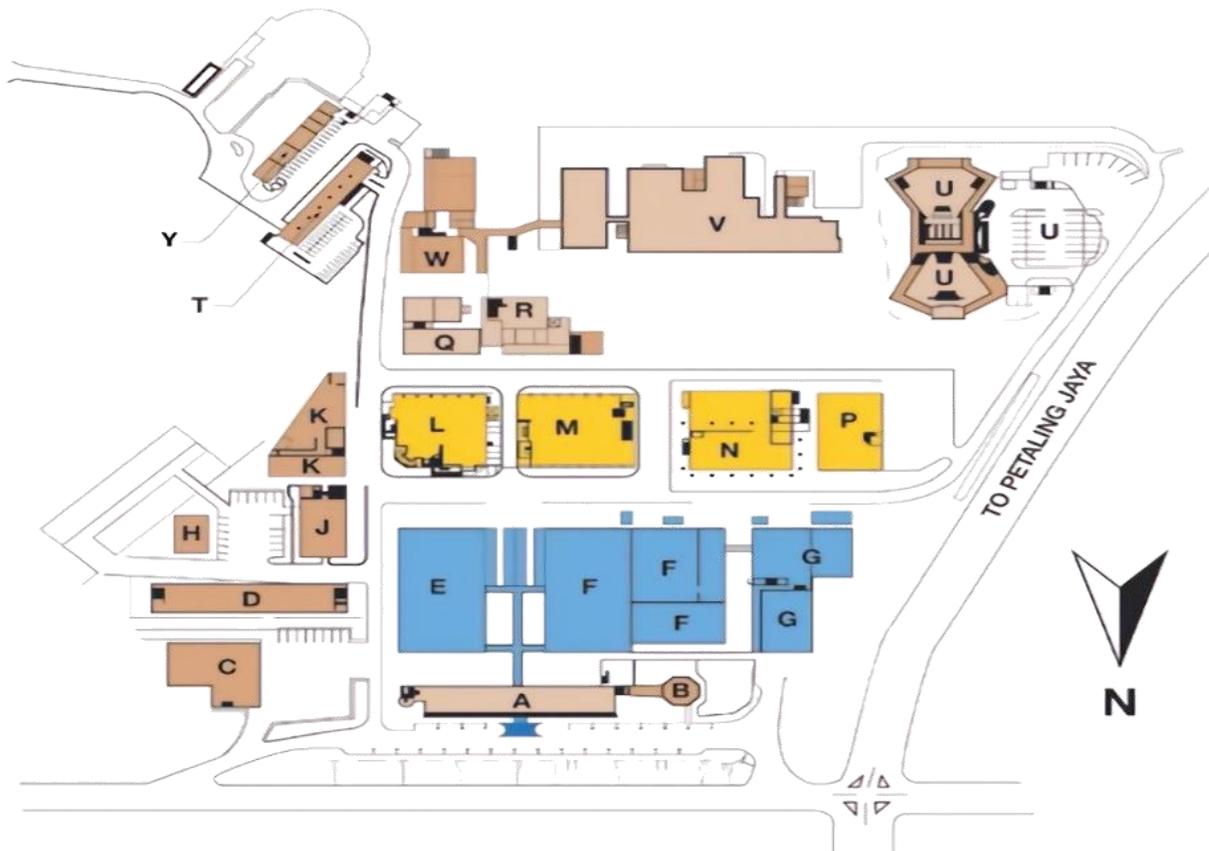
FACULTY MAP

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

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