



UNIVERSITI
MALAYA

FACULTY OF ENGINEERING

POSTGRADUAT PROGRAM HANDBOOK

2024/2025

FACULTY OF ENGINEERING
engine.um.edu.my

UNIVERSITI MALAYA
FACULTY OF ENGINEERING

POSTGRADUATE PROGRAMME HANDBOOK

ACADEMIC SESSION

2024/2025

DEPUTY DEAN (POSTGRADUATE)
BLOCK L, ENGINEERING TOWER,
FACULTY OF ENGINEERING
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LEGISLATIONS AND PRESCRIBED RULES

Master's Programmes

Master's candidates are governed by the Universiti Malaya (Master's Degree) Rules and Regulations, 2024.

Ph.D Programme

Ph.D candidates are governed by the Universiti Malaya (Degree of Doctor of Philosophy) Rules and Regulations, 2024.

In addition to the above all postgraduate candidates are also governed by the Universities and University Colleges Act, 1971 Constitution of the University of Malaya, all other statutes, rules and regulations currently applicable in the University including the University of Malaya (Discipline of Candidates) Rules 1999.

The full texts of the above rules and regulations are available at <https://umsitsguide.um.edu.my>. As a registered candidate of the Universiti Malaya, the candidates have the responsibility to be aware of and to abide by the rules and regulations of the University, the policies and requirements of their respective faculties and the advice contained in this handbook.

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VISION, MISSION, AND OBJECTIVES OF THE FACULTY

VISION

A centre of engineering excellence impacting the world.

MISSION

Pushing the boundaries of knowledge, nurturing aspiring leaders and fostering strategic partnership with industries.

OBJECTIVES REGARDING ACADEMIC PROGRAMME

- Ensure academic programmes are relevant, current, innovative and internationally recognized to meet national and global needs.
- Continuously develop academic programmes that inspire and tap students' potential.
- Ensure academic programmes are accredited by local and international engineering professional bodies.
- Continuously develop programmes that are relevant to industrial requirements.



MESSAGE FROM THE DEAN

Congratulations and welcome to the Faculty of Engineering, Universiti Malaya, FK@UM.

Thank you for choosing FK@UM to continue your dream. You are a chosen one, as many who wanted to be here did not get the opportunity as the number of applications exceed the intake capacity of the Faculty. We are proud and happy to have you here.

You will be starting your life-changing journey in UM, where you will be acquiring new skills, competencies, knowledge and experiences that will pave the way for your continued success in life and career. Be steadfast and disciplined in optimizing your stay in UM. There will be also lots of opportunities for personal development in the form of student activities, mobility program, training activities and many other. Be proactive in seizing the opportunities. It is often said that University life is the best period of life of many people who have gone through it and many will meet their best friends here.

As the learner moves through the educational system, each stage marks a rite of passage which carries with it new challenges that generate new needs and require adaptation to a different way of life. The extent to which these needs are satisfied and the extent to which the individuals are able to adjust to the new environment directly influences the individuals' motivation and, ultimately, the ability to satisfy the demands of the institution.

I am sure upon graduation you will be a better person in many fronts. You will be technically competent as an engineer. The employers will be excited to take you for mutual benefit. Some of you may pursue a different path and may become researchers, entrepreneurs and even politicians. Whatever your ambitions are, the floor is yours to make it happen.

Prof. Ir. Dr. Nik Nazri Nik Ghazali

Dean,
Faculty of Engineering

THE MANAGEMENT



**Prof. Ir. Dr.
Nik Nazri Nik Ghazali**
Dean



**Assoc. Prof. Dr.
Raja Ariffin Raja Ghazilla**
Deputy Dean (Undergraduate)



**Prof. Ir. Dr.
Mohd Faizul Mohd Sabri**
Deputy Dean (Research)



**Assoc. Prof. Ir. Dr.
Ong Zhi Chao**
Deputy Dean (Postgraduate)



**Assoc. Prof. Ir. Dr.
Nasrul Anuar Abd Razak**
Deputy Dean (Development)



**Dr. Mohd Usman
Mohd Junaidi**
Deputy Dean (Student Affairs)



Mdm. Noraïen Abu Samah
Manager



**Assoc. Prof. Ir. Ts. Dr.
Lai Khin Wee**
Head of Biomedical Department



**Dr. Haneë Farzana
Hizaddin**
Head of Chemical Department



**Assoc. Prof. Dr.
Zainah Ibrahim**
Head of Civil Department



**Assoc. Prof. Dr. Anis Salwa
Mohd Khairuddin**
Head of Electrical Department



**Assoc. Prof. Dr. Nurin
Wahidah Mohd Zulkifli**
Head of Mechanical Department

**FACULTY OF ENGINEERING
UNIVERSITI MALAYA**

COURSEWORK PROGRAMME COORDINATORS

**Master of
Biomedical
Engineering**



Dr. Tham Lai Kuan
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**Master of Safety,
Health and
Environment
Engineering**



Dr. Izzudin Izzat Zainal Abidin
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**Master of Road
Safety Engineering**



Dr. Suhana Koting
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**Master of Systems
Engineering**



Dr. Tengku Faiz Tengku Mohmed Noor Izam
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**Master of
Mechanical
Engineering**



Dr. Nazatul Liana Sukiman
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**FACULTY OF ENGINEERING
UNIVERSITI MALAYA**

OPEN & DISTANCE LEARNING (ODL) PROGRAMME

Master of
Biomedical
Engineering



Assoc. Prof. Dr. Nur Azah Binti Hamzaid
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Master of Safety,
Health and
Environment
Engineering



Ir. Dr. Jegalakshimi Jewaratnam
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FACULTY OF ENGINEERING
UNIVERSITI MALAYA

THE OFFICERS



Noraïen Abu Samah
Manager



**Nurfadila Shafina
Mohd Redha**
Senior Finance Officer



**Hasnatul Farhana
Hassan**
*Senior Assistant
Registrar (Postgraduate)*



**Nor Sabrina
Nordin**
*Senior Engineer
(Infrastructure Development)*



**Amer Faezzudden
Ahmad Fazal**
*Assistant Registrar
(Undergraduate)*



**Noor Hafiza
Halim**
*Assistant Registrar
(Quality and Internationalization)*



**Fatinurshaira Mohd
Yunus**
*Assistant Registrar
(Research)*



Amirul Fatih Japri
Senior Science Officer



**Muhammad Hazim
Hamidon**
*Science Officer
(Laboratory and Safety)*



**Muhammad Hazim
Hamidon**
*Science Officer
(Laboratory and Safety)*



**Nurul Atiqah Mohd
Azman**
*Assistant Registrar
(Student Affairs)*

DEPUTY DEAN (POSTGRADUATE) OFFICE



Nuur Hakimah Mohd Din
Secretary



**Assoc. Prof. Ir. Dr.
Ong Zhi Chao**
Deputy Dean (Postgraduate)



Hasnatul Farhana Hassan
Senior Assistant Registrar



**Nurfaizah
Mohd Jabir**
*Asst. Administrative
Officer*



**Maznah
Mohammad Zin**
*Senior Administrative
Asst.*



Nor Haryati Muen
*Senior Administrative
Asst.*



**Siti Khairiah
Ibrahim**
*Senior Administrative
Asst.*



**Farrahliza
Mohd Yusof**
Administrative Assistant



**Nur Fatihah
Abd Rahim**
Administrative Assistant

FACULTY OF ENGINEERING
UNIVERSITI MALAYA

DEPUTY DEAN (POSTGRADUATE STUDIES) OFFICE



Associate Professor Ir. Dr. Alex Ong Zhi Chao
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Senior Assistant Registrar N44



Nuur Hakimah Binti Mohd Din
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Secretary N29



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Asst. Administrative Officer N29



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Administrative Assistant N19



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Administrative Assistant N19

Scan the QR Code below to view the list of Faculty of Engineering Academic Staff



<https://engine.um.edu.my/academic-staff>

ACADEMIC CALENDAR 2024/2025 ACADEMIC SESSION (MASTER'S AND DOCTORATE LEVEL)				
SEMESTER I				
Orientation Week		29.09.2024	-	06.10.2024
Lectures	7 weeks*	07.10.2024	-	24.11.2024
Mid Semester I Break	1 week	25.11.2024	-	01.12.2024
Lectures	7 weeks*	02.12.2024	-	19.01.2025
Revision Week	1 week*	20.01.2025	-	26.01.2025
Semester I Final Examination	3 weeks*	27.01.2025	-	16.02.2025
Semester I Break	4 weeks	17.02.2025	-	16.03.2025
	23 weeks			
SEMESTER II				
Lectures	7 weeks*	17.03.2025	-	04.05.2025
Mid Semester II Break	1 week	05.05.2025	-	11.05.2025
Lectures	7 weeks*	12.05.2025	-	29.06.2025
Revision Week	1 week*	30.06.2025	-	06.07.2025
Semester II Final Examination	3 weeks*	07.07.2025	-	27.07.2025
Semester II Break	4 weeks	28.07.2025	-	24.08.2025
	23 weeks			
SPECIAL SEMESTER				
Lectures	7 weeks*	28.07.2025	-	14.09.2025
Special Semester Final Examination	1 week*	15.09.2025	-	21.09.2025
Break	1 week	22.09.2025		28.09.2025
	9 weeks			

Note:

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

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

MASTER OF MECHANICAL ENGINEERING

UNIVERSITI MALAYA
MASTER OF MECHANICAL ENGINEERING (KQK)

1. Qualification for Admission

(a) Qualifications for Admission

- (i) Bachelor Degree or equivalent with a CGPA > 3.00

OR

- (ii) CGPA 2.0 to 2.99: Must fulfill the following criteria subject to the qualification categories as prescribed by the Senate:

- a.* Related working experience
- b.* At least 1 ISI publication published
- c.* Recipients of scholarships
- d.* Government agencies staff
- e.* Graduate of University Malaya
- f.* Pass Faculty interview
- g.* Pass Faculty special assessment

OR

- (iii) Other qualifications approved by the Senate from time to time.

(b) Additional English Language requirement for international students:

A candidate who is not a Malaysian citizen and who possesses a degree or degrees from a university or an institution of higher education where the medium of instruction is not the English language for that degree or degrees must

- (i) obtain a score of 550 for the Test of English as a Foreign Language (TOEFL);

OR

- (ii) obtain a band of 5.5 in the International English Language Testing System (IELTS);

OR

- (iii) pass any English language test prescribed by the University

2. Programme Structure

- (1) The program has a total load of forty-two (42) credit hours consisting of:
 - (a) Seven (7) core courses whereby each course carries three (3) credit hours **AND**;
 - (b) Research Project (12) credit **AND**;
 - (c) Three (3) elective courses whereby each course carries three (3) credit hours; **AND/OR**
 - (d) Any other course offered by the Faculty (Bahasa Malaysia).
- (2) Details of the offered courses are according to those approved by the Senate from time to time, upon the acknowledgement by the Faculty, and is informed the candidate at the beginning of each session.
- (3) The list of courses approved by the Senate for the degree of Master Engineering is stated in List 1. The candidates shall be informed of the combination of courses that need to be taken for the program before registering for the course.
- (4) Course Registration
 - (a) Course registration is done within the week preceding of the beginning semester.
 - (b) A candidate must register for at least six credit (6) hours in any semester except:
 - (i) In the final semester of the candidate's course of study, where the candidate may register for fewer credit hours than that stipulated above;

OR
 - (ii) the candidate's appeal to withdraw from a particular course has been approved;

OR
 - (iii) Subject to Faculty approval to allow the candidate to register for 3 credit hours only.
 - (c) Registration for Research Project can only be done after the candidate has taken Research Methodology and the candidate must not under observation category.

(5) Determination of Field of Research

The field of research must be determined **before** the candidate commences the research portion of the course.

(6) Supervision

Appointment of a Supervisor may be done in parallel with the submission of Research Project Title Application.

(7) Submission of Research Project

- (a) Notice of the Research Project Submission will be given to the candidate upon receiving the title and supervision approval of Research Project.
- (b) A candidate must submit the Research Project **before** the end of the maximum period of candidature.

LIST 1**COURSES APPROVED BY SENATE FOR THE PROGRAMME OF MASTER OF MECHANICAL ENGINEERING BY COURSEWORK****1. CORE COURSES**

Course Code	Title	Credit Hours
KQK 7018	Research Project	12
KQK 7002	Engineering Data Analytics	3
KQK 7003	Thermal Systems Engineering	3
KQK 7004	Energy Conversion and Storage	3
KQK 7005	Applied Mechanics	3
KQX 7001	Research Methodology	3
KQX 7002	Project Management	3
KQK 7006	Fatigue and Fracture Mechanics	3

2. ELECTIVE COURSE

Course Code	Title	Credit Hours
KQK 7007	Computational Fluid Dynamics	3
KQK 7008	HVAC and Building Energy Management	3
KQK 7009	Sensors and Actuators	3
KQK 7010	Machinery Vibration and Condition Monitoring	3
KQK 7011	Power Plant Engineering	3
KQK 7012	Sustainability Energy Technology	3
KQK 7013	Finite Element Analysis	3
KQK 7014	Materials Selection and Mechanical Design	3
KQK 7015	Advanced Manufacturing Technology	3
KQK 7016	Integrated Computer Aided Design in Product Development	3
KQK 7017	Pump Characteristics and Applications	3

**COURSE OFFERED FOR THE PROGRAMME OF
MASTER OF MECHANICAL ENGINEERING**

Code	Course	Credit Hours	Duration of Examination	Distribution of Marks	
				%	%
				Continuous Assessments	Final Examination
CORE COURSES (33 CREDITS)					
KQX 7001	Research Methodology	3	-	100	-
KQX 7002	Project Management	3	2 hours	50	50
KQK 7018	Research Project	12	-	100	-
KQK 7002	Engineering Data Analytics	3	2 hours	50	50
KQK 7003	Thermal Systems Engineering	3	2 hours	50	50
KQK 7004	Energy Conversion and Storage	3	2 hours	50	50
KQK 7005	Applied Mechanics	3	2 hours	50	50
KQK 7006	Fatigue and Fracture Mechanics	3	2 hours	50	50
ELECTIVE COURSES					
KQK 7007	Computational Fluid Dynamics	3	2 hours	50	50
KQK 7008	HVAC and Building Energy Management	3	2 hours	50	50
KQK 7009	Sensors and Actuators	3	2 hours	50	50
KQK 7010	Machinery Vibration and Condition Monitoring	3	2 hours	50	50
KQK 7011	Power Plant Engineering	3	2 hours	50	50

Code	Course	Credit Hours	Duration of Examination	Distribution of Marks	
				%	%
				Continuous Assessments	Final Examination
KQK 7012	Sustainability Energy Technology	3	2 hours	50	50
KQK 7013	Finite Element Analysis	3	2 hours	50	50
KQK 7014	Materials Selection and Mechanical Design	3	2 hours	50	50
KQK 7015	Advanced Manufacturing Technology	3	2 hours	50	50
KQK 7016	Integrated Computer Aided Design in Product Development	3	2 hours	50	50
KQK7017	Pump Characteristics and Applications	3	2 hours	50	50

AND

- (1) Any other course approved by the Senate
- (2) Elective course offered in each semester may vary from semester to semester and subject to offer.
- (3) Elective course offered by Faculty is subject to change. Notice will be given to the candidate by the Program Coordinator or Deputy Dean (Postgraduate Studies)'s office from time to time.

PROGRAMME GOALS AND OUTCOMES

AIM OF THE PROGRAMME

The aim of the programme is to produce graduates who are knowledgeable in the field of Mechanical Engineering, providing them with high professionalism value, competitive, high ethical values as well as critical thinking skills to make decisions on issues related to field of Mechanical Engineering based on basic knowledge and expertise through the designed program structures.

PROGRAMME EDUCATIONAL OBJECTIVE (PEO)

The Programme Educational Objectives (PEO) are:

1. Graduates hold a senior or decision-making position in mechanical engineering or related field in both private and public sectors
2. Graduates engage in research and development activities in mechanical engineering or related field for their career advancement
3. Graduates contribute actively in sustainable development and well-being of the society

PROGRAMME LEARNING OUTCOMES

No.	<i>Programme Learning Outcome(s) (PLO)</i>	<i>Taxonomy Category (K/P/A)*</i>
PLO1	Demonstrate continuing advanced knowledge and apply the knowledge in solving complex mechanical engineering problems.	K, P
PLO2	Analyze and evaluate complex mechanical engineering problems or issues critically and provide solutions through the application of mechanical engineering concepts.	K, P
PLO3	Formulate and design solutions for the complex mechanical engineering problems using appropriate methods and tools.	K, P
PLO4	Communicate critically based on the mechanical engineering knowledge using oral or written medium as individual or in a group.	K, P
PLO5	Demonstrate competency incorporating advanced numerical concept and adopt relevant digital technologies in solving complex mechanical engineering problems.	K, P
PLO6	Demonstrate significant leadership skills in project management and technical project in the context of complex mechanical engineering application.	A, K
PLO7	Identify the need for continuous professional development and entrepreneurial element in the context of mechanical engineering discipline.	A, K
PLO8	Plan and execute technical or research project ethically and professionally as a socially responsible mechanical engineer.	A, K

Reference notes:

The Domain of the MQF in Programme Learning Outcomes program (PLO)

PLO Domain

- PLO1** Knowledge and Understanding
- PLO2** Cognitive Skills
- PLO3** Practical Skills
- PLO4** Interpersonal and Communication Skills
- PLO5** Digital and Numeracy Skills
- PLO6** Leadership, Autonomy and Responsibility
- PLO7** Personal and Entrepreneurial Skills
- PLO8** Ethics and Professionalism.

Taxonomic Category

- K** Cognitive
- A** Affective
- P** Psychomotor

PLANNER FOR MASTER OF MECHANICAL ENGINEERING (SEMESTER 1 INTAKE)

COURSE CODE	SEMESTER 1			SEMESTER 2			SEMESTER 3 (SHORT SEMESTER)		
	COURSE CODE		CREDIT	COURSE CODE		CREDIT	COURSE CODE		CREDIT
Core Courses (compulsory to take all courses) 33 credits	Code	Subject	3	Code	Subject	3	Code	Subject	6
	KQX7001	Research Methodology		KQX7002	Project Management		KQK7018	Research Project * (P)	
	KQK7002	Engineering Data Analytics		KQK7018	Research Project * (P)				
	KQK7003	Thermal Systems Engineering		KQK7005	Applied Mechanics				
	KQK7004	Energy Conversion and Storage		KQK7006	Fatigue and Fracture Mechanics				
Elective Courses (choose only 3 courses from the list) 9 credits	Code	Subject	3	Code	Subject	3	Code	Subject	
	KQK7007	Computational Fluid Dynamics		KQK7009	Sensors and Actuators				
	KQK7008	HVAC and Building Management		KQK7011	Power Plant Engineering				
	KQK7010	Machinery Vibration and Condition Monitoring		KQK7012	Sustainability Energy Technology				
	KQK7014	Materials Selection in Mechanical Design		KQK7013	Finite Element Analysis				
	KQK7016	Integrated Computer Aided Design in Product Development		KQK7015	Advanced Manufacturing Technology				
				KQK7017	Pump Characteristics and Applications				

NOTE:

- (1) *Registration for Research Project can only be done after the candidate has completed **Research Methodology** and the candidate must not be under observation category.
- (2) **Courses will be offered if there are sufficient requests.

PLANNER FOR MASTER OF MECHANICAL ENGINEERING (SEMESTER 2 INTAKE)

COURSE CODE	SEMESTER 2			SEMESTER 3 (SHORT SEMESTER)			SEMESTER 1		
	COURSE CODE		CREDIT	COURSE CODE		CREDIT	COURSE CODE		CREDIT
Core Courses 33 credits	Code	Subject	3	Code	Subject	6	Code	Subject	3
	KQX7001	Research Methodology		KQK7018	Research Project * (P)		KQX7002	Project Management	
	KQK7005	Applied Mechanics					KQK7002	Engineering Data Analytics	
	KQK7006	Fatigue and Fracture Mechanics					KQK7003	Thermal Systems Engineering	
							KQK7004	Energy Conversion and Storage	
Elective Courses (choose only 3 courses from the list) 9 credits			3				KQK7018	Research Project * (P)	6
	Code	Subject		Code	Subject		Code	Subject	
	KQK7009	Sensors and Actuators					KQK7007	Computational Fluid Dynamics	
	KQK7011	Power Plant Engineering					KQK7008	HVAC and Building Management	
	KQK7012	Sustainability Energy Technology					KQK7010	Machinery Vibration and Condition Monitoring	
	KQK7013	Finite Element Analysis					KQK7014	Materials Selection in Mechanical Design	
	KQK7015	Advanced Manufacturing Technology					KQK7016	Integrated Computer Aided Design in Product Development	
	KQK7017	Pump Characteristics and Applications							

NOTE:

- (1) *Registration for Research Project can only be done after the candidate has completed **Research Methodology** and the candidate must not be under observation category.
- (2) **Courses will be offered if there are sufficient requests.

PENTING / IMPORTANT:

Kandungan Pro Forma ini tidak boleh diubah tanpa kelulusan Senat bagi perkara-perkara yang telah ditandakan*. Pindaan kepada perkara lain boleh diluluskan di peringkat Akademi/Fakulti/Institut/Pusat.

*Contents of this Pro Forma shall not be changed without the Senate's approval for items indicated with *. Changes to the other items can be approved at the Academy/Faculty/Institution/Centre level.*

	Versi Bahasa Malaysia Malay Version	Versi Bahasa Inggeris English Version
Akademi/Fakulti/Institut/Pusat <i>Academy/Faculty/Institute/Centre</i>	Fakulti Kejuruteraan	<i>Faculty of Engineering</i>
Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7001	<i>KQK7001</i>
Tajuk Kursus* <i>Course Title*</i>	Projek Penyelidikan	<i>Research Project</i>
Kredit* <i>Credit*</i>	12	<i>12</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	480	<i>480</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	KQX7001 - Metodologi Penyelidikan	<i>KQX7001 – Research Methodology</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menentukan kajian literatur dan kajian teori yang diperlukan untuk penyelidikan. 2. Merekabentuk kaedah untuk membuat kajian eksperimen atau teori. 3. Menyelesaikan masalah penyelidikan melalui metodologi dan alat yang ditentukan.	<i>At the end of the course, students are able to:</i> 1. <i>Determine literature review and theoretical study required for the research.</i> 2. <i>Design a methodology to carry out experimental or theoretical research</i> 3. <i>Solve a research problem through a defined methodology and tools.</i>

	Versi Bahasa Malaysia Malay Version	Versi Bahasa Inggeris English Version
	4. Menilai data dan penemuan penyelidikan menggunakan alat digital yang sesuai. 5. Menggunakan kemahiran pengurusan projek yang sesuai dalam menyelesaikan projek penyelidikan. 6. Menunjukkan hasil projek penyelidikan kepada latar belakang khalayak yang berbeza melalui pembentangan. 7. Meneliti kesan kewangan dan ekonomi daripada hasil penyelidikan yang dilakukan 8. Menghubungkan hasil penyelidikan yang diperolehi dengan impak kepada masyarakat.	4. Evaluate the data and findings of the research using the appropriate digital tools. 5. Apply appropriate project management skills in completing the research project. 6. Demonstrate the outcome of research project to different background of audience through presentation. 7. Examine the financial and economic impacts of the research outcomes. 8. Relate the research results obtained to the impact on society
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Projek penyelidikan akan mendedahkan pelajar dalam menjalankan penyelidikan bermula daripada membuat ulangkaji risalah yang berkaitan dengan topik kajian. Kemudian diikuti dengan merancang dan menjalankan kajian dengan kaedah yang bersesuaian. Data kajian akan dikumpulkan dan dianalisa bagi menyelesaikan permasalahan penyelidikan. Laporan projek penyelidikan dan pembentangan hasil penyelidikan pada akhir semester.	Research projects will expose students in conducting research starting from reviewing the literature review related to the topic of study. Then followed by planning and conducting a research by utilizing an appropriate method. The data will be collected and analysed to solve the research problems. Research project reports and presentation of research results will be done at the end of the semester
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 100% Peperiksaan Akhir: 0%	Continuous Assessment:100% Final Examination:0%
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	Results will be notified through notice board and online
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7002	<i>KQK7002</i>
Tajuk Kursus* <i>Course Title*</i>	Analisis Data Kejuruteraan	<i>Engineering Data Analytics</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisa data kejuruteraan dengan menggunakan kaedah berangka 2. Menganalisa data kejuruteraan dengan menggunakan kaedah pemprosesan isyarat digit.	<i>At the end of the course, students are able to:</i> 1. <i>Analyse engineering data using numerical methods.</i> 2. <i>Analyse engineering data using digital signal processing methods.</i>

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	3. Meramal suatu hasil kejuruteraan yang diinginkan dengan menggunakan sifat data dan algoritma pembelajaran mesin yang sesuai.	3. <i>Predict a desired engineering outcome using suitable data feature and machine learning algorithm.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Proses membuat keputusan berasaskan data adalah komponen penting dalam sistem kejuruteraan yang baru muncul di industri 4.0. Ia terutamanya melibatkan tugas penyifatan data dan kemahiran pemodelan sistem diskret yang berkesan. Kursus ini memperkenalkan alat matematik umum yang digunakan untuk menganalisa data kejuruteraan seperti analisa berangka dan pemprosesan isyarat, untuk menyari sift data yang sesuai untuk ramalan hasil yang diinginkan. Pelajar perlu membangun model matematik atau model 'kotak hitam' dengan pembelajaran mesin dan mengaplikasikannya bersama sifat data yang dipilih untuk menganggar penyelesaian. Dengan itu, penyelesaian ini dapat memberikan celik akal untuk membuat keputusan yang lebih baik dalam aplikasi kejuruteraan.	<i>Data-driven decision making process is an essential component of emerging engineering systems in industry 4.0. It mainly involves effective data featuring task and discrete system modelling skill. This course introduces general mathematical tools used to analyse engineering data such as numerical analysis and signal processing, in order to extract its suitable feature for prediction of the desired outcome. Students need to develop a mathematical model or a 'black-box' model with machine learning, and apply it with the selected data feature to estimate the solution. Hence, this solution will give a new insight for better decision making in engineering application.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7003	<i>KQK7003</i>
Tajuk Kursus* <i>Course Title*</i>	Kejuruteraan Sistem Haba	<i>Thermal Systems Engineering</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Model sistem haba yang kompleks kepada komponen-komponen asas pemindahan haba dan aliran bendalir. 2. Menilai sistem haba berdasarkan prinsip pemindahan haba dan aliran bendalir. 3. Mengukur potensi penambahbaikan reka bentuk	<i>At the end of the course, students are able to:</i> 1. <i>Model a complex thermal system into basic components of heat transfer and fluid flow.</i> 2. <i>Evaluate a thermal system based on principles of heat transfer and fluid flow.</i> 3. <i>Measure the potential of thermal design improvement and optimization by means of</i>

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	dan pengoptimuman sistem haba dengan menggunakan alatan atau kaedah moden.	<i>modern tools or methods.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Rangkaian rintangan termal untuk pemindahan haba yang stabil, Pemindahan haba yang stabil dari permukaan bersirip atau penukar haba, Pengaliran haba konduksi tak stabil dalam geometri-geometri asas, Pengaliran haba tak stabil pada kedudukan yang berlainan, Aliran bendalir dan pemindahan haba pada plat rata, silinder dan sfera, dan di atas tiub-tiub yang tersusun, Kaedah berangka dan perisian komputer aliran bendalir dan haba (kes-kes 2D dan 3D), Aliran laminar dan aliran bergelora dan pemindahan haba dalam tiub, Sistem penukar haba, Pemindahan Haba Radiasi.	<i>Thermal resistance network for steady heat transfer, Steady heat transfer from finned surfaces or heat exchanger, Transient heat conduction in uniform and standard geometries and with spatial effects, Fluid flow and heat transfer over flat plate, cylinders and sphere and over tube banks, Laminar and turbulent flow and heat transfer in tubes, Numerical Method and Computational Fluid Dynamics (2D & 3D cases), Heat exchangers, Radiation Heat Transfer</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7004	<i>KQK7004</i>
Tajuk Kursus* <i>Course Title*</i>	Penukaran Tenaga dan Penyimpanan	<i>Energy Conversion and Storage</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisis penukaran tenaga dalam proses thermo-mekanikal, thermo-kimia, elektrokimia dan fotoelektrik. 2. Menunjukkan pengaruh parameter utama yang mempengaruhi kecekapan loji janakuasa 3. Membanding pelbagai sistem penukaran tenaga	<i>At the end of the course, students are able to:</i> 1. <i>Analyse energy conversion in thermo-mechanical, thermo-chemical, electrochemical, and photoelectric processes.</i> 2. <i>Demonstrate the influence major parameters that influence the efficiency of</i>

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	termasuk kos, penerimaan sosial dan juga akibat alam sekitar	<i>the power plants</i> 3. <i>Compare various energy conversion systems including cost, social acceptability as well as environmental consequences</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Pengenalan kepada tenaga, Senario tenaga, Ekonomi tenaga, Enjin haba dan termodinamik: kuasa bendalir dan enjin haba, Enjin haba dan termodinamik: proses termodinamik dan ciri-ciri, Penukaran termal kepada tenaga mekanikal: Kitaran Rankine, Penukaran kimia kepada tenaga termal - Bahan Api & Pembakaran, Penukaran termal kepada tenaga mekanikal: Kitaran Brayton, Penukaran nuklear kepada tenaga termal, Penukaran elektromagnetik kepada tenaga termal – Solar, Penukaran elektromagnetik kepada tenaga termal – PV, Penukaran kimia kepada tenaga elektrik- Fuel Cells, Peningkatan kecekapan tenaga, Penyimpanan Tenaga	<i>Introduction to energy, Energy scenario, Energy economics, Heat Engines & thermodynamics: fluid power and heat engine, Heat Engines & thermodynamics ;thermodynamic processes and properties, Thermal to mechanical energy conversion: Rankine Cycle, Chemical to thermal energy conversion - Fuels & Combustion, Thermal to mechanical energy conversion- Brayton cycle, Nuclear to Thermal Energy Conversion, Electromagnetic to Thermal Energy Conversion- Solar, Electromagnetic to Electrical Energy Conversion- PV, Chemical to Electrical Energy Conversion- Fuel Cells, Energy efficiency improvement, Energy Storage</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50%</i> <i>Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7005	<i>KQK7005</i>
Tajuk Kursus* <i>Course Title*</i>	Mekanik Gunaan	<i>Applied Mechanics</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisa masalah mekanik gunaan secara logik. 2. Mengaplikasi teori mekanik gunaan dalam masalah kehidupan sebenar 3. Merumuskan penyelesaian kepada masalah mekanik gunaan tiga dimensi	<i>At the end of the course, students are able to:</i> 1. <i>Analyse applied mechanics problem in a logical manner.</i> 2. <i>Apply theory of applied mechanics in the real life problem.</i> 3. <i>Formulate solution to a three-dimensional applied mechanics problem.</i>

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Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Pengenalan kepada Mekanik, Mekanik Jasad Tegar dan Mekanisme Planar, Struktur Kerangka, Pengurangan Beban Tergai, Kekuatan Ricih dan Momen Lentur, Geseran dan Pelinciran, Hubungan, Analisis Kinematik Grafik dan Analisa Mekanisme Planar, Kerja, Tenaga dan Kuasa, Gerakan Berkala, Dinamik Putaran, Pengimbangan Mesin – Putaran dan Salingan, Pemacu talisawat dan Brek, Gear Trains	<i>Introduction to Mechanics, Mechanics of Rigid Bodies and Planar Mechanisms, Framework Structure, Reduction of a Simple Distributed Loading, Shear Force and Bending Moment, Friction and Lubrication, Linkages, Graphical and Analytical Kinematic Analysis of Planar Mechanisms, Work, Energy and Power, Periodic Motion, Dynamics of Rotation, Balancing of Machines – Rotating and Reciprocating, Belt Drives and Brakes, Gear Trains</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7006	<i>KQK7006</i>
Tajuk Kursus* <i>Course Title*</i>	Kelesuan dan Mekanik Retak	<i>Fatigue and Fracture Mechanics</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menjelaskan mekanisme-mekanisme kegagalan dalam bahan 2. Merekabentuk bahan dan komponen melawan kegagalan 3. Menjalankan analisis kegagalan bahan kejuruteraan, komponen dan struktur	<i>At the end of the course, students are able to:</i> 1. <i>Explain failure mechanisms in materials</i> 2. <i>Design materials & components against failure</i> 3. <i>Perform failure analysis of engineering materials, components and structures</i>

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Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini dimulakan dengan memberi pengenalan pada kegagalan yang selalu dihadapi oleh bahan semasa perkhidmatannya. Kaji semula yang ringkas berkaitan dengan konsep tegasan dan terikan akan diajarkan. Selepas ini, tiga kegagalan akan dibincangkan dengan teliti: deformasi plastik, kegagalan rapuh dan keletihan. Akhirnya, beberapa contoh mengenali dengan kegagalan kejuruteraan akan dianalisis dan dibincangkan.	<i>The course starts with general introduction on failures commonly encountered in materials during the service. A brief review on the concept of stress and strain will be given. Then, three failures will be discussed in detail: yielding, brittle fracture and fatigue. Finally, some examples of engineering failure analysis will be discussed.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7007	<i>KQK7007</i>
Tajuk Kursus* <i>Course Title*</i>	Dinamik Bendalir Berkomputer	<i>Computational Fluid Dynamics</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menentukan kesedaran yang kritikal persamaan mekanik bendalir dan sifat-sifat matematik mereka dalam formulasi yang pelbagai. 2. Menilai prinsip-prinsip dan batasan teknik alternatif bagi simulasi aliran bergelora dan peralihan. 3. Menilai sumber potensi ralat dan ketidakpastian	<i>At the end of the course, students are able to:</i> 1. <i>Determine a critical awareness of the governing equations of fluid mechanics, and their mathematical properties, in various formulations.</i> 2. <i>Appraise the principles and limitations of alternative techniques for the simulation of</i>

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	simulasi berangka.	<i>turbulent and transitional flows.</i> 3. <i>Evaluate the potential sources of error and uncertainty in numerical simulations.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan menyediakan pelajar dengan kefahaman yang jelas terhadap penggunaan simulasi pengiraan dan teknik-teknik pemodelan digunakan untuk masalah kejuruteraan. Ia juga akan menyediakan perspektif struktur data canggih, algoritma dan reka bentuk perisian. Pengenalan kepada kaedah pengkomputeran teragih dan berprestasi tinggi juga akan pelajari.	<i>The course will provide students with a sound understanding of the use of computational simulation and modeling techniques applied to engineering problems. It will also provide insight into advanced data structures, algorithms and software design. An introduction to distributed and high performance computing methods will also be included.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50%</i> <i>Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7008	<i>KQK7008</i>
Tajuk Kursus* <i>Course Title*</i>	HVAC dan Pengurusan Tenaga Bangunan	<i>HVAC and Building Energy Management</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Merekabentuk sistem HVAC & R untuk bangunan. 2. Menghitung beban pemanasan dan penyejukan bangunan. 3. Menaksir operasi sistem HVAC & R di bawah keadaan beban pemanasan dan penyejukan yang	<i>At the end of the course, students are able to:</i> 1. <i>Design HVAC & R systems for buildings.</i> 2. <i>Calculate building heating and cooling load</i> 3. <i>Evaluate the operation of HVAC & R systems under different heating and cooling load conditions.</i>

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	berbeza.	
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Menggunakan prinsip rekabentuk untuk sistem penyamanan udara dan pendinginan. Menaksir operasi peralatan penyamanan udara di bawah keadaan beban yang berbeza. Membina kebolehan untuk menggunakan maklumat dari buku pegangan rekabentuk tertubuh seperti panduan ASHRAE. Mempunyai kebolehan untuk melakukan pengiraan beban penyamanan udara bangunan dan menilai faktor yang mempengaruhinya.	<i>Understand the design principles for air conditioning and refrigeration apparatus. Evaluate the operation of air conditioning equipment under varying load conditions. Develop the ability to use information from established design handbooks such as the ASHRAE guide. Be able to perform building air conditioning load calculations and appreciate factors influencing them</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7009	<i>KQK7009</i>
Tajuk Kursus* <i>Course Title*</i>	Penderia dan Penggerak	<i>Sensors and Actuators</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: - Memilih penderia yang sesuai berdasarkan prinsip kerja untuk penggunaan dalam sistem pengukuran - Mengaplikasi pasca-pemprosesan isyarat yang diperolehi daripada penderia dalam sistem pengukuran	<i>At the end of the course, students are able to:</i> <i>Choose appropriate sensors based on working principles for use in measurement system</i> <i>Apply post-processing on signals acquired from sensors in a measurement system</i> <i>Decide suitability of actuators and</i>

	3. Menentukan kesesuaian penggerak dan mekanisme berdasarkan aplikasi yang diperlukan 4. Mereka sistem automatik lengkap yang mengandungi penderia dan penggerak	<i>mechanisms according to required applications</i> 4. <i>Design a complete automated system containing sensors and actuation</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini mendedahkan pelajar kepada penderia, penggerak, dan pembangunan sistem dengan komponen berkenaan. Ini termasuk pengenalan kepada penderia, penggerak dan Internet Pelbagai Benda (IoT), pelantar-pelantar IoT dan sistem pengukuran, penderia-penderia dalam pelbagai pengukuran, termasuk sesaran, kehampiran, getaran, pecutan, suhu, tekanan, dan penderia piezorintangan dan piezoelektrik serta penggunaan, prinsip dan praktik perolehan data, pasca-pemprosesan isyarat daripada penderia, pelbagai jenis penggerak, penggerakan lurus, berputar serta mekanisme penukaran pergerakan, kawalan sistem penggerakan, dan sistem automatik lengkap dengan integrasi penderia, penggerak dan IoT.	<i>This course exposes students to sensors, actuators, and the development of systems with relevant components. This includes introduction to sensors, actuators and Internet of Things (IoT), platforms of IoT and measurement systems, sensors in various measurements, including displacement, proximity, vibration, acceleration, temperature, pressure, and piezoresistive and piezoelectric sensors together with applications, data acquisition principles and practices, post-processing of acquired data from sensors, various types of actuators, linear and rotary actuation together with motion conversion mechanisms, controls for actuation systems, and integration of sensors, actuators and IoT for complete automated system.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50%</i> <i>Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7010	<i>KQK7010</i>
Tajuk Kursus* <i>Course Title*</i>	Getaran Jentera dan Pemantauan Keadaan	<i>Machinery Vibration and Condition Monitoring</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisa data getaran jentera melalui teknik pemantauan keadaan 2. Menentukan kegagalan jentera yang umum dengan data getaran 3. Menilai masalah getaran rumit yang melibatkan isu-isu dinamik jentera	<i>At the end of the course, students are able to:</i> 1. <i>Analyse machinery vibration through condition monitoring technique</i> 2. <i>Determine common machinery fault conditions using vibration data</i> 3. <i>Evaluate complex vibration problem involving machinery dynamics issues</i>

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Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Asas getaran, had dan piawai getaran, Pelaksanaan penyelenggaraan, Skim pemantauan keadaan dan audit kualiti, Pengumpulan isyarat getaran dengan menggunakan transduser, penukaran isyarat getaran dari isyarat analog ke digital, Domain masa- analisa gelombang, Domain frekuensi- analisa 'FFT', analisa fasa, Diagnostik kegagalan jentera, <i>Dinamik Jentera, analisa ragaman, analisa 'ODS', analisa bunyi</i>	<i>Fundamentals of vibration, Limits and standards of vibration Maintenance practices, Condition monitoring scheme and Quality Auditing, Collection of vibration signal using transducers. Conversion of vibration signals from analogue to digital signals, Time domain - waveform analysis, Frequency domain - Fast Fourier transform (FFT) analysis, Phase analysis, Machinery faults diagnostics, Machinery dynamics, Modal Analysis, Operating Deflection Shape Analysis, Noise Analysis</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7011	<i>KQK7011</i>
Tajuk Kursus* <i>Course Title*</i>	Kejuruteraan Lojikuasa	<i>Power Plant Engineering</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisis sistem asas kuasa wap dan gas; untuk loji haba konvensional dan nuclear 2. Menyelesaikan masalah-masalah kecekapan tenaga di dalam sistem lojikuasa 3. Mengenalpasti kaedah modifikasi yang boleh diambil untuk mengoptimumkan sistem lojikuasa	<i>At the end of the course, students are able to:</i> 1. <i>Analyse on fundamental systems of vapor and gas sytems and applying on thermal plants for conventional and nuclear plant</i> 2. <i>Solve all the energy efficiencies problems in power systems</i> 3. <i>Identify the modification methods that can</i>

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		<i>be applied to optimize the power plant</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Pengenalan – Ekonomi Penjanaan Kuasa - Sistem wap – sistem gas – Kitaran Gabungan – Sistem Nuklear - Loji Nuklear – Fizik Reaktor - Loji Hidro – Ladang Suria – Loji Sumber Alternative – Kecekapan Loji - Ulangkaji	<i>Introduction – Economics of Power Generation – Vapor System – Gas System – Combine Cycle – Nuclear System – Reactor Physics – Hydro Plant – Solar Farm – Alternative Energy Plants – Plant Efficiency - Revision</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7012	<i>KQK7012</i>
Tajuk Kursus* <i>Course Title*</i>	Teknologi Tenaga Lestari	<i>Sustainability Energy Technology</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menerangkan tenaga asas, penukaran tenaga dan kegunaannya 2. Menganalisa isu teknikal di dalam sistem tenaga dan kebolehmampaan 3. Menerangkan pelbagai teknologi penghasilan tenaga boleh diperbaharui dan konvensional,	<i>At the end of the course, students are able to:</i> 1. <i>Explain energy basics, renewable energy conversion and its applications</i> 2. <i>Analyse the technical issues in renewable energy systems and sustainability</i> 3. <i>Explain various renewable and conventional energy production technologies, practices</i>

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	amalan serta alternatif penggunaan tenaga	<i>and alternatives to energy use</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Sistem-sistem tenaga memainkan satu peranan penting dalam kehidupan harian dan mustahak dalam kejuruteraan. Kajian mengenai sejarah penggunaan tenaga menunjukkan kepelbagaian teknologi-teknologi penjanaan tenaga, dan aliran ini berkemungkinan akan berterusan. Sumber-sumber tenaga lestari sedang giat bertambah dan akan wujud sebagai sumber penjanaan tenaga penting. Tenaga boleh diperbaharui bertambah dengan pesat pada kadar 30% atau lebih setiap tahun dan ia boleh memberi impak yang penting pada penjanaan dan penggunaan tenaga. Matlamat kursus ini adalah bagi membolehkan pelajar-pelajar untuk mengenalpasti di mana, bagaimana dan kenapa teknologi tenaga diperbaharui sepatutnya di gunakan secara berkesan.	<i>Energy systems play a critical role in everyday life and as such are an important part of engineering. Examination of historical energy patterns shows a continual diversification of energy generating technologies, and the trend is likely to continue. Sustainable energy sources are increasingly visible and are important part of the emerging energy mix. Renewable energy continues to grow rapidly at rates 30% per year or more and is now at a level that they can make a significant impact on energy generation and utilization. This course describes key renewable energy technologies. The goal of the course is for students to able to identify where, how and why renewable energy technologies should be appropriately used.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7013	<i>KQK7013</i>
Tajuk Kursus* <i>Course Title*</i>	Analisis Unsur Terhingga	<i>Finite Element Analysis</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menunjukkan penggunaan kaedah elemen terhad untuk menyelesaikan masalah-masalah kejuruteraan asas. 2. Menilai had kaedah unsur terhingga khusus dan dapat membangunkan prosedur-prosedur paling sesuai untuk masalah kejuruteraan khusus.	<i>At the end of the course, students are able to:</i> 1. <i>Demonstrate the use of finite element methods to solve the basic engineering problems.</i> 2. <i>Assess the limitation of specific finite element method and be able to develop the</i>

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	3. Pengoptimuman reka bentuk menggunakan teknik-teknik kaedah unsur terhingga.	<i>most suitable procedures for specific engineering problems.</i> 3. <i>Design optimization utilising the techniques of finite element method.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Pengenalan kepada Matrix algebra, Jenis elemen-elemen terhad unsur-unsur Bar dan unsur-unsur, masalah-masalah dimensi, teori asas, tekanan, syarat-syarat sempadan. Elemen terhad memperagakan dan penyelesaian teknik, penyelesaian persamaan, kaedah-kaedah langsung dan berlelar. Elemen-elemen plat, teori plat dan aplikasi, mengopek teori unsur-unsur dan permohonan pepejal, unsur-unsur getaran dan struktur dinamik.	Introduction- Review of Matrix algebra- Type of finite elements-spring elements-Bar and Beam elements-Two-dimensional problems – basic theory – stress – strain relations – boundary conditions. Finite element modeling and solution techniques- Equation solving; direct and iterative methods. Plate elements – plate theory and application- shell elements-theory and application -solid elements-Structural vibration and dynamics; Frequency Response Analysis- Transient Response Analysis.
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50%</i> <i>Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7014	<i>KQK7014</i>
Tajuk Kursus* <i>Course Title*</i>	Pemilihan Bahan dalam Rekabentuk Mekanikal	<i>Materials Selection in Mechanical Design</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisis hubungan antara syarat rekabentuk produk, struktur dan sifat bahan kejuruteraan. 2. Menjelaskan kepentingan proses pembuatan dalam pemilihan bahan dan rekabentuk. 3. Merekabentuk bahan dalam situasi yang melibatkan pelbagai halangan dan konflik dari segi	<i>At the end of the course, students are able to:</i> 1. <i>Analyse the relationships between product design requirements, structure and properties of engineering materials.</i> 2. <i>Explain the importance of manufacturing process in materials selection and design.</i> 3. <i>Design materials in situations involving</i>

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	objektif	<i>multiple constraints and conflicting objectives.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini bermula dengan mengkaji semula struktur dan sifat-sifat keluarga besar bahan serta kajian semula proses reka bentuk kejuruteraan. Kemudian, memperkenalkan kriteria prestasi dan carta sifat bahan. Selepas itu, asas-asas di proses pemilihan bahan dalam reka bentuk kejuruteraan dibincangkan. Pelajar akan dilatih untuk memilih bahan-bahan dalam keadaan reka bentuk kompleks yang melibatkan pelbagai halangan dan objektif yang bercanggah. Faktor ekonomi dan alam sekitar akan dibincangkan.	<i>This course starts with a review of the structure and properties of major families of materials as well as a review of the engineering design process. It then introduces performance criteria and materials property charts. Basics of materials selection process in engineering design are covered. Students will be trained to select materials in complex design situations involving multiple constraints and conflicting objectives. Economic and environmental factors are discussed.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Akademi/Fakulti/Institut/Pusat <i>Academy/Faculty/Institute/Centre</i>	Fakulti Kejuruteraan	<i>Faculty of Engineering</i>
Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7015	<i>KQK7015</i>
Tajuk Kursus* <i>Course Title*</i>	Teknologi Pembuatan Termaju	<i>Advanced Manufacturing Technology</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengklasifikasi teknologi pembuatan termaju sedia ada yang sesuai untuk aplikasi dan disiplin kejuruteraan yang tertentu. 2. Menganalisa had teknologi pembuatan termaju dalam proses pembuatan. 3. Mengaplikasikan konsep Kejuruteraan Balikan	<i>At the end of the course, students are able to:</i> 1. <i>Classify the suitable established advanced manufacturing technology for particular engineering application and discipline.</i> 2. <i>Analyse the advanced manufacturing technology limitation in the manufacturing processes.</i>

	Versi Bahasa Malaysia Malay Version	Versi Bahasa Inggeris English Version
	dan menghujah teknik prototaip pantas untuk bahagian atau produk yang tertentu.	3. <i>Apply the concept of Reverse Engineering and justify rapid prototyping technique for a particular part or product.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Konsep teknologi pemprosesan bahan bukan tradisional akan diperkenalkan dengan pelbagai jenis pemesinan termaju meliputi kaedah berasaskan haba, proses reaksi kimia dan proses hakisan. Kaedah kejuruteraan balikan termasuk proses pendigitan melalui pengimbasan optik dan pengimbasan laser juga diperkenalkan. Pelbagai teknik prototaip pantas akan diterangkan kepada pelajar.	<i>The concept of non-traditional material processing technology will be introduced with various type of advanced machining encompasses thermal-based methods, chemical reaction processes and erosion processes. The method of reverse engineering including digitizing processes through optical scanning and laser scanning will be introduced. Various rapid prototyping techniques will be explained to the students.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7016	<i>KQK7016</i>
Tajuk Kursus* <i>Course Title*</i>	Rekabentuk Terbantu Komputer Bersepadu dalam Pembangunan Produk	<i>Integrated Computer Aided Design in Product Development</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Ilustrasikan prinsip komputer grafik di dalam aplikasi rekabentuk terbantu komputer. 2. Menunjukkan penggunaan sistem rekabentuk terbantu komputer dalam proses pembangunan produk. 3. Merekabentuk menggunakan sistem rekabentuk	<i>At the end of the course, students are able to:</i> 1. <i>Illustrate the computer graphic principles in the Computer Aided Design application.</i> 2. <i>Demonstrate the use of computer aided design systems in the product development process.</i> 3. <i>Design using computer aided design system</i>

	Versi Bahasa Malaysia Malay Version	Versi Bahasa Inggeris English Version
	terbantu komputer bagi pembangunan produk secara bersepadu.	<i>for concurrent product development.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memberi penekanan kepada pemodelan parametrik pepejal dengan menggunakan perisian reka bentuk terbantu komputer yang komersial. Pelajar dijangka membangunkan kemahiran dan menggunakan Teknik yang bersesuaian untuk menghasilkan profil geometri yang berfungsi sebagai pangkalan data untuk menghasilkan model 3-D, lukisan kerja, bil bahan dan pandangan model yang dipasang. Di samping itu, pelajar akan didedahkan kepada pembangunan output prototaip pantas (percetakan 3-D) dan teknologi canggih realiti bertambah (AR).	<i>This course emphasis on parametric solid modelling using commercial computer aided design software. Student is expected to develop skills and utilize appropriate techniques to produce geometric profiles that serve as a database to produce 3-D models, working drawings, bill of materials and exploded views of assembled models. In addition, the student will be exposed into development of rapid prototype output (3-D printing) and advanced technology of augmented reality (AR).</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Mekanik	<i>Department of Mechanical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Mekanikal	<i>Master of Mechanical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQK7017	<i>KQK7017</i>
Tajuk Kursus* <i>Course Title*</i>	Ciri-ciri dan Aplikasi Pam	<i>Pump Characteristics and Applications</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Bandingkan pelbagai jenis pam berdasarkan kepada ciri-cirinya dan aplikasinya. 2. Menilai secara mendalam ciri-ciri pam. 3. Menilai prestasi pam termasuk sambungan paipnya berdasarkan aplikasi kehidupan sebenar.	<i>At the end of the course, students are able to:</i> 1. <i>Compare different types of pumps based on its characteristics and applications.</i> 2. <i>Evaluate detailed characteristics of pumps.</i> 3. <i>Evaluate pump performance including its piping network based on a real life application.</i>

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Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Rajah prestasi pam, Penggunaan pam yang sesuai untuk sistem paip, Pam adalah susunan bersiri dan selari, Penggunaan pam yang sesuai untuk sistem paip, Udara dalam pam dan Jumlah Bersih Sedutan Positif, Pam anjakan positif, Pam emparan, Penutup mekanikal, O-Rings.	<i>Pump performance curve, Matching a pump to a piping system, Pump is serial and parallel arrangement, Matching a pump to a piping system, Pump cavitation and Net Positive Suction Head (NPSH), Positive displacement pumps, Centrifugal pumps, Mechanical Seals, O-Rings.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Akademi/Fakulti/Institut/Pusat <i>Academy/Faculty/Institute/Centre</i>	Fakulti Kejuruteraan	<i>Faculty of Engineering</i>
Jabatan <i>Department</i>	Pejabat Timbalan Dekan (Ijazah Tinggi)	<i>Deputy Dean (Postgraduates) Office</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan Sarjana Kejuruteraan Mekanikal Sarjana Kejuruteraan Sistem Sarjana Kejuruteraan Keselamatan, Kesihatan dan Alam Sekitar Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Biomedical Engineering Master of Mechanical Engineering Master of Systems Engineering Master of Safety, Health and Environment Engineering Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQX7001	<i>KQX7001</i>
Tajuk Kursus* <i>Course Title*</i>	Metodologi Penyelidikan	<i>Research Methodology</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat:	<i>At the end of the course, students are able to:</i>

	1. Menentukan masalah penyelidikan yang bersesuaian dengan bidang kejuruteraan 2. Merekabentuk kaedah kajian untuk menyelesaikan masalah kajian 3. Menilai secara kritikal kebolehlaksanaan dan kepraktisan kaedah kajian untuk menyelesaikan masalah kajian. 4. Menyelaraskan maklumat penyelidikan yang relevan ke dalam laporan teknikal yang komprehensif	1. <i>Determine research problem or issues related to the respective engineering field.</i> 2. <i>Design appropriate research methodology to solve the research problem</i> 3. <i>Evaluate critically the feasibility and practicality of relevant methods and tools to solve the research problem</i> 4. <i>Coordinate relevant research information into comprehensive technical report.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini mendedahkan pelajar kepada teknik – teknik bagaimana untuk menjalankan kajian. Di awal kursus pelajar di ajar dengan pelbagai teknik kajian termasuk, kaedah kajian saintifik. Kemudian, etika kajian, reka bentuk eksperimen dan teknik statistik di terangkan kepada pelajar di ikuti dengan mengenal pasti masalah kajian dan penulisan cadangan. Pelajar akan menguasai kemahiran kajian, penulisan saintifik, komunikasi lisan bagi dapatan kajian.	<i>This course exposes students to the techniques of how to conduct research. At the beginning of the course students are taught with various research techniques including, scientific research methods. Then, research ethics, experimental design and statistical techniques are explained to students followed by identifying research problems and writing suggestions. Students will master research skills, scientific writing, and oral communication for research findings.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 100% Peperiksaan Akhir:-	<i>Continuous Assessment:100%</i> <i>Final Examination: -</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>



PRO FORMA KURSUS COURSE PRO FORMA

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Akademi/Fakulti/Institut/Pusat <i>Academy/Faculty/Institute/Centre</i>	Fakulti Kejuruteraan	Faculty of Engineering
Jabatan <i>Department</i>	Pejabat Timbalan Dekan (Ijazah Tinggi)	Deputy Dean (Postgraduates) Office
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan Sarjana Kejuruteraan Mekanikal Sarjana Kejuruteraan Sistem Sarjana Kejuruteraan Keselamatan, Kesihatan dan Alam Sekitar Sarjana Kejuruteraan Keselamatan Jalan Raya	Master of Biomedical Engineering Master of Mechanical Engineering Master of Systems Engineering Master of Safety, Health and Environment Engineering Master of Road Safety Engineering
Kod Kursus* <i>Course Code*</i>	KQX7002	KQX7002
Tajuk Kursus* <i>Course Title*</i>	Pengurusan Projek	Project Management
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	None
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat:	At the end of the course, students are able to:

	1. Menganalisa prinsip komponen dan konsep pengurusan projek. 2. Membenarkan pelbagai pemacu perubahan yang boleh menjejaskan projek selama kitaran hidupnya. 3. Menyelesaikan segala cabaran semasa projek secara efektif. 4. Mengaplikasikan kemahiran keusahawanan dan kepimpinan dalam pengurusan sesuatu projek.	1. <i>Analyze the principle components and concepts of project management.</i> 2. <i>Justify the various drivers of change which may impact a project during its life cycle.</i> 3. <i>Solve every challenges faced during the project.</i> 4. <i>Apply entrepreneurial and leadership skills in a project management.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memberikan pengenalan yang sistematik dan menyeluruh untuk semua aspek pengurusan projek. Projek adalah aspek yang semakin penting dalam perniagaan kejuruteraan moden. Oleh itu, kursus ini mengutarakan pentingnya memahami hubungan antara projek dan matlamat strategik organisasi. Kursus ini juga membincangkan kemahiran teknikal, budaya, dan interpersonal yang diperlukan untuk menguruskan projek dengan jayanya dari awal hingga akhir. Ia menekankan bahawa pengurusan projek adalah disiplin profesional yang merangkumi pengetahuan dan kemahirannya yang tersendiri. Konsep diperkukuhkan dengan menggunakan kajian kes yang merangkumi pelbagai jenis projek dan industri.	<i>This course provides a systematic and thorough introduction to all aspects of project management. Projects are an increasingly important aspect of modern engineering business. Therefore, the course underlines the importance of understanding the relation between projects and the strategic goals of the organisation. The course also discusses the technical, cultural, and interpersonal skills necessary to successfully manage projects from start to finish. It emphasises that project management is a professional discipline with its own tools, body of knowledge, and skills. Concepts are reinforced by case studies covering a wide variety of project types and industries.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

MASTER OF SAFETY, HEALTH & ENVIRONMENT ENGINEERING

UNIVERSITI MALAYA
MASTER OF SAFETY, HEALTH AND ENVIRONMENT ENGINEERING

1. Qualification for Admission

(1) Qualifications for Admission

- (a) Bachelor Degree or equivalent with a CGPA > 3.00

OR

- (b) CGPA 2.0 to 2.99: Must fulfill the following criteria subject to the qualification categories as prescribed by the Senate:
- (i) Related working experience
 - (ii) At least 1 ISI publication published
 - (iii) Recipients of scholarships
 - (iv) Government agencies staff
 - (v) Graduate of University Malaya
 - (vi) Pass Faculty interview
 - (vii) Pass Faculty special assessment

OR

- (c) Other qualifications approved by the Senate.

(2) Additional English Language requirement for international students:

A candidate who is not a Malaysian citizen and who possesses a degree or degrees from a university or an institution of higher education where the medium of instruction is not the English language for that degree or degrees must

- (a) obtain a score of 550 for the Test of English as a Foreign Language (TOEFL);
- OR**
- (b) obtain a band of 5.5 in the International English Language Testing System (IELTS);
- OR**
- (c) pass any English language test prescribed by the University

2. Program Structure

- (1) The program has a total of **forty-three (43) credits** consisting of:
- (a) seven (7) core courses, each consist of three credits hours **AND**;
 - (b) research project (10 credits) **AND**;
 - (c) four (4) elective courses each consist of three (3) credits

- (2) Details of the offered courses, approved by the Senate, and acknowledged by the Faculty, will be informed to the candidate at the beginning of each session.
- (3) The list of courses approved by the Senate for the degree of Master Engineering is a stated in **List 1**. The candidates shall be informed of the combination of courses which need be taken for the program before registering for the course.
- (4) Course Registration
 - (a) Course registration is done two weeks preceeding the beginning of the semester.
 - (b) A candidate must register for **at least six (6) credits** in any semester except:
 - (i) in the final semester of the candidate's course of study, where the candidate may register for fewer credit hours than that stipulated above;

OR
 - (ii) the candidate's appeal to withdraw from a particular course has been approved

OR
 - (iii) subject to Faculty's approval allowing the candidate to register for 3 credit hours only.
- (5) Determination of Field of Research

The field of research must be determined before the candidate commences the research portion of the course.
- (6) Supervision

Appointment of a Supervisor may be done in parallel with the submission of Research Project Title Application.
- (7) Submission of Research Project
 - (a) Notice of the Research Project Submission will be given to the candidate upon receiving the title and supervision approval of Research Project.
 - (b) A candidate must submit the Research Project before the end of the maximum period of candidature.

LIST 1**COURSES APPROVED BY SENATE FOR THE PROGRAMME OF
MASTER OF SAFETY, HEALTH AND ENVIRONMENT ENGINEERING****1. CORE COURSES**

Course Code	Title	Credit Hours
KQX7001	Research Methodology	3
KQX7002	Project Management	3
KQD7016	Research Project	10
KQD7002	Safety, Health and Environmental Legislation in Malaysia	3
KQD7003	Occupational and Industrial Health in Engineering	3
KQD7004	Sustainable Process Engineering	3
KQD7005	Quantitative Risk Assessment	3
KQD7006	Hazard Identification and Evaluation	3

2. ELECTIVE COURSE

Course Code	Title	Credit Hours
KQD7007	Environmental Monitoring and Assessment	3
KQD7008	Life Cycle Assessment and Management	3
KQD7009	Hazardous Waste Control	3
KQD7010	Industrial Ergonomics	3
KQD7011	Air Pollution Management and Control	3
KQD7014	Human Factor and Management at Work Place	3
KQD7015	Industrial Emergency and Crisis Management	3

**COURSE OFFERED FOR THE PROGRAMME OF
MASTER OF SAFETY, HEALTH AND ENVIRONMENT ENGINEERING**

Code	Course	Credit Hours	Duration of Examination	Distribution of Marks	
				%	%
				Continuous Assessments	Final Examination
CORE COURSES					
KQX7001	Research Methodology	3	-	100	-
KQX7002	Project Management	3	2 hours	50	50
KQD7016	Research Project	10	-	100	-
KQD7002	Safety, Health and Environmental Legislation in Malaysia	3	2 hours	50	50
KQD7003	Occupational and Industrial Health in Engineering	3	2 hours	50	50
KQD7004	Sustainable Process Engineering	3	2 hours	50	50
KQD7005	Quantitative Risk Assessment	3	2 hours	50	50
ELECTIVE COURSES					
KQD7006	Hazard Identification and Evaluation	3	2 hours	50	50
KQD7007	Environmental Monitoring and Assessment	3	2 hours	50	50
KQD7008	Life Cycle Assessment and Management	3	2 hours	50	50
KQD7009	Hazardous Waste Control	3	2 hours	50	50
KQD7010	Industrial Ergonomics	3	2 hours	50	50
KQD7011	Air Pollution Management and Control	3	2 hours	50	50

KQD7014	Human Factor and Management at Work Place	3	2 hours	50	50
KQD7015	Industrial Emergency and Crisis Management	3	2 hours	50	50

AND

- (1) Any other course approved by the Senate
- (2) Elective course offered in each semester may vary from semester to semester and subject to offer.
- (3) Elective course offered by Faculty is subject to change. Notice will be given to the candidate by the Program Coordinator or Deputy Dean (Postgraduate Studies)'s office from time to time.

PROGRAMME GOALS AND OUTCOMES

AIM OF THE PROGRAMME

The aim of the program is to produce graduates who are knowledgeable in the field of Safety, Health and Environment, providing them with high professionalism value, competitive, high ethical values as well as critical thinking skills to make decisions on issues related to field of Safety, Health and Environment based on basic knowledge and expertise through the designed program structures.

PROGRAMME EDUCATIONAL OBJECTIVE (PEO)

The programme educational objectives (PEO) are:

1. Graduates hold a senior or decision-making position in safety, health and environment engineering or related field in both private and public sectors.
2. Graduates engage in research and development activities in safety, health and environment engineering or related field for their career advancement.
3. Graduates contribute actively in sustainable development and well-being of the society.

PROGRAMME LEARNING OUTCOMES

No.	<i>Programme Learning Outcome(s) (PLO)</i>	Kategori Taksonomi Taxonomy Category (K/P/A)*
PLO1	<i>Apply knowledge critically and integratively to resolve complex problems in safety, health and environment engineering using advance or innovative approaches.</i>	K,P
PLO2	<i>Analyze and synthesize complex engineering problems critically through the application of specialized concepts in safety, health and environment engineering.</i>	K,P
PLO3	<i>Develop solutions for complex problems in safety, health and environment engineering using practical skills, tools or investigative techniques which are informed by knowledge.</i>	K,P
PLO4	<i>Communicate ideas and rationale of using appropriate methods to peers and experts in safety, health and environment engineering field using oral or written medium.</i>	A,K
PLO5	<i>Apply appropriate digital technologies and software competently to develop solutions for complex problems in safety, health and environment engineering field.</i>	K,A
PLO6	<i>Demonstrate leadership skill by responsibly planning and managing work within own team in safety, health and environment engineering projects.</i>	A,K

PLO7	<i>Identify need for professional advancement through continuous professional development and entrepreneurial ventures in safety, health and environment engineering.</i>	A,K
	<i>Demonstrate adherence to ethical and professional codes of practice in addressing community and global issues related to safety, health and environment engineering.</i>	A,K

Reference notes:

The Domain of the MQF in Programme Learning Outcomes program (PO)

PO Domain

- PO1** Knowledge
- PO2** Practical Skills
- PO3** Social Skills and Responsibility
- PO4** Values, Attitudes and Professionalism
- PO5** Communication, Leadership and Team Skills
- PO6** Problem Solving and Scientific Skills
- PO7** Information Management and Life Long Learning Skills
- PO8** Managerial and Entrepreneurial Skills

Taxonomic Category

- K** Cognitive
- A** Affective
- P** Psychomotor

PLANNER FOR MASTER OF SAFETY, HEALTH AND ENVIRONMENT ENGINEERING

COURSE CODE	SEMESTER 1			SEMESTER 2			SEMESTER 3**		
	COURSE CODE		CREDIT	COURSE CODE		CREDIT	COURSE CODE		CREDIT
Core Courses	Code	Subject	3	Code	Subject	3	Code	Subject	5
	KQX7002	Project Management		KQX7001	Research Methodology		KQD7016	Research Project (P)	
	KQD7003	Occupational and Industrial Health in Engineering		KQD7016	Research Project (P)				
	KQD7004	Sustainable Process Engineering		KQD7002	Safety, Health and Environmental Legislation in Malaysia				
	KQD7006	Hazard Identification and Evaluation		KQD7005	Quantitative Risk Assessment				
Elective Courses	Code	Subject	3	Code	Subject	3	Code	Subject	
	KQD7008	Life Cycle Assessment and Management		KQD7009	Hazardous Waste Control				
	KQD7010	Industrial Ergonomics		KQD7014	Human Factor and Management at Work Place				
	KQD7011	Air Pollution Management and Control		KQD7015	Industrial Emergency and Crisis Management				
	KQD7007	Environmental Monitoring and Assessment							

NOTE:

**Courses will be offered if there are sufficient request.

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Kimia	<i>Department of Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7001	<i>KQD7001</i>
Tajuk Kursus* <i>Course Title*</i>	Projek Penyelidikan	<i>Research Project</i>
Kredit* <i>Credit*</i>	10	<i>10</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	400	<i>400</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengkaji dokumen saintifik dan melaporkan tinjauan literatur 2. Menentukan jurang penyelidikan dan membina objektif yang boleh dicapai.	<i>At the end of the course, students can:</i> <i>1. Review scientific documents and report literature review</i> <i>2. Determine research gap and construct deliverable objectives</i>

	3. Mencadangkan metodologi yang sesuai untuk penyelidikan eksperimental atau bukan eksperimental 4. Menganalisa dapatan kajian dan menggunakan alat digital dan perisian yang sesuai. 5. Menunjukkan kemahiran pengurusan projek yang efektif dalam menyiapkan projek penyelidikan dalam masa yang ditentukan. 6. Menganalisa kesan ekonomi dari hasil projek penyelidikan. 7. Menganalisa hasil kajian berkenaan dengan kesannya terhadap kesihatan, keselamatan dan/atau alam sekitar. 8. Membentangkan hasil projek penyelidikan kepada khalayak.	<i>3. Propose suitable methodology to conduct experimental or non-experimental research</i> <i>4. Analyse the findings of the research and use appropriate software and digital tools.</i> <i>5. Demonstrate effective project management skills in completing the research project on time.</i> <i>6. Evaluate the economic impacts of the research project</i> <i>7. Evaluate the outcomes of the research with respect to safety, health and/or environment impact.</i> <i>8. Present outcome of research project to audience</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Projek penyelidikan akan mendedahkan pelajar dalam membuat ulangkaji risalah berkaitan dengan topik kajian spesifik, merancang kaedah kajian, mengumpul data eksperimen dan menghuraikan data, menulis laporan dan membuat pembentangan.	<i>Research project will expose students to carry out literature review on a specific research topic, plan a research methodology, collect experimental data and Interpret data, write a dissertation and carry out a presentation</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 100% Peperiksaan Akhir: 0%	<i>Continuous Assessment: 100%</i> <i>Final Examination: 0%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas dalam talian	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>



PRO FORMA KURSUS COURSE PRO FORMA

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7002	KQD7002
Tajuk Kursus* <i>Course Title*</i>	Perundangan Keselamatan, Kesihatan dan Alam Sekitar di Malaysia	<i>Safety, Health and Environmental Legislation in Malaysia</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti faktor pendorong utama terhadap pembangunan, tujuan dan bidang 'self regulating act'. 2. Menganalisa perbezaan di antara preskriptif dan deskriptif bagi undang-undang SHE di Malaysia.	<i>At the end of the course, students are able to:</i> 1. <i>Identify the main driver towards the development, purpose and scope of self-regulating act.</i> 2. <i>Analyse the difference of prescriptive and descriptive SHE legislation in Malaysia.</i>

	3. Mencadangkan sistem pengurusan Keselamatan dan Kesihatan di tempat kerja yang merangkumi kepatuhan kepada akta dan peraturan tempatan.	3. <i>Propose Safety and Health management system at workplace that incorporates compliance to local acts and regulation</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan memperkenalkan pelajar kepada undang-undang Sejarah keselamatan & kesihatan Malaysia (common law, tort, vicarious liability), Act, Regulation, Order, Code of Practice, Guidelines, Occupational Safety & Health Act 514 (1994), Factory and Machinery Act 139 (1967), Peraturan Kebijakan Keselamatan & Kesihatan (1995), Peraturan Jawatankuasa Keselamatan & Kesihatan (1996), Peraturan Pegawai Keselamatan & Kesihatan (1997), Peraturan Pengendalian Bahaya Kemalangan Besar Industri (CIMA) (1996, Klasifikasi, Pelabelan dan Data Keselamatan Lembaran Bahan Kimia Berbahaya (2013), Penggunaan dan Pendedahan Piawai Bahan Kimia Berbahaya kepada Kesihatan (USECHH) (2000), Pemberitahuan Kemalangan, Kejadian Berbahaya, Keracunan Pekerjaan & Peraturan Penyakit Pekerjaan (NADOPOD) (2004), Pendedahan Kebisingan (2019) Kod Amalan DOSH: Kualiti Udara Dalam Ruangan / Ruang Terhad / AIDS / Dadah & Alkohol, Kilang dan Jentera Akta 139 (1967): BOWEC / Lead / Mineral Debu / Kebajikan Umum / Asbes, Akta Kualiti Alam Sekeliling (1974) & anak syarikat undang-undang, Akta Perkhidmatan Bomba 134, Sijil Kebakaran 2000, Undang-Undang Bangunan Seragam (1984), sistem Pengurusan Keselamatan & Kesihatan.	<i>This course will introduce students to History of Malaysian safety & health legislation (common law, tort, vicarious liability), Act, Regulation, Order, Code of Practice, Guidelines, Occupational Safety & Health Act 514 (1994), Factory and Machinery Act 139 (1967), Safety & Health Policy Regulation (1995), Safety & Health Committee Regulation (1996), Safety & Health Officer Regulation (1997), Control of Industrial Major Accidents Hazard Regulation (CIMA) (1996, Classification, Labelling and Safety Data Sheet of Hazardous Chemicals (2013), Use and Standard Exposure of Chemicals Hazardous to Health Regulation (USECHH) (2000), Notification of Accident, Dangerous Occurrence, Occupational Poisoning & Occupational Disease Regulation (NADOPOD) (2004), Noise Exposure (2019) DOSH Code of Practice: Indoor Air Quality / Confined Space / AIDS / Drug & Alcohol, Factory and Machinery Act 139 (1967): BOWEC / Lead / Mineral Dust / General Welfare/Asbestos, Environmental Quality Act (1974) & subsidiary legislation, Fire Services Act 134, Fire Certificate 2000, Uniform Building By Law (1984), Safety & Health Management system.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>



PRO FORMA KURSUS
COURSE PRO FORMA

Kriteria Dalam Penilaian Sumatif
Criteria in Summative Assessment

Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019
Peraturan-peraturan Universiti Malaya (Ijazah Sarjana)
2019

University of Malaya Rules (Master's Degree) 2019
University of Malaya Regulations (Master's Degree)
2019

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7003	<i>KQD7003</i>
Tajuk Kursus* <i>Course Title*</i>	Kesihatan Pekerjaan dan Industri dalam Kejuruteraan	<i>Occupational and Industrial Health in Engineering</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisis bahaya di tempat kerja, penyakit atau ancaman kecederaan. 2. Menentukan langkah-langkah pencegahan untuk bahaya, penyakit dan ancaman kecederaan yang	<i>At the end of the course, students can:</i> 1. <i>Analyze occupational hazards, diseases or impending injuries</i> 2. <i>Determine preventive actions to address the identified hazards.</i>

	dikenalpasti. 3. Menyarankan persekitaran pekerjaan dan perindustrian yang selamat dan sihat.	3. <i>Propose a safe and healthy occupational and industrial environment</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Dalam kursus ini, pelajar akan belajar tentang aspek penting kesihatan pekerjaan dalam industri, termasuk bahaya kesihatan, undang-undang kesihatan pekerjaan, penyakit pekerjaan, kesihatan higen, dan mencegah bahaya kesihatan ditempat kerja.	<i>In this course, students will be able to learn about the occupational health aspects important to the industry, inclusive of health hazards, occupational health laws, occupational disease, occupational hygiene and prevention of health hazards at the workplace.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50%</i> <i>Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7004	<i>KQD7004</i>
Tajuk Kursus* <i>Course Title*</i>	Proses Kejuruteraan Lestari	<i>Sustainable Process Engineering</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: - Menjelaskan sifat ekologi kitaran arus dan pengangkutan serta nasib bendasing - Menjelaskan kesan dan akibat dari aktiviti pemprosesan terhadap alam sekitar.	<i>At the end of the course, students can:</i> <i>Explain the ecological nature of cycles and flows and transport and fate of contaminants.</i> <i>Explain the effects and impacts of processing activities on the environment.</i>

	3. Mencadangkan strategi pencegahan pencemaran yang relevan dan bersepadu untuk pembangunan lestari bagi industri pemprosesan.	3. <i>Propose appropriate integrated pollution prevention strategy for sustainable development of processing industries.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan memperkenalkan pelajar kepada isu umum dalam pencemaran alam sekitar, Ciri-ciri dan nasib pencemar alam sekitar, pengangkutan dan transformasi pencemar, dan aktiviti industri dan alam sekitar. Selain itu, para pelajar juga akan diberi pendedahan mengenai pembangunan dan rekabentuk proses lestari, operasi proses lestari, pengurusan pencemaran berintegrasi, peraturan dan komitmen antarabangsa, serta pembangunan lestari.	<i>This course will introduce the students to general issues in environmental pollution, properties and fate of environmental contaminants, transport and transformation of contaminants and industrial activities and the environment. Moreover, the students also will be exposed to the sustainable process development and design, sustainable process operations, integrated pollution management, regulations and international commitments as well as the sustainable development.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7005	<i>KQD7005</i>
Tajuk Kursus* <i>Course Title*</i>	Penilaian Risiko Kuantitatif	<i>Quantitative Risk Assessment</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengaplikasikan teknik mengenalpasti bahaya yang sesuai. 2. Menentukan kriteria risiko untuk industri proses dan kesihatan persekitaran. 3. Menganggarkan risiko kepada individu dan	<i>At the end of the course, students can:</i> 1. <i>Apply suitable hazard identification techniques</i> 2. <i>Determine risk characteristics for both process industry and environmental health hazard.</i> 3. <i>Estimate individual and societal risks based on outcomes from consequence and probability</i>

	masyarakat berdasarkan hasil daripada analisa akibat dan kebarangkalian.	<i>analysis.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan memperkenalkan pelajar kepada penilaian risiko industri; Mengenalpasti sumber-sumber bahaya seperti ciri-ciri bahan mudah terbakar, meletup dan toksik, analisa pohon kegagalan ('fault tree') dan analisa pohon kejadian ('event tree'); Analisa akibat seperti kebakaran kolam ('pool fire'), kebakaran jet ('jet fire'), bebola api ('fireball') dan BLEVE dan letupan awan wap ('vapour cloud'); serta Analisa kesan yang merangkumi kesan terma, kesan peletupan dan kesan toksik. Selain itu, pelajar juga akan dapat mempelajari tentang Analisa frekuensi/Kebarangkalian seperti pengkalan data kadar kegagalan dan Peraturan kebarangkalian untuk pohon kegagalan; Anggaran Risiko yang merangkumi risiko individu dan risiko sosial; dan juga Penilaian Risiko Alam Sekitar seperti risiko sistematik kesihatan dan risiko kanser.	<i>This course will introduce student to industrial risk assessment; Identification of sources of hazard such as flammability, explosive and toxic properties of material, fault tree analysis and event tree analysis; Consequence Analysis such as pool fire, jet fire, fireball due to BLEVE and vapour cloud explosion; as well as Effect Analysis which include thermal effect, explosion effect and toxic effect. Besides, students also will be able to learn about Frequency/Probability Analysis like failure rate database and probability rules in fault tree analysis; Risk Estimation which include individual risk and societal risk; and also Environmental Risk Assessment such as systematic health risk and cancer risk.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Akademi/Fakulti/Institut/Pusat <i>Academy/Faculty/Institute/Centre</i>	Kejuruteraan	<i>Engineering</i>
Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7006	<i>KQD7006</i>
Tajuk Kursus* <i>Course Title*</i>	Mengenalpasti Hazad dan Penilaian	<i>Hazard Identification and Evaluation</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisa hazad di tempat kerja dan unit pemprosesan sebagai langkah pencegahan kemalangan.	<i>At the end of the course, students can:</i> 1. <i>Analyze hazards at workplace and processing units as accident preventive measure.</i> 2. <i>Propose a good safety management system at</i>

	2. Mencadangkan sistem pengurusan keselamatan yang baik di tempat kerja dan penunjuk aras prestasi yang baik untuk mempertingkatkan keselamatan proses. 3. Menganggarkan risiko oleh letupan dan kekurangan dalam sistem pengurusan keselamatan proses.	<i>workplace and better performance indicators for a safety improvement process.</i> 3. <i>Estimate risks of explosions and deficiencies in process safety management system.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan memperkenalkan pelajar kepada Teknik Mengenalpasti Hazad seperti bancian hazad (Senarai semak), Analisis Keselamatan Kerja, Mengenalpasti Hazad dan Kawalan Penilaian Risiko (HIRAC), HAZOP, Analisis 'Fault Tree' serta Audit Keselamatan, Bahaya dari Tindakbalas Kimia, BLEVE, VCE, Pengendalian Selamat Bahan Kimia, Limit Mudah Terbakar bagi Wap, TLVs dan Letupan, Selain itu, pelajar juga akan dapat mempelajari mengenai Rekabentuk untuk Keselamatan, Pengurusan Proses Keselamatan, Prestasi Piawai bagi Peningkatan Proses Keselamatan, Sikap Keselamatan dan Perilaku Manusia, OSHA 1994, CIMAHA, Penganggaran kos kemalangan, Mengulas Kemalangan dan Menganalisis, dan melakukan Penyiasatan Kemalangan.	<i>This course will introduce students to the Hazard Identification Techniques such as hazard survey (Checklist), Job Safety Analysis, Hazard Identification and Risk Assessment Control (HIRAC), HAZOP, Fault Tree Analysis as well as Safety Audits, Hazards from Chemical Reaction, BLEVE, VCE, Safe Handling of Industrial Chemicals, Flammability Limits for Vapor, TLVs and Explosion. Furthermore, students also will be able to learn about Designing for Safety, Process Safety Management, Performance Standards for a Safety Improvement Process, Safety Attitudes and Human Behaviour, OSHA 1994, CIMAHA, Accident Cost Estimation, Accidents Review and Analysis and Accident Investigation Study.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7007	KQD7007
Tajuk Kursus* <i>Course Title*</i>	Penilaian dan Pemantauan Alam Sekitar	<i>Environmental Monitoring and Assessment</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	None
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti protokol terbaik pensampelan untuk tugas khusus dalam analisis persekitaran. 2. Melakukan analisis kualitatif dan kuantitatif bagi sampel gas, pepejal dan cecair dengan	<i>At the end of the course, students can:</i> 1. <i>Identify the best sampling protocol for a specific environmental analysis task.</i> 2. <i>Perform qualitative and quantitative analysis of gaseous, solids and liquid samples using GC,</i>

	menggunakan GC, HPLC dan ICP-AES. 3. Menganalisa spectrum GC, HPLC dan ICP-AES untuk menganggarkan komposisi elemen bagi sampel cecair, gas dan pepejal.	<i>HPLC and ICP-AES.</i> 3. <i>Analyse GC, HPLC and ICP-AES spectra for elemental composition estimation of liquid, gas and solid samples.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini merangkumi beberapa topik penting berkaitan dengan penilaian dan pemantauan alam sekitar iaitu Pensampelan, peralatan pensampelan, protokol pensampelan dalam pensampelan udara (pensampelan cerombong dan pensampelan ambien), pensampelan air dan pensampelan pepejal, tanah dan lumpur. Selain itu, kursus ini memperkenalkan pelajar kepada teknik analitikal, penyediaan sampel, Teknik Kromatografik (GC teknik dan HPLC) secara teori dan aplikasi persekitaran, Teknik Spektroskopik (spektrofotometri); Teknik Spektroskopik (AA dan ICP-AES)- Teori dan Aplikasi Persekitaran; Teknik Elektroanalitikal- Teori dan Aplikasi Persekitaran; ICP-AES Makmal.	<i>This course covers few important topics for environmental monitoring and assessment such as sampling, sampling equipment, sampling protocols in air sampling (stack sampling and ambient sampling), water sampling and sampling of solids, soils and sludge. Besides, this course introduce students to analytical techniques, sample preparation; Chromatographic techniques (GC techniques)- Theory and Environmental applications; Chromatographic techniques (HPLC techniques)- Theory and Environmental applications; GC and HPLC Laboratory; Spectroscopic techniques (spectrophotometry) - Theory and Environmental applications; Spectroscopic techniques (AA and ICP-AES) - Theory and Environmental applications; Electroanalytical techniques; ICP-AES Laboratory - Theory and Environmental applications.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7008	<i>KQD7008</i>
Tajuk Kursus* <i>Course Title*</i>	Pengurusan dan Penilaian Kitar Hayat	<i>Life Cycle Assessment and Management</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	None
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menilai pembelajaran penilaian kitar hayat untuk analisis impak. 2. Mengaplikasikan konsep dan metodologi penilaian kitar	<i>At the end of the course, students can:</i> 1. <i>Assess an LCA study for impacts analysis.</i> 2. <i>Apply the concepts and methodologies of life cycle assessment.</i>

	hayat. 3. Menyelesaikan isu dan pengurusan alam sekitar dengan penggunaan strategi pengurusan kitar hayat	3. <i>Solve environmental issues and management using life cycle management strategies.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan memperkenalkan pelajar kepada isu alam sekitar dan Pengurusan, Kitar Hayat Berdasarkan Inisiatif Persekitaran, Pengenalan terhadap siri Matlamat Piawai Penilaian Kitar Hayat dan Definisi Skop, Inventori kitar hayat, Penilaian Kesan Kitar Hayat, Interpretasi Kitar Hayat, SIMA PRO – Perisian simulasi dan LCA, Pengurusan Kitar Hayat. Selain itu, pelajar juga akan diberi pendedahan kepada Peralatan LCM, Sistem Pengurusan Alam Sekitar, Pengurusan Rantaian Terintegrasi, Pendekatan Pengurusan Terhadap LCM, dan Persaingan bagi negara-negara yang sedang membangun.	<i>This course will introduce students to Environmental Issues and Management, Life Cycle Based Environmental Initiatives, ISO 14040 – Introduction to Life Cycle Assessment (LCA) Series of Standards Goal and Scope Definition, Life Cycle Inventory, Life Cycle Impact Assessment, Life Cycle Interpretation, SIMA PRO – LCA simulation software and LCA course Project. Besides, students also will be exposed to the Life Cycle Management (LCM), LCM Tool Box, Environmental Management Systems, Integrated Chain Management, Management Approaches Toward LCM and Challenges for Developing Countries.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7009	<i>KQD7009</i>
Tajuk Kursus* <i>Course Title*</i>	Kawalan Sisa Merbahaya	<i>Hazardous Waste Control</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti pengurusan sisa berbahaya yang diperlukan bagi melindungi manusia dan alam sekitar	<i>At the end of the course, students are able to:</i> 1. <i>Identify appropriate hazardous waste management practices required to protect human</i>

	dengan mempertimbangkan ciri-ciri sisa berbahaya yang umumnya dihasilkan di pelbagai lokasi industri dan bukan-industri. 2. Mengjustifikasi skim rawatan yang tepat untuk pelbagai jenis sisa berbahaya yang dihasilkan dan lokasi yang tercemar dengan sisa berbahaya. 3. Menyelesaikan kajian kes berdasarkan keperluan peraturan dan teknikal yang melibatkan isu-isu umum yang berkaitan dengan pengurusan sisa berbahaya.	<i>beings and the environment by taking into consideration the characteristics of hazardous waste commonly generated at various industrial and non-industrials premises.</i> 2. <i>Justify appropriate treatment schemes for various hazardous waste types generated and sites contaminated with hazardous waste.</i> 3. <i>Solve case studies based on regulatory and technical requirements involving common issues related to hazardous waste management.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Dalam kursus ini, pelajar akan diberi pendedahan mengenai pengenalan dan definasi sisa berbahaya, analisis toksik pada sisa berbahaya, secara amnya pengurusan sisa, audit dan teknik pemilihan pencegahan pencemaran untuk sisa berbahaya. Selain itu, pelajar akan dapat mempelajari mengenai rawatan terma, kimia, fizikal dan biologi, rekabentuk tempat pembuangan dan operasi pelupusan sisa berbahaya, teknik 'site-remediation', peraturan sisa berjadual dan komitmen antarabangsa bagi Malaysia dan juga analisis ringkas risiko yang melibatkan sisa berbahaya.	<i>In this course, students will be exposed to the introduction and definition of hazardous waste, toxicity analysis for hazardous waste, general waste management practices, auditing and selected pollution prevention techniques for hazardous wastes. Moreover, students also will be able to learn about thermal, chemical, physical and biological treatment, landfill design and operation of hazardous waste disposal, site-remediation techniques, scheduled waste regulations and international commitments for Malaysia and also brief risk analysis involving hazardous waste.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7010	<i>KQD7010</i>
Tajuk Kursus* <i>Course Title*</i>	Ergonomik Industri	<i>Industrial Ergonomics</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	None
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menentukan kepentingan faktor manusia & ergonomic dan keselamatan & kesihatan dalam aplikasi peralatan	<i>At the end of the course, students can:</i>

	dan peranti di persekitaran tempat kerja 2. Menyatakan kaedah ergonomik untuk mendiagnosis kerja dan rekabentuk pekerjaan. 3. Menginterpretasi amalan kerja dan rekabentuk pekerjaan dalam industri.	1. <i>Determine the important of human factors & ergonomics and safety & health in designing equipment and in work environments</i> 2. <i>Specify ergonomics methods in diagnosing job and work design</i> 3. <i>Interpret the practices in job and work design in industries</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini mengandungi lapan bahagian penting terutama: keselamatan dan kesihatan industri, industri ergonomik, prinsip ergonomik dalam rekabentuk, kesan persekitaran kepada pekerja, fisiologi manusia, antropometri, rekabentuk pekerjaan dan analisis tugas	<i>This course contains eight essential parts mainly: industrial safety and health, ergonomics industries, ergonomics principal in design, effect of environment on workers, human physiology, anthropometry, works design and analysis of tasks.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50%</i> <i>Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7011	<i>KQD7011</i>
Tajuk Kursus* <i>Course Title*</i>	Pengurusan dan Kawalan Pencemaran Udara	<i>Air Pollution Management and Control</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menerangkan konsep kualiti udara dan ciri-ciri, jenis serta sumber dan kesannya terhadap kesihatan dan	<i>At the end of the course, students are able to:</i> 1. <i>Explain the concept of air quality and its characteristics, types and sources and their</i>

	alam sekitar. 2. Menilai serakan pencemar melalui permodelan. 3. Merumuskan strategi kawalan dan pengurusan untuk pencemar zarah dan gas.	<i>impact on health and environment.</i> 2. <i>Evaluate the dispersion of pollutants through modelling.</i> 3. <i>Formulate the control and management strategies for particulates and gaseous pollutants.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan memperkenalkan pelajar kepada isu umum yang berkaitan dengan pencemaran udara, kualiti udara, dan juga jenis, sumber dan kesan pencemar udara. Selain itu, pelajar juga akan diberi pendedahan kepada isu pemanasan global, meteorologi udara dan serakan pencemar, serta pengurusan dan kawalan pencemar udara gas dan zarah udara.	<i>This course will introduce students to general issues on air pollution, air quality and also types, sources and impacts of air pollutants. Besides, students also will be exposed to the Global warming issue, air meteorology and dispersion of pollutants, as well as management and control of gaseous and particulate air pollutants.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50%</i> <i>Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7014	<i>KQD7014</i>
Tajuk Kursus* <i>Course Title*</i>	Faktor Kemanusiaan dan Pengurusan Tempat Kerja	<i>Human Factor and Management at Work Place</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti kepentingan faktor kemanusiaan dalam aplikasi peralatan dan persekitaran tempat kerja	<i>At the end of the course, students are able to:</i> 1. <i>Identify the importance of human factor in the application of tools and work</i>

	2. Menganalisa rekabentuk yang berkaitan dan penting bagi persekitaran tempat kerja di industri 3. Mengamalkan kesedaran diri, tanggungjawab dan kepercayaan diri di tempat kerja.	<i>environment.</i> 2. <i>Analyse relevant and significant human factor design for work environment in industries.</i> 3. <i>Practice self-awareness, responsibility and self-belief at the workplace.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini mengandungi beberapa bahagian penting terutama: mengenalpasti, aplikasi dan analisis rekabentuk untuk persekitaran tempat kerja. Kursus ini juga membincangkan pembangunan kesedaran, tanggungjawab dan kepercayaan diri, serta peranan pengurus, dalam mewujudkan organisasi berprestasi tinggi.	<i>This course contains topics which include: Identification, application and analysis the importance of ergonomics in the application and design for special population. This course also discusses the awareness building, responsibility and self-belief, as well as roles of manager, in creating a high performance organization.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>



PRO FORMA KURSUS COURSE PRO FORMA

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Kimia	<i>Department of Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7015	<i>KQD7015</i>
Tajuk Kursus* <i>Course Title*</i>	Pengurusan Kecemasan dan Krisis Industri	<i>Industrial Emergency and Crisis Management</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	122	122
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	None
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Membangunkan Pelan Pengurusan Krisis (CMP) untuk industri yang spesifik. 2. Menyediakan Pelan Tindakan Kecemasan (ERP) untuk scenario industri.	<i>At the end of the course, students are able to:</i> 1. <i>Develop appropriate Crisis Management Plan (CMP) for specific industries.</i> 2. <i>Prepare an Emergency Response plan (ERP) for industrial scenarios.</i>

	3. Menggunakan kaedah terkini dalam pengurusan krisis.	3. <i>Use advanced tools in managing crisis.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Dalam kursus ini konsep dan definasi Pengurusan Krisis dan Perancangan Kecemasan di loji-loji industri akan diterangkan. Strategi secara sistematik dan pendekatan akan diajar untuk mengenalpasti, merancang dan mengurus scenario kecemasan di loji-loji industri. Beberapa pembelajaran kes akan digunakan untuk tujuan ini. Kursus ini merangkumi penerangan ke atas kaedah-kaedah pencegahan, persediaan, tindakan dan pemulihan seandainya terdapat sebarang krisis yang timbul. Pelajar juga akan mempelajari penggunaan teknik-teknik terkini seperti GIS (Sistem Informasi Geografi) dan perisian CAMEO di dalam pengurusan krisis.	<i>In this course the concepts and definitions of Crisis Management and Emergency Planning in industrial plants will be explained. Systematic strategies and approaches will be taught to identify, plan and manage emergency scenarios in industrial plants. Several case studies will be used for this purpose. This course includes explanation of methods of prevention, preparedness, response and recovery in case of crisis. Students will also learn the application of advanced techniques such as GIS (geographical Information System) and CAMEO software in managing emergencies.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Pejabat Timbalan Dekan (Ijazah Tinggi)	<i>Deputy Dean (Postgraduates) Office</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan Sarjana Kejuruteraan Mekanikal Sarjana Kejuruteraan Sistem Sarjana Kejuruteraan Keselamatan, Kesihatan dan Alam Sekitar Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Biomedical Engineering Master of Mechanical Engineering Master of Systems Engineering Master of Safety, Health and Environment Engineering Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQX7001	<i>KQX7001</i>
Tajuk Kursus* <i>Course Title*</i>	Metodologi Penyelidikan	<i>Research Methodology</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat:	<i>At the end of the course, students are able to:</i>

	1. Menentukan masalah penyelidikan yang bersesuaian dengan bidang kejuruteraan 2. Merekabentuk kaedah kajian untuk menyelesaikan masalah kajian 3. Menilai secara kritikal kebolehlaksanaan dan kepraktisan kaedah kajian untuk menyelesaikan masalah kajian. 4. Menyelaraskan maklumat penyelidikan yang relevan ke dalam laporan teknikal yang komprehensif	1. <i>Determine research problem or issues related to the respective engineering field.</i> 2. <i>Design appropriate research methodology to solve the research problem</i> 3. <i>Evaluate critically the feasibility and practicality of relevant methods and tools to solve the research problem</i> 4. <i>Coordinate relevant research information into comprehensive technical report.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini mendedahkan pelajar kepada teknik – teknik bagaimana untuk menjalankan kajian. Di awal kursus pelajar di ajar dengan pelbagai teknik kajian termasuk, kaedah kajian saintifik. Kemudian, etika kajian, reka bentuk eksperimen dan teknik statistik di terangkan kepada pelajar di ikuti dengan mengenal pasti masalah kajian dan penulisan cadangan. Pelajar akan menguasai kemahiran kajian, penulisan saintifik, komunikasi lisan bagi dapatan kajian.	<i>This course exposes students to the techniques of how to conduct research. At the beginning of the course students are taught with various research techniques including, scientific research methods. Then, research ethics, experimental design and statistical techniques are explained to students followed by identifying research problems and writing suggestions. Students will master research skills, scientific writing, and oral communication for research findings.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 100% Peperiksaan Akhir:-	<i>Continuous Assessment:100%</i> <i>Final Examination: -</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Pejabat Timbalan Dekan (Ijazah Tinggi)	<i>Deputy Dean (Postgraduates) Office</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan Sarjana Kejuruteraan Mekanikal Sarjana Kejuruteraan Sistem Sarjana Kejuruteraan Keselamatan, Kesihatan dan Alam Sekitar Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Biomedical Engineering Master of Mechanical Engineering Master of Systems Engineering Master of Safety, Health and Environment Engineering Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQX7002	KQX7002
Tajuk Kursus* <i>Course Title*</i>	Pengurusan Projek	<i>Project Management</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat:	<i>At the end of the course, students are able to:</i>

	1. Menganalisa prinsip komponen dan konsep pengurusan projek. 2. Membenarkan pelbagai pemacu perubahan yang boleh menjejaskan projek selama kitaran hidupnya. 3. Menyelesaikan segala cabaran semasa projek secara efektif. 4. Mengaplikasikan kemahiran keusahawanan dan kepimpinan dalam pengurusan sesuatu projek.	1. <i>Analyze the principle components and concepts of project management.</i> 2. <i>Justify the various drivers of change which may impact a project during its life cycle.</i> 3. <i>Solve every challenges faced during the project.</i> 4. <i>Apply entrepreneurial and leadership skills in a project management.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memberikan pengenalan yang sistematik dan menyeluruh untuk semua aspek pengurusan projek. Projek adalah aspek yang semakin penting dalam perniagaan kejuruteraan moden. Oleh itu, kursus ini mengutarakan pentingnya memahami hubungan antara projek dan matlamat strategik organisasi. Kursus ini juga membincangkan kemahiran teknikal, budaya, dan interpersonal yang diperlukan untuk menguruskan projek dengan jayanya dari awal hingga akhir. Ia menekankan bahawa pengurusan projek adalah disiplin profesional yang merangkumi pengetahuan dan kemahirannya yang tersendiri. Konsep diperkukuhkan dengan menggunakan kajian kes yang merangkumi pelbagai jenis projek dan industri.	<i>This course provides a systematic and thorough introduction to all aspects of project management. Projects are an increasingly important aspect of modern engineering business. Therefore, the course underlines the importance of understanding the relation between projects and the strategic goals of the organisation. The course also discusses the technical, cultural, and interpersonal skills necessary to successfully manage projects from start to finish. It emphasises that project management is a professional discipline with its own tools, body of knowledge, and skills. Concepts are reinforced by case studies covering a wide variety of project types and industries.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>



MASTER OF SAFETY, HEALTH AND ENVIRONMENT ENGINEERING (ODL)

UNIVERSITI MALAYA
MASTER OF SAFETY, HEALTH AND ENVIRONMENT ENGINEERING (ODL)

1. Qualification for Admission

(1) Qualifications for Admission

- (a) Bachelor Degree or equivalent with a CGPA > 3.00

OR

- (b) CGPA 2.0 to 2.99: Must fulfill the following criteria subject to the qualification categories as prescribed by the Senate:

- (i) Related working experience
- (ii) At least 1 ISI publication published
- (iii) Recipients of scholarships
- (iv) Government agencies staff
- (v) Graduate of University Malaya
- (vi) Pass Faculty interview
- (vii) Pass Faculty special assessment

OR

- (c) Other qualifications approved by the Senate.

(2) Additional English Language requirement for international students:

A candidate who is not a Malaysian citizen and who possesses a degree or degrees from a university or an institution of higher education where the medium of instruction is not the English language for that degree or degrees must

- (a) obtain a score of 550 for the Test of English as a Foreign Language (TOEFL); **OR**

- (b) obtain a band of 5.5 in the International English Language Testing System (IELTS);

OR

- (c) pass any English language test prescribed by the University

2. Program Structure

(1) The program has a total of **forty-three (43) credits** consisting of:

- (a) seven (7) core courses, each consist of three credits hours **AND**;
- (b) research project (10 credits) **AND**;
- (c) four (4) elective courses each consist of three (3) credits

(2) Details of the offered courses, approved by the Senate, and acknowledged by the

Faculty, will be informed to the candidate at the beginning of each session.

- (3) The list of courses approved by the Senate for the degree of Master Engineering is a stated in **List 1**. The candidates shall be informed of the combination of courses which need be taken for the program before registering for the course.

(4) Course Registration

- (a) Course registration is done two weeks preceeding the beginning of the semester.

- (b) A candidate must register for **at least six (6) credits** in any semester except:

- (i) in the final semester of the candidate's course of study, where the candidate may register for fewer credit hours than that stipulated above;

OR

- (ii) the candidate's appeal to withdraw from a particular course has been approved

OR

- (iii) subject to Faculty's approval allowing the candidate to register for 3 credit hours only.

(5) Determination of Field of Research

The field of research must be determined before the candidate commences the research portion of the course.

(6) Supervision

Appointment of a Supervisor may be done in parallel with the submission of Research Project Title Application.

(7) Submission of Research Project

- (a) Notice of the Research Project Submission will be given to the candidate upon receiving the title and supervision approval of Research Project.

- (b) A candidate must submit the Research Project before the end of the maximum period of candidature.

**COURSES APPROVED BY SENATE FOR THE PROGRAMME OF
MASTER OF SAFETY, HEALTH AND ENVIRONMENT ENGINEERING
(ODL)**

1. CORE COURSES

Course Code	Title	Credit Hours
KQX7001DL	Research Methodology	3
KQX7002DL	Project Management	3
KQD7001DL	Research Project	5
KQD7002DL	Safety, Health and Environmental Legislation in Malaysia	3
KQD7003DL	Occupational and Industrial Health in Engineering	3
KQD7004DL	Sustainable Process Engineering	3
KQD7005DL	Quantitative Risk Assessment	3
KQD7006DL	Hazard Identification and Evaluation	3

2. ELECTIVE COURSE

Course Code	Title	Credit Hours
KQD7007DL	Environmental Monitoring and Assessment	3
KQD7008DL	Life Cycle Assessment and Management	3
KQD7009DL	Hazardous Waste Control	3
KQD7010DL	Industrial Ergonomics	3
KQD7011DL	Air Pollution Management and Control	3
KQD7014DL	Human Factor and Management at Work Place	3
KQD7015DL	Industrial Emergency and Crisis Management	3

**COURSE OFFERED FOR THE PROGRAMME OF
MASTER OF SAFETY, HEALTH AND ENVIRONMENT ENGINEERING (ODL)**

Code	Course	Credit Hours	Duration of Examination	Distribution of Marks	
				%	%
				Continuous Assessments	Final Examination
CORE COURSES					
KQX7001D	Research Methodology	3	-	100	-
KQX7002D	Project Management	3	2 hours	100	-
KQD7001D	Research Project	5	-	100	-
KQD7002D	Safety, Health and Environmental Legislation in Malaysia	3	2 hours	50	50
KQD7003D	Occupational and Industrial Health in Engineering	3	2 hours	50	50
KQD7004D	Sustainable Process Engineering	3	2 hours	50	50
KQD7005D	Quantitative Risk Assessment	3	2 hours	50	50
KQD7006D	Hazard Identification and Evaluation	3	2 hours	50	50
ELECTIVE COURSES					
KQD7007D	Environmental Monitoring and Assessment	3	2 hours	50	50
KQD7008D	Life Cycle Assessment and Management	3	2 hours	50	50
KQD7009D	Hazardous Waste Control	3	2 hours	50	50
KQD7010D	Industrial Ergonomics	3	2 hours	50	50
KQD7011D	Air Pollution Management and Control	3	2 hours	50	50
KQD7014D	Human Factor and Management at Work Place	3	2 hours	50	50

KQD7015DL	Industrial Emergency and Crisis Management	3	2 hours	50	50
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AND

- (1) Any other course approved by the Senate
- (2) Elective course offered in each semester may vary from semester to semester and subject to offer.
- (3) Elective course offered by Faculty is subject to change. Notice will be given to the candidate by the Program Coordinator or Deputy Dean (Postgraduate Studies)'s office from time to time.

PROGRAMME GOALS AND OUTCOMES

AIM OF THE PROGRAMME

The aim of the program is to produce graduates who are knowledgeable in the field of Safety, Health and Environment, providing them with high professionalism value, competitive, high ethical values as well as critical thinking skills to make decisions on issues related to field of Safety, Health and Environment based on basic knowledge and expertise through the designed program structures.

PROGRAMME EDUCATIONAL OBJECTIVE (PEO)

The programme educational objectives (PEO) are:

1. Graduates hold a senior or decision-making position in safety, health and environment engineering or related field in both private and public sectors.
2. Graduates engage in research and development activities in safety, health and environment engineering or related field for their career advancement.
3. Graduates contribute actively in sustainable development and well-being of the society.

PROGRAMME LEARNING OUTCOMES

No.	Programme Learning Outcome(s) (PLO)	Kategori Taksonomi Taxonomy Category (K/P/A)*
PLO1	<i>Apply knowledge critically and integratively to resolve complex problems in safety, health and environment engineering using advance or innovative approaches.</i>	K,P
PLO2	<i>Analyze and synthesize complex engineering problems critically through the application of specialized concepts in safety, health and environment engineering.</i>	K,P
PLO3	<i>Develop solutions for complex problems in safety, health and environment engineering using practical skills, tools or investigative techniques which are informed by knowledge.</i>	K,P
PLO4	<i>Communicate ideas and rationale of using appropriate methods to peers and experts in safety, health and environment engineering field using oral or written medium.</i>	A,K
PLO5	<i>Apply appropriate digital technologies and software competently to develop solutions for complex problems in safety, health and environment engineering field.</i>	K,A
PLO6	<i>Demonstrate leadership skill by responsibly planning and managing work within own team in safety, health and environment engineering projects.</i>	A,K
PLO7	<i>Identify need for professional advancement through continuous professional development and entrepreneurial ventures in safety, health and environment engineering.</i>	A,K

PLO8	<i>Demonstrate adherence to ethical and professional codes of practice in addressing community and global issues related to safety, health and environment engineering.</i>	A,K
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Reference notes:

The Domain of the MQF in Programme Learning Outcomes program (PO)

PO Domain

- PO1** Knowledge
- PO2** Practical Skills
- PO3** Social Skills and Responsibility
- PO4** Values, Attitudes and Professionalism
- PO5** Communication, Leadership and Team Skills
- PO6** Problem Solving and Scientific Skills
- PO7** Information Management and Life Long Learning Skills
- PO8** Managerial and Entrepreneurial Skills

Taxonomic Category

- K** Cognitive
- A** Affective
- P** Psychomotor

PLANNER FOR MASTER OF SAFETY, HEALTH AND ENVIRONMENT ENGINEERING (ODL)

Year	Component	Semester I			Semester II			Semester Khas		
		Code	Subject	Credit	Code	Subject	Credit	Code	Subject	Credit
1	Faculty Core Courses	KQX 7002DL	Project Management	3	KQX 7001DL	Research Methodology	3			
	Program Core Courses	KQD 7004DL	Sustainable Process Engineering	3	KQD 7002DL	Safety, Health and Environmental Legislation in Malaysia	3			
		KQD 7006DL	Hazard Identification and Evaluation	3	KQD 7005DL	Quantitative Risk Assessment	3			
	Elective Courses	KQD 7007DL	Environmental Monitoring and Assessment	3	KQD 7009DL	Hazardous Waste Control	3			
	Total Credit				12					

Year	Component	Semester I			Semester II			Special Semester		
		Code	Subject	Credit	Code	Subject	Credit	Code	Subject	Credit
2	Faculty Core Courses									
	Program Core Courses	KQD 7001DL	Research Project (P)	5	KQD 7001DL	Research Project (P)	5			
		KQD 7003DL	Occupational and Industrial Health in Engineering	3						
	Elective Courses	KQD 7008DL	Life Cycle Assessment and Management	3	KQD 7011DL	Air Pollution Management and Control	3			
		KQD 7010DL	Industrial Ergonomics	3	KQD 7014DL	Human Factor and Management at Work Place	3			
					KQD 7015DL	Industrial Emergency and Crisis Management	3			
	Total Credit				11			8		
	TOTAL OVERALL CREDIT			43						

* For elective courses, select 4 courses from the list of elective courses offered.



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Jabatan <i>Department</i>	Jabatan Kejuruteraan Kimia	<i>Department of Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7001DL	<i>KQD7001DL</i>
Tajuk Kursus* <i>Course Title*</i>	Projek Penyelidikan	<i>Research Project</i>
Kredit* <i>Credit*</i>	10	<i>10</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	400	<i>400</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>

Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengkaji dokumen saintifik dan melaporkan tinjauan literatur 2. Menentukan jurang penyelidikan dan membina objektif yang boleh dicapai. 3. Mencadangkan metodologi yang sesuai untuk penyelidikan eksperimental atau bukan eksperimental 4. Menganalisa dapatan kajian dan menggunakan alat digital dan perisian yang sesuai. 5. Menunjukkan kemahiran pengurusan projek yang efektif dalam menyiapkan projek penyelidikan dalam masa yang ditentukan. 6. Menganalisa kesan ekonomi dari hasil projek penyelidikan. 7. Menganalisa hasil kajian berkenaan dengan kesannya terhadap kesihatan, keselamatan dan/atau alam sekitar. 8. Membentangkan hasil projek penyelidikan kepada khalayak.	<i>At the end of the course, students are able to:</i> 1. <i>Review scientific documents and report literature review</i> 2. <i>Determine research gap and construct deliverable objectives</i> 3. <i>Propose suitable methodology to conduct experimental or non-experimental research</i> 4. <i>Analyse the findings of the research and use appropriate software and digital tools.</i> 5. <i>Demonstrate effective project management skills in completing the research project on time.</i> 6. <i>Evaluate the economic impacts of the research project</i> 7. <i>Evaluate the outcomes of the research with respect to safety, health and/or environment impact.</i> 8. <i>Present outcome of research project to audience</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Projek penyelidikan akan mendedahkan pelajar dalam membuat ulangkaji risalah berkaitan dengan topik kajian spesifik, merancang kaedah kajian, mengumpul data eksperimen dan menghuraikan data, menulis laporan dan membuat pembentangan.	<i>Research project will expose students to carry out literature review on a specific research topic, plan a research methodology, collect experimental data and Interpret data, write a dissertation and carry out a presentation</i>



PRO FORMA KURSUS
COURSE PRO FORMA

Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 100% Peperiksaan Akhir: 0%	<i>Continuous Assessment: 100%</i> <i>Final Examination: 0%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas dalam talian	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7002DL	KQD7002DL
Tajuk Kursus* <i>Course Title*</i>	Perundangan Keselamatan, Kesihatan dan Alam Sekitar di Malaysia	<i>Safety, Health and Environmental Legislation in Malaysia</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	Tiada
Hasil Pembelajaran Kursus*	Di akhir kursus ini, pelajar dapat:	<i>At the end of the course, students are able to:</i>

Course Learning Outcomes*	1. Mengenalpasti faktor pendorong utama terhadap pembangunan, tujuan dan bidang 'self-regulating act' (C2) 2. Menganalisa perbezaan di antara preskriptif dan deskriptif bagi undang-undang SHE di Malaysia (C4) 3. Mencadangkan sistem pengurusan Keselamatan dan Kesihatan di tempat kerja yang merangkumi kepatuhan kepada akta dan peraturan tempatan (A5)	1. <i>Identify the main driver towards the development, purpose and scope of self-regulating act (C2)</i> 2. <i>Analyse the difference of prescriptive and descriptive SHE legislation in Malaysia (C4)</i> 3. <i>Propose Safety and Health management system at workplace that incorporates compliance to local acts and regulation (A5)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan memperkenalkan pelajar kepada undang-undang Sejarah keselamatan & kesihatan Malaysia (common law, tort, vicarious liability), Act, Regulation, Order, Code of Practice, Guidelines, Occupational Safety & Health Act 514 (1994), Factory and Machinery Act 139 (1967), Peraturan Kebijakan Keselamatan & Kesihatan (1995), Peraturan Jawatankuasa Keselamatan & Kesihatan (1996), Peraturan Pegawai Keselamatan & Kesihatan (1997), Peraturan Pengendalian Bahaya Kemalangan Besar Industri (CIMAHA) (1996, Klasifikasi, Pelabelan dan Data Keselamatan Lembaran Bahan Kimia Berbahaya (2013), Penggunaan dan Pendedahan Piawai Bahan Kimia Berbahaya kepada Kesihatan (USECHH) (2000), Pemberitahuan Kemalangan, Kejadian Berbahaya, Keracunan Pekerjaan & Peraturan Penyakit Pekerjaan (NADOPOD) (2004), Pendedahan Kebisingan (2019) Kod Amalan DOSH: Kualiti Udara Dalam Ruangan / Ruang Terhad / AIDS / Dadah & Alkohol, Kilang dan Jentera Akta 139 (1967): BOWEC / Lead / Mineral Debu / Kebajikan Umum / Asbes, Akta Kualiti Alam Sekeliling (1974) & anak	<i>This course will introduce students to History of Malaysian safety & health legislation (common law, tort, vicarious liability), Act, Regulation, Order, Code of Practice, Guidelines, Occupational Safety & Health Act 514 (1994), Factory and Machinery Act 139 (1967), Safety & Health Policy Regulation (1995), Safety & Health Committee Regulation (1996), Safety & Health Officer Regulation (1997), Control of Industrial Major Accidents Hazard Regulation (CIMAHA) (1996, Classification, Labelling and Safety Data Sheet of Hazardous Chemicals (2013), Use and Standard Exposure of Chemicals Hazardous to Health Regulation (USECHH) (2000), Notification of Accident, Dangerous Occurrence, Occupational Poisoning & Occupational Disease Regulation (NADOPOD) (2004), Noise Exposure (2019) DOSH Code of Practice: Indoor Air Quality / Confined Space / AIDS / Drug & Alcohol, Factory and Machinery Act 139 (1967): BOWEC / Lead / Mineral Dust / General Welfare/Asbestos, Environmental</i>

	syarikat undang-undang, Akta Perkhidmatan Bomba 134, Sijil Kebakaran 2000, Undang-Undang Bangunan Seragam (1984), sistem Pengurusan Keselamatan & Kesihatan.	<i>Quality Act (1974) & subsidiary legislation, Fire Services Act 134, Fire Certificate 2000, Uniform Building By Law (1984), Safety & Health Management system.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% e-Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% e-Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas atas talian 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in online class.</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>



PRO FORMA KURSUS COURSE PRO FORMA

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7003DL	<i>KQD7003DL</i>
Tajuk Kursus* <i>Course Title*</i>	Kesihatan Pekerjaan dan Industri dalam Kejuruteraan	<i>Occupational and Industrial Health in Engineering</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>

Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisis bahaya di tempat kerja, penyakit atau ancaman kecederaan. 2. Menentukan langkah-langkah pencegahan untuk bahaya, penyakit dan ancaman kecederaan yang dikenalpasti. 3. Menyarankan persekitaran pekerjaan dan perindustrian yang selamat dan sihat.	<i>At the end of the course, students are able to:</i> 1. <i>Analyze occupational hazards, diseases or impending injuries</i> 2. <i>Determine preventive actions to address the identified hazards.</i> 3. <i>Propose a safe and healthy occupational and industrial environment</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Dalam kursus ini, pelajar akan belajar tentang aspek penting kesihatan pekerjaan dalam industri, termasuk bahaya kesihatan, undang-undang kesihatan pekerjaan, penyakit pekerjaan, kesihatan higen, dan mencegah bahaya kesihatan ditempat kerja.	<i>In this course, students will be able to learn about the occupational health aspects important to the industry, inclusive of health hazards, occupational health laws, occupational disease, occupational hygiene and prevention of health hazards at the workplace.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% e-Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50%</i> <i>e-Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7004DL	<i>KQD7004DL</i>
Tajuk Kursus* <i>Course Title*</i>	Proses Kejuruteraan Lestari	<i>Sustainable Process Engineering</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>

Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menjelaskan sifat ekologi kitaran arus dan pengangkutan serta nasib bendasing (C2) 2. Menjelaskan kesan dan akibat dari aktiviti pemprosesan terhadap alam sekitar (A4) 3. Mencadangkan strategi pencegahan pencemaran yang relevan dan bersepadu untuk pembangunan lestari bagi industri pemprosesan (A5)	<i>At the end of the course, students can:</i> 1. <i>Explain the ecological nature of cycles and flows and transport and fate of contaminants (C2)</i> 2. <i>Explain the effects and impacts of processing activities on the environment (A4)</i> 3. <i>Propose appropriate integrated pollution prevention strategy for sustainable development of processing industries (A5)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan memperkenalkan pelajar kepada isu umum dalam pencemaran alam sekitar, Ciri-ciri dan nasib pencemar alam sekitar, pengangkutan dan transformasi pencemar, dan aktiviti industri dan alam sekitar. Selain itu, para pelajar juga akan diberi pendedahan mengenai pembangunan dan rekabentuk proses lestari, operasi proses lestari, pengurusan pencemaran berintegrasi, peraturan dan komitmen antarabangsa, serta pembangunan lestari.	<i>This course will introduce the students to general issues in environmental pollution, properties and fate of environmental contaminants, transport and transformation of contaminants and industrial activities and the environment. Moreover, the students also will be exposed to the sustainable process development and design, sustainable process operations, integrated pollution management, regulations and international commitments as well as the sustainable development.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% e-Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% e-Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>



PRO FORMA KURSUS
COURSE PRO FORMA

Kriteria Dalam Penilaian Sumatif
Criteria in Summative Assessment

Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019
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2019

University of Malaya Rules (Master's Degree) 2019
University of Malaya Regulations (Master's Degree)
2019

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7005DL	<i>KQD7005DL</i>
Tajuk Kursus* <i>Course Title*</i>	Penilaian Risiko Kuantitatif	<i>Quantitative Risk Assessment</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>

Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengaplikasikan teknik mengenalpasti bahaya yang sesuai (C4) 2. Menentukan kriteria risiko untuk industri proses dan kesihatan persekitaran (P4) 3. Menganggarkan risiko kepada individu dan masyarakat berdasarkan hasil daripada analisa akibat dan kebarangkalian (C6)	<i>At the end of the course, students can:</i> 1. <i>Apply suitable hazard identification techniques (C4)</i> 2. <i>Determine risk characteristics for both process industry and environmental health hazard (P4)</i> 3. <i>Estimate individual and societal risks based on outcomes from consequence and probability analysis (C6)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan memperkenalkan pelajar kepada penilaian risiko industri; Mengenalpasti sumber-sumber bahaya seperti ciri-ciri bahan mudah terbakar, meletup dan toksik, analisa pohon kegagalan ('fault tree') dan analisa pohon kejadian ('event tree'); Analisa akibat seperti kebakaran kolam ('pool fire'), kebakaran jet ('jet fire'), bebola api ('fireball') dan BLEVE dan letupan awan wap ('vapour cloud'); serta Analisa kesan yang merangkumi kesan terma, kesan peletupan dan kesan toksik. Selain itu, pelajar juga akan dapat mempelajari tentang Analisa frekuensi/Kebarangkalian seperti pengkalan data kadar kegagalan dan Peraturan kebarangkalian untuk pohon kegagalan; Anggaran Risiko yang merangkumi risiko individu dan risiko sosial; dan juga Penilaian Risiko Alam Sekitar seperti risiko sistematik kesihatan dan risiko kanser.	<i>This course will introduce student to industrial risk assessment; Identification of sources of hazard such as flammability, explosive and toxic properties of material, fault tree analysis and event tree analysis; Consequence Analysis such as pool fire, jet fire, fireball due to BLEVE and vapour cloud explosion; as well as Effect Analysis which include thermal effect, explosion effect and toxic effect. Besides, students also will be able to learn about Frequency/Probability Analysis like failure rate database and probability rules in fault tree analysis; Risk Estimation which include individual risk and societal risk; and also Environmental Risk Assessment such as systematic health risk and cancer risk.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% e-Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% e-Final Examination: 50%</i>

Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7006DL	<i>KQD7006DL</i>
Tajuk Kursus* <i>Course Title*</i>	Mengenalpasti Hazad dan Penilaian	<i>Hazard Identification and Evaluation</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>

Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisa hazard di tempat kerja dan unit pemprosesan sebagai langkah pencegahan kemalangan (C4) 2. Mencadangkan sistem pengurusan keselamatan yang baik di tempat kerja dan penunjuk aras prestasi yang baik untuk mempertingkatkan keselamatan proses (A5) 3. Menganggarkan risiko oleh letupan dan kekurangan dalam sistem pengurusan keselamatan proses (C5)	<i>At the end of the course, students can:</i> 1. <i>Analyze hazards at workplace and processing units as accident preventive measure (C4)</i> 2. <i>Propose a good safety management system at workplace and better performance indicators for a safety improvement process (A5)</i> 3. <i>Estimate risks of explosions and deficiencies in process safety management system (C5)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan memperkenalkan pelajar kepada Teknik Mengenalpasti Hazard seperti bancian hazard (Senarai semak), Analisis Keselamatan Kerja, Mengenalpasti Hazard dan Kawalan Penilaian Risiko (HIRAC), HAZOP, Analisis 'Fault Tree' serta Audit Keselamatan, Bahaya dari Tindakbalas Kimia, BLEVE, VCE, Pengendalian Selamat Bahan Kimia, Limit Mudah Terbakar bagi Wap, TLVs dan Letupan, Selain itu, pelajar juga akan dapat mempelajari mengenai Rekabentuk untuk Keselamatan, Pengurusan Proses Keselamatan, Prestasi Piawai bagi Peningkatan Proses Keselamatan, Sikap Keselamatan dan Perilaku Manusia, OSHA 1994, CIMAHA, Penganggaran kos kemalangan, Mengulas Kemalangan dan Menganalisis, dan melakukan Penyiasatan Kemalangan.	<i>This course will introduce students to the Hazard Identification Techniques such as hazard survey (Checklist), Job Safety Analysis, Hazard Identification and Risk Assessment Control (HIRAC), HAZOP, Fault Tree Analysis as well as Safety Audits, Hazards from Chemical Reaction, BLEVE, VCE, Safe Handling of Industrial Chemicals, Flammability Limits for Vapor, TLVs and Explosion. Furthermore, students also will be able to learn about Designing for Safety, Process Safety Management, Performance Standards for a Safety Improvement Process, Safety Attitudes and Human Behaviour, OSHA 1994, CIMAHA, Accident Cost Estimation, Accidents Review and Analysis and Accident Investigation Study.</i>

Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% e-Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50%</i> <i>e-Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Akademi/Fakulti/Institut/Pusat <i>Academy/Faculty/Institute/Centre</i>	Fakulti Kejuruteraan	<i>Faculty of Engineering</i>
Jabatan <i>Department</i>	Pejabat Timbalan Dekan (Ijazah Tinggi)	<i>Deputy Dean (Postgraduates) Office</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQX7001DL	<i>KQX7001DL</i>
Tajuk Kursus* <i>Course Title*</i>	Metodologi Penyelidikan	<i>Research Methodology</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus*	Di akhir kursus ini, pelajar dapat:	<i>At the end of the course, students are able to:</i>

<i>Course Learning Outcomes*</i>	1. Menentukan masalah penyelidikan yang bersesuaian dengan bidang kejuruteraan (C4) 2. Merekabentuk kaedah kajian untuk menyelesaikan masalah kajian (C6) 3. Menilai secara kritikal kebolehlaksanaan dan kepraktisan kaedah kajian untuk menyelesaikan masalah kajian (A3) 4. Menyelaraskan maklumat penyelidikan yang relevan ke dalam laporan teknikal yang komprehensif (A4)	1. <i>Determine research problem or issues related to the respective engineering field (C4)</i> 2. <i>Design appropriate research methodology to solve the research problem (C6)</i> 3. <i>Evaluate critically the feasibility and practicality of relevant methods and tools to solve the research problem (A3)</i> 4. <i>Coordinate relevant research information into comprehensive technical report (A4)</i>
<i>Sinopsis Kandungan Kursus Synopsis of Course Contents</i>	Kursus ini mendedahkan pelajar kepada teknik – teknik bagaimana untuk menjalankan kajian. Di awal kursus pelajar di ajar dengan pelbagai teknik kajian termasuk, kaedah kajian saintifik. Kemudian, etika kajian, reka bentuk eksperimen dan teknik statistik di terangkan kepada pelajar di ikuti dengan mengenal pasti masalah kajian dan penulisan cadangan. Pelajar akan menguasai kemahiran kajian, penulisan saintifik, komunikasi lisan bagi dapatan kajian.	<i>This course exposes students to the techniques of how to conduct research. At the beginning of the course students are taught with various research techniques including, scientific research methods. Then, research ethics, experimental design and statistical techniques are explained to students followed by identifying research problems and writing suggestions. Students will master research skills, scientific writing, and oral communication for research findings.</i>
<i>Pemberatan Penilaian* Assessment Weightage*</i>	Penilaian Berterusan: 100% Peperiksaan Akhir: -	<i>Continuous Assessment: 100% Final Examination: -</i>
<i>Kaedah Maklum Balas Tentang Prestasi Methodologies for Feedback on Performance</i>	Dimaklumkan melalui talian.	<i>Results will be notified through online</i>
<i>Kriteria Dalam Penilaian Sumatif Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>



PRO FORMA KURSUS COURSE PRO FORMA

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Jabatan <i>Department</i>	Pejabat Timbalan Dekan (Ijazah Tinggi)	<i>Deputy Dean (Postgraduates) Office</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQX7002DL	<i>KQX7002DL</i>
Tajuk Kursus* <i>Course Title*</i>	Pengurusan Projek	<i>Project Management</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>

Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisa prinsip komponen dan konsep pengurusan projek (A4) 2. Membenarkan pelbagai pemacu perubahan yang boleh menjejaskan projek selama kitaran hidupnya (A3) 3. Menyelesaikan segala cabaran semasa projek secara efektif (A5) 4. Mengaplikasikan kemahiran keusahawanan dan kepimpinan dalam pengurusan sesuatu projek (C3)	<i>At the end of the course, students are able to:</i> 1. <i>Analyze the principle components and concepts of project management (A4)</i> 2. <i>Justify the various drivers of change which may impact a project during its life cycle (A3)</i> 3. <i>Solve every challenges faced during the project (A5)</i> 4. <i>Apply entrepreneurial and leadership skills in a project management (C3)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memberikan pengenalan yang sistematik dan menyeluruh untuk semua aspek pengurusan projek. Projek adalah aspek yang semakin penting dalam perniagaan kejuruteraan moden. Oleh itu, kursus ini mengutarakan pentingnya memahami hubungan antara projek dan matlamat strategik organisasi. Kursus ini juga membincangkan kemahiran teknikal, budaya, dan interpersonal yang diperlukan untuk menguruskan projek dengan jayanya dari awal hingga akhir. Ia menekankan bahawa pengurusan projek adalah disiplin profesional yang merangkumi pengetahuan dan kemahirannya yang tersendiri. Konsep diperkukuhkan dengan menggunakan kajian kes yang merangkumi pelbagai jenis projek dan industri.	<i>This course provides a systematic and thorough introduction to all aspects of project management. Projects are an increasingly important aspect of modern engineering business. Therefore, the course underlines the importance of understanding the relation between projects and the strategic goals of the organisation. The course also discusses the technical, cultural, and interpersonal skills necessary to successfully manage projects from start to finish. It emphasises that project management is a professional discipline with its own tools, body of knowledge, and skills. Concepts are reinforced by case studies covering a wide variety of project types and industries.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 100% Peperiksaan Akhir:	<i>Continuous Assessment: 100%</i> <i>Final Examination:</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Dimaklumkan melalui talian.	<i>Notified through online</i>



**UNIVERSITI
MALAYA**

**PRO FORMA KURSUS
COURSE PRO FORMA**

Kriteria Dalam Penilaian Sumatif
Criteria in Summative Assessment

Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019.
Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana)
2019.

University of Malaya Rules (Master's Degree) 2019
University of Malaya Regulations (Master's Degree)
2019

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7007DL	<i>KQD7007DL</i>
Tajuk Kursus* <i>Course Title*</i>	Penilaian dan Pemantauan Alam Sekitar	<i>Environmental Monitoring and Assessment</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>

Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti protokol terbaik pensampelan untuk tugas khusus dalam analisis persekitaran (C2) 2. Melakukan analisis kualitatif dan kuantitatif bagi sampel gas, pepejal dan cecair dengan menggunakan GC, HPLC dan ICP-AES (P2) 3. Menganalisa spectrum GC, HPLC dan ICP-AES untuk menganggarkan komposisi elemen bagi sampel cecair, gas dan pepejal (C4)	<i>At the end of the course, students can:</i> 1. <i>Identify the best sampling protocol for a specific environmental analysis task (C2)</i> 2. <i>Perform qualitative and quantitative analysis of gaseous, solids and liquid samples using GC, HPLC and ICP-AES (P2)</i> 3. <i>Analyse GC, HPLC and ICP-AES spectra for elemental composition estimation of liquid, gas and solid samples (C4)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini merangkumi beberapa topik penting berkaitan dengan penilaian dan pemantauan alam sekitar iaitu Pensampelan, peralatan pensampelan, protokol pensampelan dalam pensampelan udara (pensampelan cerombong dan pensampelan ambien), pensampelan air dan pensampelan pepejal, tanah dan lumpur. Selain itu, kursus ini memperkenalkan pelajar kepada teknik analitikal, penyediaan sampel, Teknik Kromatografik (GC teknik dan HPLC) secara teori dan aplikasi persekitaran, Teknik Spektroskopik (spektrofotometri); Teknik Spektroskopik (AA dan ICP-AES)- Teori dan Aplikasi Persekitaran; Teknik Elektroanalitikal- Teori dan Aplikasi Persekitaran; ICP-AES Makmal.	<i>This course covers few important topics for environmental monitoring and assessment such as sampling, sampling equipment, sampling protocols in air sampling (stack sampling and ambient sampling), water sampling and sampling of solids, soils and sludge. Besides, this course introduce students to analytical techniques, sample preparation; Chromatographic techniques (GC techniques)- Theory and Environmental applications; Chromatographic techniques (HPLC techniques)- Theory and Environmental applications; GC and HPLC Laboratory; Spectroscopic techniques (spectrophotometry) - Theory and Environmental applications; Spectroscopic techniques (AA and ICP-AES) - Theory and Environmental applications; Electroanalytical techniques; ICP-AES Laboratory - Theory and Environmental applications.</i>

Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% e-Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50%</i> <i>e-Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>



PRO FORMA KURSUS
COURSE PRO FORMA

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7008DL	<i>KQD7008DL</i>
Tajuk Kursus* <i>Course Title*</i>	Pengurusan dan Penilaian Kitar Hayat	<i>Life Cycle Assessment and Management</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>

Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menilai pembelajaran penilaian kitar hayat untuk analisis impak (C5) 2. Mengaplikasikan konsep dan metodologi penilaian kitar hayat (C3) 3. Menyelesaikan isu dan pengurusan alam sekitar dengan penggunaan strategi pengurusan kitar hayat (P4)	<i>At the end of the course, students can:</i> 1. Assess an LCA study for impacts analysis (C5) 2. Apply the concepts and methodologies of life cycle assessment (C3) 3. Solve environmental issues and management using life cycle management strategies (P4)
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan memperkenalkan pelajar kepada isu alam sekitar dan Pengurusan, Kitar Hayat Berdasarkan Inisiatif Persekitaran, Pengenalan terhadap siri Matlamat Piawai Penilaian Kitar Hayat dan Definisi Skop, Inventori kitar hayat, Penilaian Kesan Kitar Hayat, Interpretasi Kitar Hayat, SIMA PRO – Perisian simulasi dan LCA, Pengurusan Kitar Hayat. Selain itu, pelajar juga akan diberi pendedahan kepada Peralatan LCM, Sistem Pengurusan Alam Sekitar, Pengurusan Rangkaian Terintegrasi, Pendekatan Pengurusan Terhadap LCM, dan Persaingan bagi negara-negara yang sedang membangun.	<i>This course will introduce students to Environmental Issues and Management, Life Cycle Based Environmental Initiatives, ISO 14040 – Introduction to Life Cycle Assessment (LCA) Series of Standards Goal and Scope Definition, Life Cycle Inventory, Life Cycle Impact Assessment, Life Cycle Interpretation, SIMA PRO – LCA simulation software and LCA course Project. Besides, students also will be exposed to the Life Cycle Management (LCM), LCM Tool Box, Environmental Management Systems, Integrated Chain Management, Management Approaches Toward LCM and Challenges for Developing Countries.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% e-Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% e-Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. Discussions in class 2. Returning graded assignments and tests 3. Final grades are announced



PRO FORMA KURSUS
COURSE PRO FORMA

Kriteria Dalam Penilaian Sumatif
Criteria in Summative Assessment

Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019
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University of Malaya Regulations (Master's Degree)
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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7009DL	<i>KQD7009DL</i>
Tajuk Kursus* <i>Course Title*</i>	Kawalan Sisa Merbahaya	<i>Hazardous Waste Control</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>

Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti pengurusan sisa berbahaya yang diperlukan bagi melindungi manusia dan alam sekitar dengan mempertimbangkan ciri-ciri sisa berbahaya yang umumnya dihasilkan di pelbagai lokasi industri dan bukan-industri (C2) 2. Mengjustifikasi skim rawatan yang tepat untuk pelbagai jenis sisa berbahaya yang dihasilkan dan lokasi yang tercemar dengan sisa berbahaya (C5) 3. Menyelesaikan kajian kes berdasarkan keperluan peraturan dan teknikal yang melibatkan isu-isu umum yang berkaitan dengan pengurusan sisa berbahaya (P4)	<i>At the end of the course, students are able to:</i> 1. <i>Identify appropriate hazardous waste management practices required to protect human beings and the environment by taking into consideration the characteristics of hazardous waste commonly generated at various industrial and non-industrials premises (C2)</i> 2. <i>Justify appropriate treatment schemes for various hazardous waste types generated and sites contaminated with hazardous waste (C5)</i> 3. <i>Solve case studies based on regulatory and technical requirements involving common issues related to hazardous waste management (P4)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Dalam kursus ini, pelajar akan diberi pendedahan mengenai pengenalan dan definisi sisa berbahaya, analisis toksik pada sisa berbahaya, secara amnya pengurusan sisa, audit dan teknik pemilihan pencegahan pencemaran untuk sisa berbahaya. Selain itu, pelajar akan dapat mempelajari mengenai rawatan terma, kimia, fizikal dan biologi, rekabentuk tempat pembuangan dan operasi pelupusan sisa berbahaya, teknik 'site-remediation', peraturan sisa berjadual dan komitmen antarabangsa bagi Malaysia dan juga analisis ringkas risiko yang melibatkan sisa berbahaya.	<i>In this course, students will be exposed to the introduction and definition of hazardous waste, toxicity analysis for hazardous waste, general waste management practices, auditing and selected pollution prevention techniques for hazardous wastes. Moreover, students also will be able to learn about thermal, chemical, physical and biological treatment, landfill design and operation of hazardous waste disposal, site-remediation techniques, scheduled waste regulations and international commitments for Malaysia and also brief risk analysis involving hazardous waste.</i>

Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% e-Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50%</i> <i>e-Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>



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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7010DL	<i>KQD7010DL</i>
Tajuk Kursus* <i>Course Title*</i>	Ergonomik Industri	<i>Industrial Ergonomics</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>

Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menentukan kepentingan factor manusia & ergonomic dan keselamatan & kesihatan dalam aplikasi peralatan dan peranti di persekitaran tempat kerja (C4) 2. Menyatakan kaedah ergonomic untuk mendiagnosis kerja dan rekabentuk pekerjaan (P5) 3. Menginterpretasi amalan kerja dan rekabentuk pekerjaan dalam industri (C5)	<i>At the end of the course, students can:</i> 1. <i>Determine the important of human factors & ergonomics and safety & health in designing equipment and in work environments (C4)</i> 2. <i>Specify ergonomics methods in diagnosing job and work design (P5)</i> 3. <i>Interpret the practices in job and work design in industries (C5)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini mengandungi lapan bahagian penting terutama: keselamatan dan kesihatan industri, industri ergonomik, prinsip ergonomik dalam rekabentuk, kesan persekitaran kepada pekerja, fisiologi manusia, antropometri, rekabentuk pekerjaan dan analisis tugas	<i>This course contains eight essential parts mainly: industrial safety and health, ergonomics industries, ergonomics principal in design, effect of environment on workers, human physiology, anthropometry, works design and analysis of tasks.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% e-Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% e-Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>



PRO FORMA KURSUS
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Akademi/Fakulti/Institut/Pusat <i>Academy/Faculty/Institute/Centre</i>	Kejuruteraan	<i>Engineering</i>
Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7011DL	<i>KQD7011DL</i>
Tajuk Kursus* <i>Course Title*</i>	Pengurusan dan Kawalan Pencemaran Udara	<i>Air Pollution Management and Control</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>

Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menerangkan konsep kualiti udara dan ciri-ciri, jenis serta sumber dan kesannya terhadap kesihatan dan alam sekitar (C2) 2. Menilai serakan pencemar melalui permodelan (C5) 3. Merumuskan strategi kawalan dan pengurusan untuk pencemar zarah dan gas (P4)	<i>At the end of the course, students are able to:</i> 1. <i>Explain the concept of air quality and its characteristics, types and sources and their impact on health and environment (C2)</i> 2. <i>Evaluate the dispersion of pollutants through modelling (C5)</i> 3. <i>Formulate the control and management strategies for particulates and gaseous pollutants (P4)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan memperkenalkan pelajar kepada isu umum yang berkaitan dengan pencemaran udara, kualiti udara, dan juga jenis, sumber dan kesan pencemar udara. Selain itu, pelajar juga akan diberi pendedahan kepada isu pemanasan global, meteorologi udara dan serakan pencemar, serta pengurusan dan kawalan pencemar udara gas dan zarah udara.	<i>This course will introduce students to general issues on air pollution, air quality and also types, sources and impacts of air pollutants. Besides, students also will be exposed to the Global warming issue, air meteorology and dispersion of pollutants, as well as management and control of gaseous and particulate air pollutants.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% e-Peperiksaan Akhir: 50%	<i>Continuous Assessment:50% e-Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>



PRO FORMA KURSUS COURSE PRO FORMA

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Jabatan <i>Department</i>	Kejuruteraan Kimia	<i>Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7014DL	<i>KQD7014DL</i>
Tajuk Kursus* <i>Course Title*</i>	Faktor Kemanusiaan dan Pengurusan Tempat Kerja	<i>Human Factor and Management at Work Place</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>

Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti kepentingan faktor kemanusiaan dalam aplikasi peralatan dan persekitaran tempat kerja (C2) 2. Menganalisa rekabentuk yang berkaitan dan penting bagi persekitaran tempat kerja di industri (C4) 3. Mengamalkan kesedaran diri, tanggungjawab dan kepercayaan diri di tempat kerja (A5)	<i>At the end of the course, students are able to:</i> 1. <i>Identify the importance of human factor in the application of tools and work environment (C2)</i> 2. <i>Analyse relevant and significant human factor design for work environment in industries (C4)</i> 3. <i>Practice self-awareness, responsibility and self-belief at the workplace (A5)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini mengandungi beberapa bahagian penting terutama: mengenalpasti, aplikasi dan analisis rekabentuk untuk persekitaran tempat kerja. Kursus ini juga membincangkan pembangunan kesedaran, tanggungjawab dan kepercayaan diri, serta peranan pengurus, dalam mewujudkan organisasi berprestasi tinggi.	<i>This course contains topics which include: Identification, application and analysis the importance of ergonomics in the application and design for special population. This course also discusses the awareness building, responsibility and self-belief, as well as roles of manager, in creating a high performance organization.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan:50% e-Peperiksaan Akhir:50%	<i>Continuous Assessment:50% e-Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	1. Perbincangan di dalam kelas 2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	1. <i>Discussions in class</i> 2. <i>Returning graded assignments and tests</i> 3. <i>Final grades are announced</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>



PRO FORMA KURSUS COURSE PRO FORMA

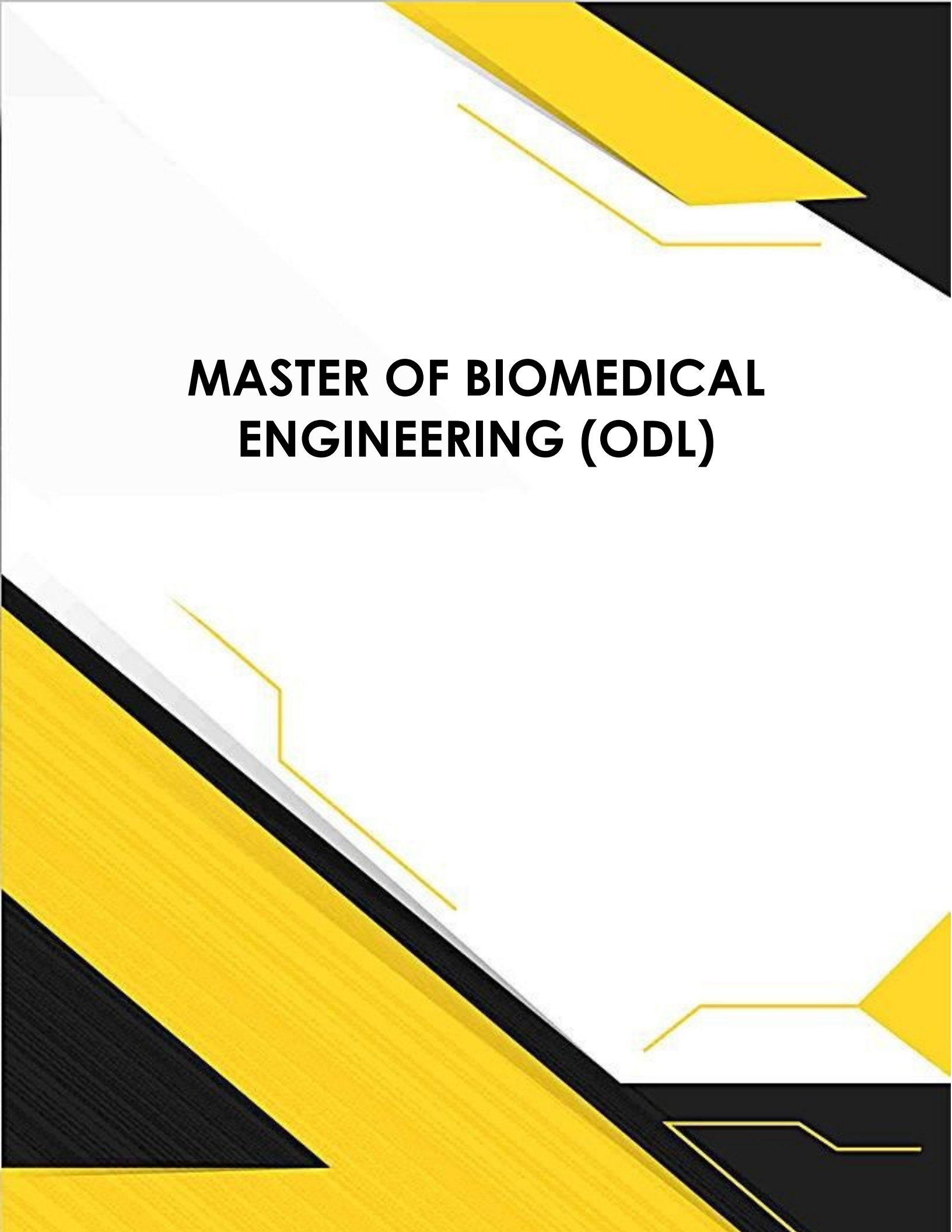
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Jabatan <i>Department</i>	Jabatan Kejuruteraan Kimia	<i>Department of Chemical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	<i>Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQD7015DL	<i>KQD7015DL</i>
Tajuk Kursus* <i>Course Title*</i>	Pengurusan Kecemasan dan Krisis Industri	<i>Industrial Emergency and Crisis Management</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>

Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Membangunkan Pelan Pengurusan Krisis (CMP) untuk industri yang spesifik (P4) 2. Menyediakan Pelan Tindakan Kecemasan (ERP) untuk scenario industri (A4) 3. Menggunakan kaedah terkini dalam pengurusan krisis (A5)	<i>At the end of the course, students are able to:</i> 1. <i>Develop appropriate Crisis Management Plan (CMP) for specific industries (P4)</i> 2. <i>Prepare an Emergency Response plan (ERP) for industrial scenarios (A4)</i> 3. <i>Use advanced tools in managing crisis (A5)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Dalam kursus ini konsep dan definisi Pengurusan Krisis dan Perancangan Kecemasan di loji-loji industri akan diterangkan. Strategi secara sistematik dan pendekatan akan diajar untuk mengenalpasti, merancang dan mengurus scenario kecemasan di loji-loji industri. Beberapa pembelajaran kes akan digunakan untuk tujuan ini. Kursus ini merangkumi penerangan ke atas kaedah-kaedah pencegahan, persediaan, tindakan dan pemulihan seandainya terdapat sebarang krisis yang timbul. Pelajar juga akan mempelajari penggunaan teknik-teknik terkini seperti GIS (Sistem Informasi Geografi) dan perisian CAMEO di dalam pengurusan krisis.	<i>In this course the concepts and definitions of Crisis Management and Emergency Planning in industrial plants will be explained. Systematic strategies and approaches will be taught to identify, plan and manage emergency scenarios in industrial plants. Several case studies will be used for this purpose. This course includes explanation of methods of prevention, preparedness, response and recovery in case of crisis. Students will also learn the application of advanced techniques such as GIS (geographical Information System) and CAMEO software in managing emergencies.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan:50% e-Peperiksaan Akhir:50%	<i>Continuous Assessment:50% e-Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>



MASTER OF BIOMEDICAL ENGINEERING (ODL)

UNIVERSITI MALAYA
MASTER OF BIOMEDICAL ENGINEERING (ODL)

Qualifications for Admission

(1) Qualifications for Admission

- (a) Bachelor Degree or equivalent with a CGPA > 3.00

OR

- (b) CGPA 2.0 to 2.99: Must fulfill the following criteria subject to the qualification categories as prescribed by the Senate:

- a.* Related working experience
- b.* At least 1 ISI publication published
- c.* Recipients of scholarships
- d.* Government agencies staff
- e.* Graduate of University Malaya
- f.* Pass Faculty interview
- g.* Pass Faculty special assessment

OR

- (c) Other qualifications approved by the Senate from time to time.

(2) Additional English Language requirement for international students:

A candidate who is not a Malaysian citizen and who possesses a degree or degrees from a university or an institution of higher education where the medium of instruction is not the English language for that degree or degrees must

- (i) obtain a score of 550 for the Test of English as a Foreign Language (TOEFL);

OR

- (ii) obtain a band of 5.5 in the International English Language Testing System (IELTS);

OR

- (iii) pass any English language test prescribed by the University

1. Programme Structure

- (1) The program has a total load of forty-two (42) credit hours consisting of:

- (a) Five (5) core courses whereby each course carries three (3) credit hours **AND**;
- (b) Research Project (12 credits) **AND**;
- (c) Three (3) elective courses whereby each course carries three (3) credit hours;
- (d) Any other course offered by the Faculty.

- (2) Details of the offered courses are according to those approved by the Senate from time to time, upon the acknowledgement by the Faculty, and is informed the candidate at the beginning of each session.
- (3) The list of courses approved by the Senate for the degree of Master of Biomedical Engineering is stated in **List 1**. The candidates shall be informed of the combination of courses which need be taken for the program before registering for the course.
- (4) Course Registration
 - (a) Course registration is done within two weeks preceding the beginning of the semester.
 - (b) A candidate must register for at least six (6) credit hours in any semester except:
 - (a) In the final semester of the candidate's course of study, where the candidate may register for fewer credit hours than that stipulated above;
 - OR**
 - (b) the candidate's appeal to withdraw from a particular course has been approved;
 - OR**
 - (c) subject to Faculty approval to allow the candidate to register for 3 credit hours only.
- (c) Registration for Research Project can only be done after the candidate has taken **Research Methodology** and the candidate must not be in under observation category.

(5) Determination of Field of Research

The field of research must be determined **before** the candidate commences the research portion of the course.

(6) Supervision

Appointment of a Supervisor may be done in parallel with the submission of Research Project Title Application.

(7) Submission of Research Project

(a) Notice of the Research Project Submission will be given to the candidate upon receiving the title and supervision approval of Research Project.

(b) A candidate must submit the Research Project **before** the end of the maximum period of candidature.

2. Duration of Study

The duration of study : two (2) semesters + one (1) special semester, to **eight (8) semesters (maximum)**.

**COURSES APPROVED BY SENATE FOR THE PROGRAMME OF MASTER OF BIOMEDICAL
ENGINEERING (ODL)**

1. CORE COURSES

Course Code	Title	Credit Hours
KQB 7001D	Research Project	12
KQB 7002D	Bioinstrumentation	3
KQB 7003D	Engineering Biomechanics and Motion Analysis	3
KQB 7004D	Healthcare Technology	3
KQB 7005D	Medical Imaging	3
KQB 7006D	Tissues Engineering	3
KQX 7001D	Research Methodology	3
KQX 7002D	Project Management	3

2. ELECTIVECOURSES

Course Code	Title	Credit Hours
KQB 7008D	Artificial Intelligence in Medicine	3
KQB 7009D	Rehabilitation Engineering	3
KQB 7010D	Telemedicine	3

**COURSE OFFERED FOR THE PROGRAMME OF
MASTER OF BIOMEDICAL ENGINEERING (ODL)**

Code	Course	Credit Hours	Duration of Examination	Distribution of Marks	
				%	%
				Continuous Assessments	Final Examination
CORE COURSES					
KQB 7001D	Research Project		12 hours	100	
KQB 7002D	Bioinstrumentation	3	2 hours	50	50
KQB 7003D	Engineering Biomechanics and Motion Analysis	3	2 hours	50	50
KQB 7004D	Healthcare Technology	3	2 hours	50	50
KQB 7005D	Medical Imaging	3	2 hours	50	50
KQB 7006D	Tissues Engineering	3	2 hours	50	50
KQX 7001D	Research Methodology	3	-	100	-
KQX 7002D	Project Management	3	2 hours	50	50
ELECTIVE COURSES					
KQB 7008D	Artificial Intelligence in Medicine	3	2 hours	50	50
KQB 7009D	Rehabilitation Engineering	3	2 hours	50	50
KQB 7010D	Telemedicine	3	2 hours	50	50

AND

- (1) Any other course approved by the Senate
- (2) Elective course offered in each semester may vary from semester to semester and subject to offer.
- (3) Elective course offered by Faculty is subject to change. Notice will be given to the candidate by the Program Coordinator or Deputy Dean (Postgraduate Studies)'s office from time

PROGRAMME GOALS AND OUTCOMES

AIM OF THE PROGRAMME

The aim of the program is to produce graduates who are knowledgeable in the field of Biomedical Engineering, providing them with high professionalism value, competitive, high ethical values as well as critical thinking skills to make decisions on issues related to field of Biomedical Engineering based on basic knowledge and expertise through the designed program structures.

PROGRAMME EDUCATIONAL OBJECTIVE (PEO)

The Programme Educational Objective (PEO) are:

1. Graduates hold a senior or decision making position in government or biomedical engineering sectors
2. Graduates engage in Research and Development activities in biomedical engineering for their career development
3. Graduates contribute actively in sustainable development of biomedical engineering and well-being of society

PROGRAMME LEARNING OUTCOMES

No.	Programme Learning Outcome(s) (PLO)	Taxonomy Category (K/P/A)*
PLO1	<i>Demonstrate continuing advanced knowledge in solving complex biomedical engineering problem.</i>	K, P
PLO2	<i>Analyze complex biomedical engineering problems critically and providesolutions through research, using advanced techniques, tools, skills or by a range of integrated approaches.</i>	K, P
PLO3	<i>Conduct standard and specialized research approaches and apply practical skills, tools or investigative techniques in formulating solutionsfor contemporary complex biomedical engineering problems.</i>	K, P
PLO4	<i>Communicate effectively as individual or in a group to peers, experts, ornon-experts ethically and professionally using appropriate methods.</i>	K, P
PLO5	<i>Demonstrate competency in using and adapt relevant digital technologies, statistical and numerical knowledge in designing solutionsfor complex biomedical engineering problems.</i>	K, P

PLO6	<i>Demonstrate significant independence, leadership, and interpersonal skills as a member or leader in project planning in complex biomedical engineering application.</i>	A, K
PLO7	<i>Identify the needs of self-advancement through continuous professional development and adapt entrepreneurial element in the context of biomedical engineering.</i>	A, K
PLO8	<i>Demonstrate adherence to ethical and professional codes of practice in planning and execution of the technical or research project relevant to biomedical engineering.</i>	A, K

Reference notes:

The Domain of the MQF in Programme Learning Outcomes program (PO)

PO Domain

PLO1 Knowledge and Understanding

PLO2 Cognitive Skills

PLO3 Practical Skills

PLO4 Interpersonal and Communication Skills

PLO5 Digital and Numeracy Skills

PLO6 Leadership, Autonomy and Responsibility

PLO7 Personal and Entrepreneurial Skills

PLO8 Ethics and Professionalism.

Taxonomic Category

K Cognitive

A Affective

P Psychomotor

PLANNER FOR MASTER OF BIOMEDICAL ENGINEERING (ODL)

Year	Component	Semester I			Semester II			Special Sem		
		Code	Subject	Credit	Code	Subject	Credit	Code	Subject	Credit
1	Faculty Core Courses	KQX 7001DL	Research Methodology	3						
		KQX 7002DL	Project Management	3						
	Program Core Courses	KQB 7002DL	Bioinstrumentation	3	KQB 7001DL	Research Project (P)	6	KQB 7001DL	Research Project (P)	
		KQB 7003DL	Engineering Biomechanics and Motion Analysis	3	KQB 7005DL	Medical Imaging	3			
		KQB 7004DL	Healthcare Technology	3	KQB 7006DL	Tissue Engineering	3			
	Elective Courses	KQB 7008DL	Artificial Intelligence in Medicine	3	KQB 7009DL	Rehabilitation Engineering	3			
					KQB 7010DL	Telemedicine	3			
	Total Credit	18			18					

Total Overall Credit: 42

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Bioperubatan	<i>Department of Biomedical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan	<i>Master of Biomedical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQB7001DL	<i>KQB7001DL</i>
Tajuk Kursus* <i>Course Title*</i>	Projek Penyelidikan	<i>Research Project</i>
Kredit* <i>Credit*</i>	12	<i>12</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	480	<i>480</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	KQX7001DL - Metodologi Penyelidikan	<i>KQX7001DL – Research Methodology</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Membina ulasan kritikal dan kajian teori yang diperlukan untuk penyelidikan. 2. Mereka bentuk kaedah untuk menjalankan penyelidikan kejuruteraan yang kompleks 3. Menyelesaikan masalah penyelidikan melalui	<i>At the end of the course, students are able to:</i> 1. <i>Construct critical review and theoretical study required for the research.</i> 2. <i>Design a methodology to carry out complex engineering research.</i> 3. <i>Analyse research problem through</i>

	Versi Bahasa Malaysia Malay Version	Versi Bahasa Inggeris English Version
	metodologi dan alat yang bersesuaian. 4. Menilai data dan penemuan penyelidikan menggunakan alat digital yang sesuai. 5. Menunjukkan hasil projek penyelidikan kepada latar belakang khalayak yang berbeza melalui pembentangan. 6. Menggunakan kemahiran pengurusan projek yang sesuai dalam menyelesaikan projek penyelidikan. 7. Menjelaskan kesan kewangan dan ekonomi daripada hasil penyelidikan. 8. Menghubungkan hasil penyelidikan berkenaan dengan kesannya kepada masyarakat.	<i>advanced methodology and tools.</i> 4. <i>Evaluate the data and findings of the research using the appropriate digital tools.</i> 5. <i>Demonstrate the outcome of research project to different background of audience through presentation.</i> 6. <i>Apply appropriate project management skills in completing the research project.</i> 7. <i>Explain the financial and economic impacts of the research outcomes.</i> 8. <i>Relate the outcomes of the research with respect to its impacts on society.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Projek penyelidikan akan mendedahkan pelajar dalam membuat ulangkaji risalah berkaitan dengan topik kajian spesifik, merancang kaedah kajian, mengumpul data eksperimen dan menghuraikan data, menulis laporan dan membuat pembentangan.	<i>Research project will expose students to carry out literature review on a specific research topic, plan a research methodology, collect experimental data and Interpret data, write a dissertation and carry out a presentation</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 100% Peperiksaan Akhir: 0%	<i>Continuous Assessment: 100% Final Examination: 0%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Makluman secara dalam talian.	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Kejuruteraan Bioperubatan	<i>Biomedical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan	<i>Master of Biomedical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQB7002DL	<i>KQB7002DL</i>
Tajuk Kursus* <i>Course Title*</i>	Bioinstrumentasi	<i>Bioinstrumentation</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1) Menggunakan prinsip-prinsip kejuruteraan untuk memilih alat yang optimum untuk mengukur pembolehubah perubatan (C3). 2) Menganalisa masalah utama sistem analog dan digital instrumentasi (C4).	<i>At the end of the course, students are able to:</i> 1) <i>Use the principles of engineering to choose the optimal instrument for measuring medical variables (C3).</i> 2) <i>Analyze the problem of analog and digital instrumentation systems (C4.)</i>

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	3) Merekabentuk sebuah peralatan canggih untuk mengukur pembolehubah perubatan dan dalam penyelidikan biologi dengan mengambilkira aspek inovasi baru bagi persiapan IR4.0 (P5).	3) <i>Design an advanced instrumentation for measurement of medical variables and in biological research by considering the new innovation aspect for IR4.0 preparation (P5).</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini merangkumi prinsip-prinsip, teknologi, kaedah dan aplikasi biosensor dan bioinstrumentation. Objektifnya adalah untuk menghubungkan prinsip-prinsip kejuruteraan untuk memahami biosistem pada deria dan bioelectronics. Penguat instrumentasi dan litar jambatan akan diajar secara terperinci. Sistem biosensor berasaskan prinsip transduksi juga akan diberi perhatian yang meluas. Para pelajar akan dapat merekabentuk dan memilih komponen-komponen yang sesuai terhadap masalah pengukuran.	<i>This course covers the principles, technologies, methods and applications of biosensor and bioinstrumentation. The objective is to link engineering principles to understanding of biosystems in sensors and bioelectronics. Instrumentation amplifier and the bridge circuit will be covered in detail. The transduction principle based biosensor systems will also be discussed extensively. The students will be able to design and select the appropriate components in response to measurement problems.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan:50% Peperiksaan Akhir:50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Kejuruteraan Bioperubatan	<i>Biomedical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan	<i>Master of Biomedical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQB7003DL	<i>KQB7003DL</i>
Tajuk Kursus* <i>Course Title*</i>	Biomekanik Kejuruteraan dan Analisis Gerakan	<i>Engineering Biomechanics and Motion Analysis</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	122	<i>122</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menyelesaikan persamaan-persamaan gerakan untuk sistem jasad tegar multisekmen. (C4) 2. Menjelaskan anatomi dan fungsi otot-rangka tangan kaki dan badan. (C5) 3. Menggabung pengetahuan anatomi dan fungsi otot-rangka dengan dinamik mekanik untuk	<i>At the end of the course, students are able to:</i> 1. <i>Solve equations of motion for multisegment systems of rigid bodies. (C4)</i> 2. <i>2. Explain the musculoskeletal anatomy and function of the limbs and trunk. (C5)</i> 3. <i>Combine knowledge of the musculoskeletal anatomy and function with mechanical dynamics</i>

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	mensamagerakkan kawalan gerakan. (P4)	<i>to simulate the control of movement. (P4)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini meliputi deskripsi kuantitatif dan kuanlitif bagi tindakan otot-otot berkaitan gerakan manusia; pengenalan kepada dinamik jasad tegar dan dinamik sistem-sistem multipaut dengan menggunakan pendekatan Newtonan dan Langrangian; model otot dengan aplikasi untuk mengawal gerakan multisendi; dinamik ke hadapan dan songsang bagi sistem-sistem terpacu multisendi dan otot.	<i>The course covers quantitative and qualitative descriptions of the action of muscles in relation to human movement; introduction to rigid body dynamics and dynamics of multi-link systems using Newtonian and Lagrangian approaches; muscle models with application to control of multi-joint movement; forward and inverse dynamics of multi-joint and muscle driven systems.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan:50% Peperiksaan Akhir:50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Kejuruteraan Bioperubatan	<i>Biomedical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan	<i>Master of Biomedical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQB7004DL	<i>KQB7004DL</i>
Tajuk Kursus* <i>Course Title*</i>	Teknologi Penjagaan Kesihatan	<i>Healthcare Technology</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menentukan kepentingan pengurusan teknologi penjagaan kesihatan (C4) 2. Menyesuaikan kepentingan Teknologi Informasi dan Komunikasi dalam sektor penjagaan kesihatan.(C5) 3. Menjelaskan teknologi terkini yang digunakan dalam industri penjagaan kesihatan. (C5)	<i>At the end of the course, students are able to:</i> 1. <i>Determine the importance of Healthcare Technology.(C4)</i> 2. <i>Accommodate the prominence of Information and Communication Technology in Healthcare Sector.(C5)</i> 3. <i>Explain the current technologies used in</i>

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	4. Mengenalpasti kepentingan keselamatan, standard dan etika yang berkaitan penjagaan kesihatan. (C5)	<i>Healthcare Industry. (C5)</i> 4. <i>Identify the importance of safety, standards and ethics related to Healthcare. (C5)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini merangkumi topik yang berkaitan dengan Penjagaan KesihatanTecnologi. Kursus ini bertujuan untuk menerangkanPengetahuan mengenai teknologi semasa yang digunakan dalam sektor kesihatan Menguraikan keselamatan medis, piawaian Peranti dan isu etika untuk membimbing jurutera bioperubatan.	<i>The course covers topics related to Healthcare Technologies. The course is intended to describe knowledge of current technologies used in the health sector elaborating medical safety, Device standards and Ethicalissues to guide biomedical engineers.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan:50% Peperiksaan Akhir:50%	<i>Continuous Assessment:50%</i> <i>Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master'sDegree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Bioperubatan	<i>Department of Biomedical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan	<i>Master of Biomedical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQB7005DL	<i>KQB7005DL</i>
Tajuk Kursus* <i>Course Title*</i>	Pengimejan Perubatan	<i>Medical Imaging</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengintepretasi prinsip-prinsip kerja, reka bentuk dan aplikasi pelbagai peralatan perubatan pengimejan diagnostik dan terapeutik. (C5) 2. Menjelaskan konsep dalam perlindungan dan keselamatan sinaran. (C5)	<i>At the end of the course, students are able to:</i> 1. <i>Interpret the working principles, designs and applications of various medical diagnostic imaging and therapeutic equipment. (C5)</i> 2. <i>Explain radiation protection and safety concept. (C5)</i>

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	3. Membangun penilaian kualiti imej pada kaedah imej perubatan yang berbeza. (P4)	3. 3. <i>Develop image quality assessment on different medical image modalities (P4)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memperkenalkan prinsip-prinsip asas dan rekabentuk peralatan pengimejan perubatan diagnostik. Beberapa topik pengimejan perubatan diliputi seperti asas atom dan sifat radiasi, penghasilan x-ray dan interaksi dengan bahan, sinar gamma, radiografi projeksi, mamografi, fluros kopi, tomografi berkomputer, pengimejan resonans magnetik, sistem ultrabunyi, pengimejan perubatan nuklear, laser dan optoelektronik. Kursus ini juga mendedahkan pelajar-pelajar kepada konsep kualiti imej dan keselamatan radiasi dalam pengimejan perubatan.	<i>The course introduces the basic principles and designs of medical diagnostic imaging equipment. Topics covered include basic atomics and nature of radiation, X-ray production and interaction with matter, gamma rays, projection radiography, mammography, fluoroscopy, computed tomography, magnetic resonance imaging, ultrasound system, nuclear medicine imaging, laser and optoelectronics. The course also exposes students to the concept of image quality and radiation safety in medical imaging.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan:50% ePeperiksaan Akhir:50%	<i>Continuous Assessment:50% eFinal Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian.	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>



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Akademi/Fakulti/Institut/Pusat <i>Academy/Faculty/Institute/Centre</i>	Fakulti Kejuruteraan	<i>Faculty of Engineering</i>
Jabatan <i>Department</i>	Jabatan Kejuruteraan Bioperubatan	<i>Department of Biomedical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan	<i>Master of Biomedical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQB7006DL	<i>KQB7006DL</i>
Tajuk Kursus* <i>Course Title*</i>	Kejuruteraan Tisu	<i>Tissue Engineering</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	121	<i>121</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menerangkan prinsip-prinsip di sebalik Kejuruteraan Tisu. (C5) 2. Menilai cabaran dan penyelesaian Kejuruteraan Tisu. (C5) 3. Menghujah isu-isu pengawalseliaan dan etika yang berkaitan dengan Kejuruteraan Tisu. (C5)	<i>At the end of the course, students are able to:</i> 1. <i>Explain the principles behind Tissue Engineering (C5)</i> 2. <i>Evaluate Tissue Engineering challenges and solutions. (C5)</i> 3. <i>Justify the regulatory and ethical issues related to Tissue Engineering. (C5)</i>

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Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini merangkumi prinsip- prinsip kejuruteraan tisu bertumpu kepada kombinasi sel, perancah, komponen-komponen matriks sel luar dan stimulasi sesuai. Ia juga memberi ulasan semasa mengenai strategi dan penggunaan kejuruteraan tisu serta isu-isu etika.	<i>This course covers the principles of tissue engineering focused upon the combination of cells, scaffolds, components of extracellular matrix and appropriate stimulation. It also reviews current strategies and usage of tissue engineering as well as ethical issues.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan:50% Peperiksaan Akhir:50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Makluman secara dalam talian.	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malay Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019.</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Bioperubatan	<i>Department of Biomedical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan	<i>Master of Biomedical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQB7008DL	<i>KQB7008DL</i>
Tajuk Kursus* <i>Course Title*</i>	Kepintaran Buatan dalam Perubatan	<i>Artificial Intelligence in Medicine</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	122	122
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengintegrasikan teknik kecerdasan buatan ke arah pembangunan profesional dan keusahawanan dalam bidang perubatan. (C5) 2. Menentukan teori-teori teknik kecerdikan buatan	<i>At the end of the course, students are able to:</i> 1. <i>Integrate the artificial intelligence technique towards professional development and entrepreneurship in medicine. (C5)</i> 2. <i>Determine the theories of artificial intelligence</i>

	dalam kejuruteraan bioperubatan. (C4) 3. Mengaplikasikan teknik-teknik kecerdikan buatan kepada beberapa kegunaan dalam kejuruteraan bioperubatan. (C3)	<i>techniques. (C4)</i> 3. <i>Apply the artificial intelligence techniques in some biomedical engineering applications. (C3)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini meliputi asas-asas kefahaman tentang konsep-konsep kecerdikan buatan dan kegunaan asasnya dalam Kejuruteraan Bioperubatan.	<i>The course covers the fundamental understanding of the artificial intelligence concepts and its basic applications in biomedical engineering.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan:50% Peperiksaan Akhir:50%	<i>Continuous Assessment: 50%</i> <i>Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Makluman secara dalam talian.	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Bioperubatan	<i>Department of Biomedical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan	<i>Master of Biomedical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQB7009DL	<i>KQB7009DL</i>
Tajuk Kursus* <i>Course Title*</i>	Kejuruteraan Rehabilitasi	<i>Rehabilitation Engineering</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: - Menyelesaikan masalah rehabilitasi klinikal dan yang berkaitan dengan menggunakan instrumentasi biomekanikal termaju. (C4) - Menggunakan konsep dan teori rehabilitasi dalam menilai pergerakan manusia yang kurang upaya. (A5).	<i>At the end of the course, students are able to:</i> <i>Solve clinical rehabilitation problems and related issues by using advanced biomechanical instrumentation. (C4)</i> <i>Use the concepts and theories of rehabilitation in assessing disordered human movements.</i>

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		(A5)
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini meliputi teknik untuk gerakan manusia dan analisis beban dan gait patologi dan aktiviti-aktiviti lain. Aplikasi teknik kepada rekabentuk dan penilaian untuk implan ortopedik.	<i>The course covers techniques of human movement and load analysis in normal and pathological gait and other activities. Application of the techniques to the design and evaluation of orthopaedic implants.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Makluman secara dalam talian.	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019.</i>



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Akademi/Fakulti/Institut/Pusat <i>Academy/Faculty/Institute/Centre</i>	Fakulti Kejuruteraan	<i>Faculty of Engineering</i>
Jabatan <i>Department</i>	Jabatan Kejuruteraan Bioperubatan	<i>Department of Biomedical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan	<i>Master of Biomedical Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQB7010DL	<i>KQB7010DL</i>
Tajuk Kursus* <i>Course Title*</i>	Teleperubatan	<i>Telemedicine</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menggunakan konsep perangkaian komputer dan komunikasi serta protokol dalam teleperubatan. (C3) 2. Membangun seni bina Internet dalam aplikasi kejuruteraan bioperubatan yang relevan. (P4) 3. Menyelesaikan masalah-masalah komunikasi berkaitan	<i>At the end of the course, students are able to:</i> 1. <i>Use the concept of computer networking and communication as well as protocols in telemedicine. (C3)</i> 2. <i>Develop the architecture of Internet in relevant biomedical engineering applications. (P4)</i> 3. <i>Propose solutions to biomedical engineering-</i>

	Versi Bahasa Malaysia Malay Version	Versi Bahasa Inggeris English Version
	dengan kejuruteraan bioperubatan. (C4)	<i>related communications problems. (C4)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini meliputi teleperubatan dan pelbagai topik berkaitan perangkaan, terutamanya yang digunakan dalam bidang kejuruteraan bioperubatan. Topik termasuklah pengenalan kepada topologi perangkaan dan piawaian yang berkaitan; pengenalan kepada internet dan kegunaannya; asas-asas antaramuka komputer; dan teknologi-teknologi perangkaan komputer yang ada pada masa ini relevan kepada penyelidikan dan pembekalan perkhidmatan kejuruteraan bioperubatan.	<i>The course covers the telemedicine and various networking-related topics, particularly those applicable to biomedical engineering applications. Topics include an introduction to network topologies and related standards, introduction to the Internet and its applications, fundamentals of computer interface, and currently available computer networking technologies relevant to biomedical engineering research and service provision.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan:50% Peperiksaan Akhir:50%	<i>Continuous Assessment:50% Final Examination:50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master'sDegree) 2019 University of MalayaRegulations (Master's Degree) 2019</i>



PRO FORMA KURSUS COURSE PRO FORMA

PENTING / IMPORTANT:

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Akademi/Fakulti/Institut/Pusat <i>Academy/Faculty/Institute/Centre</i>	Fakulti Kejuruteraan	<i>Faculty of Engineering</i>
Jabatan <i>Department</i>	Pejabat Timbalan Dekan (Ijazah Tinggi)	<i>Deputy Dean (Postgraduates) Office</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan Sarjana Kejuruteraan Mekanikal Sarjana Kejuruteraan Sistem Sarjana Kejuruteraan Keselamatan, Kesihatan dan Alam Sekitar	<i>Master of Biomedical Engineering Master of Mechanical Engineering Master of Systems Engineering Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQX7001DL	<i>KQX7001DL</i>
Tajuk Kursus* <i>Course Title*</i>	Metodologi Penyelidikan	<i>Research Methodology</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat:	<i>At the end of the course, students are able to:</i>

	Versi Bahasa Malaysia Malay Version	Versi Bahasa Inggeris English Version
	1. Menentukan masalah penyelidikan yang bersesuaian dengan bidang kejuruteraan 2. Merekabentuk kaedah kajian untuk menyelesaikan masalah kajian 3. Menilai secara kritikal kebolehlaksanaan dan kepraktisan kaedah kajian untuk menyelesaikan masalah kajian. 4. Menyelaraskan maklumat penyelidikan yang relevan ke dalam laporan teknikal yang komprehensif	1. <i>Determine research problem or issues related to the respective engineering field.</i> 2. <i>Design appropriate research methodology to solve the research problem</i> 3. <i>Evaluate critically the feasibility and practicality of relevant methods and tools to solve the research problem.</i> 4. <i>Coordinate relevant research information into comprehensive technical report.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini mendedahkan pelajar kepada teknik – teknik bagaimana untuk menjalankan kajian. Di awal kursus pelajar di ajar dengan pelbagai teknik kajian termasuk, kaedah kajian saintifik. Kemudian, etika kajian, reka bentuk eksperimen dan teknik statistik di terangkan kepada pelajar di ikuti dengan mengenal pasti masalah kajian dan penulisan cadangan. Pelajar akan menguasai kemahiran kajian, penulisan saintifik, komunikasi lisan bagi dapatan kajian.	<i>This course exposes students to the techniques of how to conduct research. At the beginning of the course students are taught with various research techniques including, scientific research methods. Then, research ethics, experimental design and statistical techniques are explained to students followed by identifying research problems and writing suggestions. Students will master research skills, scientific writing, and oral communication for research findings.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 100% Peperiksaan Akhir: Tiada	<i>Continuous Assessment: 100% Final Examination: None</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Makluman secara dalam talian.	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Pejabat Timbalan Dekan (Ijazah Tinggi)	<i>Deputy Dean (Postgraduates) Office</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan Sarjana Kejuruteraan Mekanikal Sarjana Kejuruteraan Sistem Sarjana Kejuruteraan Keselamatan, Kesihatan dan Alam Sekitar	<i>Master of Biomedical Engineering Master of Mechanical Engineering Master of Systems Engineering Master of Safety, Health and Environment Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQX7002DL	<i>KQX7002DL</i>
Tajuk Kursus* <i>Course Title*</i>	Pengurusan Projek	<i>Project Management</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 5. Menganalisa prinsip komponen dan konsep	<i>At the end of the course, students are able to:</i> <i>1. Analyze the principle components and concepts</i>

	Versi Bahasa Malaysia Malay Version	Versi Bahasa Inggeris English Version
	pengurusan projek. 6. Membenarkan pelbagai pemacu perubahan yang boleh menjejaskan projek selama kitaran hidupnya. 7. Menyelesaikan segala cabaran semasa projek secara efektif. 8. Mengaplikasikan kemahiran keusahawanan dan kepimpinan dalam pengurusan sesuatu projek.	<i>of project management.</i> 2. <i>Justify the various drivers of change which may impact a project during its life cycle.</i> 3. <i>Solve every challenges faced during the project.</i> 4. <i>Apply entrepreneurial and leadership skills in a project management.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memberikan pengenalan yang sistematik dan menyeluruh untuk semua aspek pengurusan projek. Projek adalah aspek yang semakin penting dalam perniagaan kejuruteraan moden. Oleh itu, kursus ini mengutarakan pentingnya memahami hubungan antara projek dan matlamat strategik organisasi. Kursus ini juga membincangkan kemahiran teknikal, budaya, dan interpersonal yang diperlukan untuk menguruskan projek dengan jayanya dari awal hingga akhir. Ia menekankan bahawa pengurusan projek adalah disiplin profesional yang merangkumi pengetahuan dan kemahirannya yang tersendiri. Konsep diperkukuhkan dengan menggunakan kajian kes yang merangkumi pelbagai jenis projek dan industri.	<i>This course provides a systematic and thorough introduction to all aspects of project management. Projects are an increasingly important aspect of modern engineering business. Therefore, the course underlines the importance of understanding the relation between projects and the strategic goals of the organisation. The course also discusses the technical, cultural, and interpersonal skills necessary to successfully manage projects from start to finish. It emphasises that project management is a professional discipline with its own tools, body of knowledge, and skills. Concepts are reinforced by case studies covering a wide variety of project types and industries.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 100% Peperiksaan Akhir: 0%	<i>Continuous Assessment: 100%</i> <i>Final Examination: 0%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Makluman secara dalam talian.	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

MASTER OF SYSTEMS ENGINEERING

UNIVERSITI MALAYA
MASTER OF SYSTEMS ENGINEERING

1. Qualification for Admission

(1) Qualifications for Admission

- (a) Bachelor Degree or equivalent with a CGPA > 3.00

OR

- (b) CGPA 2.0 to 2.99: Must fulfill the following criteria subject to the qualification categories as prescribed by the Senate:
- (i) Related working experience
 - (ii) At least 1 ISI publication published
 - (iii) Recipients of scholarships
 - (iv) Government agencies staff
 - (v) Graduate of University Malaya
 - (vi) Pass Faculty interview
 - (vii) Pass Faculty special assessment

OR

- (c) Other qualifications approved by the Senate from time to time.

(2) Additional English Language requirement for international students:

A candidate who is not a Malaysian citizen and who possesses a degree or degrees from a university or an institution of higher education where the medium of instruction is not the English language for that degree or degrees must

- (a) obtain a score of 550 for the Test of English as a Foreign Language (TOEFL);
OR
- (b) obtain a band of 5.5 in the International English Language Testing System (IELTS);
OR
- (c) pass any English language test prescribed by the University

2. Program Structure

- (1) The program has a total load of **forty-three (42) credits** consisting of:
- (a) Five (5) core courses where each consists of three credits hours **AND**;
 - (b) Research Project (12 credits) **AND**;
 - (c) Five (5) elective courses where each consist of three (3) credits; **AND/OR**

- (d) Any other course offered by the Faculty.
- (2) Details of the offered courses are according to those approved by the Senate from time to time, upon the acknowledgement by the Faculty, and as informed to the candidate at the beginning of each session.
- (3) The list of courses approved by the Senate for the degree of Master of Systems Engineering is as stated in **List 1**. The candidates shall be informed of the combination of courses which need be taken for the program before registering for the course.
- (4) Course Registration
 - (a) Course registration is done within two weeks preceding the beginning of the semester.
 - (b) A candidate must register for **at least six (6) credits** in any semester except:
 - (i) In the final semester of the candidate's course of study, where the candidate may register for fewer credit hour than as stipulated above;
 - OR**
 - (ii) the candidate's appeal to withdraw from a particular course has been approved
 - OR**
 - (iii) Subject to Faculty approval to allow the candidate to register for 3 credit hours only.
- (5) Determination of Field of Research

The field of research must be determined before the candidate commences the research portion of the course.
- (6) Supervision

Appointment of a Supervisor may be done in parallel with the submission of Research Project Title Application.
- (7) Submission of Research Project
 - (a) Notice of the Research Project Submission will be given to the candidate upon receiving the title and supervision approval of Research Project.
 - (b) A candidate must submit the Research Project before the end of the maximum period of candidature.

LIST 1**COURSES APPROVED BY SENATE FOR THE PROGRAMME OF
MASTER OF SYSTEMS ENGINEERING****1. CORE COURSES**

Course Code	Title	Credit Hours
KQX 7001	Research Methodology	3
KQX 7002	Project Management	3
KQC 7035	Research Project	12
KQC 7015	Machine Learning	3
KQC 7016	Data Analytics	3
KQC 7017	System Analysis and Design	3

2. ELECTIVE COURSE

Course Code	Title	Credit Hours
KQC 7018	Smart Power Distribution System	3
KQC 7019	Green Energy Systems	3
KQC 7020	Power Electronics	3
KQC 7021	Electrical Energy Conversion Technologies	3
KQC 7022	Power Quality	3
KQC 7023	Digital Signal Processing	3
KQC 7024	Communication Networks	3
KQC 7025	Wireless Communication Systems	3
KQC 7026	Antenna and Propagation	3
KQC 7027	Optical Devices	3
KQC 7028	MEMS Design	3
KQC 7029	Embedded Systems	3

KQC 7030	IC Design	3
KQC 7031	Industrial Automation and Robotics	3
KQC 7032	Human Factor and Work Management	3
KQC 7033	Discrete-time Control Systems	3
KQC 7034	Electromagnetic Compatibility and Interference	3

**COURSE OFFERED FOR THE PROGRAMME OF
MASTER OF SYSTEMS ENGINEERING**

Code	Course	Credit Hours	Duration of Examination	Distribution of Marks	
				%	%
				Continuous Assessments	Final Examination
CORE COURSES					
KQX 7001	Research Methodology	3	-	100	-
KQX 7002	Project Management	3	2 hours	50	50
KQC 7035	Research Project	12	-	100	-
KQC 7015	Machine Learning	3	2 hours	50	50
KQC 7016	Data Analytics	3	2 hours	50	50
KQC 7017	System Analysis and Design	3	2 hours	50	50
ELECTIVE COURSES					
KQC 7018	Smart Power Distribution System	3	2 hours	50	50
KQC 7019	Green Energy Systems	3	2 hours	50	50
KQC 7020	Power Electronics	3	2 hours	50	50
KQC 7021	Electrical Energy Conversion Technologies	3	2 hours	50	50
KQC 7022	Power Quality	3	2 hours	50	50
KQC 7023	Digital Signal Processing	3	2 hours	50	50
KQC 7024	Communication Networks	3	2 hours	50	50
KQC 7025	Wireless Communication Systems	3	2 hours	50	50

Code	Course	Credit Hours	Duration of Examination	Distribution of Marks	
				%	%
				Continuous Assessments	Final Examination
KQC 7026	Antenna and Propagation	3	2 hours	50	50
KQC 7027	Optical Devices	3	2 hours	50	50
KQC 7028	MEMS Design	3	2 hours	50	50
KQC 7029	Embedded Systems	3	2 hours	50	50
KQC 7030	IC Design	3	2 hours	50	50
KQC 7031	Industrial Automation and Robotics	3	2 hours	50	50
KQC 7032	Human Factor and Work Management	3	2 hours	50	50
KQC 7033	Discrete-time Control Systems	3	2 hours	50	50
KQC 7034	Electromagnetic Compatibility and Interference	3	2 hours	50	50

AND

- (1) Any other course approved by the Senate
- (2) Elective course offered in each semester may vary from semester to semester and subject to offer.
- (3) Elective course offered by Faculty is subject to change. Notice will be given to the candidate by the Program Coordinator or Deputy Dean (Postgraduate Studies)'s office from time to time.

PROGRAMME GOALS AND OUTCOMES

AIM OF THE PROGRAMME

The aim of the program is to produce human capital who are knowledgeable, have high ethical values and practice a professional culture in developing the field of systems engineering through the designed program structures.

PROGRAMME EDUCATIONAL OBJECTIVE (PEO)

The programme educational objectives (PEO) are:

1. Graduates will be in senior position or as decision maker in government or private sectors in the field of systems engineering.
2. Graduates will involve in research and development activities in the field of systems engineering for their career development.
3. Graduates will actively contribute to sustainable development of the field of systems engineering and the well-being of society.

PROGRAMME LEARNING OUTCOMES

No.	<i>Programme Learning Outcome(s) (PLO)</i>	Kategori Taksonomi Taxonomy Category (K/P/A)*
PLO1	Demonstrate continuing advanced knowledge and have the capabilities to further develop and use the knowledge in new situations or disciplines in systems engineering context.	K, P
PLO2	Analyze and evaluate problems in systems engineering contexts and disciplines critically, particularly in situations with limited information, and provide solutions through the application of appropriate tools and techniques.	K, P
PLO3	Analyze information and use it to develop solutions in the field of systems engineering using advanced practical skills.	K, P
PLO4	Report effectively the finding of the learning outcomes in the field of systems engineering using oral and written medium.	K, P
PLO5	Evaluate existing and new information in systems engineering field by applying digital and numerical methods.	K, P
PLO6	Ability to participate and function as a leader or member in project management and technical project effectively in the systems engineering or multidisciplinary field.	A, K
PLO7	Identify the need for continuous professional development and entrepreneurship in the context of systems engineering.	A, K

PLO8	Plan and perform research undertakings professionally, ethically, and in a socially responsible manner.	A, K
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Reference notes:

The Domain of the MQF in Programme Learning Outcomes program (PO)

PO Domain

- PLO1** Knowledge and Understanding
- PLO2** Cognitive Skills
- PLO3** Practical Skills
- PLO4** Interpersonal and Communication Skills
- PLO5** Digital and Numeracy Skills
- PLO6** Leadership, Autonomy and Responsibility
- PLO7** Personal and Entrepreneurial Skills
- PLO8** Ethics and Professionalism.

Taxonomic Category

- K** Cognitive
- A** Affective
- P** Psychomotor

PLANNER FOR MASTER OF SYSTEMS ENGINEERING

COURSE CODE	SEMESTER 1			SEMESTER 2			SEMESTER 3**		
	COURSE CODE		CREDIT	COURSE CODE		CREDIT	COURSE CODE		CREDIT
Core Courses	Code	Subject	3	Code	Subject	3	Code	Subject	6
	KQX7001	Research Methodology		KQX7002	Project Management		KQC7035	Research Project (P)	
	KQC7015	Machine Learning		KQC7035	Research Project (P)				
	KQC7017	System Analysis and Design		KQC7016	Data Analytics				
Elective Courses	Code	Subject		Code	Subject		Code	Subject	
	KQC70XX	Elective 1		KQC70XX	Elective 4				
	KQC70XX	Elective 2		KQC70XX	Elective 5				
	KQC70XX	Elective 3							

List of Elective Courses Offered

Semester I**			Semester II**		
Code	Course	Credit	Code	Course	Credit
KQC7018	Smart Power Distribution System	3	KQC7020	Power Electronics	3
KQC7019	Green Energy Systems	3	KQC7022	Power Quality	3
KQC7021	Electrical Energy Conversion Technologies	3	KQC7023	Digital Signal Processing	3
KQC7024	Communication Networks	3	KQC7027	Optical Devices	3
KQC7025	Wireless Communication Systems	3	KQC7029	Embedded Systems	3
KQC7026	Antenna and Propagation	3	KQC7031	Industrial Automation and Robotics	3
KQC7028	MEMS Design	3	KQC7032	Human Factor and Work Management	3
KQC7030	IC Design	3	KQC7034	Electromagnetic Compatibility and Interference	3
KQC7033	Discrete-time Control Systems	3			

NOTE: **Courses will be offered if there are at least 5 requests.

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Kod Kursus* <i>Course Code*</i>	KQX7001	<i>KQX7001</i>
Tajuk Kursus* <i>Course Title*</i>	Metodologi Penyelidikan	<i>Research Methodology</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat:	<i>At the end of the course, students are able to:</i>

	1. Menentukan masalah penyelidikan yang bersesuaian dengan bidang kejuruteraan 2. Merekabentuk kaedah kajian untuk menyelesaikan masalah kajian 3. Menilai secara kritikal kebolehlaksanaan dan kepraktisan kaedah kajian untuk menyelesaikan masalah kajian. 4. Menyelaraskan maklumat penyelidikan yang relevan ke dalam laporan teknikal yang komprehensif	1. <i>Determine research problem or issues related to the respective engineering field.</i> 2. <i>Design appropriate research methodology to solve the research problem</i> 3. <i>Evaluate critically the feasibility and practicality of relevant methods and tools to solve the research problem</i> 4. <i>Coordinate relevant research information into comprehensive technical report.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini mendedahkan pelajar kepada teknik – teknik bagaimana untuk menjalankan kajian. Di awal kursus pelajar di ajar dengan pelbagai teknik kajian termasuk, kaedah kajian saintifik. Kemudian, etika kajian, reka bentuk eksperimen dan teknik statistik di terangkan kepada pelajar di ikuti dengan mengenal pasti masalah kajian dan penulisan cadangan. Pelajar akan menguasai kemahiran kajian, penulisan saintifik, komunikasi lisan bagi dapatan kajian.	<i>This course exposes students to the techniques of how to conduct research. At the beginning of the course students are taught with various research techniques including, scientific research methods. Then, research ethics, experimental design and statistical techniques are explained to students followed by identifying research problems and writing suggestions. Students will master research skills, scientific writing, and oral communication for research findings.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 100% Peperiksaan Akhir:-	<i>Continuous Assessment:100%</i> <i>Final Examination: -</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>



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Jabatan <i>Department</i>	Pejabat Timbalan Dekan (Ijazah Tinggi)	Deputy Dean (Postgraduates) Office
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan Sarjana Kejuruteraan Mekanikal Sarjana Kejuruteraan Sistem Sarjana Kejuruteraan Keselamatan, Kesihatan dan Alam Sekitar Sarjana Kejuruteraan Keselamatan Jalan Raya	Master of Biomedical Engineering Master of Mechanical Engineering Master of Systems Engineering Master of Safety, Health and Environment Engineering Master of Road Safety Engineering
Kod Kursus* <i>Course Code*</i>	KQX7002	KQX7002
Tajuk Kursus* <i>Course Title*</i>	Pengurusan Projek	Project Management
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	None
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat:	At the end of the course, students are able to:



	1. Menganalisa prinsip komponen dan konsep pengurusan projek. 2. Membenarkan pelbagai pemacu perubahan yang boleh menjejaskan projek selama kitaran hidupnya. 3. Menyelesaikan segala cabaran semasa projek secara efektif. 4. Mengaplikasikan kemahiran keusahawanan dan kepimpinan dalam pengurusan sesuatu projek.	1. <i>Analyze the principle components and concepts of project management.</i> 2. <i>Justify the various drivers of change which may impact a project during its life cycle.</i> 3. <i>Solve every challenges faced during the project.</i> 4. <i>Apply entrepreneurial and leadership skills in a project management.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memberikan pengenalan yang sistematik dan menyeluruh untuk semua aspek pengurusan projek. Projek adalah aspek yang semakin penting dalam perniagaan kejuruteraan moden. Oleh itu, kursus ini mengutarakan pentingnya memahami hubungan antara projek dan matlamat strategik organisasi. Kursus ini juga membincangkan kemahiran teknikal, budaya, dan interpersonal yang diperlukan untuk menguruskan projek dengan jayanya dari awal hingga akhir. Ia menekankan bahawa pengurusan projek adalah disiplin profesional yang merangkumi pengetahuan dan kemahirannya yang tersendiri. Konsep diperkukuhkan dengan menggunakan kajian kes yang merangkumi pelbagai jenis projek dan industri.	<i>This course provides a systematic and thorough introduction to all aspects of project management. Projects are an increasingly important aspect of modern engineering business. Therefore, the course underlines the importance of understanding the relation between projects and the strategic goals of the organisation. The course also discusses the technical, cultural, and interpersonal skills necessary to successfully manage projects from start to finish. It emphasises that project management is a professional discipline with its own tools, body of knowledge, and skills. Concepts are reinforced by case studies covering a wide variety of project types and industries.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7001	<i>KQC7001</i>
Tajuk Kursus* <i>Course Title*</i>	Projek Penyelidikan	<i>Research Project</i>
Kredit* <i>Credit*</i>	12	<i>12</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	480	<i>480</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Membina kajian literatur dan kajian teori yang diperlukan untuk penyelidikan. 2. Merekabentuk satu kaedah untuk membuat kajian eksperimen atau teori 3. Menyiasat masalah penyelidikan melalui kaedah yang ditetapkan.	<i>At the end of the course, students are able to:</i> <i>1. Construct literature review and theoretical study required for the research.</i> <i>2. Design a methodology to carry out experimental or theoretical research</i> <i>3. Investigate the research problem through a defined methodology.</i>

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	4. Membentangkan projek penyelidikan kepada khalayak dari pelbagai latar belakang. 5. Menganalisa data dan dapatan kajian dengan alat analisa eksperimen dan perisian yang sesuai. 6. Menunjukkan penggunaan kemahiran pengurusan projek yang sesuai dalam menyiapkan projek penyelidikan. 7. Menganalisa kesan ekonomi dari hasil penyelidikan. 8. Menganalisa hasil kajian berkenaan dengan kesannya terhadap sosial dan alam sekitar.	4. Present the research project to audience of various background. 5. Analyse the data and findings of the research using the appropriate experimental and software analysis tools. 6. Demonstrate the use of appropriate project management skills in completing the research project. 7. Analyse the economic impacts of the research outcomes. 8. Analyse the outcomes of the research with respect to its impacts on social and environment.
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Projek penyelidikan akan mendedahkan pelajar dalam membuat ulangkaji risalah berkaitan dengan topik kajian spesifik, merancang kaedah kajian, mengumpul data eksperimen dan menghuraikan data, menulis laporan dan membuat pembentangan.	Research project will expose students to carry out literature review on a specific research topic, plan a research methodology, collect experimental data and Interpret data, write a dissertation and carry out a presentation
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 100% Peperiksaan Akhir: 0%	Continuous Assessment: 100% Final Examination: 0%
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas dalam talian	Online feedback
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7015	<i>KQC7015</i>
Tajuk Kursus* <i>Course Title*</i>	Pembelajaran Mesin	<i>Machine Learning</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>No</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengaplikasikan pelbagai algoritma pembelajaran mesin. 2. Menyesuaikan pelbagai algoritma pembelajaran terhadap data. 3. Menilai algoritma pembelajaran dan pemilihan model.	<i>At the end of the course, students are able to:</i> 1. Apply various machine learning algorithms. 2. Adapt various learning algorithms to data. 3. Evaluate various learning algorithms and model selection.

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Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Untuk menyediakan pelajar dengan pengenalan mendalam dalam dua bidang Pembelajaran Mesin: diselia dan tidak diselia. Beberapa model dan algoritma utama seperti regresi, pengkelasan, pengelompokan dan proses keputusan Markov akan dibincangkan dan dipelajari. Topik akan termasuk regresi linear dan logistik, regularisasi, MLE, kesimpulan probabilistik (Bayesian), SVM dan kaedah kernel, ANN, pengelompokan, dan pengurangan dimensi	<i>To provide students with an in-depth introduction to two main areas of Machine Learning: supervised and unsupervised. Some of the main models and algorithms for regression, classification, clustering and Markov decision processes will be discussed and studied. Topics will include linear and logistic regression, regularisation, MLE, probabilistic (Bayesian) inference, SVMs and kernel methods, ANNs, clustering, and dimensionality reduction.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian.	<i>Online feedback.</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7016	<i>KQC7016</i>
Tajuk Kursus* <i>Course Title*</i>	Analitik Data	<i>Data Analytics</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>No</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Merekabentuk kaedah yang sesuai untuk mewakili pelbagai jenis data untuk analisis selanjutnya. 2. Mengesahkan kecekapan pelbagai teknik yang digunakan untuk klasifikasi dan pengelompokan data. 3. Melakukan analisis data yang melibatkan mekanisme untuk regresi data, peraturan persatuan, dan	<i>At the end of the course, students are able to:</i> 1. <i>Design the appropriate methods for representing different types of data for further analysis.</i> 2. <i>Validate the efficiency of various techniques used for data classification and clustering.</i> 3. <i>Perform data analysis involving mechanisms for data regression, association rules, and map-</i>

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	pengurangan peta dengan mengambil kira isu-isu etika.	<i>reduced by considering ethical issues.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini bertujuan untuk menyediakan pelajar dengan konsep asas analisis data, dengan tumpuan kepada aplikasi kejuruteraan elektrik. Antara topik yang dibincangkan dalam kursus ini adalah pelbagai teknik untuk penyediaan dan pemodelan data, membuat keputusan, klasifikasi data dan pengelompokan data. Selain itu, alat-alat yang digunakan untuk analisis data juga akan diperkenalkan dalam kursus ini, termasuk Pemrograman Python dan R, dan Hadoop.	<i>This course aims to provide the students with basic concept of data analytics, focusing on the electrical engineering applications. Among the topics that are covered in this course are various techniques for data preparation and modeling, decision-making, data classification and data clustering. Besides, tools used for data analytics is also introduced in this course, including Python and R Programming, and Hadoop.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian.	Online feedback.
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7017	<i>KQC7017</i>
Tajuk Kursus* <i>Course Title*</i>	Analisa dan Rekabentuk Sistem	<i>System Analysis and Design</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>No</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mencadangkan penyelesaian rekabentuk bagi keadaan akhir tertakrif dengan menggunakan metodologi rekabentuk kejuruteraan berstruktur. 2. Membangunkan satu penyelesaian kejuruteraan terperinci dengan menggunakan alat-alat rekabentuk	<i>At the end of the course, students are able to:</i> <i>1. Propose design solution for a defined end state using a structured engineering design methodology.</i> <i>2. Develop a detailed engineering solution using appropriate design tools for the selected design</i>

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	yang sesuai bagi penyelesaian rekabentuk terpilih. 3. Menghubungkan penyelesaian kejuruteraan yang direkabentuk dengan data/skenario kajian kes awal.	<i>solution.</i> 3. <i>Relate the designed engineering solution with initial case study data/scenario.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memperkenalkan satu set kemahiran utama yang semua penganalisis perlu tahu tidak kira pendekatan atau metodologi yang digunakan untuk membangunkan sistem yang lebih berkesan dan cekap. Semua projek sistem maklumat dilaksanakan melalui empat fasa iaitu perancangan, analisis, reka bentuk, dan pelaksanaan. Semua projek memerlukan penganalisis untuk mengumpul keperluan, memodelkan keperluan perniagaan, dan membuat pelan tindakan untuk bagaimana sistem itu perlu dibina; dan semua projek memerlukan pemahaman tentang konsep tingkah laku organisasi seperti pengurusan perubahan dan pembinaan pasukan.	<i>This course introduces a core set of skills that all analysts need to know no matter what approach or methodology is used to develop more effective and efficient systems. All information systems projects move through the four phases of planning, analysis, design, and implementation. All projects require analysts to gather requirements, model the business needs, and create blueprints for how the system should be built; and all projects require an understanding of organizational behavior concepts like change management and team building.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50%</i> <i>Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7018	<i>KQC7018</i>
Tajuk Kursus* <i>Course Title*</i>	Sistem Pengagihan Kuasa Pintar	<i>Smart Power Distribution System</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>No</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisa konsep-konsep sistem kuasa elektrik. 2. Menilai kesan-kesan persepaduan teknologi rendah karbon kepada operasi sistem pengagihan elektrik. 3. Mencadangkan penyelesaian yang sesuai untuk permasalahan perancangan sistem pengagihan elektrik.	<i>At the end of the course, students are able to:</i> 1. <i>Analyse the concepts of electrical power system</i> 2. <i>Assess the effects of low carbon technology integration to the operation of electrical distribution system.</i> 3. <i>Propose feasible solutions for electrical distribution system planning problems.</i>

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Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memperkenalkan konsep-konsep penting didalam sistem kuasa elektrik. Kursus ini juga menyediakan pengetahuan mendalam tentang penjana agihan dan teknologi rendah karbon serta kesan dan cabaran persepadaan teknologi ini kepada perancangan dan operasi rangkaian pengagihan moden. Pelajar akan mempelajari kaedah-kaedah yang bersesuaian bagi memenuhi keperluan piawaian tempatan dan antarabangsa berkenaan dengan perancangan perkembangan dan operasi sistem pengagihan di dalam menuju konsep grid pintar.	<i>This course introduces important concepts in power system. The course also provides in-depth knowledge on the distributed generation and low carbon technology as well as the impacts and challenges of its integration into modern distribution networks. Students will learn how to design appropriate solutions for distribution system planning to satisfy national and international electrical distribution standards in anticipation of future smart grid concepts.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7019	<i>KQC7019</i>
Tajuk Kursus* <i>Course Title*</i>	Sistem Tenaga Hijau	<i>Green Energy Systems</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisa sistem penukaran tenaga dan penyimpanan untuk teknologi boleh diperbaharui. 2. Menilai prestasi dan kebolehpercayaan sistem tenaga boleh diperbaharui. 3. Merekabentuk sistem tenaga boleh diperbaharui yang kecil.	<i>At the end of the course, students are able to:</i> 1. <i>Analyze energy conversion systems and storage for renewable technologies.</i> 2. <i>Evaluate the performance and the reliability of renewable energy systems.</i> 3. <i>Design a small renewable energy system.</i>

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Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Masyarakat moden bergantung kepada bekalan tenaga stabil sedia ada. Tenaga boleh diperbaharui merupakan komponen yang semakin penting kepada penghasilan tenaga baru. Kursus ini merangkumi penukaran tenaga, penggunaan dan penyimpanan tenaga boleh diperbaharui seperti angin, biojisim, solar, sel bahan api dan sistem hibrid. Konsep Termodinamik (termasuk undang-undang pertama dan kedua) akan menjadi asas untuk pemodelan sistem tenaga boleh diperbaharui. Kursus ini juga merangkumi kesan-kesan ke atas alam sekitar akibat daripada penukaran tenaga dan cara-cara tenaga boleh diperbaharui dapat mengurangkan pencemaran alam sekitar dan perubahan iklim global.	<i>Modern society relies on stable, readily available energy supplies. Renewable energy is an increasingly important component of the new energy mix. The course covers energy conversion, utilization and storage for renewable technologies such as wind, solar, hydro, Oceanic Energy and hybrid systems. Thermodynamics concepts (including the first and second law) will form the basis for modeling the renewable energy systems. The course also touches upon the environmental consequences of energy conversion and how renewable energy can reduce air pollution and global climate change.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7020	<i>KQC7020</i>
Tajuk Kursus* <i>Course Title*</i>	Elektronik Kuasa	<i>Power Electronics</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Memilih peranti kuasa untuk penukar elektronik kuasa. 2. Menilai prestasi penukar untuk aplikasi perindustrian. 3. Merekabentuk penukar kuasa yang berkaitan dengan aplikasi perindustrian mengikut piawaian.	<i>At the end of the course, students are able to:</i> 1. <i>Select power devices for power electronics converters.</i> 2. <i>Evaluate the converter performance for industrial applications.</i> 3. <i>Design power converters related to industrial applications according to standards.</i>

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Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini membentangkan aplikasi elektronik kuasa, standard EMC, DC-DC-suis mod penukar, teknik PWM, 'buck' tiga-fasa, rangsangan dan 'flyback' penukar, penukar salunan dan penyongsang bertingkat.	<i>This course presents power electronics applications, EMC standards, DC-DC switch-mode converters, PWM techniques, three-phase buck, boost and flyback converters, resonant converters and multilevel inverters.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian.	<i>Online feedback.</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7021	<i>KQC7021</i>
Tajuk Kursus* <i>Course Title*</i>	Teknologi Penukaran Tenaga Elektrik	<i>Electrical Energy Conversion Technologies</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganggarkan rekabentuk asas, parameter angkutan dan fungsi peranti penukaran/ penyimpanan tenaga. 2. Membenarkan teknik pencirian dan fabrikasi yang sesuai bagi peranti penukaran/penyimpanan tenaga.	<i>At the end of the course, students are able to:</i> 1. <i>Estimate basic design, transport parameter and function of energy conversion/storage device.</i> 2. <i>Justify suitable characterization and fabrication techniques for energy conversion/storage device.</i>

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	3. Merekabentuk peranti penukaran/ penyimpanan tenaga yang mengandungi teknologi bahan dan struktur peranti.	3. <i>Design energy conversion/storage device employing material and device structure technologies.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Pada masa kini, peranti penukaran/penyimpanan tenaga memainkan peranan yang penting dalam teknologi pengumpulan tenaga elektrik dengan mengitar semula sumber tenaga yang terbuang. Matlamat kursus ini adalah untuk menghasilkan pelajar yang mampu mencadang dan merekabentuk peranti penukaran/penyimpanan tenaga termaju dengan pengetahuan asas yang mencukupi dalam prinsip, bahan, teknik fabrikasi dan pengukuran peranti. Melalui kursus ini, pelajar akan didedahkan dengan teknologi terkini dan asas-asas peranti termoelektrik, ferroelektrik, fotovoltaiik dan bateri. Tidak terhad kepada prinsip-prinsip asas dan rekabentuk peranti, pelajar juga akan didedahkan kepada teknik fabrikasi dan pengukuran termaju.	<i>Nowadays, energy conversion/storage device plays an important role in harvesting electrical energy technology by recycling waste energy resources. The goal of this course is to prepare students to be able to propose or design an advanced energy conversion/storage device with adequate basic in knowledge of device principle, material, fabrication technique and characterization. Throughout the course, students will be exposed with current technologies and fundamentals of thermoelectric, ferroelectric and photovolatic devices, and batteries. Not limited to its principles and device designs, students will also be exposed to its advanced fabrication technique and characterization.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7022	<i>KQC7022</i>
Tajuk Kursus* <i>Course Title*</i>	Kualiti Kuasa	<i>Power Quality</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>No</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menyiasat fenomena kualiti kuasa dan kepentingannya kepada masyarakat dan industri. 2. Menilai masalah kualiti kuasa. 3. Mencadangkan teknik mengurangkan gangguan kualiti kuasa dengan mengambil kira isu-isu etika.	<i>At the end of the course, students are able to:</i> 1. <i>Investigate the power quality phenomenon and its importance to society and industry.</i> 2. <i>Evaluate power quality problems.</i> 3. <i>Propose techniques to mitigate power quality disturbances by considering ethical issues.</i>

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Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memperkenalkan pelbagai jenis isu kualiti kuasa yang berlaku di industri. Sejarah kualiti kuasa, punca-punca dan kesan kepada pengguna elektrik dan pembekal kuasa dibentangkan. Teori di sebalik kejadian kualiti kuasa diberi secara mendalam. Dalam kursus ini, penekanan adalah diberi kepada voltan lendut dan harmonik, yang mana kerap dihadapi oleh pengguna elektrik. Piawaian dan penyelesaian yang sesuai untuk menghadapi masalah kualiti kuasa akan dibentangkan. Beberapa contoh masalah kualiti kuasa di industri akan diberi sebagai kajian kes.	<i>This course introduces different type of power quality issues that occurs in industry. The history of power quality, its causes and impact to electrical consumers and power provider are presented. Theory behind power quality occurrence is given in details. In this course, emphasis is given to voltage sags and harmonic, which frequent face by electrical consumers. Standard and suitable solutions to mitigate power quality will be presented. Few examples of power quality problems in industry will also give as a study case.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian.	Online feedback.
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7023	<i>KQC7023</i>
Tajuk Kursus* <i>Course Title*</i>	Pemprosesan Isyarat Digit	<i>Digital Signal Processing</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>No</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisa isyarat dalam sistem komunikasi menggunakan teknik pemprosesan isyarat digit. 2. Menilai isyarat komunikasi untuk memenuhi keperluan tertentu. 3. Menerangkan pendekatan penyelesaian masalah	<i>At the end of the course, students are able to:</i> 1. <i>Analyse signals in communication systems using digital signal processing technique.</i> 2. <i>Assess the communication signals to meet a particular requirement.</i> 3. <i>Explain the problem solving approaches to</i>

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	untuk membuat keputusan menggunakan metodologi kejuruteraan yang baik.	<i>make decisions using sound engineering methodologies.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini membentangkan pengenalan luas kepada reka bentuk sistem pemprosesan isyarat digital dan asas kukuh dalam teori dan teknik yang boleh digunakan dalam pelbagai aplikasi kejuruteraan. Topik-topik yang diliputi adalah analog untuk proses penukaran digital, penapis digital, jelmaan Laplace, jelmaan-Z, perkakasan dan perisian untuk pemproses isyarat digital, dan aplikasi pemprosesan isyarat digital untuk memproses imej dan isyarat audio.	<i>This course presents a broad-based introduction to digital signal processing system design and a solid grounding in theory and techniques which can be applied in various engineering applications. Topics covered are analogue to digital conversion process, digital filters, Laplace transform, Z-transform, hardware and software for digital signal processors, and applications of digital signal processing to process image and audio signal.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian dan komen secara lisan semasa kuliah.	<i>Online feedback and oral comments during lectures.</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7024	<i>KQC7024</i>
Tajuk Kursus* <i>Course Title*</i>	Rangkaian Komunikasi	<i>Communication Networks</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>No</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menilai pelbagai jenis rangkaian komunikasi dan isu-isu pelaksanaannya. 2. Membandingkan ciri-ciri protokol penghalaan berkenaan dengan teknologi rangkaian komunikasi masa kini.	<i>At the end of the course, students are able to:</i> 1. <i>Evaluate various types of communication networks and their implementation issues.</i> 2. <i>Compare the characteristics of routing protocols with respect to the current communication technologies.</i> 3. <i>Propose how a specific user application should</i>

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	3. Mencadangkan bagaimana sesuatu aplikasi pengguna tertentu harus menggunakan rangkaian maju kelajuan tinggi.	<i>use advanced high speed networks.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini direkabentuk untuk menyediakan pelajaran mendalam dalam bidang rangkaian komunikasi dan teknologi berkaitan. Ia meliputi evolusi dalam teknologi rangkaian daripada rangkaian pensuisan-litar kepada rangkaian pensuisan-paket, dan bagaimana rangkaian ini menyokong berbagai jenis aplikasi seperti VPN dan MPLS. Selain itu, keselamatan rangkaian turut diperkenalkan.	<i>This course is designed to provide an in-depth study on communication networks and their supporting technologies. It covers the evolution of networking technologies from circuit switching to packet-switching networks, and how these networks are used in supporting various types of applications, such as VPN and MPLS. Besides, network security is also introduced.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara talian melalui Spectrum.	Online feedback via Spectrum.
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7025	<i>KQC7025</i>
Tajuk Kursus* <i>Course Title*</i>	Sistem Komunikasi Tanpa Wayar	<i>Wireless Communication Systems</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>No</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Membandingkan pelbagai teknologi komunikasi tanpa wayar. 2. Menerangkan operasi rangkaian tanpa wayar bergerak dan aplikasinya. 3. Menilai prestasi sistem komunikasi tanpa wayar.	<i>At the end of the course, students are able to:</i> 1. <i>Compare various wireless communication technologies.</i> 2. <i>Explain the operation of wireless mobile networks and its applications.</i> 3. <i>Evaluate the performance of wireless communication systems.</i>

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Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memberikan teknologi komunikasi tanpa wayar. Kursus ini juga mempamerkan konsep tanpa wayar setempat dan kawasan rangkaian persendirian. Selain itu, rangkaian tanpa wayar bergerak dan aplikasinya juga diterangkan.	This course provides wireless communication technology. This course also presents the concept of wireless local and personal area networks. Besides that, wireless mobile networks and applications is also presented.
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50%</i> <i>Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian.	Online feedback.
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7026	<i>KQC7026</i>
Tajuk Kursus* <i>Course Title*</i>	Antena dan Perambatan	<i>Antenna and Propagation</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>No</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir pembelajaran ini, pelajar mampu untuk : 1. Menilai parameter penting antena. 2. Membandingkan gelombang satah elektromagnetik dan hukum -hukum perambatan gelombang di antara antena pemancar dan penerima dengan menilai impak kepada persekitaran. 3. Mengesahkan pelbagai jenis antena dan konsep	<i>At the end of this course, students are able to :</i> 1. <i>Evaluate the important antenna parameters.</i> 2. <i>Compare the plane electromagnetic wave and the wave propagation law between the transmitter and receiver of the antenna by evaluating the impact to the environment.</i> 3. <i>Validate various type of antenna and the</i>

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	pengukuran antenna.	<i>concept of antenna measurement.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Pengenalan kepada prinsip asas antenna. Bermula dengan gelombang satah elektromagnetik dan hukum-hukum yang berkaitan dengan perambatan gelombang antara antenna penghantaran dan penerimaan. Parameter penting antenna seperti corak, kearahannya, dan gandaan diterangkan. Kursus ini meliputi jenis-jenis antenna seperti dwi-kutub elektrik, gelung dan tatasusun lurus dan termasuk juga konsep asas pengukuran antenna.	<i>Introduce the basic essentials of antenna. Starting with the plane electromagnetic waves and the laws that governs the propagation between the transmitting and receiving antennas, the important antennas parameters such as patterns, directivity and gain is explained. The course covers the antenna family that describes various antenna types, the electric dipoles, the loop antennas, uniform linear arrays and the basic concept of antenna measurements.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian.	Online feedback.
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7027	<i>KQC7027</i>
Tajuk Kursus* <i>Course Title*</i>	Peranti Optik	<i>Optical Devices</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>No</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: - Menentukan had yang ditetapkan oleh gentian optik dan prinsip kerja penguat and peranti optik yang lain serta had masing-masing. - Menentu ukur satu sistem komunikasi optik berdasarkan kepada anggaran kuasa, anggaran	<i>At the end of the course, students are able to:</i> <i>Determine the limits imposed by optical fibers and the working principle of optical amplifiers and other optical devices and their limitations.</i> <i>Validate a detailed engineering solution using appropriate design tools for the selected design</i>

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	pencapahan, dan prestasi BER. 3. Merekabentuk satu sistem WDM dan menganalisa prestasinya disebabkan kesan pencapahan dan tidak linear dengan mengambil kira faktor ekonomi.	<i>solution.</i> 3. <i>Design a WDM system and analyze its performance due to dispersion and nonlinear effects by considering the economical factor.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memperkenalkan asas gentian optik, pengenalan kepada komunikasi optik, pelemahan dalam sistem gentian optik, penguat optik, sumber ketidaksamaan, kesan tidak linear, senibina jaringan optik, peranti optik pasif dan aktif.	<i>This course presents the fundamental of fiber optic, introduction to optical communication, attenuation in optical fiber systems, optical amplifiers, sources of impairments, nonlinear effects, dispersion management, optical network, passive and active optical devices.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7028	<i>KQC7028</i>
Tajuk Kursus* <i>Course Title*</i>	Rekabentuk MEMS	<i>MEMS Design</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>No</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengaplikasikan prinsip asas dan hukum penskalaan dalam teknologi-teknologi berlainan yang boleh digunakan dalam rekabentuk MEMS. 2. Menyesuaikan teknologi MEMS untuk mikropenderia dan penggerak dengan penekanan terhadap	<i>At the end of the course, students are able to:</i> 1. <i>Apply basic principles and scaling laws underlying different technologies applied in MEMS design.</i> 2. <i>Adapt MEMS technology for microsensors and actuators with an emphasis on usage of smart</i>

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	penggunaan bahan dan struktur pintar. 3. Menilai peluang komersial untuk status semasa teknologi MEMS (dengan contoh kajian kes yang spesifik) dan menyediakan aplikasi berpotensi untuk masa depan.	<i>materials and structures.</i> 3. <i>Evaluate commercial opportunities for the current status of MEMS technology (with specific examples or case studies) and provide potential futuristic applications.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	MEMS adalah peranti kecil bersaiz mikro yang berkebolehan untuk menjalankan banyak tugas dan fungsi berhubung dengan isyarat elektrik, mekanik, haba, optik, bendalir dan jenis-jenis isyarat yang lain. Kursus ini akan menyediakan asas daripada disiplin-disiplin yang berkaitan dengan pemahaman dan aplikasi teknologi MEMS (Micro-Electro-Mechanical Systems). Topik rekabentuk akan merangkumi prinsip mekanik, frekuensi radio dan prinsip mikrobendalir. Kaedah fabrikasi akan merangkumi teknik mikropemesinan pukal dan permukaan yang kebanyakannya bergantung kepada pemprosesan VLSI. Kursus ini juga akan memperkenalkan proses integrasi di antara platform peranti sedia ada dan sifat bahan berkaitan dengan rekabentuk dan fabrikasi MEMS.	<i>MEMS are miniature devices in micron dimensions that are capable of performing many tasks and functions that involve electrical, mechanical, thermal, optical, fluidic, and other types of signals. This course will provide the fundamentals from many disciplines relevant to the understanding and application of Micro-Electro-Mechanical Systems (MEMS) technology. Design topics will include mechanical, RF and microfluidic principles. Fabrication methods will cover bulk and surface micromachining techniques that rely heavily on VLSI processing. Process integration with existing device platforms and materials properties related to MEMS design and fabrication will be discussed.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50%</i> <i>Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian	<i>Online feedback</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7029	<i>KQC7029</i>
Tajuk Kursus* <i>Course Title*</i>	Sistem Terbenam	<i>Embedded Systems</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>No</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Merekabentuk komponen perkakasan seperti mikropemproses, bus dan pengantaramukaan persisian untuk sistem terbenam. 2. Membangun komponen persisian peringkat rendah sistem terbenam.	<i>At the end of the course, students are able to:</i> 1. <i>Design hardware components such as microprocessor, bus and peripheral interfacing of an embedded system.</i> 2. <i>Compose the low-level software components of an embedded system.</i>

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	3. Membina projek reka bentuk sistem terbenam skala kecil.	3. <i>Construct small embedded system design project.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini menyediakan pengenalan praktikal untuk reka bentuk sistem elektronik berasaskan mikropemproses. Kuliah dan kerja projek akan mendedahkan pelajar kepada pelbagai peringkat dalam projek kejuruteraan (reka bentuk, pelaksanaan, pengujian dan dokumentasi) dan pelbagai konsep sistem terbenam.	<i>This course provides a practical introduction to the design of microprocessor-based electronic systems. The lectures and project work will expose students to the various stages in an engineering project (design, implementation, testing and documentation) and a range of embedded system concepts.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Gred/markah untuk tugas, ujian dan/atau pembentangan individu diumumkan dalam kelas dan/atau dipamerkan di papan kenyataan.	<i>Grades/marks for assignment, test and/or individual presentation announced in class and/or displayed on the notice board.</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7030	<i>KQC7030</i>
Tajuk Kursus* <i>Course Title*</i>	Rekabentuk IC	<i>IC Design</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>No</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menganalisa konsep teori litar VLSI CMOS analog. 2. Mengintegrasikan litar CMOS analog asas. 3. Menilai prestasi litar terkamil analog CMOS dengan mengadaptasikan perisian komputer canggih.	<i>At the end of the course, students are able to:</i> 1. <i>Analyze the theoretical concepts of analog CMOS VLSI circuits.</i> 2. <i>Integrate basic analog CMOS VLSI circuits.</i> 3. <i>Evaluate the performance of integrated CMOS analog circuits adapting standardized state of the</i>

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		<i>art tools</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini berperanan dalam memperkenalkan konsep pemodelan, merekabentuk dan analisis litar CMOS VLSI analog. Pelajar dilengkapi dengan teori latarbelakang litar terkamil analog yang kukuh dengan penekanan kepada rekabentuk dan analisis. Rekabentuk CMOS berasaskan cermin arus, penguat pembezaan bersepadu, kepersisan rujukan voltan/arus dan litar analog tak lurus akan dibincangkan dengan mempertimbangkan parameter praktikal, dan mengadaptasi faedah dan batasanya. Pelajar akan didedahkan dalam penggunaan perisian EDA bertahap industri untuk merekabentuk, mempertingkatkan dan simulasi litar terkamil CMOS analog.	<i>The goal of this course is to introduce the modelling, design and analysis of analog CMOS VLSI circuits. A strong theoretical background of integrated analog circuits design is imparted to the students along with the emphasis on their design and analysis. Design of CMOS based current mirrors, integrated differential amplifiers, precision voltage/current reference and nonlinear analog circuits are discussed considering practical parameters, adapting their advantages and limitations. Students will be exposed to use industry standard EDA tools to design, optimize and simulate analog CMOS integrated circuits.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Gred/markah untuk tugas, ujian dan/atau pembentangan individu diumumkan dalam kelas dan/atau dipamerkan di papan kenyataan.	<i>Grades/marks for assignment, test and/or individual presentation announced in class and/or displayed on the notice board.</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7031	<i>KQC7031</i>
Tajuk Kursus* <i>Course Title*</i>	Automasi Industri dan Robotik	<i>Industrial Automation and Robotics</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	No
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Memahami prinsip fungsi penderia dan penggerak perindustrian yang biasa. 2. Merekabentuk aturcara PLC yang dapat menafsirkan maklumat daripada penderia dan menukarkannya ke dalam penggerakkan yang sepadan. 3. Menganalisa masalah robotik yang diberikan dan	<i>At the end of the course, students are able to:</i> 1. <i>Understand the functioning principles of the common industrial sensors and actuators.</i> 2. <i>Design PLC programs that able to interpret the information from sensors and convert it into the corresponding actuation.</i> 3. <i>Analyse a given robotic problem and select</i>

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	memilih penderia/penggerak yang sesuai untuknya bagi kegunaan komersial.	<i>appropriate sensors/actuators needed for it for commercial use.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini merangkumi pelbagai topik penting dalam bidang automasi industri dan robotik termasuk penderia dan penggerak, Pengawal Logik Boleh-atur (PLC) dan prinsip robotik dan seni bina kawalannya.	<i>This course covers a wide range of important topics in industrial automation and robotics including sensors and actuators, Programmable Logic Controller (PLC) and principles of robotics and its control architecture.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara atas talian dan komen secara lisan semasa kuliah.	<i>Online feedback and oral comments during lectures.</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7032	<i>KQC7032</i>
Tajuk Kursus* <i>Course Title*</i>	Faktor Manusia dan Pengurusan Kerja	<i>Human Factor and Work Management</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	No
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Membenarkan kepentingan faktor manusia dalam aplikasi alat dan persekitaran pekerjaan. 2. Menganalisa rekabentuk faktor kemanusiaan yang berkaitan dan penting untuk persekitaran kerja dan industri.	<i>At the end of the course, students are able to:</i> 1. <i>Justify the importance of human factor in the application of tools and work environment.</i> 2. <i>Analyze relevant and significant human factor design for work environment in industries.</i> 3. <i>Design and manage a holistic organisation.</i>

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	3. Merekabentuk dan mengurus organisasi yang holistik.	
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini mengandungi beberapa bahagian penting terutama: mengenalpasti, aplikasi dan analisis rekabentuk untuk persekitaran tempat kerja. Kursus ini juga membincangkan pembangunan kesedaran, tanggungjawab dan kepercayaan diri, serta peranan pengurus, dalam mewujudkan organisasi berprestasi tinggi.	<i>This course contains topics which include: Identification, application and analysis the importance of ergonomics in the application and design for special population. This course also discusses the awareness building, responsibility and self-belief, as well as roles of manager, in creating a high performance organization.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara dalam talian melalui Spectrum.	Online feedback via Spectrum.
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7033	<i>KQC7033</i>
Tajuk Kursus* <i>Course Title*</i>	Sistem Kawalan Masa-diskret	<i>Discrete-time Control Systems</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	No
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Membina perwakilan sistem masa-diskret menggunakan persamaan perbezaan, rangkap pindah dan model ruang keadaan. 2. Menganalisa prestasi dan kestabilan bagi sistem masa-diskret. 3. Merekabentuk pengawal digit yang boleh memenuhi	<i>At the end of the course, students are able to:</i> 1. <i>Construct discrete-time systems representation using difference equations, transfer function and state space models.</i> 2. <i>Analyze discrete-time system performance and stability.</i> 3. <i>Design digital controllers that are able to meet the</i>

	Versi Bahasa Malaysia Malay Version	Versi Bahasa Inggeris English Version
	spesifikasi yang ditetapkan.	<i>defined specifications.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini berkaitan dengan teori dan reka bentuk sistem kawalan masa-diskret. Topik utama termasuk jelmaan-Z, pensampelan dan pembinaan semula data, analisa prestasi dan kestabilan sistem masa-diskret dan reka bentuk pengawal digital menggunakan teknik berasaskan sambutan frekuensi dan berasaskan ruang-keadaan.	<i>This course deals with the theory and the design of discrete-time control systems. Major topics include Z-transform, sampling and data reconstruction, performance and stability analysis of discrete-time systems and design of digital controller using frequency response based and state-space based techniques.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas secara atas talian dan komen secara lisan semasa kuliah.	<i>Online feedback and oral comments during lectures.</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

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Akademi/Fakulti/Institut/Pusat <i>Academy/Faculty/Institute/Centre</i>	Fakulti Kejuruteraan	<i>Faculty of Engineering</i>
Jabatan <i>Department</i>	Jabatan Kejuruteraan Elektrik	<i>Department of Electrical Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Sistem	<i>Master of Systems Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQC7034	<i>KQC7034</i>
Tajuk Kursus* <i>Course Title*</i>	Keserasian dan Gangguan Elektromagnet	<i>Electromagnetic Compatibility and Interference</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	No
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: - Menjalankan pengukuran pancaran dan ujian kelalian. - Menilai mekanisma gandingan gangguan, konfigurasi peralatan dan pbumian. - Merekabentuk litar analog dan digital untuk kawalan pancaran dengan mengambil kira impak kepada	<i>At the end of the course, students are able to:</i> <i>Perform emission measurements and immunity tests.</i> <i>Evaluate interference coupling mechanisms, equipment layout and grounding.</i> <i>Design analogue and digital circuit for emission</i>

	Versi Bahasa Malaysia Malay Version	Versi Bahasa Inggeris English Version
	manusia dan persekitaran.	<i>control by considering the impact to human and environment.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini bermula dengan pengenalan kepada subjek interferens dan provisi untuk direktif EMC serta kaedah dalam mencapai pematuhan. Pelbagai piawaian yang berkaitan akan dibincangkan. Ia termasuk pengenalan kepada peralatan, kaedah ujian dan beberapa punca kesalahan dan ketidakpastian dalam pengujian EMC. Ini termasuk perbincangan berkenaan teknik-teknik untuk mencapai prestasi EMC boleh terima pada tahap rekabentuk. Ia juga meliputi prinsip asas penilaian mekanisme gandingan interferen, pemilihan konfigurasi litar, ciri komponen dan perisian. Pengurusan EMC dan prinsip-prinsip kawalan juga dibincangkan.	<i>This course starts with the introduction on subject of interference and the provision of the EMC directive and the means of achieving compliance. Various standards which are relevant are discussed. It includes introduction to the equipment, the test methods and some of the causes of error and uncertainty that attend EMC testing. Discussions on techniques for achieving an acceptable EMC performance at the design stage are included. It also covers basic principles involve in coupling electromagnetic interference, as well as choice of circuit configuration, components and software feature. EMC management and control principles are also discussed.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Perbincangan dalam kelas Gred akhir akan dimaklumkan kepada pelajar	Discussion in class Final grades will be given to students
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>Please refer to the University of Malaya Rules (Master's Degree) 2019 and University of Malaya Regulations (Master's Degree) 2019</i>

MASTER OF ROAD SAFETY ENGINEERING

UNIVERSITI MALAYA
MASTER OF ROAD SAFETY ENGINEERING

1. Qualification for Admission

(a) Qualifications for Admission

- (i) Bachelor Degree or equivalent with a CGPA > 3.00

OR

- (ii) CGPA 2.0 to 2.99: Must fulfill the following criteria subject to the qualification categories as prescribed by the Senate:

- a.* Related working experience
- b.* Produce publication in the relevant field
- c.* Recipients of scholarships
- d.* Government agencies staff
- e.* Graduate of University Malaya
- f.* Pass Faculty interview
- g.* Pass Faculty special assessment

OR

- (iii) Other qualifications approved by the Senate from time to time.

(b) Additional English Language requirement for international students:

A candidate who is not a Malaysian citizen and who possesses a degree or degrees from a university or an institution of higher education where the medium of instruction is not the English language for that degree or degrees must

- (i) obtain a score of 550 for the Test of English as a Foreign Language (TOEFL);

OR

- (ii) obtain a band of 5.5 in the International English Language Testing System (IELTS);

OR

- (iii) pass any English language test prescribed by the University

2. Program Structure

- (1) The program has a total load of forty-two (42) credit hours consisting of:

- (a) Seven (7) core courses whereby each course carries three (3) credit hours **AND**;

- (b) Research Project (12) credit **AND**;

- (c) Three (3) elective courses whereby each course carries three (3) credit hours; **AND/OR**
 - (d) Any other course offered by the Faculty (Bahasa Malaysia).
- (2) Details of the offered courses are according to those approved by the Senate from time to time, upon the acknowledgement by the Faculty, and is informed the candidate at the beginning of each session.
- (3) The list of courses approved by the Senate for the degree of Master Engineering is stated in List 1. The candidates shall be informed of the combination of courses that need to be taken for the program before registering for the course.
- (4) Course Registration
 - (a) Course registration is done within the week preceding of the beginning semester.
 - (b) There are two mode of study offered in this program, which is Full-Time Mode and Part-Time Mode.
 - (c) In the Full-Time Mode, a candidate must register for at least fourteen credit (14) hours in any semester except:
 - (i) In the final semester of the candidate's course of study, where the candidate may register for fewer credit hours than that stipulated above;

OR

 - (ii) the candidate's appeal to withdraw from a particular course has been approved;

OR

- (iii) Subject to Faculty approval to allow the candidate to register for 3 credit hours only.
- (d) In the Part-Time Mode, a candidate must register for not more than fourteen credit (14) hours in any semester except:
- (e) Registration for Research Project can only be done after the candidate has taken Research Methodology and the candidate must not under observation category.

(5) Determination of Field of Research

The field of research must be determined **before** the candidate commences the research portion of the course.

(6) Supervision

Appointment of a Supervisor may be done in parallel with the submission of Research Project Title Application.

(7) Submission of Research Project

- (a) Notice of the Research Project Submission will be given to the candidate upon receiving the title and supervision approval of Research Project.
- (b) A candidate must submit the Research Project **before** the end of the maximum period of candidature.

LIST 1**COURSES APPROVED BY SENATE FOR THE PROGRAMME OF MASTER OF ROAD SAFETY ENGINEERING****1. CORE COURSES**

Course Code	Title	Credit Hours
KQL 7001	Traffic Engineering and Safety	3
KQL 7002	Road Safety Management	3
KQL 7003	Data Analytic Applications in Road Safety	3
KQL 7004	Road Safety Audit and Traffic Risk Analysis	3
KQL 7005	Traffic Crash Analysis	3
KQL 7006	Research Project	12
KQX 7001	Research Methodology	3
KQX 7002	Project Management	3

2. ELECTIVE COURSE

Course Code	Title	Credit Hours
KQL 7007	Human Behaviour in Traffic Safety	3
KQL 7008	Intelligent Transport System in Road Safety	3
KQL 7009	Sustainable Transport System	3
KQL 7010	Traffic Modelling, Simulation and Safety	3
KQL 7011	Urban Transport Planning and Safety	3
KQL 7012	Vehicle Safety System	3

**COURSE OFFERED FOR THE PROGRAMME OF
MASTER OF OF MASTER OF ROAD SAFETY ENGINEERING ENGINEERING**

Code	Course	Credit Hours	Duration of Examination	Distribution of Marks	
				%	%
				Continuous Assessments	Final Examination
CORE COURSES					
KQL 7001	Traffic Engineering and Safety	3	2 hours	50	50
KQL 7002	Road Safety Management	3	2 hours	50	50
KQL 7003	Data Analytic Applications in Road Safety	3	2 hours	50	50
KQL 7004	Road Safety Audit and Traffic Risk Analysis	3	2 hours	50	50
KQL 7005	Traffic Crash Analysis	3	2 hours	50	50
KQL 7013	Research Project	12	-	100	-
KQX 7001	Research Methodology	3	-	100	-
KQX 7002	Project Management	3	2 hours	50	50
ELECTIVE COURSES					
KQL 7007	Human Behaviour in Traffic Safety	3	2 hours	50	50
KQL 7008	Intelligent Transport System in Road Safety	3	2 hours	50	50
KQL 7009	Sustainable Transport System	3	2 hours	50	50
KQL 7010	Traffic Modelling, Simulation and Safety	3	2 hours	50	50
KQL 7011	Urban Transport Planning and Safety	3	2 hours	50	50
KQL 7012	Vehicle Safety System	3	2 hours	50	50

AND

- (1) Any other course approved by the Senate
- (2) Elective course offered in each semester may vary from semester to semester and subject to offer.
- (3) Elective course offered by Faculty is subject to change. Notice will be given to the candidate by the Program Coordinator or Deputy Dean (Postgraduate Studies)'s office from time to time.

PROGRAMME GOALS AND OUTCOMES

AIM OF THE PROGRAMME

The aim of the program is to produce graduates who are knowledgeable in the field of Road Safety Engineering, providing them with high professionalism value, competitive, high ethical values as well as critical thinking skills to make decisions on issues related to field of Road Safety Engineering based on basic knowledge and expertise through the designed program structures.

PROGRAMME EDUCATIONAL OBJECTIVE (PEO)

The programme educational objectives (PEO) are:

1. Graduates practice professional leadership in the field of road safety.
2. Graduates engage in Research and Development activities in road safety for their career development.
3. Graduates contribute actively in sustainable development of road safety, and well-being of society

PROGRAMME LEARNING OUTCOMES

No.	<i>Programme Learning Outcome(s) (PLO)</i>	<i>Taxonomy Category (K/P/A)*</i>
PLO1	Demonstrate continuing advanced knowledge and able to further develop the knowledge in solving complex road safety problems.	K
PLO2	Analyze complex road safety problems or issues critically and provide solutions through the application of specialized concepts and / or methods.	K
PLO3	Apply and design appropriate solutions to road safety problems using appropriate research methods, tools and approaches.	K, P
PLO4	Communicate ideas and rationales using appropriate methods as individuals or groups, experts or non-experts ethically, critically and professionally.	K, A
PLO5	Demonstrate competency by combining digital technology as well as appropriate software and statistics in resolving complex road safety issues and problems.	K, P
PLO6	Demonstrates high leadership, responsible and interpersonal skills in planning and management of road safety project.	A
PLO7	Identify the need for continuous and sustainable professional development and entrepreneurial elements in the context of road safety.	A
PLO8	Demonstrate adherence to ethical and professional codes of practice in planning and execution of the technical or research project relevant to road safety.	A

Reference notes:

The Domain of the MQF in Programme Learning Outcomes program (PLO)

PLO Domain

- PLO1** Knowledge and Understanding
- PLO2** Cognitive Skills
- PLO3** Practical Skills
- PLO4** Interpersonal and Communication Skills
- PLO5** Digital and Numeracy Skills
- PLO6** Leadership, Autonomy and Responsibility
- PLO7** Personal and Entrepreneurial Skills
- PLO8** Ethics and Professionalism.

Taxonomic Category

- K** Cognitive
- A** Affective
- P** Psychomotor

PLANNER FOR MASTER OF ROAD SAFETY ENGINEERING (FULL-TIME MODE)

COURSE CODE	SEMESTER 1			SEMESTER 2			SEMESTER 3**		
	COURSE CODE		CREDIT	COURSE CODE		CREDIT	COURSE CODE		CREDIT
Core Courses	Code	Subject	3	Code	Subject	3	Code	Subject	6
	KQX7001	Research Methodology		KQL7002	Road Safety Management		KQK7013	Research Project * (P)	
	KQX7002	Project Management		KQL7003	Data Analytic Applications in Road Safety				
	KQL7001	Traffic Engineering and Safety		KQL7004	Road Safety Audit and Traffic Risk Analysis				
	KQL7005	Traffic Crash Analysis		KQL7013	Research project (P)				
Elective Courses	Code	Subject	3	Code	Subject	3	Code	Subject	
	KQL70xx	Elective 1		KQL70xx	Elective 3				
	KQL70xx	Elective 2							

NOTE:

*Registration for Research Project can only be done after the candidate has completed **Research Methodology** and the candidate must not be under observation category.

PLANNER FOR MASTER OF ROAD SAFETY ENGINEERING (PART-TIME MODE)

Year 1

COURSE CODE	SEMESTER 1			SEMESTER 2		
	COURSE CODE		CREDIT	COURSE CODE		CREDIT
Core Courses	Code	Subject		Code	Subject	
	KQX7001	Research Methodology	3	KQL7002	Road Safety Management	3
	KQX7002	Project Management	3	KQL7003	Data Analytic Applications in Road Safety	3
	KQL7001	Traffic Engineering and Safety	3	KQL7004	Road Safety Audit and Traffic Risk Analysis	3

Year 2

COURSE CODE	SEMESTER 1			SEMESTER 2			SEMESTER 3		
	COURSE CODE		CREDIT	COURSE CODE		CREDIT	COURSE CODE		CREDIT
Core Courses	Code	Subject		Code	Subject		Code	Subject	
	KQL7005	Traffic Crash Analysis	3	KQL7013	Research project* (P)	6	KQL7013	Research Project * (P)	6
Elective Courses	Code	Subject		Code	Subject		Code	Subject	
	KQL70xx	Elective 1	3	KQL70xx	Elective 3	3			
	KQL70xx	Elective 2	3						

NOTE:

*Registration for Research Project can only be done after the candidate has completed **Research Methodology** and the candidate must not be under observation category.

List of Elective Courses:

KQL7007 Human Behaviour in Road Safety

KQL7008 Intelligent Transport System in Road Safety

KQL7009 Sustainable Transport System

KQL7010 Traffic Modelling, Simulation and Safety

KQL7011 Urban Transport Planning and Safety

KQL7012 Vehicle Safety System

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Awam	<i>Department of Civil Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQL7001	<i>KQL7001</i>
Tajuk Kursus* <i>Course Title*</i>	Kejuruteraan Trafik dan Keselamatan	<i>Traffic Engineering and Safety</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	-	-
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti komponen infrastruktur utama dan petunjuk prestasi dalam keselamatan trafik. 2. Menggunakan metodologi dan teknik yang berbeza pada komponen infrastruktur keselamatan trafik yang berbeza.	<i>At the end of the course, students are able to:</i> 1. <i>Identify the main infrastructure components and performance indicators in traffic safety.</i> 2. <i>Apply distinct methodologies and techniques to the different traffic safety infrastructure components.</i>

	3. Menganalisis penyelesaian keselamatan dengan mempertimbangkan prestasi. 4. Merekabentuk penyelesaian yang cekap dan selamat dalam aspek kejuruteraan.	3. <i>Analyze safety solutions by considering performance.</i> 4. <i>Design efficient and safe solutions in the engineering aspect.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan mendedahkan pelajar dengan masalah keselamatan yang berkaitan dengan reka bentuk infrastruktur dan kejuruteraan trafik. Selain itu, pelbagai komponen dan aspek keselamatan dalam kajian kejuruteraan trafik juga terkandung dalam kursus ini.	<i>This course will expose students with safety issues relating the traffic infrastructures design and traffic engineering. Besides, various safety component and aspects in traffic engineering study also covered in this course.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Awam	<i>Department of Civil Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQL7002	<i>KQL7002</i>
Tajuk Kursus* <i>Course Title*</i>	Pengurusan Keselamatan Jalan Raya	<i>Road Safety Management</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	-	-
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Memahami saiz dan trend bagi masalah keselamatan jalan raya dalam masyarakat yang berbeza. 2. Membedah faktor-faktor kemalangan, pendedahan, risiko kemalangan, serta kesannya terhadap angka kemalangan dan tahap kecederaan.	<i>At the end of the course, students are able to:</i> 1. <i>Comprehend the size and the trend of the road safety problem in different societies.</i> 2. <i>Dissect the accident factors, exposure, accident risks, and their influence to the accident numbers and the injury severity.</i>

	3. Menilai prestasi cara penyelesaian yang berbeza dalam meningkatkan keselamatan jalan raya.	3. <i>Evaluate the performance of different countermeasures that enhance road safety.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan mendedahkan pelajar dengan masalah keselamatan yang berkaitan dengan pengurusan lalu lintas. Kajian mengenai pelbagai polisi keselamatan lalu lintas, penyebab kemalangan dan keutamaan lain yang berkaitan dengan pengurusan lalu lintas, tindakan pencegahan 3E - Pendidikan, Kejuruteraan & Penguatkuasaan, dan rancangan tindakan akan dirangkumi dalam kursus ini.	<i>This course will expose students with safety issues relating to the traffic management. Study on various traffic safety policies, accident causes and other priorities that related to traffic management, countermeasures 3E – Education, Engineering & Enforcement, and action plan will be covered in this course.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Awam	<i>Department of Civil Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQL7003	<i>KQL7003</i>
Tajuk Kursus* <i>Course Title*</i>	Aplikasi Data Analitikal di dalam Keselamatan Jalan Raya	<i>Data Analytic Applications in Road Safety</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	-	<i>-</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menerangkan asas-asas untuk teknik statistik. 2. Menunjukkan teknik yang mencukupi dalam analisis pengolahan data dengan menggunakan pelbagai kaedah statistik dan strategi.	<i>At the end of the course, students are able to:</i> 1. <i>Explain the fundamentals of statistical techniques.</i> 2. <i>Demonstrate adequate technique in data treatment analysis using various statistical methods and strategies.</i>

	3. Menganalisis data daripada masalah-masalah atau isu-isu berkaitan keselamatan jalan raya. 4. Menilai keputusan-keputusan yang diperoleh daripada analisis dengan masalah-masalah atau isu-isu sebenar berkaitan keselamatan jalan raya	3. <i>Analyse the data from the problems or issues related to road safety.</i> 4. <i>Evaluate the results obtained from the analysis with the real problems or issues on road safety.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini menyediakan dan memperkenalkan pelajar mengenai bagaimana menganalisis data dari bidang keselamatan lalu lintas dan menukar maklumat menjadi pengetahuan berguna. Pengetahuan ini akan membantu pelajar untuk memahami makna di sebalik penemuan dengan menerapkan pendekatan empirikal yang sesuai yang membolehkan mereka membuat keputusan yang lebih baik dalam masalah yang berkaitan. Dalam kursus ini, pelbagai analisis data yang menggunakan alat statistik canggih akan dibincangkan, misalnya, analisis deskriptif, inferensi dan ramalan.	<i>This course prepares and introduces students on how to analyze data from traffic safety area and convert the information to useful knowledge. This knowledge will help the students to understand the meaning behind the findings by applying appropriate empirical approaches which enable them to make better decisions in the related issues. In this course, a wide range of data analytic techniques which are using advanced statistical tools will be discussed, for instance, descriptive, inferential and predictive analytics.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50%</i> <i>Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Awam	<i>Department of Civil Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQL7004	<i>KQL7004</i>
Tajuk Kursus* <i>Course Title*</i>	Audit Keselamatan Jalan Raya dan Analisis Risiko Trafik	<i>Road Safety Audit and Traffic Risk Analysis</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	-	<i>-</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Memahami peranan dan tanggungjawab kumpulan audit serta senarai semak Audit Keselamatan Jalan bagi setiap peringkat pengauditan. (C2) 2. Menilai laporan Audit Keselamatan Jalan Raya dan Laporan Penilaian Risiko Trafik menggunakan	<i>At the end of the course, students are able to:</i> 1. <i>Understand audit team roles and responsibility, and Safety Audit checklists for each stage of the audit. (C2)</i> 2. <i>Evaluate a Road Safety Audit and Traffic Risk Assessment report using knowledge in road geometric specific traffic risk assessment methods. (C5)</i>

	pengetahuan dalam spesifikasi geometri jalan raya dan kaedah penilaian risiko trafik. (C5) 3. Menganalisa contoh-contoh praktikal dalam kajian kes berkenaan isu keselamatan jalan dalam konteks Audit Keselamatan Jalan dan Penilaian Risiko Traffik dalam satu kumpulan. (C4)	3. <i>Analyse practical examples of road safety issues in a case study in the context of road safety audit and traffic risk assessment in a team. (C4)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Prinsip-prinsip dan penggunaan praktikal audit keselamatan jalan raya peringkat 1-5 dan analisis risiko trafik.	<i>Principles and practical application of Road Safety Audit Stage 1-5 dan traffic risk analysis.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Awam	<i>Department of Civil Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQL7005	<i>KQL7005</i>
Tajuk Kursus* <i>Course Title*</i>	Analisis Kemalangan Trafik	<i>Traffic Crash Analysis</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	-	<i>-</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Menerangkan pembangunan-pembangunan terkini di dalam bidang analisis kemalangan trafik. 2. Menganalisis punca-punca kemalangan melalui kajian sebelum dan selepas kejadian kemalangan.	<i>At the end of the course, students are able to:</i> 1. <i>Explain the most recent developments in traffic crash analysis field</i> 2. <i>Analyze the causes of crashes through pre and post-crash studies.</i> 3. <i>Understand various methods in collecting and</i>

	3. Memahami pelbagai kaedah di dalam mengumpul dan memproses data kemalangan trafik. 4. Menerangkan strategi-strategi yang berkesan untuk memperbaiki keselamatan jalan raya berdasarkan contoh-contoh sebenar dan penyelesaian-penyelesaian praktikal	<i>processing traffic crash data analysis.</i> 4. <i>Describe the effective strategies to improve road safety based on the real-life examples and practical solutions.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini berkaitan dengan penyiasatan kemalangan lalu lintas dan menonjolkan perincian dari hasil yang dijangka berdasarkan analisis yang relevan. Dalam kursus ini, pelbagai perkembangan terkini dalam analisis kemalangan lalu lintas akan dibincangkan dan penyebab kemalangan akan dianalisis. Di samping itu, pelbagai kaedah yang berkaitan dengan pengumpulan data dan analisis data kemalangan jalan raya akan dibincangkan dengan para pelajar. Contoh situasi kemalangan nyata dan penyelesaian praktikal dalam menyusun strategi yang berkesan juga akan disertakan.	<i>This course is related to investigation on traffic accident and highlighting the details from the expected output based on relevant analysis. In this course, various recent development in traffic accident analysis will be discussed and the causes of accident will be analyzed. In addition, various methods related to data collection and traffic accident data analysis will be discussed with the students. The examples of real-life situation during accident and practical solutions in developing effective strategies will also be included.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50%</i> <i>Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Awam	<i>Department of Civil Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQL7006	<i>KQL7006</i>
Tajuk Kursus* <i>Course Title*</i>	Projek Penyelidikan	<i>Research Project</i>
Kredit* <i>Credit*</i>	12	<i>12</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	480	<i>480</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	KQX7001 - Metodologi Penyelidikan	<i>KQX7001 – Research Methodology</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Membina ulasan kritikal dan kajian teori yang diperlukan untuk penyelidikan. 2. Mereka bentuk kaedah untuk menjalankan penyelidikan keselamatan trafik yang kompleks 3. Menyelesaikan masalah penyelidikan melalui	<i>At the end of the course, students are able to:</i> 1. <i>Construct critical review and theoretical study required for the research.</i> 2. <i>Design a methodology to carry out complex traffic safety research</i> 3. <i>Analyse research problem through advanced</i>

	metodologi dan alat yang bersesuaian. 4. Menilai data dan penemuan penyelidikan menggunakan alat digital yang sesuai. 5. Menunjukkan hasil projek penyelidikan kepada latar belakang khalayak yang berbeza melalui pembentangan. 6. Menggunakan kemahiran pengurusan projek yang sesuai dalam menyelesaikan projek penyelidikan. 7. Menjelaskan kesan kewangan dan ekonomi daripada hasil penyelidikan. 8. Menghubungkan hasil penyelidikan berkenaan dengan kesannya kepada masyarakat.	<i>methodology and tools.</i> 4. <i>Evaluate the data and findings of the research using the appropriate digital tools.</i> 5. <i>Demonstrate the outcome of research project to different background of audience through presentation.</i> 6. <i>Apply appropriate project management skills in completing the research project.</i> 7. <i>Explain the financial and economic impacts of the research outcomes.</i> 8. <i>Relate the outcomes of the research with respect to its impacts on society.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Projek penyelidikan akan mendedahkan pelajar dalam membuat ulangkaji risalah berkaitan dengan topik kajian spesifik, merancang kaedah kajian, mengumpul data eksperimen dan menghuraikan data, menulis laporan dan membuat pembentangan.	<i>Research project will expose students to carry out literature review on a specific research topic, plan a research methodology, collect experimental data and Interpret data, write a dissertation and carry out a presentation</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 100% Peperiksaan Akhir: 0%	<i>Continuous Assessment:100%</i> <i>Final Examination: 0%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Awam	<i>Department of Civil Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQL7007	<i>KQL7007</i>
Tajuk Kursus* <i>Course Title*</i>	Tingkah Laku Manusia dalam Keselamatan Jalan Raya	<i>Human Behaviour in Road Safety</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	-	-
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Memahami penyesuaian tingkah laku dan sumbangan kritikal mereka terhadap faktor manusia dalam kemalangan jalan.	<i>At the end of the course, students are able to:</i> 1. <i>Comprehend the behavioural adaptations and their critical contributions to the human factors in traffic crashes.</i> 2. <i>Discover the theories and models that describe the road user behaviour, performance and errors.</i>

	2. Mengetahui teori dan model yang menggambarkan tingkah laku, prestasi dan kesilapan pengguna jalan raya. 3. Mengenalpasti peranan manusia, mesin dan persekitaran, keadaan dan keperluan pengguna jalan raya yang berbeza. 4. Menilai contoh bagi teori-teori tingkahlaku sebenar untuk memahami punca kemalangan dalam merangka strategi untuk meningkatkan keselamatan jalan raya.	3. <i>Identify the roles of man, machine and environment, the conditions and needs of different road-users.</i> 4. <i>Evaluate real-life examples of behavioural theories and models to understand the causes of crashes in developing strategies for improving road safety.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memperkenalkan kesan penyesuaian tingkah laku terhadap keselamatan pengguna jalan raya, faktor-faktor yang mempengaruhi pemandu dan pengguna jalan raya lain untuk mengubah tingkah laku mereka, pelbagai teknik yang digunakan untuk menjelaskan dan menilai kesan penyesuaian tingkah laku terhadap keselamatan pengguna jalan raya.	<i>This course introduces the impacts of behavioural adaption on road user safety, factors that affect drivers and other road users to alter their behaviour, different techniques to explain and evaluate impacts of behavioural adaption on road user safety.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>



PRO FORMA KURSUS COURSE PRO FORMA

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Awam	<i>Department of Civil Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQL7008	<i>KQL7008</i>
Tajuk Kursus* <i>Course Title*</i>	Sistem Pengangkutan Pintar dalam Keselamatan Jalan Raya	<i>Intelligent Transport System in Road Safety</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Mengaitkan elemen sistem pengangkutan pintar dan keselamatan jalan raya melalui teknologi termaju. 2. Mengkaji kesan-kesan keselamatan jalan raya melalui pemilihan pengguna rangkaian	<i>At the end of the course, students are able to:</i> 1. <i>Relate the elements of intelligent transportation systems and road safety through advanced technologies.</i>

	pengangkutan multimodal dengan menggunakan kajian-kajian kes sebenar. 3. Simulasi scenario realistik dalam rangkaian pengangkutan untuk kecekapan pengangkutan di masa hadapan.	2. <i>Examine the effects of road safety through the selection of multimodal transport networks users using real case studies.</i> 3. <i>Simulate realistic scenarios in the transport networks for future efficiency of transportation.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memperkenalkan kepada elemen asas sistem pengangkutan pintar (ITS), yang memfokuskan pada aspek teknologi dan keselamatan lalu lintas. Topiknya merangkumi kaedah dan model untuk simulasi rangkaian pengangkutan multimodal, menunjukkan ramalan pemboleh ubah keadaan dan tingkah laku pengguna yang terlibat dalam proses pilihan jalan dalam rangkaian multimodal; keselamatan lalu lintas di rangkaian bandar; penggunaan sistem teknologi canggih dan simulasi masa nyata.	<i>This course introduces to the basic elements of intelligent transportation systems (ITS), focusing on technological aspects and traffic safety. The topics include the methods and models for the simulation of multimodal transport networks, pointing out the forecasting of state variables and the behaviour of users involved in the path choice process in multimodal networks; traffic safety in urban networks; the deployment of advanced technology system and real time simulation.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50%</i> <i>Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas pelajar akan diberikan melalui perbincangan di dalam kelas dan juga melalui platform Spectrum	<i>Student's feedback will be given through class discussion and Spectrum platform</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>Please refer to the University of Malaya (Masters Degree) Rules 2019 and University of Malaya (Masters Degree) Regulations 2019.</i>

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Jabatan <i>Department</i>	Kejuruteraan Awam	<i>Civil Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQL7009	<i>KQL7009</i>
Tajuk Kursus* <i>Course Title*</i>	Sistem Pengangkutan Lestari	<i>Sustainable Transport System</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	<i>None</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Terangkan prinsip asas yang berkaitan dengan reka bentuk lestari dan kejuruteraan pengangkutan. (C2) 2. Menyelidiki isu-isu yang berkaitan dengan sektor pengangkutan termasuk ketergantungan kepada	<i>At the end of the course, students are able to:</i> 1. <i>Explain fundamental principles relating to sustainable design and transportation engineering. (C2)</i> 2. <i>Investigate underlying issues associated with the transport sector including automobile</i>



	kenderaan, penggunaan tanah dan dan tingkah laku perjalanan, pergolakan bandar, dan perubahan iklim berdasarkan data, statistik, dan pengetahuan fakta. (C4) 3. Menganalisis penyelesaian pengangkutan lestari yang diperlukan untuk mengurangkan kesan-kesan seperti pembangunan masyarakat lestari, alternatif mod dan tenaga, pembangunan berorientasikan transit, dasar dan harga, pengurusan permintaan pengangkutan, dan adaptasi dan mitigasi terhadap perubahan iklim. (C4) 4. Gunakan kaedah berkelanjutan, ukuran prestasi, prinsip reka bentuk perancangan pengangkutan, dan teknik analisis kapasiti untuk menyelesaikan masalah pengangkutan. (C3)	<i>dependence, land use and travel behavior, urban sprawl, and climate change impacts on the basis of data, statistics, and factual knowledge. (C4)</i> 3. <i>Analyze possible sustainable transportation solutions to reduce impacts such as sustainable community development, modal and energy alternatives, transit-oriented development, policy and pricing, transportation demand management, and adaptation and mitigation to climate change. (C4)</i> 4. <i>Apply sustainable methods, performance measures, transportation planning design principles, and capacity analysis techniques to solve transportation problems. (C3)</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memperkenalkan sistem kejuruteraan pengangkutan dan proses keputusan mengenai perancangan pengangkutan yang berorientasikan prinsip mobiliti lestari. Kursus ini akan meneliti keseimbangan antara meningkatkan mobiliti sambil mengurangkan kesan-kesan terhadap persekitaran, sosial, dan ekonomi. Pertama dengan memeriksa masalah yang berkaitan dengan sistem pengangkutan di abad ke-21, dan kedua dengan mencari jalan penyelesaian yang mungkin untuk perancangan masa depan. Masalah pengangkutan yang disiasat meliputi ketergantungan kepada kenderaan, penggunaan bahan bakar, penyebaran bandar, dan kesan perubahan iklim. Untuk menangani masalah ini, penyelesaian seperti pembangunan komuniti lestari, alternatif mod, pembangunan berorientasi transit, dan pengurusan permintaan pengangkutan diselidiki bersama dengan alat seperti, analisis kapasiti, ukuran prestasi, dan sistem penilaian lestari. Prinsip, kaedah, alat, dan kajian kes ini memberikan gambaran mengenai integrasi dan	<i>This course introduces the engineering of transportation systems and the decision process about transport planning oriented to sustainable mobility principles. This course will look at the balance between enhancing mobility while reducing impacts on the environment, society, and economy. First by looking at the problems associated with twenty-first-century transport system, and second by discovering possible solutions to future planning. The transport problems that are explored include automobile dependence, fuel consumption, urban sprawl, and climate change impacts. To respond to these implications, solutions such as sustainable community development, modal alternatives, transit-oriented development, and transportation demand management are investigated along with tools such as, capacity analysis, performance measures, and sustainable rating systems. These principles, methods, tools, and case studies provide insight into</i>

	kemajuan keberlanjutan ke dalam sistem pengangkutan.	<i>the integration and progression of sustainability into the transportation system.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Maklumbalas pelajar akan diberikan melalui perbincangan di dalam kelas dan juga melalui platform Spectrum	<i>Student's feedback will be given through class discussion and Spectrum platform</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Sila rujuk Kaedah-kaedah Universiti Malaya (Ijazah Sarjana) 2019 dan Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>Please refer to the University of Malaya (Masters Degree) Rules 2019 and University of Malaya (Masters Degree) Regulations 2019.</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Awam	<i>Department of Civil Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQL7010	<i>KQL7010</i>
Tajuk Kursus* <i>Course Title*</i>	Pemodelan Trafik, Simulasi dan Keselamatan	<i>Traffic Modelling, Simulation and Safety</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	-	-
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Memahami alat dan teknik asas dalam pemodelan dan simulasi trafik. 2. Menilai prestasi pelbagai kaedah reka bentuk melalui kajian kes yang berbeza.	<i>At the end of the course, students are able to:</i> 1. <i>Comprehend the fundamental tools and techniques of traffic modelling and simulation.</i> 2. <i>Evaluate the performance of various design methods through different case study.</i> 3. <i>Apply different methods in modelling and</i>

	3. Menggunakan kaedah yang berbeza dalam pemodelan dan simulasi untuk menyokong pengambilan keputusan dalam konteks keselamatan.	<i>simulation to support the decision making in the safety context.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini akan memberi pendedahan kepada pelajar dengan alat dan teknik pemodelan yang berbeza yang terdapat di pasaran seperti EMME, VISUM, VISSIM, pakej pemodelan CUBE dan lain-lain. Sistem keselamatan dan mobiliti keselamatan akan dibangunkan dengan menggunakan perisian pemodelan dan simulasi yang berbeza ini. Selain itu, pelajar juga akan didedahkan dengan pelbagai kajian kes dari dalam dan luar negara mengenai reka bentuk sistem trafik yang selamat.	<i>This course will expose students with different modelling tools and techniques available in the market such as EMME, VISUM, VISSIM, CUBE modelling package etc. The safety mobility and transport system will be develop using these different modelling and simulation software. Besides, students will also be exposed with various case study from local and abroad on the safe traffic system design.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>



PRO FORMA KURSUS COURSE PRO FORMA

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Awam	<i>Department of Civil Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQL7011	<i>KQL7011</i>
Tajuk Kursus* <i>Course Title*</i>	Perancangan Pengangkutan Bandar dan Keselamatan	<i>Urban Transport Planning and Safety</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	-	<i>-</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Memahami struktur dan dinamik bandar, serta strategi dalam mempromosikan mobiliti bandar yang mampan. 2. Menilai masalah dan fungsi jalan bandar, serta prinsip penting untuk mewujudkan trafik bandar yang lebih selamat bagi pengguna jalan raya.	<i>At the end of the course, students are able to:</i> 1. <i>Comprehend the urban structures and dynamics, and strategies in promotion of sustainable urban mobility.</i> 2. <i>Evaluate urban streets issues and functions, and vital principles for making urban traffic safer for</i>

	3. Mentafsirkan masalah yang berkaitan dengan strategi perancangan pengangkutan bandar dengan menggunakan pelbagai kaedah.	road users. 3. <i>Interpret the problems related to planning strategies for urban transport using various methods.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memperkenalkan kesan dasar perancangan bandar terhadap risiko bandar dan keselamatan jalan raya; pertimbangan jalan bandar dan fungsinya, prinsip penting dalam mewujudkan trafik bandar lebih selamat untuk pejalan kaki, penunggang basikal, dan pengguna pengangkutan awam; teknik yang berbeza untuk menerangkan dan menilai kemalangan jalan raya.	<i>This course introduces the influences of urban planning policies on susceptibility to urban and road traffic risks; urban streets concerns and their functions, essential principles for forming urban traffic safer for pedestrians, bicyclists, and public transport users; different techniques to explain and evaluate the traffic crashes.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Jabatan Kejuruteraan Awam	<i>Department of Civil Engineering</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQL7012	<i>KQL7012</i>
Tajuk Kursus* <i>Course Title*</i>	Sistem Keselamatan Kenderaan	<i>Vehicle Safety System</i>
Kredit* <i>Credit*</i>	3	<i>3</i>
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	<i>120</i>
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	-	<i>-</i>
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat: 1. Memahami pengetahuan asas dan kepakaran untuk penyelesaian masalah di bidang keselamatan trafik kenderaan. 2. Membina penyelesaian yang bersesuaian dengan menggunakan pendekatan, kaedah dan peralatan	<i>At the end of the course, students are able to:</i> 1. <i>Comprehend the fundamental knowledge and expertise for problem solving in the field of vehicle traffic safety.</i> 2. <i>Develop appropriate solutions using advanced technological approaches,</i>

	teknologi termaju bagi mengurangkan risiko kemalangan kenderaan serta kecederaan penumpang. 3. Menggunakan konsep-konsep termaju kaedah berangka yang bersesuaian dengan teknologi digital bagi penyelesaian masalah kompleks keselamatan trafik kenderaan.	<i>methods and equipment to reduce the risk of vehicle accidents and passenger injuries.</i> 3. <i>Apply advanced concepts of numerical methods that are compatible with digital technology for solving complex problems of vehicle traffic safety.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Teknologi yang dibangunkan di dalam industri automotif khususnya dalam aspek keselamatan kenderaan dan penumpang berkembang secara pesat. Kursus ini memberi tumpuan kepada teknologi canggih dalam sistem keselamatan kenderaan terutamanya dalam bidang sistem keselamatan aktif dan pasif. Sistem keselamatan bukan tradisional berdasarkan penglihatan komputer akan dilindungi. Pelajar juga akan didedahkan dengan pentingnya keselamatan pencegahan aktif dan kerumitan teknologi sistem pemandu / kenderaan / persekitaran (DVE). Kemajuan dalam prinsip sensor dan reka bentuk dan fungsi sistem keselamatan aktif semasa akan dicakupi.	<i>This course focuses on advanced technology in vehicle safety system especially in the area of active and passive safety system. Non-traditional safety system based on computer vision will be covered. Students will also be exposed to the importance of active preventive safety and the complexity of the driver/vehicle/environment (DVE) system technology. The advancement in sensor principles and the design and functions of current active safety systems will be covered.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

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Jabatan <i>Department</i>	Pejabat Timbalan Dekan (Ijazah Tinggi)	<i>Deputy Dean (Postgraduates) Office</i>
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan Sarjana Kejuruteraan Mekanikal Sarjana Kejuruteraan Sistem Sarjana Kejuruteraan Keselamatan, Kesihatan dan Alam Sekitar Sarjana Kejuruteraan Keselamatan Jalan Raya	<i>Master of Biomedical Engineering Master of Mechanical Engineering Master of Systems Engineering Master of Safety, Health and Environment Engineering Master of Road Safety Engineering</i>
Kod Kursus* <i>Course Code*</i>	KQX7001	KQX7001
Tajuk Kursus* <i>Course Title*</i>	Metodologi Penyelidikan	<i>Research Methodology</i>
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	None
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat:	<i>At the end of the course, students are able to:</i>

	1. Menentukan masalah penyelidikan yang bersesuaian dengan bidang kejuruteraan 2. Merekabentuk kaedah kajian untuk menyelesaikan masalah kajian 3. Menilai secara kritikal kebolehlaksanaan dan kepraktisan kaedah kajian untuk menyelesaikan masalah kajian. 4. Menyelaraskan maklumat penyelidikan yang relevan ke dalam laporan teknikal yang komprehensif	1. <i>Determine research problem or issues related to the respective engineering field.</i> 2. <i>Design appropriate research methodology to solve the research problem</i> 3. <i>Evaluate critically the feasibility and practicality of relevant methods and tools to solve the research problem</i> 4. <i>Coordinate relevant research information into comprehensive technical report.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini mendedahkan pelajar kepada teknik – teknik bagaimana untuk menjalankan kajian. Di awal kursus pelajar di ajar dengan pelbagai teknik kajian termasuk, kaedah kajian saintifik. Kemudian, etika kajian, reka bentuk eksperimen dan teknik statistik di terangkan kepada pelajar di ikuti dengan mengenal pasti masalah kajian dan penulisan cadangan. Pelajar akan menguasai kemahiran kajian, penulisan saintifik, komunikasi lisan bagi dapatan kajian.	<i>This course exposes students to the techniques of how to conduct research. At the beginning of the course students are taught with various research techniques including, scientific research methods. Then, research ethics, experimental design and statistical techniques are explained to students followed by identifying research problems and writing suggestions. Students will master research skills, scientific writing, and oral communication for research findings.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 100% Peperiksaan Akhir:-	<i>Continuous Assessment:100%</i> <i>Final Examination: -</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019.	<i>University of Malaya Rules (Master's Degree) 2019</i> <i>University of Malaya Regulations (Master's Degree) 2019</i>



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Jabatan <i>Department</i>	Pejabat Timbalan Dekan (Ijazah Tinggi)	Deputy Dean (Postgraduates) Office
Nama Program Akademik <i>Name of Academic Programme</i>	Sarjana Kejuruteraan Bioperubatan Sarjana Kejuruteraan Mekanikal Sarjana Kejuruteraan Sistem Sarjana Kejuruteraan Keselamatan, Kesihatan dan Alam Sekitar Sarjana Kejuruteraan Keselamatan Jalan Raya	Master of Biomedical Engineering Master of Mechanical Engineering Master of Systems Engineering Master of Safety, Health and Environment Engineering Master of Road Safety Engineering
Kod Kursus* <i>Course Code*</i>	KQX7002	KQX7002
Tajuk Kursus* <i>Course Title*</i>	Pengurusan Projek	Project Management
Kredit* <i>Credit*</i>	3	3
Masa Pembelajaran Pelajar (SLT) <i>Student Learning Time (SLT)</i>	120	120
Prasyarat/Keperluan Minimum Kursus <i>Course Pre-requisite(s)/Minimum Requirement(s)</i>	Tiada	None
Hasil Pembelajaran Kursus* <i>Course Learning Outcomes*</i>	Di akhir kursus ini, pelajar dapat:	At the end of the course, students are able to:



**PRO FORMA KURSUS
COURSE PRO FORMA**

	1. Menganalisa prinsip komponen dan konsep pengurusan projek. 2. Membenarkan pelbagai pemacu perubahan yang boleh menjejaskan projek selama kitaran hidupnya. 3. Menyelesaikan segala cabaran semasa projek secara efektif. 4. Mengaplikasikan kemahiran keusahawanan dan kepimpinan dalam pengurusan sesuatu projek.	1. <i>Analyze the principle components and concepts of project management.</i> 2. <i>Justify the various drivers of change which may impact a project during its life cycle.</i> 3. <i>Solve every challenges faced during the project.</i> 4. <i>Apply entrepreneurial and leadership skills in a project management.</i>
Sinopsis Kandungan Kursus <i>Synopsis of Course Contents</i>	Kursus ini memberikan pengenalan yang sistematik dan menyeluruh untuk semua aspek pengurusan projek. Projek adalah aspek yang semakin penting dalam perniagaan kejuruteraan moden. Oleh itu, kursus ini mengutarakan pentingnya memahami hubungan antara projek dan matlamat strategik organisasi. Kursus ini juga membincangkan kemahiran teknikal, budaya, dan interpersonal yang diperlukan untuk menguruskan projek dengan jayanya dari awal hingga akhir. Ia menekankan bahawa pengurusan projek adalah disiplin profesional yang merangkumi pengetahuan dan kemahirannya yang tersendiri. Konsep diperkukuhkan dengan menggunakan kajian kes yang merangkumi pelbagai jenis projek dan industri.	<i>This course provides a systematic and thorough introduction to all aspects of project management. Projects are an increasingly important aspect of modern engineering business. Therefore, the course underlines the importance of understanding the relation between projects and the strategic goals of the organisation. The course also discusses the technical, cultural, and interpersonal skills necessary to successfully manage projects from start to finish. It emphasises that project management is a professional discipline with its own tools, body of knowledge, and skills. Concepts are reinforced by case studies covering a wide variety of project types and industries.</i>
Pemberatan Penilaian* <i>Assessment Weightage*</i>	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	<i>Continuous Assessment: 50% Final Examination: 50%</i>
Kaedah Maklum Balas Tentang Prestasi <i>Methodologies for Feedback on Performance</i>	Ditampal di papan notis atau dimaklumkan melalui talian.	<i>Results will be notified through notice board and online</i>
Kriteria Dalam Penilaian Sumatif <i>Criteria in Summative Assessment</i>	Kaedah-Kaedah Universiti Malaya (Ijazah Sarjana) 2019 Peraturan-Peraturan Universiti Malaya (Ijazah Sarjana) 2019	<i>University of Malaya Rules (Master's Degree) 2019 University of Malaya Regulations (Master's Degree) 2019</i>

MASTER OF ENGINEERING SCIENCE

Graduate on Time (GOT) Schedule for Masters by Research Candidates

Semester	Activities	Output/Milestone	Comments
1	- Attend Research Methodology Course - Attend Bahasa Melayu course* - Attend English language course** - Familiarization with and use of EndNote, Turnitin, editing software, data analysis and research tools - Attend GOT seminar - Conduct Literature Review - Proposal Defence	- Completed Research Methodology course - Fulfilment of language requirements - Presented research proposal	
2	- Expand research proposal to drafts of chapter 1, 2 & 3 - Conduct pilot study/ planning & setting up of experiment/ start data collection - Begin data analysis - Attend at least 2 courses in Upskill Program - Prepare and present Candidature Defence - Prepare for Publication 1	- Completed outline of dissertation - Submission of Publication 1 - Completed Candidature Defence	
3	- Finalise chapters 1, 2 & 3 - Finalise data analysis - Begin chapter 4 & 5 - Attend at least 1 course in Upskill Program - Submit Application for Title Approval	- Completed chapters 1, 2 & 3 - Draft of chapters 4 & 5	
4	Attend Thesis Bootcamp	- Submission of dissertation - Outcome of Committee of Examiners	

Semester	Activities	Output/Milestone	Comments
	- Finalize and submit dissertation - Committee of Examiners meeting	meeting	

Notes:

Monitoring Panel

1. Chairman & 1 member who is an expert in the field and a supervisor. A fourth member is allowed to be appointed if necessary.
2. The same panel should follow through the proposal presentation and Candidature Defense.
3. It is strongly recommended that one member is appointed as internal examiner.
4. The main responsibilities of the panel should include the following:-
 - a) Advise the student to improve the research proposal.
 - b) Monitor the progress of the student
 - c) Improve the research plan.

* Applicable to all international candidates.

** Applicable to international candidates who are writing their dissertation in languages other than English.

UNIVERSITI MALAYA
MASTER OF ENGINEERING SCIENCE

1. Programme Type

The Master of Engineering Science by research is a programme that consists of one hundred percent (100%) research leading to the submission of a dissertation.

2. Admission Requirements

(1) Qualifications for Admission

- (a) Bachelor Degree or equivalent with a CGPA > 3.00

OR

- (b) CGPA 2.0 to 2.99: Must fulfill few criteria from the following list according to the qualification categories as prescribed by the Senate:

- (i) Related working experience
- (ii) At least 1 ISI publication published
- (iii) Recipients of scholarships
- (iv) Government agencies staff
- (v) Graduate of University Malaya
- (vi) Pass Faculty interview
- (vii) Pass Faculty special assessment

OR

- (c) Other qualifications approved by the Senate from time to time.

(2) Additional English Language requirement for international students:

A candidate who is not a Malaysian citizen and who possesses a degree or degrees from a university or an institution of higher education where the medium of instruction is not the English language for that degree or degrees must

- (a) obtain a score of 550 for the Test of English as a Foreign Language (TOEFL);

OR

- (b) obtain a band of 5.5 in the International English Language Testing System (IELTS);

OR

- (c) pass any English language test prescribed by the University

3. Duration of Study

Minimum period of candidature : 2 semesters

Maximum period of candidature : 8 semesters

4. Programme Structure

- (1) This programme shall consist of one hundred percent (100%) research work leading to the submission of a dissertation which format shall be stipulated as in Part VII, University of Malaya Regulations (Master's Degree) 2019.
- (2) Candidates are required to fulfill all prescribed requirements of the programme.

5. Determination of Research Area

The determination of research area shall be done upon candidate's admission into the programme.

LEARNING OUTCOME FOR MASTER BY RESEARCH

1. Demonstrate in-depth and frontier knowledge and understanding in the relevant field/s or practice
2. Critically and creatively apply knowledge in one or more fields to resolve complex disciplinary and practical problems
3. Conduct rigorous and independent research or investigation with minimal supervision
4. Perform research adhering to legal, ethical, professional and sustainable practices
5. Demonstrate intellectual leadership qualities and management skills
6. Communicate effectively in the field/s and interact with specialist and general audience
7. Select and use suitable digital and analytical tool techniques to research problems
8. Demonstrate commitment to lifelong learning and personal development

CANDIDATURE REQUIREMENTS MASTER OF ENGINEERING SCIENCE

1. Fulfill the minimum candidature duration of 2 semesters.
2. Fulfill the University language requirement (Bahasa Malaysia and English) not later than the second (2nd) semester of candidature.
3. Fulfill the residential requirement of 6 months.
4. Attend at least 3 credits of **Research Methodology Course not later than the second (2nd) semester** of candidature.
5. Present and Pass your research proposal at **Proposal Defence** not later than the second (2nd) semester of candidature.
6. Present and Pass your research progress at **Candidature Defence** not later than the third (3rd) semester of candidature.

The candidates must fulfill the following publication requirement before the Examination Committee (Board) meeting:

Master's Degree Candidate pursuing a programme in the field of Science must show proof of acceptance of publication for at least one (1) papers in ISI (WoS) Journals prior to a Committee of Examiners meeting.

MODULE REGISTRATION

Candidates are required to enrol in the following modules during registration period:

KQX7001 Research Methodology

Within semester 1 – 2 of candidature

KMD7002 Dissertation

Every semester of candidature until the submission of Dissertation for Examination

GLT7002 BASIC OF MALAY LANGUAGE (For International Students Only)

Any semester before submission of Dissertation for Examination. Candidates may refer to the schedule from Faculty of Languages and Linguistics (fll.um.edu.my).

COURSE CONTENT OF RESEARCH METHODOLOGY

KQX7001 Research Methodology

Learning Outcomes

At the end of the course, the student is able to:

1. Determine research problem or issues related to the respective engineering field.
2. Design appropriate research methodology to solve the research problem
3. Evaluate critically the feasibility and practicality of relevant methods and tools to solve the research problem
4. Coordinate relevant research information into comprehensive technical report

Synopsis of Course Content

This course exposes students to the techniques of how to conduct research. At the beginning of the course students are taught with various research techniques including, scientific research methods. Then, research ethics, research integrity, experimental design and statistical techniques are explained to students followed by identifying research problems and writing suggestions. Students will master research skills, scientific writing, and oral communication for research findings.

Evaluation and Weightage

Continuous Assessment : 100%

Criteria in Summative Assessment :

Please refer to the Universiti Malaya Rules (Master's Degree) 2019 and Universiti Malaya Regulations (Master's Degree) 2019

DOCTOR OF PHILOSOPHY

UNIVERSITI MALAYA
DOCTOR OF PHILOSOPHY

1. Programme Type

The Doctor of Philosophy programme is by research mode that consists of one hundred percent (100%) research leading to the submission of a dissertation.

2. Admission Requirements

(1) Qualifications for Admission

- (a) Master Degree by research mode (related to Engineering field);

OR

- (b) Master Degree or equivalent with a CGPA > 3.70 (related to Engineering field);

OR

- (c) CGPA 2.0 to 3.69: Must fulfill few criteria from the following list according to the qualification categories as prescribed by the Senate:

- (i) Related working experience
- (ii) At least 1 ISI publication published
- (iii) Recipients of scholarships
- (iv) Government agencies staff
- (v) Graduate of University Malaya
- (vi) Pass Faculty interview
- (vii) Pass Faculty special assessment

OR

- (d) Other qualifications approved by the Senate from time to time.

(2) Additional English Language requirement for international students:

A candidate who is not a Malaysian citizen and who possesses a degree or degrees from a university or an institution of higher education where the medium of instruction is not the English language for that degree or degrees must

- (a) obtain a score of 550 for the Test of English as a Foreign Language (TOEFL);

OR

- (b) obtain a band of 5.5 in the International English Language Testing System (IELTS);

OR

- (c) pass any English language test prescribed by the University

3. Duration of Study

Minimum period of candidature : 4 semesters

Maximum period of candidature : 12 semesters

4. Programme Structure

- (1) This programme shall consist of one hundred percent (100%) research work leading to the submission of a thesis which format shall be stipulated as in Part VII, University of Malaya Regulations (Degree of Doctor of Philosophy) 2019.
- (2) Candidates are required to fulfill all prescribed requirements of the programme.

5. Determination of Research Area

The determination of research area shall be done upon candidate's admission into the programme.

LEARNING OUTCOME FOR DOCTOR OF PHILOSOPHY

1. Demonstrate a critical and in-depth understanding of frontier knowledge by generating substantial and original contributions to the field of engineering
2. Synthesise and integrate existing and new knowledge in one or more discipline areas to address challenges and concerns in the field of engineering
3. Design and implement advanced methodologies to resolve complex and emerging problems
4. Communicate information, insights, ideas, problems and solutions cogently with experts in the field and general audience
5. Build rapport to work effectively as part of a team to achieve decided outcomes
6. Use suitable digital and analytical techniques to research problems
7. Demonstrate intellectual leadership qualities and management skills to effectively collaborate with diverse partners
8. Demonstrate commitment to lifelong learning and professional development with entrepreneurial mindset
9. Perform research adhering to legal, ethical, professional and sustainable practices

CANDIDATURE REQUIREMENTS DOCTOR OF PHILOSOPHY

1. Fulfill the minimum candidature duration of 4 semesters.
2. Fulfill the University language requirement (Bahasa Malaysia and English) not later than the second (2nd) semester of candidature.
3. Fulfill the residential requirement of 6 months (physically or non physically).
4. Attend at least 3 credits of **Research Methodology Course** not later than the **second (2nd) semester** of candidature.
5. Present your research proposal at **Proposal Defence** not later than the second (2nd) semester of candidature.
6. Present your research progress at **Confirmation Defence** not later than the third (3rd) semester of candidature (**ONLY** applicable to admission through Fast Track candidates).
7. Present your research progress at **Candidature Defence** not later than the third (5th) semester of candidature.
8. Present your research progress at **Thesis Seminar** before the submission of thesis for examination.

The candidates must fulfill the following publication requirement before the Examination Committee (Board) meeting:

Publication Requirements:

- Candidate pursuing a programme in the field of Science must show proof of acceptance of publication for at least two (2) papers in ISI (WoS) Journals prior to viva-voce and the Committee of Examiners meeting.
- Timing – Publications must be within the candidature of the candidate
- Topics of Publications – Publications must be related and conform to the candidature's research in his/her thesis
- Affiliation – Publications must carry the affiliation of the department and/or faculty where the candidate is registered

MODULE REGISTRATION

Candidates are required to enrol in the following modules during registration period:

KVX8001 Research Methodology

Within semester 1 – 2 of candidature

KVX8002 Dissertation

Every semester of candidature until the submission of Thesis for Examination

GLT7002 BASIC OF MALAY LANGUAGE (For International Students Only)

Any semester before submission of Thesis for Examination. Candidates may refer to the schedule from Faculty of Languages and Linguistics (fll.um.edu.my).

COURSE CONTENT OF RESEARCH METHODOLOGY

KVX8001 Research Methodology

Learning Outcomes

At the end of the course, the student is able to:

1. Identify suitable research problem and write research proposal
2. Identify appropriate research technique and experimental design
3. Write research proposal based on respective chosen field
4. Prepare a review paper

Synopsis of Course Content

This course is designed to give introduction to research techniques, scientific research methods, research ethics, experimental design and statistical techniques. Identifying research problem and proposal writing, literature review, and review of basic writing skills. Written communication of research results: thesis writing and scientific paper writing. Oral communication of research results during presentation and attending conferences.

Evaluation and Weightage

Continuous Assessment : 100%

Criteria in Summative Assessment :

Please refer to the Universiti Malaya Rules (Degree of Doctor of Philosophy) 2019 and Universiti Malaya Regulations (Degree of Doctor of Philosophy) 2019.

Proposed Graduate on Time Schedule
Major Administrative and Regulatory Milestones for PhD Candidates (PhD – Fast Track)
(Sciences)

Semester	Activities	Output/ Milestone	Comments
1	- Attend Research Methodology Course - Attend Bahasa Melayu course* - Attend English language course** - Familiarization with and use of EndNote, Turnitin, editing software, data analysis and research tools - Conduct Literature Review - Proposal Defence	- Completed Research Methodology course - Fulfillment of language requirements - Presented research proposal	
2	- Complete Literature Review - Conduct pilot study/ planning & setting up of experiment/ start data collection - Attend at least 3 courses in Upskill Program (including GOT seminar) - PhD Confirmation Defence - Prepare for Candidature Defence	- Literature Review - Thesis Plan/Outline of Thesis - Submission of Publication 1 (review paper / experimental design) - Results of PhD Confirmation Defence (if unsatisfactory, continue as a Master student – refer to Master by Research GOT Schedule in Semester 3)	Candidates are strongly advised to use reference management software Eg: Mendeley, Bibtex, EndNote
3	- Investigation and development of the proposed solutions. - Data analysis - Candidature Defence report writing and Candidature Defence - Attend at least 2 courses in Upskill Program	- Completed Candidature Defence report - Completed Candidature Defence	Candidature Defence report should include data collection, findings, thesis outline

Semester	Activities	Output/ Milestone	Comments
4	- Experimentation and/or data analysis - Thesis write-up (Chapter 1, 2 & 3) - Preparation of manuscripts for submission of publication - Attend at least 2 courses in Upskill Program	- Submission of Publication 2 - Completed drafts of three chapters	
5	- Thesis write-up (complete remaining chapters) - Presentation of Thesis Seminar - Submit 3 Months Notice for thesis submission - Attend Thesis Bootcamp	- Completed thesis draft - Presented Thesis Seminar	
6	- Finalize and submit thesis - Prepare for viva voce	- Submission of thesis - Viva voce	

Notes:

Monitoring Panel

- Chairman & 1 member who is an expert in the field and a supervisor. A fourth member is allowed to be appointed if necessary.
- The same panel should follow through the proposal presentation (Proposal Defence, Candidature Defence and Thesis Seminar).
- It is strongly recommended that one member is appointed as internal examiner.
- The main responsibilities of the panel should include the following:-
 - Advise the student to improve the research proposal.
 - Monitor the progress of the student
 - Improve the thesis plan.

*Applicable to all international candidates.

** Applicable to international candidates who are writing their theses in languages other than English.

Proposed Graduate on Time Schedule
Major Administrative and Regulatory Milestones for PhD Candidates (Conventional PhD)
(Sciences)

Semester	Activities	Output/Milestone	Comments
1	- Attend Research Methodology Course - Attend Bahasa Melayu course* - Attend English language course** - Familiarization with and use of EndNote, Turnitin, editing software, data analysis and research tools - Conduct Literature Review - Proposal Defence	- Completed Research Methodology course - Fulfilment of language requirements - Presented research proposal	
2	- Complete Literature Review - Conduct pilot study/ planning & setting up of experiment/ start data collection - Attend at least 3 courses in Upskill Program (including GOT seminar) - Prepare for Candidature Defence	- Literature Review - Thesis Plan/Outline of Thesis - Submission of Publication 1 (review paper / experimental design)	Candidates are strongly advised to use reference management software Eg: Mendeley, Bibtex, EndNote
3	- Investigation and development of the proposed solutions. - Data analysis - Candidature Defence report writing - Attend at least 2 courses in Upskill Program - Candidature Defence	Completed Candidature Defence	Candidature Defence report should include data collection, findings, thesis outline
4	- Experimentation and/or data analysis - Thesis write-up (Chapter 1, 2 & 3) - Preparation of manuscripts for submission of	- Submission of Publication 2 - Completed drafts of three chapters	

Semester	Activities	Output/Milestone	Comments
	publication Attend at least 2 courses in Upskill Program		
5	- Thesis write-up (complete remaining chapters) - Presentation of Thesis Seminar - Submit 3 Months Notice for thesis submission - Attend Thesis Bootcamp	- Completed thesis draft - Presented Thesis Seminar	
6	- Finalize and submit thesis - Prepare for viva voce	- Submission of thesis - Viva voce	

Notes:

Monitoring Panel

- Chairman & 1 member who is an expert in the field and a supervisor. A fourth member is allowed to be appointed if necessary.
- The same panel should follow through the proposal presentation (Proposal Defence, Candidature Defence and Thesis Seminar).
- It is strongly recommended that one member is appointed as internal examiner.
- The main responsibilities of the panel should include the following:-
 - Advise the student to improve the research proposal.
 - Monitor the progress of the student
 - Improve the thesis plan.
- Applicable to all international candidates.

** Applicable to international candidates who are writing their theses in languages other than English.

Proposed Graduate on Time Schedule
Major Administrative and Regulatory Milestones for PhD Candidates (PhD – Conversion from Master)
(Sciences)

Semester	Activities	Output/Milestone	Comments
1	- Attend Research Methodology Course - Attend Bahasa Melayu course* - Attend English language course** - Familiarization with and use of EndNote, Turnitin, editing software, data analysis and research tools - Conduct Literature Review - Proposal Defence	- Completed Research Methodology course - Fulfilment of language requirements - Presented research proposal	
2	- Complete Literature Review - Conduct pilot study/ planning & setting up of experiment/ start data collection - Attend at least 3 courses in Upskill Program (including GOT seminar) - Prepare for Conversion Defence	- Literature Review - Thesis Plan/Outline of Thesis - Submission of Publication 1 (review paper / experimental design)	- Candidates are strongly advised to use reference management software Eg: Mendeley, Bibtex, EndNote - Candidate must have one accepted ISI publication and demonstrate PhD potential
3	- Investigation and development of the proposed solutions. - Data analysis - Conversion Defence report writing - Attend at least 2 courses in Upskill Program - Conversion Defence	Results of Conversion Defence (if unsatisfactory, continue as a Master student – refer to Master by Research GOT Schedule in Semester 3)	Conversion Defence report should include data collection, findings, thesis outline

Semester	Activities	Output/Milestone	Comments
4	- Experimentation and/or data analysis - Thesis write-up (Chapter 1, 2 & 3) - Preparation of manuscripts for submission of publication - Attend at least 2 courses in Upskill Program	- Submission of Publication 2 - Completed drafts of three chapters	
5	- Thesis write-up (complete remaining chapters) - Presentation of Thesis Seminar - Submit 3 Months Notice for thesis submission - Attend Thesis Bootcamp	- Completed thesis draft - Presented Thesis Seminar	
6	- Finalize and submit thesis - Prepare for viva voce	- Submission of thesis - Viva voce	

Notes:

Monitoring Panel

- Chairman & 1 member who is an expert in the field and a supervisor. A fourth member is allowed to be appointed if necessary.
- The same panel should follow through the proposal presentation (Proposal Defence, Candidature Defence and Thesis Seminar).
- It is strongly recommended that one member is appointed as internal examiner.
- The main responsibilities of the panel should include the following:-
 - Advise the student to improve the research proposal.
 - Monitor the progress of the student
 - Improve the thesis plan.

*Applicable to all international candidates.

** Applicable to international candidates who are writing their theses in languages other than English.

MARKING SCHEME AND GRADE POINT AVERAGE

The assessment of examinations for the coursework component shall be based on the following grading scheme:

Marks	Grade	Grade Point	Meaning
90.00 - 100.00	A+	4.00	High Distinction
80.00 - 89.99	A	4.00	Distinction
75.00 - 79.99	A-	3.70	Distinction
70.00 - 74.99	B+	3.30	Pass
65.00 - 69.99	B	3.00	Pass
60.00 - 64.99	B-	2.70	Fail
55.00 - 59.99	C+	2.30	Fail
50.00 - 54.99	C	2.00	Fail
45.00 - 49.99	C-	1.70	Fail
40.00 - 44.99	D+	1.30	Fail
35.00 – 39.99	D	1.00	Fail
00.00 - 34.99	F	0.00	Fail

Note:

Grade 'P' is given every semester for progressive courses which are conducted consecutively until the total credit of the course is completed except for clinical programme. Other than medical reasons, any candidate who does not complete grade P will be given grade F.

RESEARCH GUIDELINES

RESEARCH GUIDELINES AND REFERENCES

Candidates are encourage to refer to the Guidelines and References below in fulfillment of candidature requirements. Guidelines and References are available through :



<https://engine.um.edu.my/postgraduate-programmes>

Guidelines and References related to Higher Degree candidature are as follows:

1. Progress Report
2. Supervision Policy of Postgraduate
3. Guidelines for the Preparation of Research Reports, Dissertations and Theses
4. Guidelines in Submitting Thesis/Dissertation for Examination
5. Guidelines for Publication in Fulfilment of Graduation Requirements for Postgraduate Candidates
6. Research Ethics Policies and Guidelines
<https://umresearch.um.edu.my/university-of-malaya-research-ethics-committee-umrec>
7. Avoiding Plagiarism
8. Intellectual Property
9. Master's Degree Rules
10. Master's Degree Regulations
11. Doctor of Philosophy's Rules
12. Doctor of Philosophy's Regulations

LABORATORY REGULATIONS

General Safety Rules and Housekeeping in Laboratories & Workshops

General Safety Rules

1. Students are not permitted to enter any laboratory, workshop and store area without permission.
2. Students are only permitted in laboratories for official research or during practical classes.
3. Running in the corridors, laboratories, and workshops or on the staircases should be avoided.
4. Coats, bags and other personal belongings must NOT be taken into laboratories or workshops. From a security point of view, it is not advisable to leave valuables, laptops or other personal belongings on walkways, staircases or landings
5. Lab coats should not be worn outside the laboratory or workshop.
6. At the end of a practical class, all electronic and electrical equipment should be switched off (unless otherwise instructed).
7. All hazardous materials or apparatus must be rendered safe, or disposed off, in the manner indicated by the academic or technical staff on duty or by established procedures before leaving the laboratory.
8. Eating, drinking, storing of food, and applying cosmetics are strictly prohibited inside any laboratory or workshop.

Housekeeping

1. All laboratory benches must be cleaned and kept clear of trash, spills, debris, apparatus, glassware and/or chemicals not currently in use.
2. At the end of the workday or work session in any laboratory or workshop, all work areas, benches and sinks must be left in a clean and tidy condition. It is the user's responsibility to clear up any mess after using the laboratory or workshop. Dust or fine particulates should be removed using an appropriate vacuum cleaner. The use of brooms is not recommended.
3. All hazardous materials or apparatus must be rendered safe, or disposed off, in the manner indicated by the academic or technical staff in charge or by established procedures before leaving the laboratory
4. Stacked materials should be in stable condition.
5. The space in between two machines should be at least 60 cm wide and kept clear of any materials.
6. No bottles, plastic containers or experiment materials are allowed to be kept under the benches, on the floor or less than 15 cm from the edge of the bench top.
7. Laboratory benches should not be used as a general storage area. Apparatus, glassware and/or chemicals not in use should be kept in the proper storage area.
8. Fume hoods and biosafety cabinets should not be used as a storage area.
9. Disposal of waste should be done safely and promptly using the designated bins/containers. The technician/staff in-charge should provide the necessary guidance to dispose waste.

10. All radioactive, chemical and biological materials must be properly labelled and stored inside its designated cabinets.

IMPORTANT: Storing of chemicals in the student locker/cupboard is strictly prohibited.

11. Purchasing of new chemicals for research or the lab, or moving/transferring chemicals to the lab must first obtain permission from the lab-staff incharge or PIC.
12. Proper inventory of the materials and Chemical Register must be kept updated at all the times. The inventory level of hazardous and combustible materials should be as minimal as possible.
13. The storage of chemicals must be in accordance with the recommendations of the relevant Safety Data Sheet (SDS). Incompatible chemicals and/or materials must not be stored together. Combustible chemicals cannot be kept near heat or ignition source. Chemicals with low ignition point should be kept in the appropriate temperature.
14. All chemical bottles or containers must be capped with proper cap or seal except when being used.

Scan the QR Code below to view the list of Laboratories Faculty of Engineering and Staff In-Charge



<https://engine.um.edu.my/facilities>



ACADEMIC SESSION
2024/2025

FACULTY OF ENGINEERING
engine.um.edu.my