UNIVERSITY OF MALAYA

FACULTY OF ENGINEERING

MASTER OF ENGINEERING HANDBOOK

SESSION 2020/2021

UNIVERSITI MALAYA

03-79674477
pejtdit_fkej@um.edu.my
@engineering.unimalaya

TABLE OF CONTENTS

MESSAGE FROM THE DEAN

We bid you a warm welcome to the Faculty of Engineering and congratulations on your successful admission to our prestigious postgraduate programmes. Here, you will experience a university dedicated to being a leading resource for postgraduate studies and one that offers the right learning environment for your future success. Engineering education at Faculty of Engineering has the main objective of disseminating knowledge in the field of engineering and to equip our students to achieve expertise and excellence in technical work in order to serve the society as professional engineers.

The system of education offered is carefully structured to enable students to study both the basics of their selected field of engineering as well as mastering more specialist areas of expertise. We provide instruction in core engineering principles that are essential in any era, and compliment this with insights on the latest developments.

This handbook serves as a reference for academic information about the Faculty and its postgraduate programmes. I strongly advise that you take some time to go through this handbook to understand the course syllabus and requirements for graduation. If you should need assistance, our officers are ever willing to help should you need any further clarification.

On behalf of Faculty of Engineering, I wish you every success and that you will take with you the UM experience and that you will remember it fondly in years to come! I'm confident that this decision to embark on a postgraduate study will help you realize your personal, professional and educational dreams.

-Professor Dr. Saad Mekhilef
M.Eng (1999) (UM), PHD(2004) (UM)
saad@um.edu.my

UNIVERSITY OF MALAYA

VISION

TO BE AN INTERNATIONALLY RENOWNED INSTITUTION OF HIGHER LEARNING IN RESEARCH, INNOVATION, PUBLICATION AND TEACHING.

MISSION

TO ADVANCE KNOWLEDGE OF LEARNING THROUGH QUALITY RESEARCH AND EDUCATION FOR THE NATION AND FOR HUMANITY

Graduates of University of Malaya will be able to:

- Demonstrate knowledge and skills in their field of study, appropriate research and professional practices, and the processes of critical thinking, creative thinking, and problem solving.
- Use effective methods including contemporary technology to manage information, to achieve diverse professional goals aligned with professional standards and make decisions based on appropriate data and information.
- Engage in continuous self-improvement and professional growth support the professional development of others, and display positive leadership and professional behaviours and disposition for effective practice.
- Communicate effectively with other professionals, and the community, and project a coherent vision of social responsibilities.
- Appreciate and continue to be guided by the University's core values of integrity, respect, academic freedom, open-mindedness, accountability, professionalism, meritocracy, teamwork, creativity and social responsibility.

VISION

We strive to be an internationally renowned Faculty of Engineering in research, innovation, publication and teaching.

MISSION

To advance engineering knowledge and learning through quality education and research in the pursuit of the fulfilling aspirations of the University and nation.

ACAEMIC PROGRAMMES

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


UNIVERSITY OF MALAYA
CAMPUS MAP
We are here
JALAN ELMU GATE
SEC 16 GATE
PJ GATE
UNIVERSITY ROAD
PERSIARAN ELMU
PERSIARAN BERNAS
PERSIARAN AKAL
LINGKUNGAN BUDI
LENGKOK CENDEKIA
LINGKARAN WAWASAN
PERSIARAN GAGASAN
SUSUR DAMANSARA
KL GATE
DAMANSARA GATE
PANTAI BARU ROAD
SPRINT HIGHWAY
Tadika UM
Economics & Administration
Education
Arts & Social Sciences
Business & Accountancy
Centre for Civilisational Dialogue
UM Specialist Centre
Museum of Asian Art
Main Library
Geology
9th College
3rd College
4th College
7th College
Languages & Linguistics
Science
ICT Services (PTM)
Kompleks Perdanasiswa/ ISC
Engineering
UM LAKE
Museum of Zoology
Malay Studies
8th College
10th College
Computer Science & Information Technology
Bulit Environment
2nd College
Dewan Tunku Canselor (DTC)
High Impact Research (HIR)
Security Office/ Cultural Centre
RIMBA ILMU (Botanical Garden)
Dentistry
Medical
6th College
Examination Building
Chancellery
UM Press
ROTU Training Site
1st College
UM Sports Ground
Centre for Foundation Science (PASUM)
Islamic Studies
Rimba Ilmu
Law
UM Medical Centre
Ambang Asuhan Jepun
Kong-Zi
Graduate Studies
Asia-Europe
5th College
Sports Centre
UM Arena
Swimming Pool
Research Management & Innovation Complex
12th College
11th College
Reserve Office Training Unit (ROTU)
Department of Development and Asset Maintenance (JPPHB)
CHANCELLERY ZONE
RIMBA ILMU ZONE
LIBRARY ZONE
FACULTY/ INSTITUTE/ CENTRE
RESIDENTIAL COLLEGES
FACILITIES/ ADMINISTRATION

CAMPUS MAP

THE MANAGEMENT

FACULTY OF ENGINEERING

Prof. Dr. Saad Mekhilef
Dean

Assoc. Prof. Ir.
Dr. Suhana Mohd Said
Deputy Dean
(Undergraduate)

Assoc. Prof.
Dr. Farazila Yusof
Deputy Dean
(Postgraduate)

Assoc. Prof.
Dr. Andri Andriyana
Deputy Dean
(Research)

Dr. Raja Ariffin
Raja Ghazilla
Deputy Dean
(Development)

Dr. Juliana Usman
Head, Dept. of
Biomedical Eng.

Assoc. Prof. Ir.
Dr.Ngoh Gek Cheng
Head, Dept. of
Chemical Eng.

Assoc. Prof. Ir. Dr.
Faridah Othman
Head, Dept. of
Civil Eng.

Assoc. Prof. Ir.
Dr Chow Chee Onn
Head, Dept. of
Electrical Eng.

Assoc. Prof. Datin Ir. Dr.
Bushroa Abdul Razak
Head, Dept. of
Mechanical Eng.

Normuhaini Ab. Roni
Senior Principal
Assistant Registrar

ASSOC. PROF. DR. FARAZILA YUSOF

DEPUTY DEAN (POSTGRADUATE)

email:
farazila@um.edu.my
Tel:
03-7967 4477

THE POSTGRADUATE TEAM

DD (PG) SECRETARY

Mrs. Nuur Hakimah Mohd Din
nuur.hakimah@um.edu.my
03-7967 4477

ASSISTANT REGISTRAR

Mrs. Junainah Jamaluddin
junainah@um.edu.my
03-7967 4482

PIC - MASTER OF ENGINEERING

Ms. Maznah Mohammad Zin
Admin. Assistant
maznah_mohammadzin@um.edu.my
03-7967 5298

PIC - MASTER OF ENGINEERING SCIENCE

Mrs. Halijah Ramlan
Admin. Assistant
rhalijah@um.edu.my
03-7967 4481

PIC - APPEALS AND APPLICATIONS

Ms. Siti Khairiah Ibrahim
Admin. Assistant
ski_83@um.edu.my
03-7967 5298

PIC - CANDIDATURE SEMINARS

Mr. Abdul Alim Mohammad Ariff
Admin. Assistant
h1halim@um.edu.my
03-7967 2177

PIC - DOCTOR OF PHILOSOPHY

Mrs. Meena Subramaniam
Admin. Assistant
meena@um.edu.my
03-7967 4480

PRORGRAMME COORDINATORS

Master of Biomedical Engineering

Ir. Dr. Lai Khin Wee
Senior Lecturer
email: lai.khinwee@um.edu.my
Tel: 03-7967 7627

Master of Mechanical Engineering

Ir. Dr. Ong Zhi Chao
Senior Lecturer
email: alexongzc@um.edu.my
Tel: 03-7967 6815

Master of Safety, Health & Environment Engineering

Ir. Dr. Jegalakshimi Jewaratnam
Senior Lecturer
email: jegalaxmi24@um.edu.my
Tel: 03-7967 7689

ACADEMIC CALENDAR 2020/2021

SEMESTER I				
Registration	1 week	5.10.2020	-	9.10.2020
Lectures	5 weeks*	12.10.2020	-	15.11.2020
Mid-Semester Break	1 week	16.11.2020	-	22.11.2020
Lectures	9 weeks*	23.11.2020	-	24.01.2021
Semester I Examinations	3 weeks*	25.01.2021	-	14.02.2021
Semester I Holiday	3 weeks*	15.02.2021	-	07.03.2021
	22 weeks			
SEMESTER II				
Registration	1 week	01.03.2021	-	05.03.2021
Lectures	10 weeks*	08.03.2021	-	16.05.2021
Mid-Semester Break	1 week	17.05.2021	-	23.05.2021
Lectures	4 weeks*	24.05.2021	-	20.06.2021
Revision Week	1 week	21.06.2021	-	27.06.2021
Semester II Examinations	3 weeks*	28.06.2021	-	18.07.2021
	19 weeks			
SPECIAL SEMESTER				
Lectures	7 weeks*	26.07.2021	-	12.09.2021
Special Semester Examinations	1 week	13.09.2021	-	19.09.2021
Holiday	2 weeks*	20.09.2021	-	03.10.2021

*****

Maulidur Rasul (29 Oktober 2020)
Deepavali (14 November 2020)
Hari Krismas (25 Disember 2020)
Cuti Tahun Baru (1 Januari 2021)
Hari Thaipusam (28 Januari 2021)
Tahun Baru Cina (12 & 13 Februari 2021)
Nuzul Al-Quran (29 April 2021)
Hari Pekerja (1 Mei 2021)
Hari Raya Aidilfitri (13 & 14 Mei 2021)
Hari Wesak (26 Mei 2021)
Hari Keputeraan Agong (5 Jun 2021)
Hari Raya Aidiladha (20 Julai 2021)
Awal Muharam (10 Ogos 2021)
Hari Kebangsaan (31 Ogos 2021)

Department of Biomedical Engineering

Head of Department

Dr. Juliana Usman
T: (603) 7967 4580 / 4581
F: (603) 7967 4579

Master of Biomedical Engineering Coordinator

Ir. Dr. Lai Khin Wee
T: (603) 7967 7627

UNIVERSITI MALAYA

MASTER OF BIOMEDICAL ENGINEERING

1. Program 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 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 within the week 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) Supervision

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

(6) Determination of Field of Research

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

(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 BIOMEDICAL ENGINEERING BY COURSEWORK

1. CORECOURSES

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

2. ELECTIVECOURSES

Course Code	Title	Credit Hours
KQB 7007	Physiological Signal & Image Analysis	3
KQB 7008	Artificial Intelligence in Medicine	3
KQB 7009	Rehabilitation Engineering	3
KQB 7010	Telemedicine	3
KQB 7011	Safety, Standard and Ethics In Biomedical Engineering	3

COURSES OFFERED FOR THE PROGRAMME OF MASTER OF BIOMEDICAL ENGINEERING BY COURSEWORK FOR ACADEMIC SESSION 2020/2021

Code	Course	Credit Hours	Duration of Examination	Distribution of Marks	
				%	%
				Continuous Assessments	Final Examination
CORE COURSES					
KQB 7001	Research Project	12	-	100	-
KQB 7002	Bioinstrumentation	3	2 hours	50	50
KQB 7003	Engineering Biomechanics and Motion Analysis	3	2 hours	50	50
KQB 7004	Healthcare Technology	3	2 hours	50	50
KQB 7005	Medical Imaging	3	2 hours	50	50
KQB 7006	Tissues Engineering	3	2 hours	50	50
KQX 7001	Research Methodology	3	-	100	-
KQX 7002	Project Management	3	2 hours	50	50
ELECTIVE COURSES					
KQB 7007	Physiological Signal & Image Analysis	3	2 hours	50	50
KQB 7008	Artificial Intelligence in Medicine	3	2 hours	50	50
KQB 7009	Rehabilitation Engineering	3	2 hours	50	50
KQB 7010	Telemedicine	3	2 hours	50	50
KQB 7011	Safety, Standard and Ethics In Biomedical Engineering	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.

PLANNER FOR MASTER OF BIOMEDICAL ENGINEERING

COURSE CODE	SEMESTER 1			SEMESTER 2			SEMESTER 3**		
	COURSE CODE		CREDIT	COURSE CODE		CREDIT	COURSE CODE		CREDIT
	Code	**Subject**		**Code**	**Subject**		**Code**	**Subject**	
Core Courses	**KQB7002**	Bioinstrumentation	3	***KQB 7001**	Research Project	6	***KQB7001**	Research Project	6
	KQB7003	Engineering Biomechanics and Motion Analysis	3	**KQB7005**	Medical Imaging Tissue	3			
				KQB7006	Engineering	3			
	KQB7004	Healthcare Technology	3						
	KQX7001	Research Methodology	3						
	KQX7002	Project Management	3						
Elective Courses	**Code**	**Subject**		**Code**	**Subject**		**Code**	**Subject**	
	KQB7008	Artificial Intelligence in Medicine	3	**KQB7007**	Physiological Signal & Image Analysis	3			
				KQB7009	Rehabilitation Engineering	3			
	KQB7011	Safety, Standard and Ethics In Biomedical Engineering	3	**KQB7010**	Telemedicine	3			

NOTE:

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

(2) ****Courses will be offered if there are sufficient request.

UNIVERSITI MALAYA	**PRO FORMA KURSUS** ***COURSE PRO FORMA***

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Bioperubatan	*Department of Biomedical Engineering*
Nama Program Akademik NameofAcademic*Programme*	Sarjana Kejuruteraan Bioperubatan	*Master of Biomedical Engineering*
Kod Kursus* *Course Code**	KQB7001	*KQB7001*
Tajuk Kursus* *Course Title**	Projek Penyelidikan	*Research Project*
Kredit* *Credit**	12	*12*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	480	*480*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	KQX7001	KQX7001
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Melakukan kajian semula literatur yang diperlukan untuk projek penyelidikan 2. Merekabentuk metodologi bagi projek penyelidikan dengan mengaplikasikan peralatan eksperimen atau perisian yang sesuai	*At the end of the course, students are able to:* *1. Perform literature review required for the research project* *2. Design methodology of the research project by applying appropriate experimental tools or software* *3. Investigate the research problem through a*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	3. Menyiasat masalah penyelidikan melalui kaedah yang ditetapkan 4. Menerangkan data dan dapatan kajian secara professional 5. Membentangkan projek penyelidikan secara lisan 6. Mengenalpasti impak hasil penyelidikan terhadap masyarakat, alam sekitar atau ekonomi	*defined methodology* *4. Explain the data and findings ofthe research professionally* *5. Present the research project orally* *6. Identify the impact of the research outcome towards society, environment or economy*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran Berkomunikasi (CS1,2,3,8) 2. Kemahiran Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3,7) 3. Kemahiran Kerja Berpasukan (TS1,2,4)	*1. Communication Skills (CS1,2,3,8)* *2. Critical Thinking and Problem Solving Skills (CT1,2,3,7)* 3. *Teamwork Skills (TS1,2,4)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Projek penyelidikan akan mendedahkan pelajar dalam membuat kajian semula literatur berkaitan dengan topik kajian spesifik, merancang kaedah kajian, mengumpul data kajian dan menganalisis data, menulis laporan kajian dan membuat pembentangan	*Research project will expose students to carry out literature review on a specific research topic, plan a research methodology, collect research data and analyse data, write a research report and carry out a presentation*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 100% Peperiksaan Akhir: 0%	*Continuous Assessment:100%* *Final Examination:0%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian	*Results will be notified through notice board and online*
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*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Kejuruteraan Bioperubatan	*Biomedical Engineering*
Nama Program Akademik NameofAcademic*Programme*	Sarjana Kejuruteraan Bioperubatan	*Master of Biomedical Engineering*
Kod Kursus* *Course Code**	KQB7002	*KQB7002*
Tajuk Kursus* *Course Title**	Bioinstrumentasi	*Bioinstrumentation*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Pada akhir kursus ini, pelajar dapat: 1. Menggunakan prinsip-prinsip kejuruteraan untuk memilih alat yang optimum untuk mengukur pembolehubah perubatan. (C3) 2. Menerangkan ciri-ciri utama sistem analog dan digital instrumentasi. (C2,A3) 3. Merekabentuk sebuah peralatan canggih untuk	*At the end of the course, students are able to:* 1. Use the principles of engineering to choose the optimal instrument for measuring medical variables. (C3) 2. Explain the essentials of analog and digital instrumentation systems. (C2,A3) 3. Design an advanced instrumentation for

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	mengukur pembolehubah perubatan dan dalam penyelidikan biologi. (C6,P5)	measurement of medical variables and in biological research.(C6,P5)
Kemahiran Insaniah *Soft Skills*	Kemahiran Pemikiran Kritis dan Penyelesaian Masalah (CT7)	*Critical Thinking and Problem Solving Skills (CT7)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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.	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.
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Maklumbalas secara dalam talian	Online feedback
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*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Kejuruteraan Bioperubatan	*Biomedical Engineering*
Nama Program Akademik NameofAcademic*Programme*	Sarjana Kejuruteraan Bioperubatan	*Master of Biomedical Engineering*
Kod Kursus* *Course Code**	KQB7003	*KQB7003*
Tajuk Kursus* *Course Title**	Biomekanik Kejuruteraan dan Analisis Gerakan	Engineering Biomechanics and Motion Analysis
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	122	*122*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Pada akhir kursus ini, pelajar dapat: 1. Menyelesaikan persamaan-persamaan gerakan untuk sistem jasad tegar multisegmen. (C4,P4) 2. Menjelaskan anatomi dan fungsi otot-rangka tangan kaki dan badan. (C5,A4) 3. Menggabungkan pengetahuan anatomi dan fungsi otot-rangka dengan dinamik mekanik untuk	*At the end of the course, students are able to:* 1. Solve equations of motion for multisegment systems of rigid bodies. (C4,P4) 2. Explain the musculoskeletal anatomy and function of the limbs and trunk. (C5,A4) 3. Combine knowledge of the musculoskeletal anatomy and function with mechanical dynamics

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	mensamagerakkan kawalan gerakan. (C6,P4)	to simulate the control of movement.(C6,P4)
Kemahiran Insaniah *Soft Skills*	Kemahiran Pemikiran Kritis dan Penyelesaian Masalah (CS8)	*Critical Thinking and Problem Solving Skills (CS8)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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.	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.
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Maklumbalas secara dalam talian	Online feedback
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*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 ***MalayVersion***	**Versi Bahasa Inggeris** ***English Version***
Akademi/Fakulti/Institut/Pusat *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Kejuruteraan Bioperubatan	*Biomedical Engineering*
Nama Program Akademik NameofAcademic*Programme*	Sarjana Kejuruteraan Bioperubatan	*Master of Biomedical Engineering*
Kod Kursus* *Course Code**	KQB7004	*KQB7004*
Tajuk Kursus* *Course Title**	Teknologi Penjagaan Kesihatan	*Healthcare Technology*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Pada akhir kursus ini, pelajar dapat: 1. Menentukan kepentingan Teknologi Penjagaan Kesihatan. (C4) 2. Mengenal pasti kepenggunaan ICT dalam Sektor Penjagaan Kesihatan. (C2, A4) 3. Menerangkan teknologi semasa yang digunakan dalam Penjagaan Kesihatan Industri. (C6, A3)	*At the of this course, student will be able to:* *1. Determine the importance of Healthcare Technology. (C4)* *2. Identify the prominence of ICT in Healthcare Sector. (C2,A4)* *3. Explain the current technologies used in Healthcare Industry. (C6,A3)*

	Versi Bahasa Malaysia ***MalayVersion***	**Versi Bahasa Inggeris** ***English Version***
	4. Mengenalpasti kepentingan keselamatan, piawaian dan etika Berkaitan dengan Penjagaan Kesihatan. (C2, A4)	*4. Identify the importance of safety, standards and ethics related to Healthcare. (C2,A4)*
Kemahiran Insaniah *Soft Skills*	Etika dan moral professional (EM3)	*Ethics and Professional Ethics (EM3)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini merangkumi topik yang berkaitan dengan Penjagaan Kesihatan Teknologi. Kursus ini bertujuan untuk menerangkan Pengetahuan mengenai teknologi semasa yang digunakan dalam sektor kesihatan Menguraikan keselamatan medis, piawaian Peranti dan isu etika untuk membimbing jurutera bioperubatan.	*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 Ethical issues to guide biomedical engineers.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Maklumbalas secara dalam talian	Online feedback
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*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Kejuruteraan Bioperubatan	*Biomedical Engineering*
Nama Program Akademik NameofAcademic*Programme*	Sarjana Kejuruteraan Bioperubatan	*Master of Biomedical Engineering*
Kod Kursus* *Course Code**	KQB7005	*KQB7005*
Tajuk Kursus* *Course Title**	Pengimejan Perubatan	*Medical Imaging*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Pada 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. (C6) 3. Melakukan penilaian kualiti imej. (C6,P2)	*At the end of the course, students are able to:* 1. Interpret the working principles, designs and applications of various medical diagnostic imaging and therapeutic equipments. (C5) 2. Explain radiation protection and safety concept. (C6) 3. Perform image quality assessment. (C6,P2)

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
Kemahiran Insaniah *Soft Skills*	Etika dan moral professional (EM3)	*Ethics and Professional Ethics (EM3)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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, fluroskopi, tomografi berkomputer, pengimejan resonans magnetik, sistem ultrabunyi, pengimejan perubatan nuklear, laser dan optoeletronik. Kursus ini juga mendedahkan pelajar-pelajar kepada konsep kuality imej dan keselamatan radiasi dalam pengimejan perubatan.	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.
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Maklumbalas secara dalam talian	Online feedback
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*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Kejuruteraan Bioperubatan	*Biomedical Engineering*
Nama Program Akademik NameofAcademic*Programme*	Sarjana Kejuruteraan Bioperubatan	*Master of Biomedical Engineering*
Kod Kursus* *Course Code**	KQB 7006	KQB 7006
Tajuk Kursus* *Course Title**	Kejuruteraan Tisu	*Tissue Engineering*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120.5	*120.5*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menerangkan prinsip-prinsip di sebalik Kejuruteraan Tisu. (C2,A4) 2. Menilai cabaran dan penyelesaian Kejuruteraan Tisu. (C5) 3. Menghujah isu-isu pengawalseliaan dan etika yang berkaitan dengan Kejuruteraan Tisu. (A3, C5)	*At the end of the course, students are able to:* *1. Explain the principles behind Tissue Engineering (C2, A4)* *2. Evaluate Tissue Engineering challenges and solutions. (C5)* *3. Justify the regulatory and ethical issues related to Tissue Engineering. (A3,C5)*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
Kemahiran Insaniah *Soft Skills*	Etika dan moral professional EM1-EM2	*Ethicsand Professional Ethics EM1-EM2*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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.	*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.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Maklumbalas secara dalam talian	Online feedback
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*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Kejuruteraan Bioperubatan	*Biomedical Engineering*
Nama Program Akademik NameofAcademic*Programme*	Sarjana Kejuruteraan Bioperubatan	*Master of Biomedical Engineering*
Kod Kursus* *Course Code**	KQB7008	*KQB7008*
Tajuk Kursus* *Course Title**	Kepintaran Buatan dalam Perubatan	*Artificial Intelligence in Medicine*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	123	*123*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Pada akhir kursus ini, pelajar dapat: 1. Mengintepretasikan konsep teknik-teknik kecerdikan buatan. (C5) 2. Menentukan teori-teori teknik kecerdikan buatan dalam kejuruteraan bioperubatan. (C4) 3. Mengaplikasikan teknik-teknik kecerdikan buatan kepada beberapa kegunaan dalam kejuruteraan	*At the end of the course, students are able to:* 1. Interpret the concept of artificial intelligence techniques. (C5) 2. Determine the theories of artificial inteeligence techniques. (C4) 3. Apply the artificial intelligence techniques in some biomedical engineering applications. (C3)

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	bioperubatan. (C3)	
Kemahiran Insaniah *Soft Skills*	Pembelajaran Sepanjang Hayat (LL3)	*Life long learning (LL3)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini meliputi asas-asas kefahaman tentang konsep-konsep kecerdikan buatan dan kegunaankegunaan asasnya dalam Kejuruteraan Bioperubatan.	The course covers the fundamental understanding of the artificial intelligence concepts and its basic applications in biomedical engineering.
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Maklumbalas secara dalam talian	Online feedback
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*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 ***MalayVersion***	**Versi Bahasa Inggeris** ***English Version***
Akademi/Fakulti/Institut/Pusat *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Kejuruteraan Bioperubatan	*Biomedical Engineering*
Nama Program Akademik NameofAcademic*Programme*	Sarjana Kejuruteraan Bioperubatan	*Master of Biomedical Engineering*
Kod Kursus* *Course Code**	KQB7009	*KQB7009*
Tajuk Kursus* *Course Title**	Kejuruteraan Rehabilitasi	*Rehabilitation Engineering*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Pada akhir kursus ini, pelajar dapat: 1. Menyelesiakan masalah rehabilitasi klinikal dan yang berkaitan dengan menggunakan instrumentasi biomekanikal termaju. (C5,P4) 2. Menggunakan konsep dan teori rehabilitasi dalam menilai pergerakan manusia yang kurang upaya.(C3,A5)	*At the end of the course, students are able to:* 1. Solve clinical rehabilitation problems and related issues by using advanced biomechanical instrumentation.(C5,P4) 2. Use the concepts and theories of rehabilitation in assessing disordered human movements. (C3,A5)

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

	Versi Bahasa Malaysia ***MalayVersion***	**Versi Bahasa Inggeris** ***English Version***
Kemahiran Insaniah *Soft Skills*	Kemahiran Kerja Berpasukan (TS5)	*Teamwork Skills (TS5)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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.	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.
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Maklumbalas secara dalam talian	Online feedback
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*

UNIVERSITI MALAYA	**PRO FORMA KURSUS** ***COURSE PRO FORMA***

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Kejuruteraan Bioperubatan	*Biomedical Engineering*
Nama Program Akademik NameofAcademic*Programme*	Sarjana Kejuruteraan Bioperubatan	*Master of Biomedical Engineering*
Kod Kursus* *Course Code**	KQB 7010	*KQB 7010*
Tajuk Kursus* *Course Title**	Teleperubatan	*Telemedicine*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti konsep-konsep yang dapat digunakan untuk perangkaian komputer serta protocol-protokol dam seni bina komunikasi. (C2,A4) 2. Menghurai seni bina Internet dan penggunaan bioperubatan yang relevan. (C2,A3)	*At the of this course, student will be able to:* *1. Identify the concepts applicable to computer networking and other communications protocols and architecture. (C2,A4)* *2. Describe the architecture of Internet and relevant biomedical engineering applications. (C2,A3)*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	3. Menyelesaikan masalah-maslah komunikasi berkaitan dengan kejuruteraan bioperubatan. (C4,A5)	*3. Propose solutions to biomedical engineering-related communications problems. (C4,A5)*
Kemahiran Insaniah *Soft Skills*	1. Pemikiran Kritis dan Penyelesaian Masalah CT1-CT4	*1. Critical Thinking and Problem Solving CT1-CT4*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini meliputi teleperubatan dan pelbagai topik berkaitan perangkaian, terutamanya yang digunakan dalam bidang kejuruteraan bioperubatan. Topik termasuklah pengenalan kepada topologi perangkaian dan piawaian yang berkaitan; pengenalan kepada internet dan kegunaannya; asas-asas antaramuka komputer; dan teknologi-teknologi perangkaian komputer yang ada pada masa ini relevan kepada penyelidikan dan pembekalan perkhidmatan kejuruteraan bioperubatan.	*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.*
Pemberatan Penilaian* *Assessment Weightage**	PenilaianBerterusan: 50% PeperiksaanAkhir: 50%	*Continuous Assessment: 50%* *Final Examination: 50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	1) Markah untuk tugasan dan penilaian berterusan diumumkan sebelum peperiksaan akhir 2) Gred untuk peperiksaan akhir akan diberikan.	*1) Announcement of marks for assignments and continuous assessment before the final examination.* *2) Grades for final exam will be given.*
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*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Kejuruteraan	*Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan	*Master of Engineering*
Kod Kursus* *Course Code**	KQX7001	*KQX7001*
Tajuk Kursus* *Course Title**	Metodologi Penyelidikan	*Research Methodology*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Pada akhir kursus ini, pelajar dapat: 1. Mengenal pasti masalah penyelidikan yang sesuai dan menulis kertas cadangan projek 2. Mengenal pasti kaedah penyelidikan dan reka bentuk eksperimen yang sesuai 3. Menulis kertas cadangan penyelidikan berdasarkan bidang yang dipilih masing-masing	*At the end of the course, candidates are 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*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	4. Menyediakan kertas ulasan	*respective field choose* *4. Prepare a review paper*
Kemahiran Insaniah *Soft Skills*	Kemahiran Pemikiran Kritis (CT7)	*Critical Thinking (CT7)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini meliputi pemerolehan dan analisis data serta pembentangan lisan dan tulisan bagi keputusan-keputusan projek penyelidikan tertentu.	The course covers data acquisition and analysis as well as verbal and written presentations of results of a specified research project.
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 100% Peperiksaan Akhir: 0%	*Continuous Assessment: 100%* *Final Examination:0%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Maklumbalas secara dalam talian	Online feedback
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

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kursus Fakulti	*Faculty Course*
Nama Program Akademik NameofAcademic*Programme*	Sarjana Kejuruteraan	*Master of Engineering*
Kod Kursus* *Course Code**	KQX7002	*KQX7002*
Tajuk Kursus* *Course Title**	Pengurusan Projek	*Project Management*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*Nil*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Dia akhir pembelajaran ini, pelajar dapat: 1. Menerangkan prinsip komponen dan konsep pengurusan projek. 2. Menjelaskan pelbagai pemacu perubahan yang boleh menjejaskan projek selama kitran hidupnya. 3. Menyelesaikan segala cabaran semasa projek secara efektif.	*At the end of the course, students are able to:* *1. Explain the principle components and concepts of project management.* *2. Justify the various drivers of change which may impact a project during its life cycle.* *3. Solve every challenges faced during the project.*

UNIVERSITI MALAYA	**PRO FORMA KURSUS** ***COURSE PRO FORMA***

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
Kemahiran Insaniah *Soft Skills*	1. Kemahiran menulis laporan 2. Kemahiran pembelajaran kooperatif 3. Kemahiran pembentangan 4. Kemahiran menyelesaikan masalah	*1. Cooperative learning skill* *2. Presentation skills* *3. Report Writing skills* *4. Problem solving skills*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Pengenalan kepada pengurusan Projek, Strategi, Organisasi, Proses, Manusia dan Struktur.	*Introduction to Project management, Strategy, Organization, Process, People and Structure.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian berterusan : 50% Peperiksaan akhir : 50%	*Continuous Assessment : 50%* *Final examination : 50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis dan dimaklumkan pada talian.	Resutls will be notified through notice board and online.
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*

Department of Chemical Engineering

Head of Department

Assoc. Prof. Ir. Dr. Ngoh Gek Cheng
T: (603) 7967 5206 / 5313
F: (603) 7967 5319

Master of Safety, Health and Environment Engineering Coordinator

Ir. Dr. Jegalakshimi Jewaratnam
T: (603) 7967 7689

UNIVERSITI MALAYA

MASTER OF SAFETY, HEALTH AND ENVIRONMENT ENGINEERING

Program Structure

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

(a) Seven (7) core courses where each consist of three credits hours **AND;**

(b) Research Project (10 credits) **AND**;

(c) Four (4) elective courses where each consist of three (3) credits

(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 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 within the week preceding the beginning of the semester.

(b) A candidate must register for **at least six (6) credits** 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 at least 5 subjects and the candidate must not be in under observation category.

(5) Supervision

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

(6) Determination of Field of Research

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

(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

Program Master of Safety, Health and Environment Engineering

1. CORE COURSES

Course Code	Title	Credit Hours
KQX7001	Research Methodology	3
KQX7002	Project Management	3
KQD7001	Research Project	10
KQD7002	Safety, Health and Environmental Legislation in Malaysia	3
KQD7003	Occupational and Environmental Health in Engineering	3
KQD7004	Sustainable Process Engineering	3
KQD7005	Quantitative Risk Assessment	3
KQD7006	Hazard Identification and Evaluation	3

2. ELECTIVE COURSES

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
KQD7012	Environmental Management Systems	3
KQD7013	Quality Assurance and Assessment	3
KQD7014	Human Factor and Management at Workplace	3

COURSES OFFERED FOR THE PROGRAMME OF
MASTER OF SAFETY, HEALTH AND ENVIRONMENT ENGINEERING
FOR ACADEMIC SESSION 2020/2021

Code	Course	Credit Hours	Duration of Examination	Distribution of Marks	
				%	%
				Continuous Assessments	Final Examination
CORE COURSES					
KQD7001	Research Project	10	-	100	-
KQD7002	Safety, Health and Environmental Legislation in Malaysia	3	2 hours	50	50
KQD7003	Occupational and Environmental 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
KQD7006	Hazard Identification and Evaluation	3	2 hours	50	50
KQX7001	Research Methodology	3	-	100	-
KQX7002	Project Management	3	2 hours	50	50
ELECTIVE COURSES					
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
KQD7012	Environmental Management Systems	3	2 hours	50	50

OR

(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 (Higher Degree)'s office from time to time.

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
	Code	Subject		Code	Subject		Code	Subject	
Core Courses	KQD 7002	Safety, Health and Environmental Legislation in Malaysia	3	KQD 7001	Research Project	5	KQD 7001	Research Project	5
	KQD 7003	Occupational and Environmental Health in Engineering	3	KQD 7004	Sustainable Process Engineering	3			
	KQD 7006	Hazard Identification and Evaluation	3	KQD 7005	Quantitative Risk Assessment	3			
	KQX 7001	Research Methodology	3	KQX 7001	Research Methodology	3			
	KQX 7002	Project Management	3	KQX 7002	Project Management	3			

Elective Courses	**Code**	**Subject**		**Code**	**Subject**		**Code**	**Subject**	
	KQD 7007	Environmental Monitoring and Assessment	3	**KQD 7009**	Hazardous Waste Control	3			
	KQD 7008	Life Cycle Assessment and Management	3	**KQD 7011**	Air Pollution Management and Control	3			
	KQD 7010	Industrial Ergonomics	3	**KQD 7012**	Environmental Management Systems	3			
	KQD 7013	Quality Assurance and Assessment	3	**KQD 7014**	Human Factor and Management at Work Place	3			
		2 Elective Course			**2 Elective Course**				

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Kimia	*Department of Chemical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Keselamatan, Kesihatan dan Alam Sekitar	*Master of Safety, Health and Environment Engineering*
Kod Kursus* *Course Code**	KQD7001	*KQD7001*
Tajuk Kursus* *Course Title**	Projek Penyelidikan	*Research Project*
Kredit* *Credit**	10	*10*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	400	*400*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Telah menghabiskan minimum 5 subjek yang ditawarkan oleh program Sarjana Kejuruteraan Keselamatan, Kesihatan dan Alam Sekitar	Have completed a minimum of 5 subjects offered in *Master of Safety, Health and Environment Engineering.*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Melakukan kajian semula literatur yang diperlukan untuk projek penyelidikan 2. Merekabentuk metodologi bagi projek penyelidikan dengan mengaplikasikan peralatan eksperimen atau perisian yang sesuai 3. Menyiasat masalah penyelidikan melalui kaedah yang ditetapkan 4. Menerangkan data dan dapatan kajian secara professional 5. Membentangkan projek penyelidikan secara lisan	*At the end of the course, students are able to:* *1. Perform literature review required for the research project* *2. Design methodology of the research project by applying appropriate experimental tools or software* *3. Investigate the research problem through a defined methodology* *4. Explain the data and findings of the research professionally* *5. Present the research project orally*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	6. Mengenalpasti impak hasil penyelidikan terhadap masyarakat, alam sekitar atau ekonomi	*6. Identify the impact of the research outcome towards society, environment or economy*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran Berkomunikasi (CS1,2,3,8) 2. Kemahiran Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3,7) 3. Kemahiran Kerja Berpasukan (TS1,2,4)	*1. Communication Skills (CS1,2,3,8)* *2. Critical Thinking and Problem Solving Skills (CT1,2,3,7)* 3. *Teamwork Skills (TS1,2,4)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Projek penyelidikan akan mendedahkan pelajar dalam membuat kajian semula literatur berkaitan dengan topik kajian spesifik, merancang kaedah kajian, mengumpul data kajian dan menganalisis data, menulis laporan kajian dan membuat pembentangan	*Research project will expose students to carry out literature review on a specific research topic, plan a research methodology, collect research data and analyse data, write a research report and carry out a presentation*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 100% Peperiksaan Akhir: 0%	*Continuous Assessment:100%* *Final Examination:0%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian	*Results will be notified through notice board and online*
Kriteria Dalam Penilaian Sumatif *Criteria in Summative Assessment*	Kaedah-kaedah Peperiksaan Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	*University of Malay Examination Methods (Master's Degree) 2019* *University of Malaya Examination Rules (Master's Degree) 2019*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kejuruteraan Kimia	*Chemical Enginerring*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	*Master of Safety, Health and Environment Engineering*
Kod Kursus* *Course Code**	KQD7002	KQD7002
Tajuk Kursus* *Course Title**	Perundangan Keselamatan, Kesihatan dan Alam Sekitar di Malaysia	*Safety, Health and Environmental Legislation in Malaysia*
Kredit* *Credit**	3	3
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	120
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. 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. 3. Mencadangkan sistem pengurusan Keselamatan	*At the end of the course, students are able to:* *1. Identify the main driver towards the development, purpose and scope of self-regulating act.* *2. Analyze the difference of prescriptive and descriptive SHE legislation in Malaysia.* *Propose Safety and Health management system at workplace that incorporates compliance to*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	dan Kesihatan di tempat kerja.	*local acts and regulation*
Kemahiran Insaniah *Soft Skills*	4. Kemahiran Berkomunikasi (CS1,2,3,8) 5. Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3,7) 6. Kerja Berpasukan (TS1,2,4)	*4. Communication Skills (CS1,2,3,8)* *5. Critical Thinking and Problem Solving Skills(CT1,2,3,7)* *6. Team Work Skills(TS1,2,4)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini akan memperkenalkan pelajar terhadap Sejarah Malaysia bagi perundangan keselamatan & kesihatan; Akta Keselamatan & Kesihatan 514 (1994) Akta Kilang dan Mesin 139 (1967); Peraturan Dasar Keselamatan & Kesihatan (1995); Peraturan Jawatan-kuasa Keselamatan & Kesihatan (1996); Peratura Pegawai Keselamatan & Kesihatan (1997); CIMAH (1996); Peraturan CPL (1997); USECHH (2000); NADOPOD (2004); Kod Praktik DOSH:Kualiti udara dalaman / ruang tertutup / AIDS / dadah & alkohol; Manual DOSH: Peti Pertolongan Cemas di Tempat kerja, dll.; Akta Kilang dan Jentera 139 (1967): BOWEC / Bunyi Bising / Timah Hitam / Debu Mineral / Kebajikan Am / Asbestos; Akta Kualiti Alam Sekitar (1974) & Peraturan yang berkaitan; Akta perkhidmatan kebakaran 134 , Sijil Kebakaran 2000, “Uniform Building By Law (1984)”; OHSAS 18001: Sistem Pengurusan Keselamatan & Kesihatan :2007	*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 (CIMAH) (1996), Classification, Packaging and Labeling Regulation (CPL) (1997), Use and Standard Exposure of Chemicals Hazardous to Health Regulation (USECHH) (2000), Notification of Accident, Dangerous Occurrence, Occupational Poisoning & Occupational Disease Regulation (NADOPOD) (2004), DOSH Code of Practice: Indoor Air Quality / Confined Space / AIDS / Drug & Alcohol, Factory and Machinery Act 139 (1967): BOWEC / Noise / Lead / Mineral Dust / General Welfare/Asbestos, Environmental Quality Act (1974) & subsidiary legislation, Fire Services Act 134 , Fire Certificate 2000, Uniform Building By Law (1984), OHSAS 18001: Safety & Health Management system.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan:50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination: 50%*

UNIVERSITI MALAYA	**PRO FORMA KURSUS** ***COURSE PRO FORMA***

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	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*
Kriteria Dalam Penilaian Sumatif *Criteria in Summative Assessment*	Kaedah-kaedah Peperiksaan Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	*University of Malay Examination Methods (Master's Degree) 2019* *University of Malaya Examination Rules (Master's Degree) 2019*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kejuruteraan Kimia	*Chemical Enginerring*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	*Master of Safety, Health and Environment Engineering*
Kod Kursus* *Course Code**	KQD7003	*KQD7003*
Tajuk Kursus* *Course Title**	Kesihatan Industri dan Pekerjaan Dalam Kejuruteraan	*Occupational and Industrial Health in Engineering*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menganalisis bahaya di tempat kerja, penyakit atau ancaman kecederaan. 2. Mengenalpasti bahaya, penyakit dan ancaman kecederaan dan menentukan langkah-langkah yang perlu diambil.	*At the end of the course, students are able to:* *1. Analyze occupational hazards, diseases or impending injuries* *2. Identify hazards, diseases and impending injury and inform concerned personnel in managing these issues at the workplace.*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	3. Sintesis persekitaran kerja yang selamat dan sihat.	*3. Synthesis a safe and healthy work environment*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran Berkomunikasi (CS1,2,3) 2. Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3) 3. Kerja Berpasukan (TS1,2,4)	*1. Communication Skills (CS1,2)* *2. Critical Thinking and Problem Solving Skills(CT1,2,3)* *3. Team Work Skills(TS1,2,4)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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.	*In this course, students will 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.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination: 50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	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*
Kriteria Dalam Penilaian Sumatif *Criteria in Summative Assessment*	Kaedah-kaedah Peperiksaan Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	*University of Malay Examination Methods (Master's Degree) 2019* *University of Malaya Examination Rules (Master's Degree) 2019*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kejuruteraan Kimia	*Chemical Enginerring*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	*Master of Safety, Health and Environment Engineering*
Kod Kursus* *Course Code**	KQD7004	*KQD7004*
Tajuk Kursus* *Course Title**	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	*Sustainable Process Engineering*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menjelaskan sifat ekologi kitaran arus dan pengangkutan serta nasib bendasing 2. Menentukan kesan dan akibat dari aktiviti pemprosesan terhadap alam sekitar. 3. Mencadangkan strategi pencegahan pencemaran	*At the end of the course, students are able to:* *4. Explain the ecological nature of cycles and flows and transport and fate of contaminants.* *5. Determine the effects and impacts of processing activities on the environment.* *6. Propose appropriate integrated pollution*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	yang relevan dan bersepadu untuk pembangunan lestari bagi industri pemprosesan.	*prevention strategy for sustainable development of processing industries.*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran Berkomunikasi (CS1,2,3) 2. Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3,7) 3. Kerja Berpasukan (TS1,2,4)	*1. Communication Skills (CS1,2,3)* *2. Critical Thinking and Problem Solving Skills(CT1,2,3,7)* *3. Team Work Skills(TS1,2,4)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini akan memperkenalkan pelajar kepada isu umum dalam pencemaran alam sekitar, Ciri-ciri dan nasib pencemar alam sekitar, Pengangkutan dan transformasi pencemar, dan juga Aktiviti industri dan alam sekitar. Selain itu, Selain itu, para pelajar juga akan diberi pendedahan mengenai Pembangunan dan rekabentuk proses lestari, Operasi proses lestari, Pengurusan pencemaran, Peraturan dan komitmen antarabangsa, serta Pembangunan lestari.	*This course will introduce the students to general issues in environmental pollution, Properties and fate of environmental contaminants, Transport and transformation of contaminants and also 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.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination: 50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	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*
Kriteria Dalam Penilaian Sumatif *Criteria in Summative Assessment*	Kaedah-kaedah Peperiksaan Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	*University of Malay Examination Methods (Master's Degree) 2019* *University of Malaya Examination Rules (Master's Degree) 2019*

UNIVERSITI MALAYA	**PRO FORMA KURSUS** ***COURSE PRO FORMA***

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kejuruteraan Kimia	*Chemical Enginerring*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	*Master of Safety, Health and Environment Engineering*
Kod Kursus* *Course Code**	KQD7005	*KQD7005*
Tajuk Kursus* *Course Title**	Penilaian Risiko Kuantitatif	*Quantitative Risk Assessment*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti bahaya dengan teknik mengenalpasti bahaya. 2. Menentukan ciri-ciri risiko untuk kedua-dua proses industri dan bahaya kesihatan persekitaran. 3. Menganggarkan risiko individu dan sosial berdasarkan hasil dari kesan dan analisis kebarangkalian.	*At the end of the course, students are able to:* *1. Identify hazards by hazard identification techniques* *2. Determine risk characterization for both process industry and environmental health hazard.* *3. Estimate individual and societal risks based on outcomes from consequence and probability analysis.*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
Kemahiran Insaniah *Soft Skills*	1. Kemahiran Berkomunikasi (CS1,2,3) 2. Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3,5) 3. Kerja Berpasukan (TS1,2,4)	*1. Communication Skills (CS1,2,3)* *2. Critical Thinking and Problem Solving Skills(CT1,2,3,5)* *3. Team Work Skills(TS1,2,4)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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 lebihan.	*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 data base 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 excess cancer risk.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination: 50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	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*
Kriteria Dalam Penilaian Sumatif *Criteria in Summative Assessment*	Kaedah-kaedah Peperiksaan Universiti Malaya (Ijazah Sarjana) 2019.	*University of Malay Examination Methods (Master's Degree) 2019*

UNIVERSITI MALAYA	**PRO FORMA KURSUS** ***COURSE PRO FORMA***

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	*University of Malaya Examination Rules (Master's Degree) 2019*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kejuruteraan Kimia	*Chemical Enginerring*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	*Master of Safety, Health and Environment Engineering*
Kod Kursus* *Course Code**	KQD7006	*KQD7006*
Tajuk Kursus* *Course Title**	Mengenalpasti Hazard dan Penilaian	*Hazard Identification and Evaluation*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti hazad di tempat kerja atau unit pemprosesan dan mengurangkan risiko sebelum kemalangan berlaku. 2. Mencadangkan sistem pengurusan keselamatan yang baik di tempat kerja dan penunjuk aras prestasi yang baik untuk mempertingkatkan	*At the end of the course, students are able to:* *1. Identify hazards at workplace and processing units and reduce the risk well in advance of an accident.* *2. Propose a good safety management system at workplace and better performance indicators for a safety improvement process.*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	keselamatan proses. 3. Melakukan penyiasatan kemalangan untuk mengenalpasti kekurangan dalam Sistem Pengurusan Keselamatan Proses dan penganggaran risiko ke atas letupan.	*3. Perform accident investigation to identify deficiencies in Process Safety Management System as well as risk estimation on explosion.*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran Berkomunikasi (CS1,2,3) 2. Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3) 3. Kerja Berpasukan (TS1,2,4)	*1. Communication Skills (CS1,2,3)* *2. Critical Thinking and Problem Solving Skills(CT1,2,3)* *3. Team Work Skills(TS1,2,4)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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, CIMAH, Penganggaran kos kemalangan, Mengulas Kemalangan dan Menganalisis,dan melakukan Penyiasatan Kemalangan.	*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, CIMAH, Accident Cost Estimation, Accidents Review and Analysis and Accident Investigation Study.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination: 50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	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*

UNIVERSITI MALAYA	**PRO FORMA KURSUS** ***COURSE PRO FORMA***

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
Kriteria Dalam Penilaian Sumatif *Criteria in Summative Assessment*	Kaedah-kaedah Peperiksaan Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	*University of Malay Examination Methods (Master's Degree) 2019* *University of Malaya Examination Rules (Master's Degree) 2019*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kejuruteraan Kimia	*Chemical Enginerring*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	*Master of Safety, Health and Environment Engineering*
Kod Kursus* *Course Code**	*KQD7007*	*KQD7007*
Tajuk Kursus* *Course Title**	Penilaian dan Pemantauan Alam Sekitar	*Environmental Monitoring and Assessment*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti protokol terbaik pensampelan untuk tugas khusus dalam analisis persekitaran. 2. Menggunakan peralatan utama analitikal seperti GC, HPLC, ICP-AES dan UV-tampak spektrofotometri.	*At the end of the course, students are able to:* *1. Identify the best sampling protocol for a specific environmental analysis task.* *2. Employ major analytical equipments such as GC, HPLC, ICP-AES and UV-visible spectrophotometry.*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	3. Melakukan analisis kualitatif dan kuantitatif bagi sampel gas dan cecair dengan menggunakan GC dan HPLC. 4. Menganalisis secara kuantitatif bagi sampel cecair dan pepejal untuk kandungan logam dengan menggunakan ICP-AES.	*3. Perform qualitative and quantitative analysis of gaseous and liquid samples using GC and HPLC.* *4. Quantitatively analyse liquid and solid samples for their metal content using ICP-AES.*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran Berkomunikasi (CS1,2,3) 2. Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3,5) 3. Kerja Berpasukan (TS1,2,4)	*1. Communication Skills (CS1,2,3)* *2. Critical Thinking and Problem Solving Skills(CT1,2,3,5)* *3. Team Work Skills(TS1,2,4)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini merangkumi beberapa topik penting seperti pengenalan, 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 juga akan memperkenalkan pelajar kepada teknik analitikal, penyediaan sampel; Teknik Kromatografik (GC teknik) -Teori dan Aplikasi Persekitaran; Teknik Kromatografik (HPLC teknik) - Teori dan Aplikasi Persekitaran; GC dan HPLC Makmal - Teknik Spektroskopik (spektrofotometri); Teknik Spektroskopik (AA dan ICP-AES)- Teori dan Aplikasi Persekitaran; Teknik Elektroanalitikal- Teori dan Aplikasi Persekitaran; ICP-AES Makmal.	*This course covers few important topics such as introduction 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 also will 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.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination: 50%*
Kaedah Maklum Balas Tentang Prestasi	1. Perbincangan di dalam kelas	*1. Discussions in class*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
Methodologies for Feedback on Performance	2. Pengembalian penilaian dan ujian yang telah digredkan 3. Gred akhir akan diumumkan	*2. Returning graded assignments and tests* *3. Final grades are announced*
Kriteria Dalam Penilaian Sumatif *Criteria in Summative Assessment*	Kaedah-kaedah Peperiksaan Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	*University of Malay Examination Methods (Master's Degree) 2019* *University of Malaya Examination Rules (Master's Degree) 2019*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kejuruteraan Kimia	*Chemical Enginerring*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	*Master of Safety, Health and Environment Engineering*
Kod Kursus* Course Code*	KQD7008	*KQD7008*
Tajuk Kursus* *Course Title**	Pengurusan dan Penilaian Kitar Hayat	*Life Cycle Assessment and Management*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menyelesaikan isu dan pengurusan alam sekitar berdasarkan perspektif dan idea kitar hayat. 2. Mengaplikasikan konsep dan metodologi penilaian kitar hayat.	*At the end of the course, students are able to:* *1. Solve environmental issues and management based on a life cycle perspectives and thinking.* *2. Apply the concepts and methodologies of life cycle assessment.*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	3. Menilai pembelajaran penilaian kitar hayat untuk analisis impak. 4. Mencadangkankan strategi pengurusan kitar hayat untuk meningkatkan pengurusan alam sekitar.	*3. Assess an LCA study for impacts analysis.* *4. Propose life cycle management strategies for improved environmental management.*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran Berkomunikasi (CS1,2,3) 2. Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3) 3. Kerja Berpasukan (TS1,2) 4. Etika dan Moral Profesional (EM1,2) 5. Kemahiran Kepemimpinan (LS1,2,3)	*1. Communication Skills (CS1,2,3)* *2. Critical Thinking and Problem Solving Skills(CT1,2,3)* *3. Team Work Skills(TS1,2)* *4. Professional Ethics and Moral (EM1,2)* *5. Leadership Skills (LS1,2,3)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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.	*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.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination: 50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	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*

UNIVERSITI MALAYA	**PRO FORMA KURSUS** ***COURSE PRO FORMA***

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
Kriteria Dalam Penilaian Sumatif *Criteria in Summative Assessment*	Kaedah-kaedah Peperiksaan Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	*University of Malay Examination Methods (Master's Degree) 2019* *University of Malaya Examination Rules (Master's Degree) 2019*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kejuruteraan Kimia	*Chemical Enginerring*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	*Master of Safety, Health and Environment Engineering*
Kod Kursus* Course Code*	KQD7010	*KQD7010*
Tajuk Kursus* *Course Title**	Ergonomik Industri	*Industrial Ergonomics*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti kepentingan faktor manusia & ergonomic dan keselamatan & kesihatan dalam aplikasi peralatan dan peranti di persekitaran tempat	*At the end of the course, students are able to:* *1. Identify the important of human factors & ergonomics and safety & health in designing equipment and in work environments*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	kerja 2. Mengenalpasti faktor-faktor manusia & ergonomic dan keselamatan & kesihatan dengan kaedah mendiagnosis pekerjaan dan rekabentuk pekerjaan. 3. Menginterpretasi amalan kerja dan rekabentuk pekerjaan dalam industri.	*2. Identify ergonomics methods in diagnosing job and work design* *3. Interpret the practices in job and work design in industries*
Kemahiran Insaniah *Soft Skills*	1. Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3,4) 2. Kerja Berpasukan (TS1,2,3) 3. Pembelajaran Berterusan dan Pengurusan Maklumat (LL1,2) 4. Etika dan Moral Profesional (EM1,2) 5. Kemahiran Kepemimpinan (LS1,2)	*1. Critical Thinking and Problem Solving Skills(CT1,2,3,4)* *2. Team Work Skills(TS1,2,3)* *3. Life Long Learning and Information Management (LL1,2)* *4. Professional Ethics and Moral (EM1,2)* *5. Leadership Skills (LS1,2)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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	*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.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination: 50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	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*
Kriteria Dalam Penilaian Sumatif *Criteria in Summative Assessment*	Kaedah-kaedah Peperiksaan Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	*University of Malay Examination Methods (Master's Degree) 2019* *University of Malaya Examination Rules (Master's Degree) 2019*

UNIVERSITI MALAYA	**PRO FORMA KURSUS** ***COURSE PRO FORMA***

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kejuruteraan Kimia	*Chemical Enginerring*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	*Master of Safety, Health and Environment Engineering*
Kod Kursus* Course Code*	KQD7011	*KQD7011*
Tajuk Kursus* *Course Title**	Pengurusan dan Kawalan Pencemaran Udara	*Air Pollution Management and Control*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menerangkan konsep kualiti udara dan ciri-ciri, jenis serta sumber dan kesannya terhadap kesihatan dan alam sekitar. 2. Menjelaskan pengaruh atmosfera dan meteorologi terhadap kualiti udara	*At the end of the course, students are able to:* *1. Explain the concept of air quality and its characteristics, types and sources and their impact on health and environment.* *2. Explain the influences of the atmosphere and the meteorological on air quality.*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	3. Menilai serakan pencemar melalui permodelan. 4. Mencadangkan strategi kawalan dan pengurusan untuk pencemar zarahan dan gas.	*3. Evaluate the dispersion of pollutants through modelling.* *4. Propose the control and management strategies for particulates and gaseous pollutants.*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran Berkomunikasi (CS1,2,3) 2. Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3,5) 3. Kerja Berpasukan (TS1,2,4)	*1. Communication Skills (CS1,2,3)* *2. Critical Thinking and Problem Solving Skills(CT1,2,3,5)* *3. Team Work Skills(TS1,2,4)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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 zarahan udara.	*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.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination: 50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	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*
Kriteria Dalam Penilaian Sumatif *Criteria in Summative Assessment*	Kaedah-kaedah Peperiksaan Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	*University of Malay Examination Methods (Master's Degree) 2019* *University of Malaya Examination Rules (Master's Degree) 2019*

UNIVERSITI MALAYA	**PRO FORMA KURSUS** ***COURSE PRO FORMA***

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kejuruteraan Kimia	*Chemical Enginerring*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	*Master of Safety, Health and Environment Engineering*
Kod Kursus* Course Code*	KQD7012	*KQD7012*
Tajuk Kursus* *Course Title**	Sistem Pengurusan Alam Sekitar	*Environmental Management Systems*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menjelaskan konsep pengurusan alam sekitar dan keperluan kepada perubahan paradigma dalam pengurusan alam sekitar.	*At the end of the course, students are able to:* *1. Describe the concept of environmental management and the need for a paradigm*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	2. Menilai sumbangan kepada pengurusan alam sekitar yang efektif termasuk perundangan, perancangan dan pembentukan institusi. 3. Mengaplikasikan elemen-elemen sistem pengurusan alam sekitar, ISO14001 dalam pengurusan alam sekitar. 4. Merekabentuk alatan sistem pengurusan alam sekitar bagi kajian kes sebenar untuk penambahbaikan organisasi.	*shift in environmental management.* *2. Evaluate the contributors of an effective environmental management including legislation, planning and institutional set up.* *3. Apply the elements of environmental management systems, ISO14001 in environmental management.* *4. Design the environmental management system tools to actual case studies for organizational improvement.*
Kemahiran Insaniah *Soft Skills*	1. Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3,4) 2. Kerja Berpasukan (TS1,2,5) 3. Pembelajaran Berterusan dan Pengurusan Maklumat (LL1,2) 4. Etika dan Moral Profesional (EM1,2) 5. Kemahiran Kepemimpinan (LS1,2)	*1. Critical Thinking and Problem Solving Skills(CT1,2,3,4)* *2. Team Work Skills(TS1,2,5)* *3. Life Long Learning and Information Management (LL1,2)* *4. Professional Ethics and Moral (EM1,2)* *5. Leadership Skills (LS1,2)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Dalam kursus ini, pelajar akan mempelajari mengenai pengenalan kepada ekologi dan alam sekitar, anjakan paradigm dalam konsep pengurusan alam sekitar, rancangan alam sekitar dan instituisi yang terbina di Malaysia (sebagai kajian kes) dan penilaian kesan persekitaran dan aplikasinya dalam rancangan alam sekitar. Selain itu, pelajar juga akan mendapat pengetahuan tentang siri pengurusan alam sekitar dan audit, sistem maklumat 'Geographical' dan peranannya dalam rancangan alam sekitar, alat pengurusan alam sekitar seperti LCA, MFA, LCA, MFA, Environmental Performance Evaluation, Ecological Footprints dan lain-lain.	*In this course, students will learn about the introduction to ecology and environment, paradigm shift of environmental management concept, environmental planning and institutional set up in Malaysia (as a case study) and environmental impact assessment and its application in environmental planning. Besides, students also will get knowledge about the Environmental management series and auditing, geographical information system and its role in environmental planning, environmental Management Tools such as LCA, MFA, Environmental Performance Evaluation, Ecological Footprints etc.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination: 50%*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	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*
Kriteria Dalam Penilaian Sumatif *Criteria in Summative Assessment*	Kaedah-kaedah Peperiksaan Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	*University of Malay Examination Methods (Master's Degree) 2019* *University of Malaya Examination Rules (Master's Degree) 2019*

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kejuruteraan Kimia	*Chemical Enginerring*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	*Master of Safety, Health and Environment Engineering*
Kod Kursus* Course Code*	KQD7013	*KQD7013*
Tajuk Kursus* *Course Title**	Penetapan dan Penilaian Kualiti	*Quality Assurance and Assessment*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menjelaskan prinsip-prinsip pengurusan kualiti dan implikasi pada keselamatan dan persekitaran. 2. Menyediakan sistem pengurusan kualiti di tempat kerja. 3. Menggunakan kaedah menilai kualiti (termasuk	*At the end of the course, students are able to:* *1. Elaborate the principles of quality management and implications on safety and environment.* *2. Prepare a quality management system in the workplace.*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	QFD dan kejuruteraan kualiti) dan enam teknik sigma jaminan kualiti. 4. Menggunakan sistem pengurusan kualiti ISO 9000.	*3. Apply the tools of quality assessment (including QFD and quality engineering) and the six sigma technique of quality assurance.* *4. Apply ISO 9000 quality management system.*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran Berkomunikasi (CS1,2,3) 2. Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3) 3. Kerja Berpasukan (TS1,2,3,5) 4. Etika dan Moral Profesional (EM1,2) 5. Kemahiran Kepemimpinan (LS1,2)	*1. Communication Skills (CS1,2,3)* *2. Critical Thinking and Problem Solving Skills(CT1,2,3,)* *3. Team Work Skills(TS1,2,3,5)* *4. Professional Ethics and Moral (EM1,2)* *5. Leadership Skills (LS1,2)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Dalam kursus ini, pelajar akan diberikan pendedahan mengenai Prinsip-prinsip Kualiti, Kepimpinan dalam kualiti, kerjasama dan manusia yang terlibat, Kemajuan berterusan dalam Kualiti dan QFD untuk rekaan kualiti dalam produk dan perkhidmatan. Selain itu, pelajar juga akan dapat mempelajari tentang Kos Kualiti, Melaksanakan "six sigma" dan ISO 9000, dan juga Kaedah untuk penilaian kualiti.	*In this course, students will be exposed to the Principles of Quality, Leadership in quality, team work and people involvement, Continuous Improvement in Quality and QFD for designing quality in products and services. Besides, students also will be able to learn about the Cost of quality, Implementing six sigma and ISO 9000 and also tools for quality assessment.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination: 50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	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*
Kriteria Dalam Penilaian Sumatif *Criteria in Summative Assessment*	Kaedah-kaedah Peperiksaan Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	*University of Malay Examination Methods (Master's Degree) 2019* *University of Malaya Examination Rules (Master's Degree) 2019*

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kejuruteraan Kimia	*Chemical Enginerring*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Keselamatan, Kesihatan, dan Alam Sekitar	*Master of Safety, Health and Environment Engineering*
Kod Kursus* Course Code*	KQD7014	*KQD7014*
Tajuk Kursus* *Course Title**	Faktor Kemanusian dan Pengurusan Tempat Kerja	*Human Factor and Management at Work Place*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Mengenalpasti kepentingan faktor kemanusian dalam aplikasi peralatan dan persekitaran tempat kerja 2. Menganalisa rekabentuk yang berkaitan dan penting bagi persekitaran tempat kerja di industri 3. Membangunkan kesedaran, tanggungjawab dan	*At the end of the course, students are able to:* *1. Identify the importance of human factor in the application of tools and work environment.* *2. Analyse relevant and significant human factor design for work environment in industries.* *3. Build awareness, responsibility and self-belief at*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	kepercayaan-diri di tempat kerja 4. Mengurus organisasi di tempat kerja 5. Mewujudkan organisasi berprestasi tinggi	*the workplace.* *4. Manage the organisation at the workplace.* *5. Create high performance organisation.*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran Berkomunikasi (CS1,2,3,5) 2. Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3,5) 3. Kerja Berpasukan (TS1,2,4)	*1. Communication Skills (CS1,2,3,5)* *2. Critical Thinking and Problem Solving Skills(CT1,2,3,5)* *3. Team Work Skills(TS1,2,4)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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.	*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.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment: 50%* *Final Examination: 50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	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*
Kriteria Dalam Penilaian Sumatif *Criteria in Summative Assessment*	Kaedah-kaedah Peperiksaan Universiti Malaya (Ijazah Sarjana) 2019. Peraturan-peraturan Universiti Malaya (Ijazah Sarjana) 2019.	*University of Malay Examination Methods (Master's Degree) 2019* *University of Malaya Examination Rules (Master's Degree) 2019*

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*

UNIVERSITI MALAYA	**PRO FORMA KURSUS** ***COURSE PRO FORMA***

Academy/Faculty/Institution/Centre level.

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
Akademi/Fakulti/Institut/Pusat *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Kejuruteraan	*Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan	*Master of Engineering*
Kod Kursus* *Course Code**	KQX7001	*KQX7001*
Tajuk Kursus* *Course Title**	Metodologi Penyelidikan	*Research Methodology*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Pada akhir kursus ini, pelajar dapat: 1. Mengenal pasti masalah penyelidikan yang sesuai dan menulis kertas cadangan projek 2. Mengenal pasti kaedah penyelidikan dan reka bentuk eksperimen yang sesuai 3. Menulis kertas cadangan penyelidikan berdasarkan bidang yang dipilih masing-masing 4. Menyediakan kertas ulasan	*At the end of the course, candidates are 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 field choose* *4. Prepare a review paper*

UNIVERSITI MALAYA	**PRO FORMA KURSUS** ***COURSE PRO FORMA***

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
Kemahiran Insaniah *Soft Skills*	Kemahiran Pemikiran Kritis (CT7)	*Critical Thinking (CT7)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini meliputi pemerolehan dan analisis data serta pembentangan lisan dan tulisan bagi keputusan-keputusan projek penyelidikan tertentu.	The course covers data acquisition and analysis as well as verbal and written presentations of results of a specified research project.
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 100% Peperiksaan Akhir: 0%	*Continuous Assessment: 100%* *Final Examination:0%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Maklumbalas secara dalam talian	Online feedback
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

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kursus Fakulti	*Faculty Course*
Nama Program Akademik Name o fAcademic*Programme*	Sarjana Kejuruteraan	*Master of Engineering*
Kod Kursus* *Course Code**	KQX7002	*KQX7002*
Tajuk Kursus* *Course Title**	Pengurusan Projek	*Project Management*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*Nil*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Dia akhir pembelajaran ini, pelajar dapat: 1. Menerangkan prinsip komponen dan konsep pengurusan projek. 2. Menjelaskan pelbagai pemacu perubahan yang boleh menjejaskan projek selama kitran hidupnya. 3. Menyelesaikan segala cabaran semasa projek secara	*At the end of the course, students are able to:* *1. Explain the principle components and concepts of project management.* *2. Justify the various drivers of change which may impact a project during its life cycle.* *3. Solve every challenges faced during the*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	efektif.	*project.*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran menulis laporan 2. Kemahiran pembelajaran kooperatif 3. Kemahiran pembentangan 4. Kemahiran menyelesaikan masalah	*1. Cooperative learning skill* *2. Presentation skills* *3. Report Writing skills* *4. Problem solving skills*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Pengenalan kepada pengurusan Projek, Strategi, Organisasi, Proses, Manusia dan Struktur.	*Introduction to Project management, Strategy, Organization, Process, People and Structure.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian berterusan : 50% Peperiksaan akhir : 50%	*Continuous Assessment : 50%* *Final examination : 50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis dan dimaklumkan pada talian.	Resutls will be notified through notice board and online.
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*

Department of Mechanical Engineering

Head of Department

Ir. Dr. Bushroa Binti Abd Razak
T: (603) 7967 5204 / 7637
F: (603) 7967 5317

Master of Mechanical Engineering Coordinator

Ir. Dr. Ong Zhi Chao
T: (603) 7967 6815

UNIVERSITI MALAYA

MASTER OF MECHANICAL ENGINEERING

Program Structure

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

(a) Six (6) core courses whereby each course carries three (3) credit hours **AND**;

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

(c) Four (4) 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 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 within the week preceding of the beginning semester.

(b) A candidate must register for at least six credit (6) 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 under observation category.

(5) Supervision

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

(6) Determination of Field of Research

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

(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
KQE 7001	Research Project	12
KQE 7002	Analysis of Applied Engineering	3
KQE 7003	Thermal Systems Engineering	3
KQE 7004	Energy Conversion and Storage	3
KQE 7005	Applied Mechanics	3
KQX 7001	Research Methodology	3
KQX 7002	Project Management	3

2. ELECTIVE COURSE

Course Code	Title	Credit Hours
KQE 7006	Renewable Energy	3
KQE 7007	Computational Fluid Dynamics	3
KQE 7008	HVAC and Building Energy Management	3
KQE 7009	Control and Automation	3
KQE 7010	Noise and Vibration	3
KQE 7011	Power Plant Engineering	3
KQE 7012	Micro Fabrication and Devices	3
KQE 7013	Finite Element Analysis	3
KQA 7002	Materials Selection and Design	3
KQA 7007	Failure of Materials in Service	3
KQG 7007	Computer Aided Product Design and Development	3

COURSE OFFERED FOR THE PROGRAMME OF
MASTER OF MECHANICAL ENGINEERING FOR ACADEMIC SESSION 2020/2021

Code	Course	Credit Hours	Duration of Examination	Distribution of Marks	
				%	%
				Continuous Assessments	Final Examination
CORE COURSES					
KQE 7001	Research Project	12	-	100	-
KQE 7002	Analysis of Applied Engineering	3	2 hours	50	50
KQE 7003	Thermal Systems Engineering	3	2 hours	50	50
KQE 7004	Energy Conversion and Storage	3	2 hours	50	50
KQE 7005	Applied Mechanics	3	2 hours	50	50
KQX 7001	Research Methodology	3	-	100	-
KQX 7002	Project Management	3	2 hours	50	50
ELECTIVE COURSES					
KQE 7006	Renewable Energy	3	2 hours	50	50
KQE 7007	Computational Fluid Dynamics	3	2 hours	50	50
KQE 7008	HVAC and Building Energy Management	3	2 hours	50	50
KQE 7009	Control and Automation	3	2 hours	50	50
KQE 7010	Noise and Vibration	3	2 hours	50	50
KQE 7011	Power Plant Engineering	3	2 hours	50	50
KQE 7012	Micro Fabrication and Devices	3	2 hours	50	50

KQE 7013	Finite Element Analysis	3	2 hours	50	50
KQA 7002	Materials Selection and Design	3	2 hours	50	50
KQA 7007	Failure of Materials in Service	3	2 hours	50	50
KQG 7007	Computer Aided Product Design and Development	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 (Higher Degree)'s office from time to time.

PLANNER FOR MASTER OF MECHANICAL ENGINEERING PROGRAM

COURSE CODE	SEMESTER 1			SEMESTER 2			SEMESTER 3**		
	COURSE CODE		CREDIT	COURSE CODE		CREDIT	COURSE CODE		CREDIT
	Code	Subject		Code	Subject		Code	Subject	
Core Courses	**KQE 7002**	Analysis of Applied Engineering	3	***KQE 7001**	Research Project	6	***KQE 7001**	Research Project	6
	KQE 7003	Thermal Systems Engineering	3	**KQE 7005**	Applied Mechanics	3			
	KQE 7004	Energy Conversion and Storage	3	**KQX 7002**	Project Management	3			
	KQX 7001	Research Methodology	3	****KQX 7001**	Research Methodology	3			
	****KQX 7002**	Project Management	3						
	***KQE 7001**	Research Project	6						

	Code	Subject		Code	Subject		Code	Subject	
Elective Courses	**KQE 7006**	Renewable Energy	3	**KQE 7007**	Computational Fluid Dynamics	3			
	KQE 7008	HVAC and Building Energy Management	3	**KQE 7009**	Control and Automation	3			
	KQE 7010	Noise and Vibration	3	**KQE 7011**	Power Plant Engineering	3			
	KQE 7012	Micro Fabrication	3	**KQE 7013**	Finite Element Analysis	3			
	KQA 7002	Materials Selection and Design	3	**KQA 7007**	Failure of Materials In Service	3			
				KQG 7007	Computer Aided Product Design and Development	3			

NOTE:

(1) ***** 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.

(2) ****** Courses will be offered if there are sufficient request.

(3) ***Course offered for Semester II intakes.

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Mekanik	*Department of Mechanical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Mekanikal	*Master of Mechanical Engineering*
Kod Kursus* *Course Code**	KQE7001	*KQE7001*
Tajuk Kursus* *Course Title**	Projek Penyelidikan	*Research Project*
Kredit* *Credit**	12	*12*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	480	*480*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	KQX7001	KQX7001
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Melakukan kajian semula literatur yang diperlukan untuk projek penyelidikan 2. Merekabentuk metodologi bagi projek penyelidikan dengan mengaplikasikan peralatan eksperimen atau perisian	*At the end of the course, students are able to:* *1. Perform literature review required for the research project* *2. Design methodology of the research project by applying appropriate experimental tools or software*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	yang sesuai 3. Menyiasat masalah penyelidikan melalui kaedah yang ditetapkan 4. Menerangkan data dan dapatan kajian secara professional 5. Membentangkan projek penyelidikan secara lisan 6. Mengenalpasti impak hasil penyelidikan terhadap masyarakat, alam sekitar atau ekonomi	*3. Investigate the research problem through a defined methodology* *4. Explain the data and findings of the research professionally* *5. Present the research project orally* *6. Identify the impact of the research outcome towards society, environment or economy*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran Berkomunikasi (CS1,2,3,8) 2. Kemahiran Pemikiran Kritis dan Penyelesaian Masalah (CT1,2,3,7) 3. Kemahiran Kerja Berpasukan (TS1,2,4)	*1. Communication Skills (CS1,2,3,8)* *2. Critical Thinking and Problem Solving Skills (CT1,2,3,7)* 3. *Teamwork Skills (TS1,2,4)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Projek penyelidikan akan mendedahkan pelajar dalam membuat kajian semula literatur berkaitan dengan topik kajian spesifik, merancang kaedah kajian, mengumpul data kajian dan menganalisis data, menulis laporan kajian dan membuat pembentangan	*Research project will expose students to carry out literature review on a specific research topic, plan a research methodology, collect research data and analyse data, write a research report and carry out a presentation*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 100% Peperiksaan Akhir: 0%	*Continuous Assessment:100%* *Final Examination:0%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian	*Results will be notified through notice board and online*
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*

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Mekanik	*Department of Mechanical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Mekanikal	*Master of Mechanical Engineering*
Kod Kursus* *Course Code**	KQE7002	*KQE7002*
Tajuk Kursus* *Course Title**	Analisis Kejuruteraan Gunaan	*Applied Engineering Analysis*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menulis algoritma untuk model masalah kejuruteraan 2. Menyelesaikan persamaan linear dan bukan-linear	*At the end of the course, students are able to:* *1. Write algorithms to model engineering problems* *2. Solve linear and non-linear equations* *3. Solve ordinary & partial differential*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	3. Menyelesaikan persamaan pengkamiran separa & biasa menggunakan kaedah beza sehingga dan elemen terhingga	*equations using finite difference and finite element methods*
Kemahiran Insaniah *Soft Skills*	Pemikiran Kritis & Menyelesaikan Masalah CT1-CT5 Kemahiran Bekerja Berkumpulan TS1-TS5 Pembelajaran Berterusan LL1-LL3	*Critical Thinking & Problem Solving CT1-CT5* *Team Working Skills TS1-TS5* *Lifelong Learning LL1-LL3*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Pengenalan Kaedah Analisis berangka, berangka Diferensiasi dan Integrasi, Sistem Persamaan Linear Algebra, Terperinci dan Jarang Matriks, Penyelesaian dari Persamaan Polinomial dan Algebra, Penyelesaian Numerik Persamaan pengkamiran Biasa (ODEs), Penyelesaian Numerik Persamaan pengkamiran separa (PDEs), Hingga Kaedah Elemen prinsip dan Contoh, Penyelesaian Numerik Persamaan Elemen Hingga	*Introduction to numerical Analysis Methods, Numerical Differentiation and Integration, Systems of Linear Algebraic Equations, Special and Sparse Matrices, Solution of Polynomial and Algebraic Equations, Numerical Solution of Ordinary Differential Equations (ODEs), Numerical Solution of Partial Differential Equations (PDEs), Finite Element Method principle and Examples, Numerical Solution of Finite Element Equations*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment:50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian.	*Results will be notified through notice board and online*
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) 2019University of Malay Rules (Master's Degree) 2019* *University of Malaya Regulations (Master's Degree) 2019*

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Mekanik	*Department of Mechanical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Mekanikal	*Master of Mechanical Engineering*
Kod Kursus* *Course Code**	KQE7003	*KQE7003*
Tajuk Kursus* *Course Title**	Kejuruteraan Sistem Haba	*Thermal Systems Engineering*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menganalisis masalah rekabentuk secara pembezaan/campuran kejuruteraan dan artistik. 2. Meyelesaikan masalah modelan di dalam	*At the end of the course, students are able to:* *4. Analyze the design problems via comparison/mix of engineering and artistic.*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	sistem haba. 3. Melakukan sintesis terhadap langkah-langkah yang perlu diambil dalam kaedah optimasi dan ekonomi merekabentuk sistem haba.	*5. Solving the modelling problems in engineering design.* *6. Synthesize the applicable technics into optimization and economical aspects in thermal systems design*
Kemahiran Insaniah *Soft Skills*	Kemahiran Berkomunikasi (CS1-CS3) Pemikiran kritis dan penyelesaian masalah (CT1,2,3) Pembelajaran Berterusan dan Pengurusan Maklumat (LL1)	*Communication Skills (CS1 – CS3)* *Critical thinking and problem solving skills (CT1,2,3)* *Continuous Learning and information Management (LL1 – LL2)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini mengandungi Pengenalan dan Ulangkaji kepada Rekabentuk Kejuruteraan – Perimbangan Am – Moelan Sistem Haba – Rekabentuk bolh gunapakai – Pertimbangan ekonomi – Formulasi untuk Masalah Optimasi – Rekabentuk berasaskan Ilmu- Ulangkaji	*This course includes introduction and revision on Engineering Design & Basic Consideration and Modelling of Thermal Systems. Acceptable Design & Economics Consideration. Problem Formulation for Optimization and Knowledge based design.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment:50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian.	*Results will be notified through notice board and online*
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*

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Mekanik	*Department of Mechanical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Mekanikal	*Master of Mechanical Engineering*
Kod Kursus* *Course Code**	KQE7004	*KQE7004*
Tajuk Kursus* *Course Title**	Penukaran Tenaga dan Penyimpanan	*Energy Conversion and Storage*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Mendemonstrasikan konsep kecekapan tenaga dan pengurusan.. 2. Menerapkan kaedah penggunaan tenaga	*At the end of the course, students are able to:* *1. Demonstrate the concept of energy efficiency and management.* *2. Apply the methods of using energy*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	secara efisyen dalam sektor primer 3. Menganalisa potensi penjimatan dan kesan program.	*efficiently in primary sector.* *3. Analyse potential savings and impact of the programs.*
Kemahiran Insaniah *Soft Skills*	Pemikiran kritis dan penyelesaian masalah (CT1,2,3) Kerjasama berpasukan (TS1,2) Pembelajaran Berterusan dan Pengurusan Maklumat (LL1,2)	*Critical thinking and problem solving skills (CT1,2,3)* *Team work skills (TS1,2)* *Life-long learning and information management (LL1,2)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Pengenalan untuk kecekapan tenaga, Penghasilan Pencemaran, Pengurangan Pencemaran dan Pencukaian, Kecekapan Pencahayan, Teori Piawai Kecekapan Tenaga dan Label, Kecekapan Tenaga Piawai: Kesan kepada Tenaga dan Alam Sekitar, Kesan Ekonomi. Pembangunan label tenaga: Kaedah dan Hasil. Label Tenaga : Penjimatan tenaga, dan kesan ekonomi dan alam sekitar. Analsis Eknomi-Pemindahan Pasaran- Ulangkaji	*Introduction to energy efficiency, Emission production, Emission reduction and taxation, Lighting Efficiency, Theory of energy efficiency standards and labels, Energy efficiency standard: energy and environmental impact, economical impact of energy efficiency standard, Development of energy label: methodology and results, Energy label: energy savings, Economical and environmental impact Energy label Malaysia's Energy label, Fuel Economy standard and labels, Economic analysis-Engineering/economic analysis. Energy efficiency improvement, Economic analysis-Market transformation, Review*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment:50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian.	*Results will be notified through notice board and online*
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*

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Mekanik	*Department of Mechanical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Mekanikal	*Master of Mechanical Engineering*
Kod Kursus* *Course Code**	KQE7005	*KQE7005*
Tajuk Kursus* *Course Title**	Mekanik Gunaan	*Applied Mechanics*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menganalisa masalah mekanik gunaan secara logik. 2. Mengaplikasi teori mekanik gunaan dalam masalah kehidupan sebenar	*At the end of the course, students are able to:* *1. Analyze applied mechanics problem in a logical manner.* *2. Apply theory of applied mechanics in the real life problem.*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	3. Mencadangkan penyelesaian kepada masalah mekanik gunaan tiga dimensi	*3. Propose solution to a three-dimensional applied mechanics problem.*
Kemahiran Insaniah *Soft Skills*	1. Pemikiran kritis dan penyelesaian masalah (CT1-3) 2. Kerjsama berpasukan (TS1-2) 3. Pembelajaran berterusan dan pengurusan maklumat (LL1-2)	*1. Critical thinking and problem solving skills (CT1-3)* *2. Team work skills (TS1-2)* *3. Life-long learning and information management (LL1-2)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini mengandungi Pengenalan, Statik Zarah, Jasad Tegar, Daya Agihan, Struktur Analisis, Daya dalam Rasuk dan Kabel, Geseran, Daya-daya Agihan dan Kerja Maya, Kinematik Zarah, Sistem Zarah, Kinematik Jasad Tegar, Gerakan Satah Jasad Tegar, Kinetik Jasad Tegar, Getaran Mekanikal	*This course includes Introduction, Statics of Particles, Rigid Bodies, Distributed Forces, Analysis of Structures, Forces in Beams and Cables, Friction, Distributed Forces and Virtual Work, Kinematics of Particles, System of Particles, Kinematics of Rigid Bodies, Plane Motion of Rigid Bodies, Kinetics of Rigid Bodies, Mechanical Vibrations*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment:50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian.	*Results will be notified through notice board and online*
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*

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Mekanik	*Department of Mechanical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Mekanikal	*Master of Mechanical Engineering*
Kod Kursus* *Course Code**	KQE7006	*KQE7006*
Tajuk Kursus* *Course Title**	Tenaga Diperbaharui	*Renewable Energy*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menerangkan tenaga asas, penukaran tenaga dan kegunaannya 2. Menganalisa isu teknikal di dalam sistem tenaga dan kebolehmampanan	*At the end of the course, students are able to:* *1. Explain energy basics, renewable energy conversion and its applications*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	3. Menggunakan prinsip tenaga solar dan tenaga angin di dalam mereka bentuk sistem tenaga diperbaharui. 4. Menghuraikan prinsip asas di dalam tenaga yang menggunakan air dan sel bahan bakar hidrogen	*2. Analyse the technical issues in renewable energy systems and sustainability* *3. Apply solar energy and wind energy principles in the design, of renewable energy system* *4. Describe the basic principles of water based energy, and hydrogen fuel cell*
Kemahiran Insaniah *Soft Skills*	1. Pemikiran kritis dan penyelesaian masalah (CT1,2,3) 2. Kerjasama berpasukan (TS1,2) 3. Pembelajaran Berterusan dan Pengurusan Maklumat (LL1)	*1. Critical thinking and problem solving skills (CT1,2,3)* *2. Team work skills (TS1,2)* *3. Life-long learning and information management (LL1)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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 diperbaharui 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	*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. Renewable 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*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	gunakan secara berkesan.	*should be appropriately used.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment:50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian.	*Results will be notified through notice board and online*
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*

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Mekanik	*Department of Mechanical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Mekanikal	*Master of Mechanical Engineering*
Kod Kursus* *Course Code**	KQE7007	*KQE7007*
Tajuk Kursus* *Course Title**	Dinamik Bendalir Berkomputer	*Computational Fluid Dynamics*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menentukan kesedaran yang kritikal persamaan mekanik bendalir dan sifat-sifat matematik mereka dalam formulasi yang pelbagai.	*At the end of the course, students are able to:* *1. Determine a critical awareness of the governing equations of fluid mechanics, and their mathematical*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	2. Menilai prinsip-prinsip dan batasan teknik alternatif bagi simulasi aliran bergelora dan peralihan. 3. Menilai sumber potensi ralat dan ketidakpastian simulasi berangka.	*properties, in various formulations.* *2. Appraise the principles and limitations of alternative techniques for the simulation of turbulent and transitional flows.* *3. Evaluate the potential sources of error and uncertainty in numerical simulations.*
Kemahiran Insaniah *Soft Skills*	1. Pemikiran Kritis & Menyelesaikan Masalah CT1-CT6 2. Kemahiran Berkomunikasi CS1-CS7 3. Kemahiran Bekerja Berkumpulan TS1-TS5	*1. Communication Skills: CS1 – CS7* *2. Critical Thinking and Problem Solving Skills: CT1 - CT6* *3. Team Work Skills: TS1 - TS5*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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. Pelajar akan mempelajari membiasakan dengan teknik pengaturcaraan berorientasikan objek saintifik. Pengenalan kepada kaedah pengkomputeran teragih dan berprestasi tinggi juga akan pelajari.	*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. The students will learn to familiarize with scientific object oriented programming techniques. An introduction to distributed and high performance computing methods will also be included.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment:50%* *Final Examination:50%*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian.	*Results will be notified through notice board and online*
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*

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Mekanik	*Department of Mechanical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Mekanikal	*Master of Mechanical Engineering*
Kod Kursus* *Course Code**	KQE7008	*KQE7008*
Tajuk Kursus* *Course Title**	HVAC dan Pengurusan Tenaga Bangunan	*HVAC and Building Energy Management*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Merekabentuk sistem HVAC & R untuk bangunan. 2. Menghitung pengiraan beban bangunan. 3. Menaksir operasi sistem HVAC & R di	*At the end of the course, students are able to:* *1. Design the HVAC & R Systems selected.* *2. Compute building load calculations.*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	bawah keadaan beban yang berbeza.	*3. Evaluate the operation of HVAC & R under varying load conditions.*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran berkomunikasi (CS1-CS5) 2. Pemikiran kritis dan penyelesaian masalah (CT1-CT3) 3. Etika dan Moral Profesional (EM1)	*1. Communication Skills (CS1-CS5)* *2. Critical Thinking & Problem Solving (CT1 – CT3)* *3. Professional Ethics and Moral (EM1)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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.	*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*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment:50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian.	*Results will be notified through notice board and online*
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*

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Mekanik	*Department of Mechanical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Mekanikal	*Master of Mechanical Engineering*
Kod Kursus* *Course Code**	KQE7010	*KQE7010*
Tajuk Kursus* *Course Title**	Getaran dan Bunyi	*Vibration and noise*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menganalisa data getaran dan bunyi jentera. 2. Menentukan kegagalan jentera yang umum	*At the end of the course, students are able to:* *1. Analyse machinery vibration and noise data.* *2. Determine common machinery fault conditions.* *3. Evaluate complex vibration problem*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	3. Menilai masalah getaran rumit yang melibatkan isu-isu dinamik jentera	*involving machinery dynamics issues.*
Kemahiran Insaniah *Soft Skills*	Pemikiran kritis dan penyelesaian masalah (CT1,2,3) Kemahiran Kerja Berkumpulan (TS1,2) Pembelajaran Berterusan dan Pengurusan Maklumat (LL1)	*Critical thinking and problem solving skills (CT1,2,3)* *Team work skills (TS1,2)* *Life-long learning and information management (LL1)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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, Dinamik Jentera, analisa ragaman, analisa 'ODS', analisa bunyi	*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*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment:50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian.	*Results will be notified through notice board and online*
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*

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Mekanik	*Department of Mechanical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Mekanikal	*Master of Mechanical Engineering*
Kod Kursus* *Course Code**	KQE7011	*KQE7011*
Tajuk Kursus* *Course Title**	Kejuruteraan Lojikuasa	*Power Plant Engineering*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menganalisis sistem kuasa wap, gas dan nuklear 2. Menyelesaikan masalah-masalah kecekapan tenaga di dalam sistem	*At the end of the course, students are able to:* *1. Analyse the vapour, gas, and nuclear system plants.* *2. Solve the energy efficiency problems*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	lojikuasa 3. Mengenalpasti kaedah modifikasi yang boleh diambil untuk mengoptimumkan sistem lojikuasa	*in power plants* *3. Identify the modification method to be considered to optimize the performance of the plants*
Kemahiran Insaniah *Soft Skills*	1. Pemikiran kritis dan penyelesaian masalah (CT1,2,3) 2. Kerjasama berpasukan (TS1,2) 3. Pembelajaran Berterusan dan Pengurusan Maklumat (LL1)	*1. Critical thinking and problem solving skills (CT1,2,3)* *2. Team work skills (TS1,2)* *3. Life-long learning and information management (LL1)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Pengenalan – Sistem wap – sistem gas – sistem nuklear – Kitaran gabungan – Penjana Stim – Turbin Stim – Loji Nuklear – Fizik Reaktor - Loji Hidro - Penyimpanan Tenaga- Ulangkaji	*Introduction and revision on Engineering Design – Basic Consideration – Modelling of Thermal Systems – Acceptable Design – Economics Consideration – Problem Formulation for Optimization – Knowledge based design - Revision*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment:50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian.	*Results will be notified through notice board and online*
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*

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Mekanik	*Department of Mechanical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Mekanikal	*Master of Mechanical Engineering*
Kod Kursus* *Course Code**	KQE7013	*KQE7013*
Tajuk Kursus* *Course Title**	Analisis Unsur Terhingga	*Finite Element Analysis*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menunjukkan penggunaan kaedah elemen terhad untuk menyelesaikan masalah-masalah kejuruteraan asas. 2. Mengenali had kaedah unsur terhingga	*At the end of the course, students are able to:* *1. Demonstrate the use of finite element methods to solve the basic engineering problems.*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	khusus dan dapat membangunkan prosedur-prosedur paling sesuai untuk masalah kejuruteraan khusus. 3. Reka bentuk menggunakan teknik-teknik kaedah unsur terhingga.	*2. Recognize the limitation of specific finite element method and be able to develop the most suitable procedures for specific engineering problems.* *3. Design utilising the techniques of finite element method.*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran berkomunikasi (CS1,2,3,4,5) 2. Pemikiran kritis dan penyelesaian masalah (CT1-CT6) 3. Kemahiran Kepemimpinan (LS1,2)	*1. Communication Skills (CS1,2,3,4,5)* *2. Critical Thinking & Problem Solving (CT1 – CT6)* *3. Leadership Skill (LS1,2)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment:50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian.	*Results will be notified through notice board and online*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
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*

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Mekanik	*Department of Mechanical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Mekanikal	*Master of Mechanical Engineering*
Kod Kursus* *Course Code**	KQG7007	*KQG7007*
Tajuk Kursus* *Course Title**	Rekabentuk dan Pembangunan Produk Terbantu Komputer	*Computer Aided Product Design and Development*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Memahami prinsip- prinsip komputer grafik diapplikasi dalam CAD. 2. Memperoleh kecekapan dalam kemahiran	*At the end of the course, students are able to:* *1. Attain basic 3D CAD modelling proficiency skill*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	asas 3D CAD 3. Menggunakan sistem CAD dalam proses perkembangan hasil serentak.	*2. Develop 3D models knowing the capabilities and limitations of 3D modelling systems* *3. Utilise CAD system in concurrent product development process.*
Kemahiran Insaniah *Soft Skills*	Pemikiran Kritis dan Penyelesaian Masalah (CT1-CT5) Kerja Berpasukan (TS1-TS4) Pembelajaran Berterusan dan Pengurusan Maklumat (LL1,2)	*Critical Thinking and Problem Solving Skills(CT1 - CT5)* *Team Work Skills(TS1 - TS4)* *Life Long Learning and Information Management (LL1,2)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Proses merekabentuk dan peranan model CAD-Definisi : perkakasan dan perisian. Model, pandangan dunia dan koordinasi skrin. Penggunaan matrix transformasi dalam CAD. Pemodelan geometrik menggunakan kelok, permukaan dan pepejal. Manipulasi penyimpanan data CAD dari penyimpanan data model dan pemodelan interaktif - pertimbangan asas data. Pemasangan mekanikal, pengiraan jisim- toleransi bahan. Penggunaan model 3 dimensi- penggabungan analisis rekaan dan CAD. Pendekatan rekaan turun naik dalam CAD. Pemodelan elemen tertentu- naik taraf untuk pemindahan model antara sistem CAD/CAM.	*Design process and the role of CAD-Defining the model: Hardware and Software. Model, world viewing and screen coordinates. Application of transformation matrices in CAD. Geometric modeling using curves, surfaces and solids. CAD data storage-manipulation of model-Data storage and interactive modeling-data base consideration. Mechanical assembly, tolerance.- mass property calculation. Three dimensional modeling application-integration of design analysis and CAD. Top-down design approach in CAD. Standards for model transfer between CAD/CAM systems*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment:50%* *Final Examination:50%*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian.	*Results will be notified through notice board and online*
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*

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Mekanik	*Department of Mechanical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Mekanikal	*Master of Mechanical Engineering*
Kod Kursus* *Course Code**	KQA7002	*KQA7002*
Tajuk Kursus* *Course Title**	Pemilihan Bahan dan Rekabentuk	*Materials Selection and Design*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menganalisis hubungan antara permintaan reka bentuk produk dengan struktur dan sifat-sifat bahan kejuruteraan 2. Menjelaskan kepentingan proses pembuatan	*At the end of the course, students are able to:* *1. Analyze the relationships between product design requirements and the structure and properties of engineering materials* *2. Explain the importance of manufacturing*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	dalam pemilihan bahan dan reka bentuk 3. Merekabentuk bahan dalam situasi yang melibatkan pelbagai halangan dan konflik dari segi objektif	*process in materials selection and design* *3. Select materials in situations involving multiple constraints and conflicting objectives*
Kemahiran Insaniah *Soft Skills*	Kemahiran Berkomunikasi (CS1-CS3) Kemahiran Permikiran Kritis dan Penyelesaian Masalah (CT1-CT4) Kemahiran Kerja Berpasukan (TS1-TS2)	*Communication Skills (CS1-CS3)* *Critical Thinking and Problem Solving Skills (CT1-CT4)* *Team Work Skills (TS1-TS2)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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.	*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.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment:50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian.	*Results will be notified through notice board and online*
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*

PENTING / *IMPORTANT*:

UNIVERSITI MALAYA

PRO FORMA KURSUS
COURSE PRO FORMA

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Jabatan Kejuruteraan Mekanik	*Department of Mechanical Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan Mekanikal	*Master of Mechanical Engineering*
Kod Kursus* *Course Code**	KQA7007	*KQA7007*
Tajuk Kursus* *Course Title**	Kegagalan Bahan dalam Perkhidmatan	*Failure of Materials in Service*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Di akhir kursus ini, pelajar dapat: 1. Menjelaskan mekanisme-mekanisme kegagalan dalam bahan 2. Menilai hayat lesu satu komponen 3. Merekabentuk bahan dan komponen melawan kegagalan	*At the end of the course, students are able to:* *1. Explain failure mechanisms in materials* *2. Evaluate fatigue life of a component* *3. Design materials & components against failure*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	4. Menjalankan analisis kegagalan bahan kejuruteraan, komponen dan struktur	*4. Conduct failure analysis of engineering materials, components and structures*
Kemahiran Insaniah *Soft Skills*	Kemahiran Berkomunikasi (CS1,2,3) Pemikian Kritis dan Penyelesaian Masalah (CT1,2,3,4,5) Kemahiran Kerja Berkumpulan (TS1,2,3)	*Communication Skills (CS1,2,3)* *Critical Thinking and Problem Solving Skills ((CT1,2,3,4,5)* *Team Work Skills (TS1,2,3)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	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, kagagalan rapuh dan keletihan. Akhirnya, beberapa contoh mengenali dengan kegagalan kejuruteraan akan dianalisasikan dan dibincangkan.	*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.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 50% Peperiksaan Akhir: 50%	*Continuous Assessment:50%* *Final Examination:50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis atau dimaklumkan melalui talian.	*Results will be notified through notice board and online*
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*

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Fakulti Kejuruteraan	*Faculty of Engineering*
Jabatan *Department*	Kejuruteraan	*Engineering*
Nama Program Akademik Name of Academic *Programme*	Sarjana Kejuruteraan	*Master of Engineering*
Kod Kursus* *Course Code**	KQX7001	*KQX7001*
Tajuk Kursus* *Course Title**	Metodologi Penyelidikan	*Research Methodology*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*None*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Pada akhir kursus ini, pelajar dapat: 1. Mengenal pasti masalah penyelidikan yang sesuai dan menulis kertas cadangan projek 2. Mengenal pasti kaedah penyelidikan dan	*At the end of the course, candidates are able to:* *1. Identify suitable research problem and write research proposal*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	reka bentuk eksperimen yang sesuai 3. Menulis kertas cadangan penyelidikan berdasarkan bidang yang dipilih masing-masing 4. Menyediakan kertas ulasan	*2. Identify appropriate research technique and experimental design* *3. Write research proposal based on respective field choose* *4. Prepare a review paper*
Kemahiran Insaniah *Soft Skills*	Kemahiran Pemikiran Kritis (CT7)	*Critical Thinking (CT7)*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Kursus ini meliputi pemerolehan dan analisis data serta pembentangan lisan dan tulisan bagi keputusan-keputusan projek penyelidikan tertentu.	The course covers data acquisition and analysis as well as verbal and written presentations of results of a specified research project.
Pemberatan Penilaian* *Assessment Weightage**	Penilaian Berterusan: 100% Peperiksaan Akhir: 0%	*Continuous Assessment: 100%* *Final Examination:0%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Maklumbalas secara dalam talian	Online feedback
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

UNIVERSITI MALAYA	PRO FORMA KURSUS *COURSE PRO FORMA*

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 *Academy/Faculty/Institute/Centre*	Kejuruteraan	*Engineering*
Jabatan *Department*	Kursus Fakulti	*Faculty Course*
Nama Program Akademik Name o fAcademic*Programme*	Sarjana Kejuruteraan	*Master of Engineering*
Kod Kursus* *Course Code**	KQX7002	*KQX7002*
Tajuk Kursus* *Course Title**	Pengurusan Projek	*Project Management*
Kredit* *Credit**	3	*3*
Masa Pembelajaran Pelajar (SLT) *Student Learning Time (SLT)*	120	*120*
Prasyarat/Keperluan Minimum Kursus *Course Pre-requisite(s)/Minimum Requirement(s)*	Tiada	*Nil*
Hasil Pembelajaran Kursus* *Course Learning Outcomes**	Dia akhir pembelajaran ini, pelajar dapat: 1. Menerangkan prinsip komponen dan konsep pengurusan projek. 2. Menjelaskan pelbagai pemacu perubahan yang boleh menjejaskan projek selama	*At the end of the course, students are able to:* *1. Explain the principle components and concepts of project management.* *2. Justify the various drivers of change*

	Versi Bahasa Malaysia ***Malay Version***	**Versi Bahasa Inggeris** ***English Version***
	kitran hidupnya. 3. Menyelesaikan segala cabaran semasa projek secara efektif.	*which may impact a project during its life cycle.* *3. Solve every challenges faced during the project.*
Kemahiran Insaniah *Soft Skills*	1. Kemahiran menulis laporan 2. Kemahiran pembelajaran kooperatif 3. Kemahiran pembentangan 4. Kemahiran menyelesaikan masalah	*1. Cooperative learning skill* *2. Presentation skills* *3. Report Writing skills* *4. Problem solving skills*
Sinopsis Kandungan Kursus *Synopsis of Course Contents*	Pengenalan kepada pengurusan Projek, Strategi, Organisasi, Proses, Manusia dan Struktur.	*Introduction to Project management, Strategy, Organization, Process, People and Structure.*
Pemberatan Penilaian* *Assessment Weightage**	Penilaian berterusan : 50% Peperiksaan akhir : 50%	*Continuous Assessment : 50%* *Final examination : 50%*
Kaedah Maklum Balas Tentang Prestasi *Methodologies for Feedback on Performance*	Ditampal di papan notis dan dimaklumkan pada talian.	Resutls will be notified through notice board and online.
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*

MARKING SCHEME AND GRADE POINT AVERAGE

The assessment for the examination of the **COURSEWORK** component is based on the following marking scheme:

MARKS	GRADE	GRADE MARKS	MEANING
90 – 100	A+	4.0	High Distinction
80 – 89	A	4.0	Distinction
75 – 79	A-	3.7	
70 – 74	B+	3.3	Pass
65 – 69	B	3.0	
60 – 64	B-	2.7	Fail
55 – 59	C+	2.3	
50 – 54	C	2.0	
45 – 49	C-	1.7	
40 – 44	D+	1.5	
35 – 39	D	1.0	
0 – 34	F	0.0	

UNIVERSITY OF MALAYA

GUIDELINES FOR THE PREPARATION OF RESEARCH PROJECT, DISSERTATION AND THESIS 2017

TABLE OF CONTENTS

PREFACE

In the process of completing a postgraduate programme in the University of Malaya and being awarded the degree, a candidate may be required to submit a research project or dissertation or thesis, depending on the requirements of the specific programme.

The terms “research project”, “dissertation” and “thesis” are defined as follows:

- Research project refers to the documentation of the research component prepared and submitted by the candidate for the award of the Master’s programme by coursework.
- Dissertation refers to the documentation of the original research prepared and submitted by the candidate for the award of the degree for the Master’s programme by research, and by mixed mode as well as Doctoral programme by coursework and by clinical coursework.
- Thesis refers to the documentation of the original research prepared and submitted by the candidate for the award of the degree for the Doctoral programme by research, and mixed mode.

In view of this requirement, the Institute of Graduate Studies (IGS), University of Malaya has taken the initiative to provide general guidelines for the submission of research projects, dissertations and theses. These guidelines will assist candidates to meet the minimal format requirements set by the University to complete the final form of a research project, dissertation or thesis. However, the format may differ in each individual faculty, academy, institute or centre with its own additional requirements.

CHAPTER 1: FORMAT OF WRITING

A research project, dissertation or thesis can be written in one of the following formats:

- Conventional format
- Article style format
- Format of published papers (This option is only available for Doctor of Philosophy candidates)

These formats serve as a generic guideline for the postgraduate candidates in writing a research project, dissertation or thesis. Minor variation of the format as recommended by the faculty is allowed. Candidates are advised to discuss with their supervisors to determine which format is best suited for the nature of their research work.

1.1 Conventional Format

The conventional format follows the traditional monograph structure (Table 1.1). This is the most common form of research project/dissertation/thesis used by most candidates.

Table 1.1: The general structure that follows the conventional format

Preliminary
▪ Title Page ▪ Original Literary Work Declaration ▪ Abstract ▪ *Abstrak* ▪ Acknowledgements ▪ Table of Contents ▪ List of Figures ▪ List of Tables ▪ List of Symbols and Abbreviations ▪ List of Appendices
Main Body
▪ Chapter 1: Introduction ▪ Chapter 2: Literature Review ▪ Chapter 3: Methodology ▪ Chapter 4: Results ▪ Chapter 5: Discussion ▪ Chapter 6: Conclusion ▪ References (A consolidated list of references for all chapters)
Supplementary
▪ List of Publications and Papers Presented ▪ Appendix

1.2 Article Style Format

Apart from the conventional style of writing, a research project/dissertation/thesis can also be presented in the chapters that are in the format of journal article (Table 1.2). The number of chapters to be included is at the discretion of the author, depending on the suitability of the chapters in answering the research questions.

The article style format should not be confused with the format for thesis by published papers. Similar to the conventional format, a research project/dissertation/thesis in the article style format should be written extensively to elucidate the different aspects of the research work in great details.

The main body of a research project/dissertation/thesis in the article style format should contain the following chapters:

(a) General Introduction

The General Introduction gives an overview of the research by outlining the objectives, novelty as well as the research questions addressed. This chapter should also explain the correlation among the articles/chapters.

(b) Literature Review

The Literature Review provides extensive background information on past studies and current knowledge pertaining to the research topic.

(c) Article 1, Article 2, Article 3 or more

Each article should address a specific research objective or a related topic of the study. Each article forms a separate chapter and must be written in a cohesive manner with a logical and coordinated progression from one article/chapter to the other. The article/chapter should consist of its own sections on Introduction, brief Literature Review, Methodology, Results, Discussion and Conclusion.

(d) Conclusion and Recommendation

The Conclusion chapter summarizes the findings in all articles and suggests the future direction for research.

The format specifications of the research project/dissertation/thesis must conform to the general research project/dissertation/thesis requirements as outlined in Chapter 2.

Table 1.2: The general structure that follows the article style format

Preliminary
▪ Title Page ▪ Original Literary Work Declaration ▪ Abstract ▪ *Abstrak* ▪ Acknowledgements ▪ Table of Contents ▪ List of Figures ▪ List of Tables ▪ List of Symbols and Abbreviations ▪ List of Appendices
Main Body
▪ Chapter 1: General Introduction ▪ Chapter 2: Literature Review ▪ Chapter 3: Article 1* 3.1 Introduction 3.2 Literature Review 3.3 Methodology 3.4 Results 3.5 Discussion 3.6 Conclusion ▪ Chapter 4: Article 2* 4.1 Introduction 4.2 Literature Review 4.3 Methodology 4.4 Results 4.5 Discussion 4.6 Conclusion ▪ Chapter 5: Article 3* 5.1 Introduction 5.2 Literature Review 5.3 Methodology 5.4 Results 5.5 Discussion 5.6 Conclusion ▪ Chapter 6: Conclusion ▪ References (A consolidated list of references for all chapters)

Note: **Article is written with a specific title which normally refers to the research done*
Supplementary
▪ List of Publications and Papers Presented ▪ Appendices ▪ Co-authors Consent

1.3 Format of Published Papers

UM also permits the presentation of thesis for the programme of Doctor of Philosophy (PhD) in the format of published and/or submitted papers, where such papers have been published or accepted by high impact journals (e.g. journals indexed by Web of Science) during the period of candidature (Table 1.3).

Papers submitted as a PhD thesis must be based on a particular theme or focus and form a cohesive research write up. The quality of a thesis by published papers should be in accordance with PhD-level research. The following aspects should be taken into consideration before opting for this format of writing:

(a) Type of Publications

The thesis may comprise published papers and/or manuscripts accepted for publication by high impact journals (e.g. journals indexed by Web of Science). Publications which have been submitted for other degree conferment purposes are not accepted.

(b) Number of Publications

The minimum number of papers and/or manuscript is at least three (3). However, in some disciplines a larger number of papers is required to meet the expectations of scope and quality in accordance with PhD-level research. The papers should be published or accepted for publication during the period of candidature.

For candidates under the programme of **PhD by Prior Publication**, the minimum number of published works is at least five (5) and these works must be those published within a period not exceeding 10 years prior to the date of submission of thesis.

(c) Authorship

Where the papers have more than one author, the candidate must be the first author of at least two (2) out of three (3) papers.

For candidates under the programme of **PhD by Prior Publication**, the candidate should be the first author of five (5) of the published works submitted.

(d) Co-authors Consent

Candidate must obtain the consent from other co-authors for all papers and/or manuscripts and/or publications used as part of their PhD thesis. The consent can be in the form of a verification from the journal publisher or letter or email communication with the co-authors.

(e) Structure of Thesis

The thesis in the format of published papers shall consist the following:

(i) An **abstract**, which summarises the most important findings presented in each published paper or accepted manuscript. It should indicate how the included works are thematically linked or tied to a particular research framework and how, when considered together, they contribute significantly to knowledge in the discipline.

(ii) The **Introduction** chapter should include the following:

- description of research problem investigated;
- objectives of the study;
- list of publications and/or accepted manuscripts;
- the account of research progress linking the publications.
  The account of research progress must link together the various papers submitted as part of the thesis so that the reader can understand the logic behind the progression of the research programme.

(iii) The **Literature Review** chapter must contain, in accordance with discipline norms, a critical review of relevant literature, identify the knowledge gaps and the relationship of the literature to the programme of research.

(iv) The **Methodology** chapter (where applicable).

(v) The core chapter of the thesis consist of the published papers or accepted manuscripts in their **original publication format** and should NOT be retyped or reformatted. They must be presented coherently in the thesis according to the requirement of the University of Malaya (Degree of Doctor of Philosophy) Regulations, including any accompanying declarations. The following must be indicated for any jointly written paper:

- Acknowledgment of co-authors and verification of originality.
- A clear statement of the contribution made by each author in any joint published work. For example, a statement of contribution from a 3-author academic research publication is as follows:

  Tang, J.M.Y., Adli, D.S.H., & Belabut, D. (2011). Histological development of selected neural structures of Dark-sided Chorus Frog,

Microhyla heymonsi (Amphibia: Anura). *Malaysian Journal of Science*, *29*(1), 11-18.

Tang, J.M.Y. participated in all experiments, coordinated the data analysis and contributed to the writing of the manuscript. Adli, D.S.H. supervised the development of work and edited the manuscript. Belabut, D. gave technical support and conceptual advice, and helped in data interpretation.

(vi) The **Discussion** chapter explains the cumulative effect of the papers, the significance of the findings and the knowledge claim in the thesis.

(vii) The **Conclusion** summarizes the findings in all published works and suggests the future direction for research.

(viii) The **References** chapter lists all works and sources that are cited in the Introduction, Literature Review and Conclusion chapters.

In general, the examination process for theses in the format of published papers is similar to that for conventional theses. However the aspects of thesis being evaluated by the examiners may slightly differ.

Theses which have not achieved sufficient academic merit may be referred for further work within a period of between 6 to 12 months and be submitted for re-examination. In such cases, the candidate may choose to submit the thesis for re-examination in the same format or in the conventional Doctoral thesis format.

Candidates under the programme of **PhD by Prior Publication** are required to refer to the *Guidelines for Prior Publication* for further details.

Table 1.3: The general structure that follows the format or published papers

Preliminary
▪ Title Page ▪ Original Literary Work Declaration ▪ Abstract ▪ *Abstrak* ▪ Acknowledgements ▪ Table of Contents ▪ List of Figures ▪ List of Tables ▪ List of Symbols and Abbreviations ▪ List of Appendices
Main Body
▪ Chapter 1: Introduction ▪ Chapter 2: Literature Review ▪ Chapter 3: Methodology *(where applicable)* ▪ Chapter 4: *Published Paper 1 *Published Paper 2 *Published Paper 3 and so on **Note: Authors' contributions must be indicated for each published paper* ▪ Chapter 5: Discussion ▪ Chapter 6: Conclusion ▪ References (List of references for chapters of Introduction, Literature Review and Conclusion)
Supplementary
▪ List of Publications and Papers Presented ▪ Appendices ▪ Co-authors Consent

CHAPTER 2: SEQUENCE OF CONTENTS

The structure of the research project, dissertation or thesis is based on a standard format which contains the three main sections; **Preliminary**, **Main Text** and **Supplementary**.

2.1 Preliminary

This section consists in order of the following:

- Title Page
- Original Literary Work Declaration Form
- Abstract
- Acknowledgements
- Table of Contents
- List of Figures
- List of Tables
- List of Symbols And Abbreviations
- List of Appendices

2.1.1 Title Page

The title page is the first page after the front cover and should include:

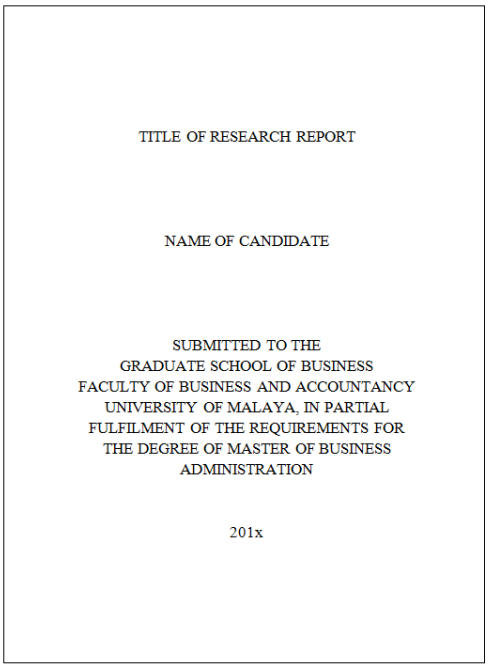
(a) The final research title which has been approved by the faculty;
(b) Name of candidate according to the registration records;
(c) A statement according to the mode of programme (Table 2.1);
(d) The year of submission.

Table 2.1: Statement on Title Page according to mode of programme

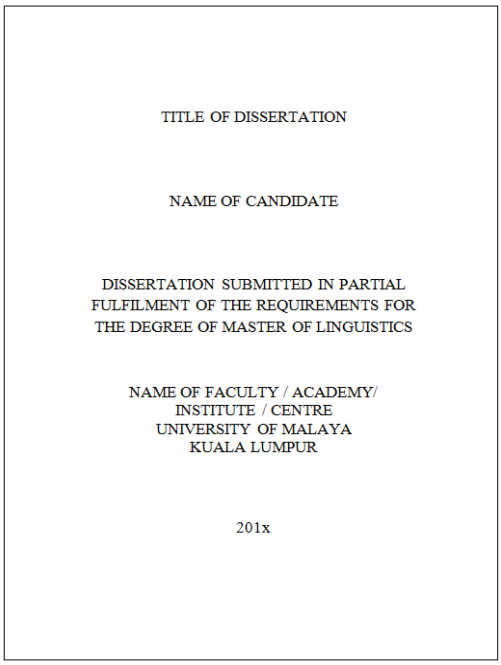
Master's Degree		
Research project (by Coursework)	**Dissertation (by Mixed mode)**	**Dissertation (by Research)**
RESEARCH PROJECT SUBMITTED TO THE (name of the Faculty) UNIVERSITY OF MALAYA, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF (Name of Programme)	DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF (Name of Programme)	DISSERTATION SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF (Name of Programme)
Doctoral Degree		
Dissertation (by Coursework or by Clinical Coursework)	**Thesis (by Mixed mode)**	**Thesis (by Research)**
DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF (Name of Programme)	THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF (Name of Programme)	THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF (Name of Programme)

This page is the first page of Roman numeral page number but it is not numbered. The text should be typed using font type **Times New Roman**, font **size 14 with 1.15 pt. line spacing**.

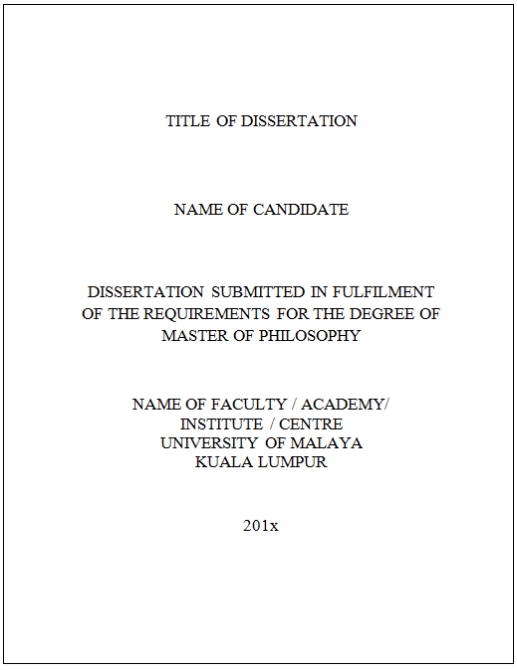
(a)



(b)



(c)



(d)

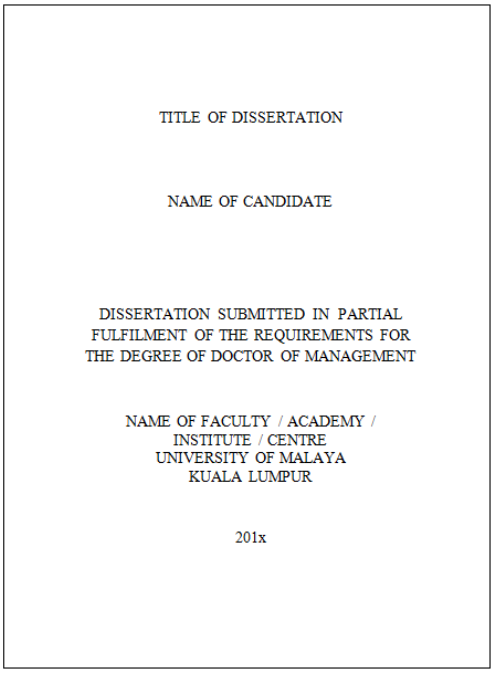


Figure 2.1, continued

(a) Master's research project by coursework, (b) Master's dissertation by Mixed mode, (c) Master's dissertation by research, (d) Doctoral dissertation by coursework, (e) Doctoral thesis by Mixed mode, and (f) Doctoral thesis by research.

(e)

TITLE OF THESIS

NAME OF CANDIDATE

THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY/ PUBLIC HEALTH

NAME OF FACULTY / ACADEMY / INSTITUTE / CENTRE
UNIVERSITY OF MALAYA
KUALA LUMPUR

201x

(f)

TITLE OF THESIS

NAME OF CANDIDATE

THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY/MEDICINE

NAME OF FACULTY / ACADEMY / INSTITUTE / CENTRE
UNIVERSITY OF MALAYA
KUALA LUMPUR

201x

Figure 2.1: Examples of title page.

2.1.2 Original Literary Work Declaration

This form must be completed by the candidate and signed by a witness (Supervisors or Head of Department/Deputy Dean of Higher Degree). The original signed form must be included in all copies of the research project/dissertation/thesis. The form can be downloaded from the IGS website in two (2) languages (English language and Bahasa Malaysia). If the research project/dissertation/thesis is written in English, hence the English version of the form is used and vice versa.

(a)

UNIVERSITI MALAYA

ORIGINAL LITERARY WORK DECLARATION

Name of Candidate: (I.C/Passport No:)

Registration/Matric No:

Name of Degree:

Title of Project Paper/Research Report/Dissertation/Thesis ("this Work"):

Field of Study:

I do solemnly and sincerely declare that:

(1) I am the sole author/writer of this Work;
(2) This Work is original;
(3) Any use of any work in which copyright exists was done by way of fair dealing and for permitted purposes and any excerpt or extract from, or reference to or reproduction of any copyright work has been disclosed expressly and sufficiently and the title of the Work and its authorship have been acknowledged in this Work;
(4) I do not have any actual knowledge nor do I ought reasonably to know that the making of this work constitutes an infringement of any copyright work;
(5) I hereby assign all and every rights in the copyright to this Work to the University of Malaya ("UM"), who henceforth shall be owner of the copyright in this Work and that any reproduction or use in any form or by any means whatsoever is prohibited without the written consent of UM having been first had and obtained;
(6) I am fully aware that if in the course of making this Work I have infringed any copyright whether intentionally or otherwise, I may be subject to legal action or any other action as may be determined by UM.

Candidate's Signature Date

Subscribed and solemnly declared before,

Witness's Signature Date

Name:
Designation:

(b)

UNIVERSITI MALAYA

PERAKUAN KEASLIAN PENULISAN

Nama: (No. K.P/Pasport:)

No. Pendaftaran/Matrik:

Nama Ijazah:

Tajuk Kertas Projek/Laporan Penyelidikan/Disertasi/Tesis ("Hasil Kerja ini"):

Bidang Penyelidikan:

Saya dengan sesungguhnya dan sebenarnya mengaku bahawa:

(1) Saya adalah satu-satunya pengarang/penulis Hasil Kerja ini;
(2) Hasil Kerja ini adalah asli;
(3) Apa-apa penggunaan mana-mana hasil kerja yang mengandungi hakcipta telah dilakukan secara urusan yang wajar dan bagi maksud yang dibenarkan dan apa-apa petikan, ekstrak, rujukan atau pengeluaran semula daripada atau kepada mana-mana hasil kerja yang mengandungi hakcipta telah dinyatakan dengan sejelasnya dan secukupnya dan satu pengiktirafan tajuk hasil kerja tersebut dan pengarang/penulisnya telah dilakukan di dalam Hasil Kerja ini;
(4) Saya tidak mempunyai apa-apa pengetahuan sebenar atau patut semunasabahnya tahu bahawa penghasilan Hasil Kerja ini melanggar suatu hakcipta hasil kerja yang lain;
(5) Saya dengan ini menyerahkan kesemua dan tiap-tiap hak yang terkandung di dalam hakcipta Hasil Kerja ini kepada Universiti Malaya ("UM") yang seterusnya mula dari sekarang adalah tuan punya kepada hakcipta di dalam Hasil Kerja ini dan apa-apa pengeluaran semula atau penggunaan dalam apa jua bentuk atau dengan apa juga cara sekalipun adalah dilarang tanpa terlebih dahulu mendapat kebenaran bertulis dari UM;
(6) Saya sedar sepenuhnya sekiranya dalam masa penghasilan Hasil Kerja ini saya telah melanggar suatu hakcipta hasil kerja yang lain sama ada dengan niat atau sebaliknya, saya boleh dikenakan tindakan undang-undang atau apa-apa tindakan lain sebagaimana yang diputuskan oleh UM.

Tandatangan Calon Tarikh

Diperbuat dan sesungguhnya diakui di hadapan,

Tandatangan Saksi Tarikh

Nama:
Jawatan:

Figure 2.2: Original Literary Work Declaration
(a) English, (b) Bahasa Malaysia

2.1.3 Abstract

An abstract is a short summary of the research project/dissertation/thesis. An abstract should briefly describe the objectives (problem statement), the significance of research, research methodology, as well as the findings and conclusion of the research.

The Abstract page begins with the title of research project/dissertation/thesis (in uppercase) that is approved by the faculty after the submission of 3 Months' Notice. Candidates are not allowed to change the title without the approval of the faculty.

An abstract must not exceed 500 words, typed in a single paragraph with double-spacing, and written in Bahasa Malaysia and English language. A maximum of five (5) keywords should also be listed below the abstract (Figure 2.3).

Where the language of the thesis is other than Bahasa Malaysia or English, an abstract in that language must also be included. The sequence of abstracts is as follows:

- For research project/dissertation/thesis written in Bahasa Malaysia, the abstract in Bahasa Malaysia is followed by the English version.
- For research project/dissertation/thesis written in English, the abstract in English is followed by the Bahasa Malaysia version.
- For research project/dissertation/thesis written in Arabic, the abstract in Arabic is followed by its version in Bahasa Malaysia and English.

The Abstract page is assigned Roman numeral "iii" and the following pages should be numbered consecutively.

[TITLE OF RESEARCH PROJECT/DISSERTATION/THESIS]

ABSTRACT

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nulla efficitur risus ac magna malesuada venenatis. Etiam a faucibus metus, at consequat leo. Sed pulvinar suscipit massa, sit amet pulvinar ligula accumsan sed. Nam sed leo mollis, feugiat felis in, porta nunc. Maecenas at erat eu augue tristique vestibulum. Donec ac lobortis nunc. Aliquam laoreet dolor a massa hendrerit, ac bibendum neque semper. Aliquam id nisi magna.Aliquam ligula orci, congue id dapibus at, luctus in magna. Maecenas non nulla ac tortor tristique laoreet. Donec porta neque semper imperdiet pulvinar. Phasellus egestas viverra ornare. Fusce nisi ex, pharetra eu gravida vel, iaculis quis quam. Mauris placerat sapien sapien, ac mollis eros imperdiet vel. Morbi nulla ipsum, commodo sed ex eu, pharetra maximus massa. In et placerat elit. Aliquam porta sem sit amet justo pellentesque consectetur. Quisque aliquet leo nunc, sed porttitor quam ullamcorper at. Suspendisse nunc lorem, tempus a feugiat ac, facilisis eu nisi. Donec feugiat vulputate turpis, at tincidunt ex posuere at. Sed semper ante vitae tincidunt malesuada. Praesent commodo diam non tortor laoreet, ac volutpat dui scelerisque. Maecenas elementum rhoncus placerat. Aliquam mollis vel diam ut imperdiet. Donec in venenatis arcu. Nam pulvinar eros nunc, vel malesuada turpis vestibulum eget. Aliquam erat volutpat. Vivamus ut euismod augue. Nam semper risus nec nibh posuere tincidunt. Pellentesque id imperdiet enim, vitae viverra lectus.

Keywords: proin fringilla, turpis metus, vitae, tincidunt

iii

Figure 2.3: Example of abstract.

2.1.4 Acknowledgements

Most research projects, dissertations or theses include a message to convey appreciation to those who have been involved and provided their assistance directly or indirectly in the preparation of the study.

This is optional and should not exceed a single page, which is numbered in Roman numeral accordingly.

2.1.5 Table of Contents

The Table of Contents lists the chapters, topics and sub-topics together with their page numbers. Sub-topics and topics should be labelled according to the chapter, for example:

CHAPTER 1: TITLE
1.1 Topic 1
    1.1.1 Sub-topic 1

CHAPTER 2: TITLE
2.1 Topic 1
    2.1.1 Sub-topic 1

This numbering system provides a clear picture of the relationship between chapters and topics and shows how they are connected.

2.1.6 List of Figures

This list contains the titles of figures, together with their page numbers, which are found throughout the text. For example, figures in Chapter 1 are numbered sequentially: Figure 1.1, Figure 1.2 and so on.

2.1.7 List of Tables

This list contains the titles of tables, together with their page numbers, which are listed in the text. The numbering system is according to chapter, for e.g.: tables in Chapter 1 are numbered sequentially: Table 1.1, Table 1.2 and so on.

2.1.8 List of Symbols and Abbreviations

The symbols, abbreviations, nomenclature and terminology that are used in the text must be listed down accordingly.

For further information on spelling and abbreviations, candidates are advised to refer to the latest edition of the Oxford Advanced Learner's Dictionary published by Oxford University Press.

2.1.9 List of Appendices

This list is optional and contains the titles of appendices placed in the supplementary section

2.2 Main Body

Candidates and supervisors should ensure that the text follows the agreed conventions of the individual faculty. The main text in the research project/dissertation/thesis must be organised following the guidelines as mentioned below:

- Text must be organised in titled chapters.
- The titles must reflect the content of the chapter.
- Every chapter must begin on a new page.
- Chapters can be divided into sub-chapters with corresponding sub-titles.
- Titles and sub-titles must be numbered.

There is no restriction on the total number of chapters in a research project/dissertation/thesis. The number of chapters differs according to the field of study conducted by the candidate whether it is science-based or social science-based. However the content of the chapters may differ according to the candidate's research or conventions of individual faculty.

Generally, a research project/dissertation/thesis will have the following basic structure:

- **INTRODUCTION**
- **LITERATURE REVIEW**
- **METHODOLOGY**
- **RESULTS**
- **DISCUSSION**
- **CONCLUSION**
- **REFERENCES**

Items in the structure are divided into separate chapters and the descriptions of these chapters are as follows:

2.2.1 Introduction

This chapter contains the introduction to the issues in which the research is concerned with, the aims and objectives of the study, and the scope or outline of the research approach as well as the structure of the research project/dissertation/thesis.

2.2.2 Literature Review

A literature review is a description of the literature relevant to a particular field or topic of study. It consists of a critically written and comprehensive account of the published works on a topic by accredited scholars and researchers. A critical literature review is a critical assessment of the relevant literature. It is directly related to the research, providing information on theories, models, materials and techniques used in the research. The literature review should be comprehensive and include recent publications which are relevant to the research.

2.2.3 Methodology

This chapter describes and explains the materials as well as the research methodology used in the study. The sub-topics for this chapter include the key research questions, the research design, and the research procedures adopted. It may also, where appropriate, indicate sampling methods, research instruments and statistical methods employed. The purpose of this is to inform the reader on the methods used to collect the data and generate the findings reported.

2.2.4 Results

This chapter explains the results which are commonly presented in the form of text, figures and tables, complete with data analysis.

2.2.5 Discussion

This chapter contains the interpretation of the results. The findings of the research should be compared and contrasted with those of previous studies presented in the literature review. The purpose of this chapter is to discuss the findings and the outcomes of the research in relation to the results that have been obtained.

2.2.6 Conclusion

In this chapter, the findings are summarized and their implications discussed. This section may include suggestions for future work.

2.2.7 References

All works or studies referred to in the research project/dissertation/thesis in the form of quotations or citations must be included in the references.

The references should be written consistently in the American Psychological Association (APA) format or in another format approved by the faculty. Each reference should be written in single spacing format and a double space should be left between references. The list of references must be arranged in alphabetical order and the entries should not be numbered. The list must also have a hanging indentation of 0.5 inch. For example:

Buchwalow, I. B., & Böcker, W. (2010). *Immunohistochemistry: basics and methods.* Berlin: Springer Verlag.

Caamaño-Tubío, R. I., Pérez, J., Ferreiro, S., & Aldegunde, M. (2007). Peripheral serotonin dynamics in the rainbow trout (*Oncorhynchus mykiss*). *Comparative Biochemistry and Physiology Part C: Toxicology & Pharmacology*, *145*(2), 245-255.

Cakir, Y., & Strauch, S. M. (2005). Tricaine (MS-222) is a safe anesthetic compound compared to benzocaine and pentobaritol to induce anesthesia in leopard frogs (*Rana pipiens*). *Pharmacological Reports, 57*, 467-474.

Cameron, A. A., Plenderleith, M. B. & Snow, P. J. (1990). Organization of the spinal cord in four species of elasmobranch fishes: cytoarchitecture and distribution of serotonin and selected neuropeptides. *The Journal of Comparative Neurology, 297*, 201-218

Reference citations in text require the following information:

- last name of the author,
- the year of publication,
- the page number for the reference (direct quotes only).

For summaries or paraphrases, the last name of the author and the year of publication must be included for the in-text reference. For examples:

Kingston and Parker (2012) found the biggest challenges in classroom to be ….

The biggest challenges in classroom were …. (Kingston & Parker, 2012).

For direct quotations (which refers to when the exact words of another author are copied), the last name of the author, the year of publication as well as the page number for the reference must be included for the in-text reference. The quotation has to be enclosed in quotation marks. For examples:

It was said that "What is taught and how it is to be taught entail teachers' moral judgements and commitments" (Frank & Quiroz, 1997, p. 208).

According to Frank and Quiroz (1997), "What is taught and how it is to be taught entail teachers' moral judgements and commitments" (p. 208).

If the quoted citation contains more than 40 words, it should be placed within a paragraph of its own with a 0.5 inch indentation. For example:

> The general theory of relativity, on its own, cannot explain these features or answer these questions because of its prediction that the universe started off with infinite density at the big bang singularity. At the singularity, general relativity and all other physical laws break down: one couldn't predict what will come out of the singularity. (Hawking, 1988, p. 309)

Please refer to the University of Malaya Library APA Formatting and Style Guide. The guide can be downloaded at UM Library website (*http://www.umlib.um.edu.my).*

2.3 Supplementary

Specific items which were not included in the main body of the text, should be put in this Supplementary section. Typically, this section includes the following:

2.3.1 List of Publications and Papers Presented

Published works as well as papers presented at conferences, seminars, symposiums etc. pertaining to the research topic of the research project/dissertation/thesis are suggested be included in this section. The first page of the article may also be appended as reference.

2.3.2 Appendices

Appendices consist of research instruments, additional illustration of data sources, raw data and quoted citations which are too long to be placed in the text. The appendix section supports the written text of the research project/dissertation/thesis by including materials that can provide additional information. These materials include research data, tables, examples of questionnaires, maps, photos and other materials that are too long to be included in the text or are not directly required to comprehend the text can be included as appendices.

Tables and graphics that are more than two pages long are suggested to be included in the Appendix section.

Appendices are labelled as APPENDIX A, APPENDIX B, etc. and they should correspond to the List of Appendices of Preliminary section.

2.3.3 Co-authors Consent

Please refer to 1.3 (d).

CHAPTER 3: FORMAT SPECIFICATIONS

3.1 Paper Quality, Printing and Duplicating

The research project/dissertation/thesis should be printed, single-sided, on high quality white A4 paper (201 × 297 mm; 80 grams). Computer pin-feed printout paper is not permitted.

The research project/dissertation/thesis, in soft- and hardcover copies, must be typed and duplicated by offset printing or good quality photocopying. All copies must be clean and neat in order to ensure easy reading.

3.2 Typing and Printing Quality

Texts in research project/dissertation/thesis should be typed on **one side** of the paper only.

They must be typed using font type **Times New Roman, font size 12** (except for tables and figures) and justified, using Microsoft Word version 6.0 or later, or similar word-processing software. Those written in Arabic should use font type **Traditional Arabic in font size 16.** Words in a language that is different from the language of the research project/dissertation/thesis must be typed in *italics*. For mathematical texts, the use of Equation Editor or LaTeX is advisable. Script fonts are not permitted.

Chapter titles should be typed with capital letters and centred between the left and right margins. Each chapter must begin on a new page. Chapters and subchapters should be also titled. Titles should be typed in bold without underline.

A high quality laser or ink-jet printer should be used for the printing.

3.3 Line Spacing

The body of the text should be typed with **double spacing**. Single-spacing is only permitted in tables, long quotations, footnotes, citation and in the references.

The first sentence of a new paragraph should not start at the bottom of a page if the space available can only fit one line.

3.4 Margins

The text should have the following margins:

- Top : 2.0 cm or 0.79 inch
- Right : 2.0 cm or 0.79 inch
- Left : 4.0 cm or 1.57 inch
- Bottom : 2.0 cm or 0.79 inch

Additional guidelines regarding margin are as follows:

- Do not type more than one sentence after the bottom margin. If it is necessary to do so, it should only be for a footnote or the completion of the last sentence of the chapter, topic or sub-topic or information in a figure.

- All tables and figures must be placed within the specified margins.
- The last paragraph of the page should contain at least two sentences. If it does not, the paragraph should begin on the next page.

3.5 Page Numbering

All page numbers should be printed 1.0 cm from the bottom edge of the page and placed at the right-hand side without any punctuation (Figure 3.1).

The page numbering system must conform to the following rules:

- The page numbers should be placed at the right hand side without any punctuation.
- Font type Times New Roman and font size 10 recommended for numbers.
- Roman numerals (i, ii, iii, …) should be used in the Preliminary section. The first page of the thesis, the title page, is an unnumbered page 'i'. Numbering begins on the second page with 'ii' for the Original Literary Work Declaration Form.
- Arabic numerals (1, 2, 3, …) are used on the pages of the text (starting with the Introduction page) and Supplementary section.

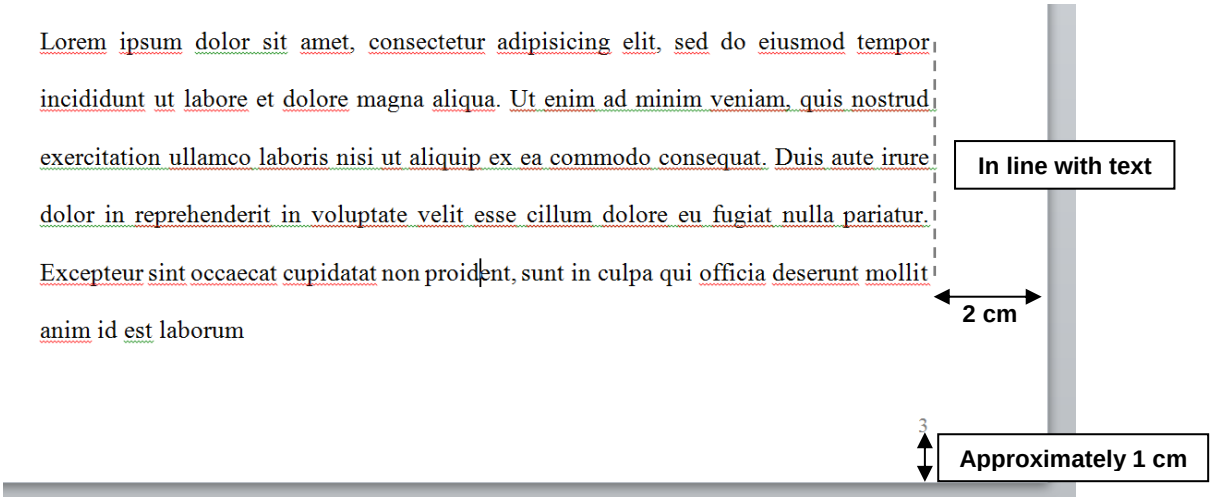


Figure 3.1: Placement of page number

3.6 Numbering of Chapters and Sub-chapters

Chapters and sub-chapters must be numbered using Arabic numerals (1, 2, 3 etc). Chapters are numbered CHAPTER 1, CHAPTER 2, CHAPTER 3, and so on. Sub-chapters are nested, but its numbering is not indented, up to a maximum of 4 levels as in the example shown below:

CHAPTER 2: FIRST LEVEL (CHAPTER TITLE)
2.1 Level 2 (sub-title);
2.1.1 Level 3 (sub-sub-title);
2.1.1.1 Level 4 (sub-sub-sub-title)

The use of letters in parenthesis in the main body for e.g., (a), (b), (c) is appropriate as a means of differentiating sub-topics of the same topic. However, it is not required to be listed in the Table of Content.

If a chapter title or chapter sub-title at any level exceeds a single line, the spacing between the lines must be the same as that of the text (double-spacing). Subsequent sub-chapters beyond the fourth nesting level must be numbered using alphabets; (a), (b), (c), and so on.

3.7 Footnotes

There are differences in the use of footnotes in various disciplines. For example, footnotes are commonly used in Social Sciences but rarely in Science and Technology. However candidates are advised to limit the use of footnotes unless they are proved necessary to the document. Footnotes are used to elaborate or provide additional information regarding matters discussed in that page.

Footnotes are recorded using Arabic numeric and numbered consecutively. Raised superscript numerals in the text refer to explanatory notes and documented sources appearing either at the bottom of the page as footnotes or at the end of the thesis as endnotes in a notes section. The advantage of using notes is that explanatory type of information can be presented along with source citations on the same page or place.

Footnotes should use a smaller font than the text (font size 8).

When using footnote, a number formatted in superscript is inserted following the punctuation mark in the text. Footnotes should be placed at the bottom of the page on which they appear (Figure 3.2). Please refer to the faculty for the recommended convention for writing of footnotes.

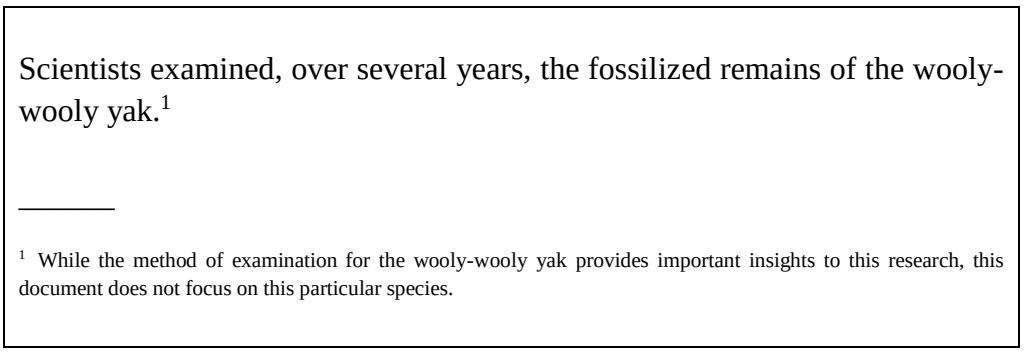


Figure 3.2: Example of footnote

3.8 Tables

Tables are printed within the body of the text at the centre of the frame and labelled according to the chapter in which they appear. Thus, for example, tables in Chapter 3 are numbered sequentially: Table 3.1, Table 3.2 and so on.

The caption should be placed **above** the table itself (Table 3.1). If the table contains a citation, the source of the reference should be included in the table caption.

Table 3.1: Example of table

Heading	Heading
Text	Text

If the table occupies more than one page, the continued table on the following page should indicate that it is a continuation, for example: 'Table 3.7, continued'. The header row should also be repeated.

3.9 Figures

Figures, like tables are printed within the body of the text at the centre of the frame and labelled according to the chapter in which they appear. Thus, for example, figures in Chapter 3 are numbered sequentially: Figure 3.1, Figure 3.2.

Figures, unlike text or tables, contain graphs, illustrations or photographs and their labels are placed at the **bottom** of the figure rather than at the top (using the same format used for tables) (Figure 3.3).

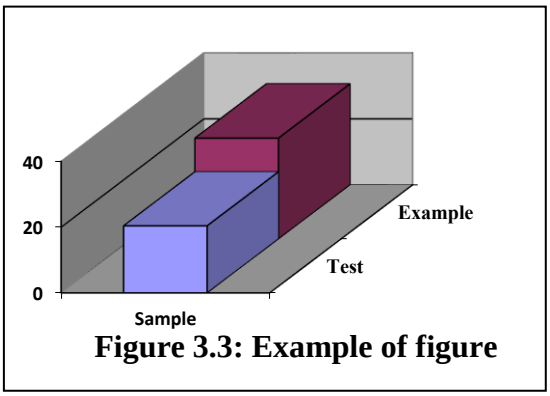


Figure 3.3: Example of figure

If the figure occupies more than one page, the continued figure on the following page should indicate that it is a continuation: for example: 'Figure 3.7, continued'.

If the figure contains a citation, the source of the reference should be placed after the label.

3.10 Binding

Each copy of the research project/dissertation/thesis submitted shall be bound in one (1) volume. The thesis cover must be of A4 size (210mm x 297mm).

For the purpose of examination, research project/dissertation/thesis submitted should be **soft cover** bound in rexine with the following colour (Figure 3.4):

- Research project: Navy blue
- Dissertation: Dark red or maroon
- Thesis: Dark red or maroon

For final submission prior to graduation, research project/dissertation/thesis submitted should be **hard cover** bound in rexine with the following colour (Figure 3.5):

- Research project: Navy blue
- Dissertation: Dark red or maroon
- Thesis: Dark red or maroon

Front Cover Colour of Dissertation/Thesis (Dark red or maroon)
Front Cover Colour of Research Project (Navy blue)

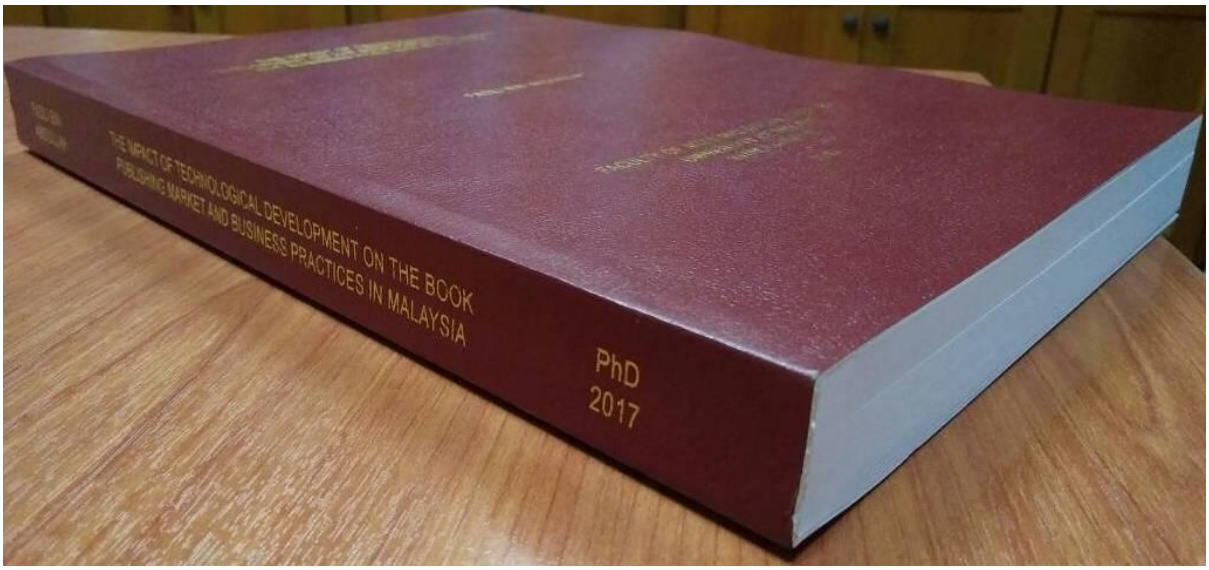
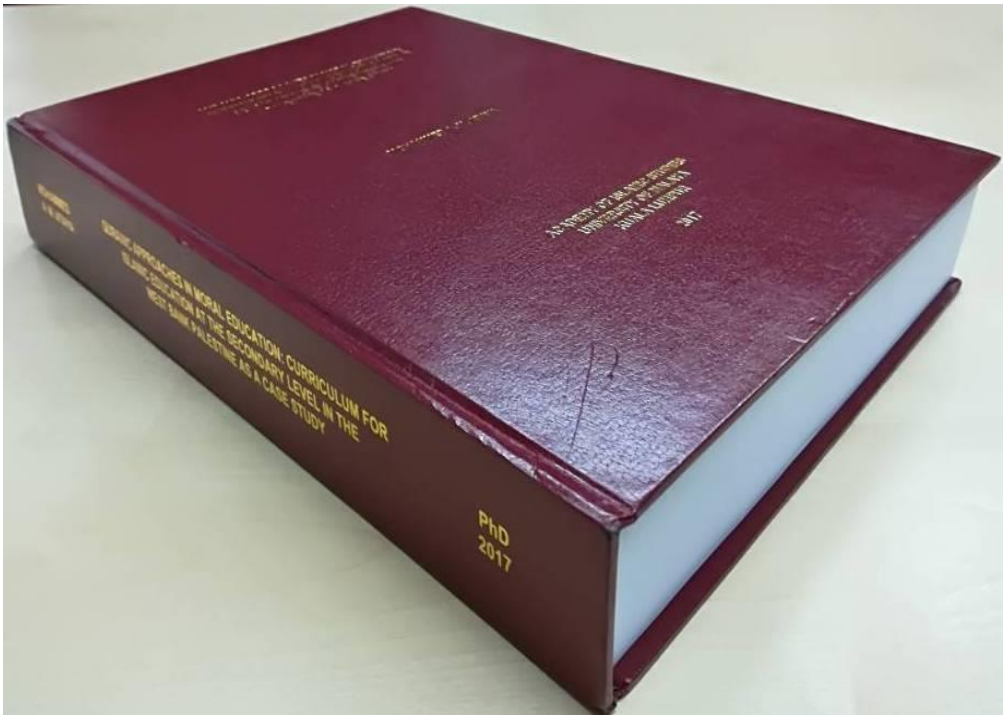


Figure 3.4: Sample of softbound copy for first submission for examination)

(a)



(b)

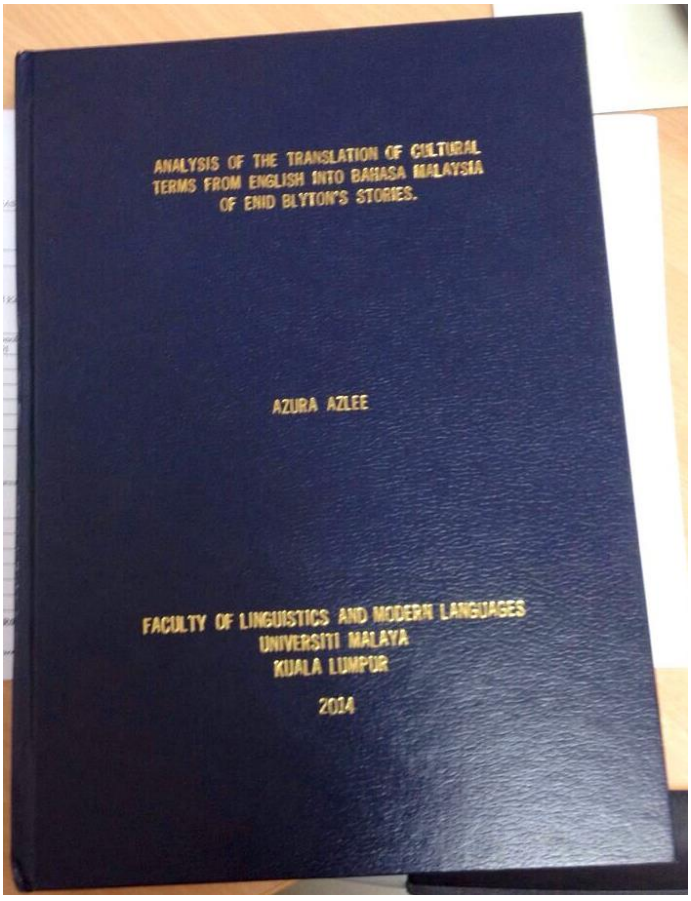


Figure 3.5: Samples of hardbound copy for final submission
(a) Example of hardbound thesis or dissertation (in dark red or maroon);
(b) Example of hardbound research project (in navy blue)

The title of research project/dissertation/thesis, name of author, name of the university and year of submission must be printed on the front cover. The letters for the Front Cover should be printed in **gold letterings** of **font size 16, font type Arial Narrow, bold and in uppercase letters** (Figure 3.6 and 3.7).

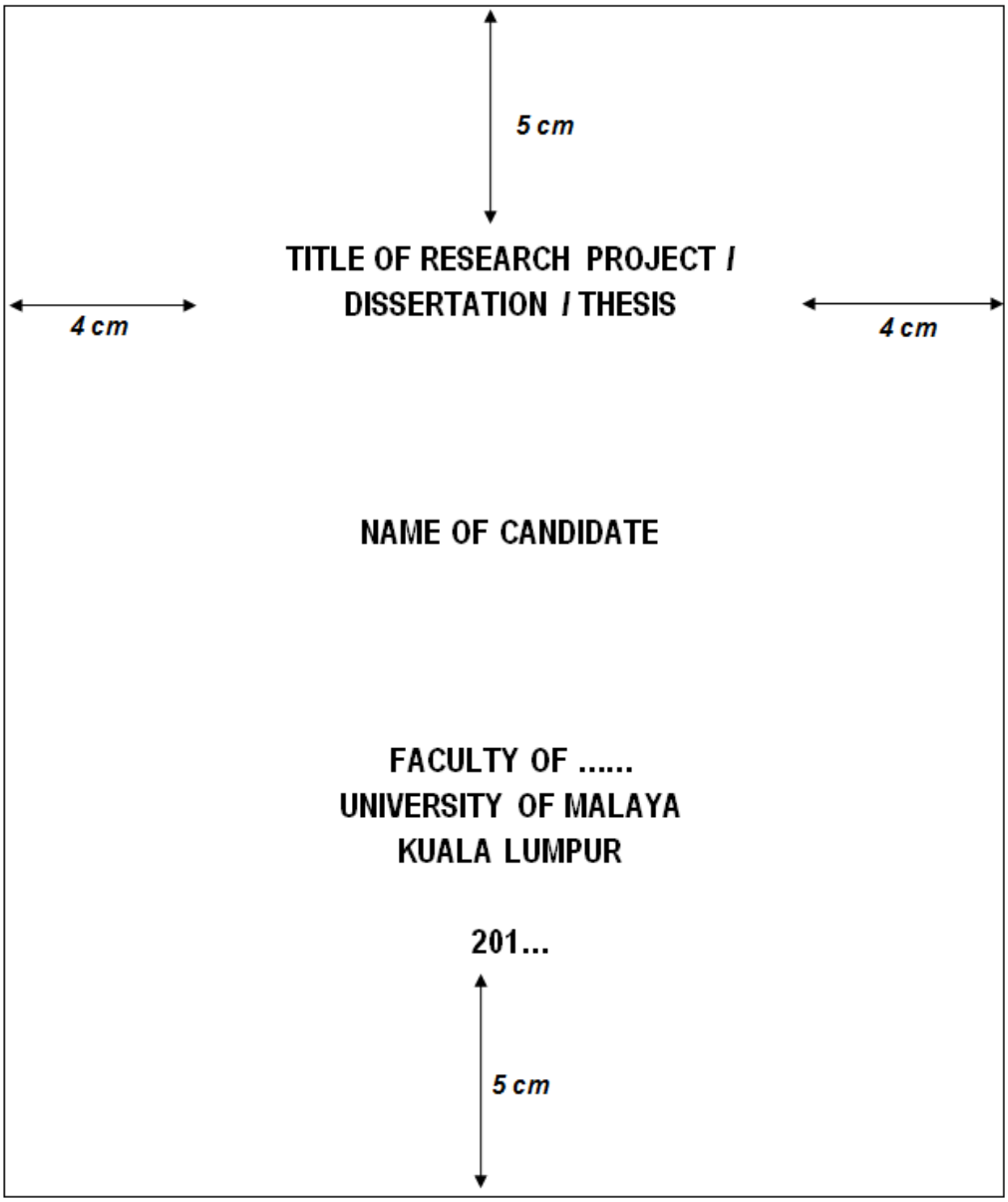


Figure 3.6: Formatting of the front cover of research project/dissertation/thesis

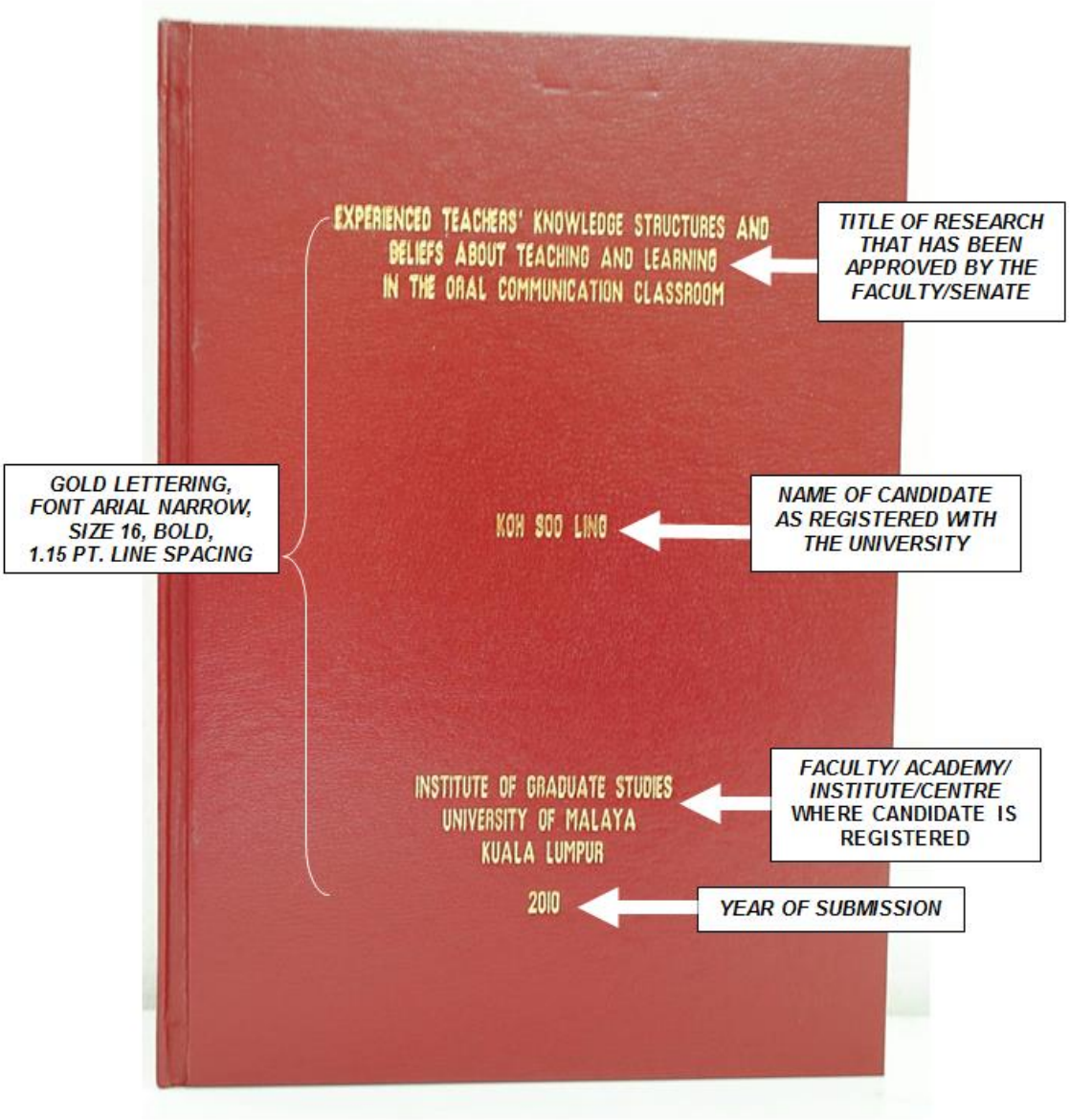


Figure 3.7: Example of the front cover of research project/dissertation/thesis

The spine of the manuscripts should show the title of research project/dissertation/thesis, name of author, year of submission and name of degree. The year of submission must be in accordance with the year when the research project/dissertation/thesis is submitted (Figure 3.8 and 3.9). If the title of the research project/dissertation/thesis exceeds the space of the spine, a smaller font size can be used (i.e. font size 16 to 14) or alternatively the title can be truncated with ellipses (…) (Figure 3.10).

AMIR GHORBANI	**PRIVATIZATION IN ALGERIA: POLICY AND PERFORMANCE**	**PhD 2017**

Figure 3.8: Spine format

Figure 3.9: Example of spine format

KWONG SIU YEE	**THE EFFECT OF GEOGRAPHICAL REGION ON THE TRANSITION TIME OF CMMI-BASED …**	**PhD 2017**

Figure 3.10: Spine format for long title

3.11 Word Length

The maximum word length for a submission for examination is shown in Table 3.2.

Table 3.2: Maximum word length

Master's Programme		
Research project (by Coursework)	**Dissertation (by Mixed mode)**	**Dissertation (by Research)**
30,000 words	40,000 words	60,000 words
Doctoral Programme		
Dissertation (by Coursework or by Clinical Coursework)	**Thesis (by Mixed mode)**	**Thesis (by Research)**
60,000 words	80,000 words	100,000 words

The minimum word length is determined by the faculty based on the programme standards according to their respective discipline (if any). The maximum length of words excludes footnotes, references, appendices, tables, figures and prefaces.

Candidates who are unable to meet the word length set by the University must seek approval from the faculty before the submission of research project/dissertation/thesis for examination.

3.12 Other Information

A candidate may not resubmit previous research work which he or she has submitted to this or any other University for the award of a degree. The candidate may, however, incorporate any part of such work, provided that there is a clear indication in the research project/dissertation/thesis of its sources.

The candidate may also include any other printed or published work by an individual or a working group to validate his or her findings. Where the contribution is from a working group, the candidate is required to provide a statement indicating which part of the work was carried out by the candidate. The statement should be signed by the rest of the group indicating their consent (this may be included in the Appendix).

Approved research projects/dissertations/theses or parts of their content are allowed for publication if they are accompanied by a statement that the work was conducted towards the fulfilment of a particular degree.

All research mode candidates are required to publish papers in Web of Science (WoS) or category A or B refereed journals based on the work during the course of study, and due reference must be made to the University in all such papers.

CHAPTER 4: SUBMISSION

4.1 Prior to Submission

Postgraduate candidates are required to submit the **3 Months' Notice** via MyUM Student Portal at least three (3) months before the actual date of submission. This is to allow timely nomination of examiners and title approval of research project/dissertation/thesis. Details on 3 Months' Notice submission is available on the IGS website (http://ips.um.edu.my > *Students > Current Students > Examination of Thesis/Dissertation).*

Submission of research project/dissertation/thesis for examination has to be done within the candidature period after title approval by the faculty.

Prior to binding and submission, it is recommended for candidates to get the format of their final drafts checked by providing a printed copy to the Thesis Unit, IGS. Also, candidates are strongly advised against copying the formatting done by other candidates as previously submitted research project/dissertation/thesis may not conform to the current formatting requirements. Failure to meet the formatting requirements may result in a thesis/dissertation being rejected at the point of submission.

Once ready, Master's candidates shall submit their research projects/dissertations to the Postgraduate Officer of the respective faculty whereas Doctoral candidates submit their theses to the Thesis Unit, IGS.

4.2 Required Documents for Submission

Documents required for submission for the purpose of examination are as follows:

- at least five (5) printed softbound copies (or such numbers as may be determined by the faculty) of the research project/dissertation/thesis;
- one (1) electronic copy (PDF format); and
- Submission of Research Project/Dissertation/Thesis for Examination/Re-examination form.

Documents required for final submission prior to graduation after completing the corrections (if any), are as follows:

- at least two (2) printed hardbound copies (or such numbers as may be determined by the faculty) of the final research project/dissertation/thesis;
- one (1) electronic copy (PDF format);
- Final Submission for Research Project/Dissertation/Thesis form;
- Repository form; and
- Correction Report form (if applicable).

All the required forms can be downloaded from the IGS website (http://ips.um.edu.my) under Current Students.

The submitted electronic copy of the research project/dissertation/thesis (in PDF format) in a compact disc (CD) or USB flash drive must be labeled with the following details (Figure 4.1):

- Name
- Matric no.
- Title of research project/dissertation/thesis
- Faculty/Academy/Institute/Centre
- Year of submission (current year)

Figure 4.1: Printed label format (inside the CD sleeve or case)

CHAPTER 5: PLAGIARISM

Postgraduate candidate of the University of Malaya are expected to produce original academic work. Plagiarism is defined as the use of original work, ideas or actual texts created by others, without acknowledging the original source. Hence, failure to acknowledge the work of others in their work means the candidate is guilty of plagiarism and may be subjected to disciplinary action under the University of Malaya (Discipline of Students) Rules 1999.

Postgraduate candidates are strongly advised to read the "How to Avoid Plagiarism: A Handbook for Postgraduate Students", which outlines the rules and regulations pertaining to acts of plagiarism.

The University also highly recommends the usage of Turnitin, an online web-based plagiarism detection application to avoid plagiarism and ensure academic integrity. In most cases, the similarity index percentage should not be more than **10% to 25%.** Please refer to your respective faculty regarding the acceptable similarity index percentage.