POSTGRADUATE HANDBOOK

FACULTY OF BIOSCIENCES AND MEDICAL ENGINEERING (FBME)

ATTENTION!

The content of this book is true and accurate at the time of publication. The faculty reserves the right to make the appropriate changes without any prior notification. This guide book is a reference for the postgraduate students enrolled in the 2013/2014 session and will be used until graduation.
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CONTENTS

FOREWORD BY THE DEAN

Welcome to the Faculty of Biosciences and Medical Engineering (FBME)

Welcome to Faculty of Biosciences and Medical Engineering (FBME), a newly established faculty in UTM to champion teachings and research in Biosciences & Medical Engineering. The faculty offers innovative programs for both undergraduates and post-graduates with a balance course in Biosciences and Medical Engineering, and a special emphasis on clinical and industrial applications.

Faculty of Biosciences and Medical Engineering (FBME) was established in the year 2012 by merging the Faculty of Biosciences and Bioengineering (FBB) and Faculty of Health Science and Biomedical Engineering (FKBSK) to promote and strengthen the interdisciplinary research in the fields of Biosciences, Medical Engineering and Health science. Therefore, we believe strongly in the value of interdisciplinary pursuits in this emerging field where the techniques and technologies from Biosciences and Engineering disciplines are used to address needs within the Biotechnology, Medical and Healthcare industries. Our vision is to ensure that UTM and the country as a whole would be fully equipped with the manpower and technologies in this emerging and demanding field of engineering.

FBME is committed to excellence in both undergraduate and graduate education. Opportunities for education and research exist in areas of biomechanics, biomaterials, tissue engineering, medical devices, bio-signal processing, MEM implantable systems, physiological modeling and simulation, monitoring and control, medical robotics as well as renewable energy, plant biotechnology to industrial biotechnology, environmental engineering, biosensor technology and bioinformatics.

FBME offers students unparalleled access to engineering experts in the fields of mechanical, electrical & electronics, biological, and computer science. The demands for Biosciences and Biomedical Engineers are increasing every year in tandem with the increasing demand for healthcare services, and the faculty is committed to produce graduates in the fields of BIOSCIENCES and ENGINEERING with industrial leadership capability especially in the healthcare industry.

This postgraduate handbook contains important information about the faculty and academic programmes offered. Please use this handbook wisely and as a main source of reference to plan your success in your studies. Finally, I wish you all the best and good luck in your postgraduate studies.

Prof. Dr. Jasmy Yunus

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INSTITUTION PROFILE

UNIVERSITI TEKNOLOGI MALAYSIA (UTM)

RESEARCH UNIVERSITY

INSTITUTION PROFILE

UNIVERSITI TEKNOLOGI MALAYSIA (UTM)

Universiti Teknologi Malaysia (UTM), a premier university in engineering, science and technology located in Johor Bahru, the southern city in Iskandar Malaysia which is a vibrant economic corridor in the south of Peninsular Malaysia.

It is renowned for being at the forefront of engineering and technological knowledge and expertise, contributing to the technical and professional workforce of the nation since its inception in 1904.
UTM has also established a reputation for cutting-edge research undertakings and innovative education, proven by becoming the three-time winner of the National Intellectual Property Award for organization category. Its mission is to lead in the development of creative and innovative human capital and advanced technologies that will contribute to the nation's wealth creation.

With a strength of more than 2,000 academic staff, of which more than 200 are foreign graduate faculty members, UTM continuously strives to develop and enhance quality academic and professional programmes of international standard and global recognition. The student population consists of more than 11,000 full-time undergraduate students, more than 6,000 enrolled on distance learning programmes as part-time students and more than 9,000 postgraduate students in various fields of specialization. Out of this, more than 3,000 are foreign students.

Having produced more than 200,000 technical graduates and qualified professionals over the years, UTM has earned its place as Malaysia's premier university in Engineering and Technology which inspires creativity and innovation.

RESEARCH UNIVERSITY

In June 2010, the government has declared UTM as the country's fifth research university and this put UTM playing a bigger role in the development of the nation. Being as one of the research university, UTM seeks to actively participate in new adventures of ideas, experiment with innovative methods, and take intellectual initiatives to further discover and expand the frontiers of knowledge. UTM expect to have an increase in research activities and more students to enrol in the postgraduate programs including the taught Masters programs as well as the Masters and PhD research programs.

LOCATION

Set in a splendid campus, with modern buildings and excellent facilities, UTM main campus is superbly located to take advantage of the best that Johor has to offer. The main Skudai campus is situated on a 1,222 - hectares site that provides a lovely setting of landscape gardens for the bustling academic village and residences. The main campus is easily accessible by road, rail and air. Regular flights from Senai Airport connect the state capital of Johor Bahru to Kuala Lumpur and others domestic destinations. Transport services at the airport are also readily available. Taxis are a popular cheap means of transport. Air-conditioned coaches are also available to and from Johor Bahru to other states in Peninsular Malaysia. The KTM (Malayan Railway) offers numerous train services connecting Singapore and other states in Malaysia through Johor Bahru station. A 18-hectare UTM City Campus is situated at Jalan Semarak, Kuala Lumpur.

INTERNATIONAL STUDENTS

The university encourages the admission of international students, and seeks to serve the aspirations of all with the ability and motivation to benefit from higher education. The university arranges special induction and orientation programmes for international students. There are more than 500 international students from over 24 countries are represented on the campus. An exciting and dynamic learning environment is enhanced by the contributions of students from diverse backgrounds. International schools conveniently situated at the nearby Johor Bahru city permit children of married students for primary and secondary

education. The University also provides a full range of admission, welfare and student services to meet the needs of international students.

ACCOMMODATION

Students are guaranteed accommodation in their first year. University housing is available at both campuses. Hostels are available for more than 20,000 students and new colleges are equipped with computer rooms and internet facilities. Apartments for married students are also available.

FACILITIES

UTM provides various facilities to support all kinds of students and staff activities. There are fully air-conditioned lecture halls and rooms, well-equipped auditoriums, seminar rooms, laboratories, a medical centre, student hostels, guest houses, a mosque, banks and a post office. The University has a large and spacious library that can accommodate up to 2,500 students at any one time. The library is with more than 300,000 books, some 5,000 journals, on-line references and internet access. Sporting and recreational facilities in the university are extensive and encompass nearby all interest which include canoeing and horse riding. These are complemented by the varied opportunities for leisure activities in the nearby progressive city of Johor Bahru, and together they make UTM a conducive place for studying.

PHILOSOPHY, VISION, MISSION, MOTTO, THEME and CORE VALUES

UNIVERSITI TEKNOLOGI MALAYSIA (UTM)

PHILOSOPHY

The divine law of Allah is the foundation for science and technology. Universiti Teknologi Malaysia strives with total and unified to develop excellence in science and technology for universal peace and prosperity, in accordance with His Will.

VISION

To be recognized as a world-class centre of academic and technological excellence.

MISSION

To be a leader in the development of human capital and innovative technologies that will contribute to the nation's wealth creation.

MOTTO

In The Name Of God for Mankind (Kerana Tuhan Untuk Manusia).

THEME

Inspiring Creative and Innovative Minds

CORE VALUES

- Committed
- Communicative
- Committed
- Creative
- Consistent
- Competent

FACULTY PROFILE

FACULTY OF BIOSCIENCES AND MEDICAL ENGINEERING (FBME)

FACULTY IN BRIEF

Faculty of Biosciences and Medical Engineering (FBME)

Background

There were several postgraduate programmes offered by Faculty of Health Science and Biomedical Engineering (FKBSK) in the research areas of biomedical engineering, health care, rehabilitation technology, biosignal and medical implant technology. Similarly, Faculty of Biosciences and Bioengineering (FBB) offered post graduate programmes in the research areas of structural biology, proteomics, functional genomics, nano biotechnology, drug delivery, cancer studies, structural bioinformatics, drug design as well as protein engineering, genetic engineering, tissue engineering, metabolic engineering, biomaterial development, bioprocess engineering, biosensor technology. Both faculties were conducted research in the advancement of life sciences independently. In 2012, FKBSK and FBB were merged to strengthen "the interdisciplinary life science research". The new faculty was given the name "Faculty of Biosciences and Medical Engineering (FBME)".

There are three departments:

1. Department Biosciences and Health Sciences
2. Department of Biotechnology and Medical Engineering
3. Department of Clinical Sciences

VISION, MISSION AND MOTTO

VISION

FBME is committed to be a world-class centre of excellence and a leader in teaching, learning and research in the field of biosciences and medical engineering.

MISSION

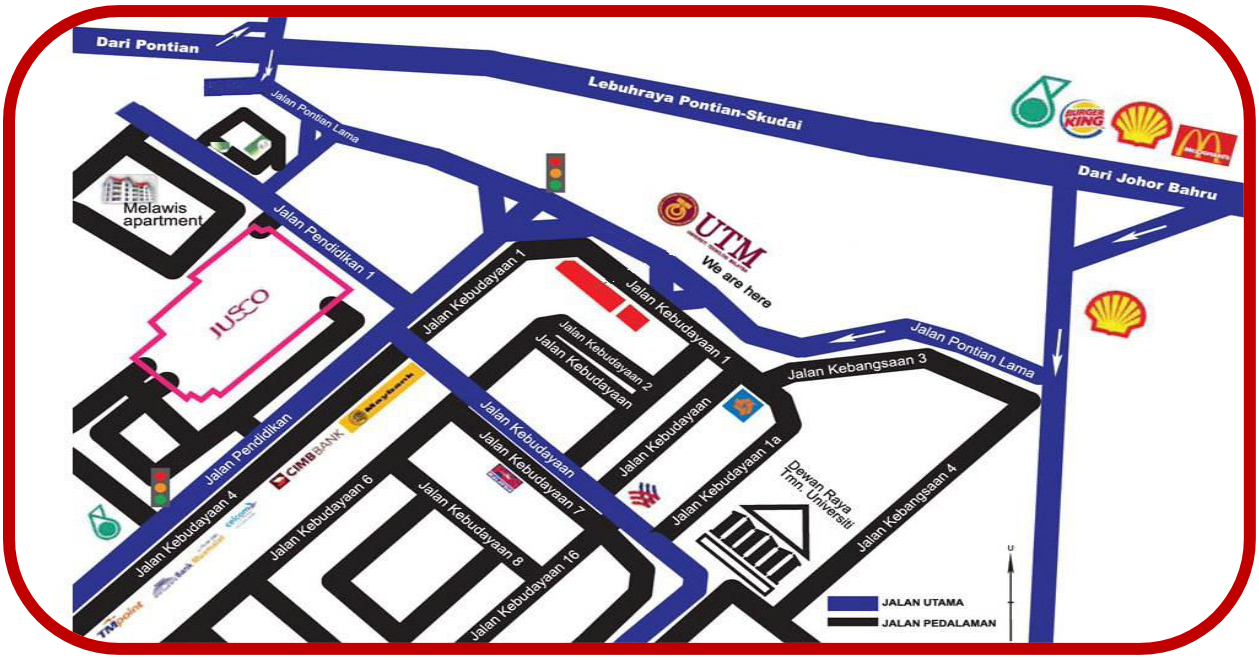
- To produce graduates with high ethical values and good professional conduct who are competent in the fields of biosciences and medical engineering.
- To spearhead advances in the fields of biosciences and medical engineering through multidisciplinary research, integrated learning, and global networking
- To fulfill the needs of all stakeholders in producing graduates that contribute towards nation building, wealth creation and sustainable development

MOTTO

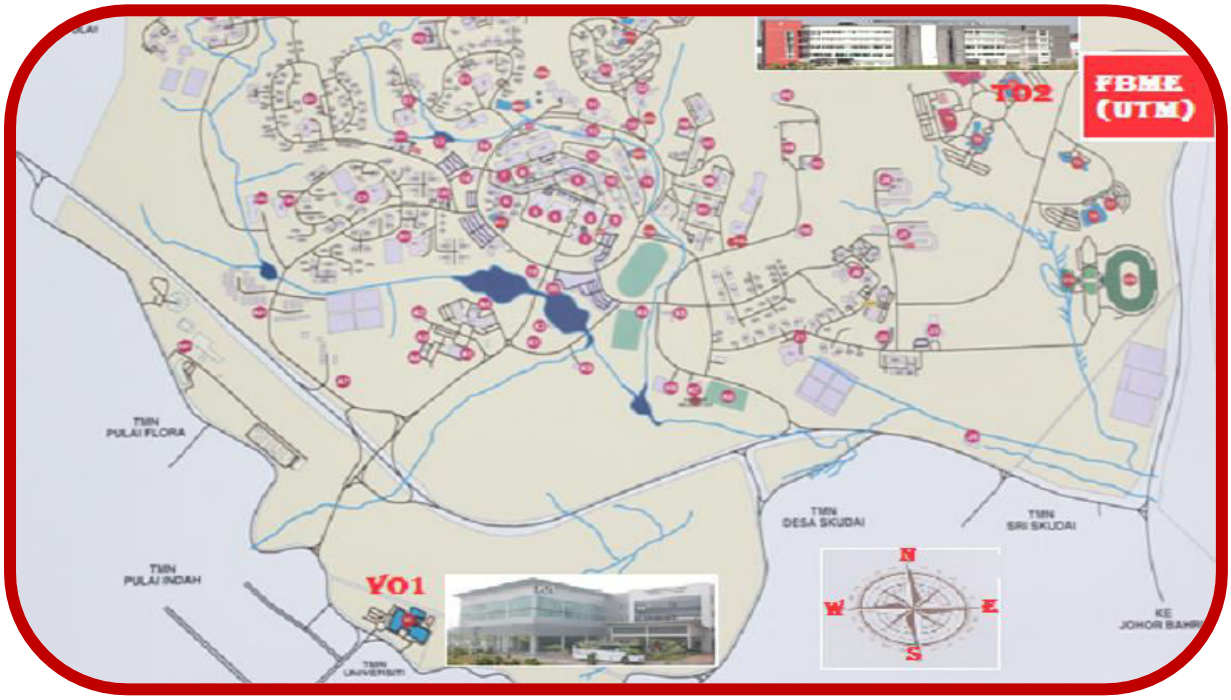
Revealing Science, Engineering The Future

FACULTY MAP

FACULTY OF BIOSCIENCES AND MEDICAL ENGINEERING (FBME)



Faculty of Biosciences and Medical Engineering has been allocated two buildings. Satellite building (V01) is situated near Taman Universiti. The administration and academic offices are also located in this building. Second building is located in Research Cluster and therefore called cluster building (T02). Locations of these buildings are shown in the map and visualized by pictures as well.



FACULTY ADMINISTRATION

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POSTGRADUATE STUDIES COMMITTEE

FACULTY OF BIOSCIENCES AND MEDICAL ENGINEERING (FBME)

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Dean

Professor Dr. Jasmy Yunus

Members:

Deputy Dean (Academics)

Dr. Fahrul Zaman bin Huyop
Associate Professor

Deputy Dean (Development)

Ir. Dr. Mohammed Rafiq Dato' Abdul Kadir
Associate Professor

Academic Manager (Postgraduate programmes)

Dr. Azli bin Yahya

Head of the Department (Biosciences and Health Sciences)

Dr. Shafinaz binti Shahir

Head of the Department (Biotechnology and Medical Engineering)

Dr. Nasrul Humaimi Mahmood

Head of the Department (Clinical Sciences)

Dr. Kahar Osman
Associate Professor

Laboratory Manager

Dr. Alina binti Wagiran

IT Manager

Dr. Salehhuddin Hamdan

Deputy Registrar (Academic)

Haji Mokhtar bin Kader

Senior Assistant Registrar (HR)

Mr. Mohd Farid bin Rahmat

RESEARCH FACILITIES

FACULTY OF BIOSCIENCES AND MEDICAL ENGINEERING (FBME)

RESEARCH FACILITIES

Equipments and techniques

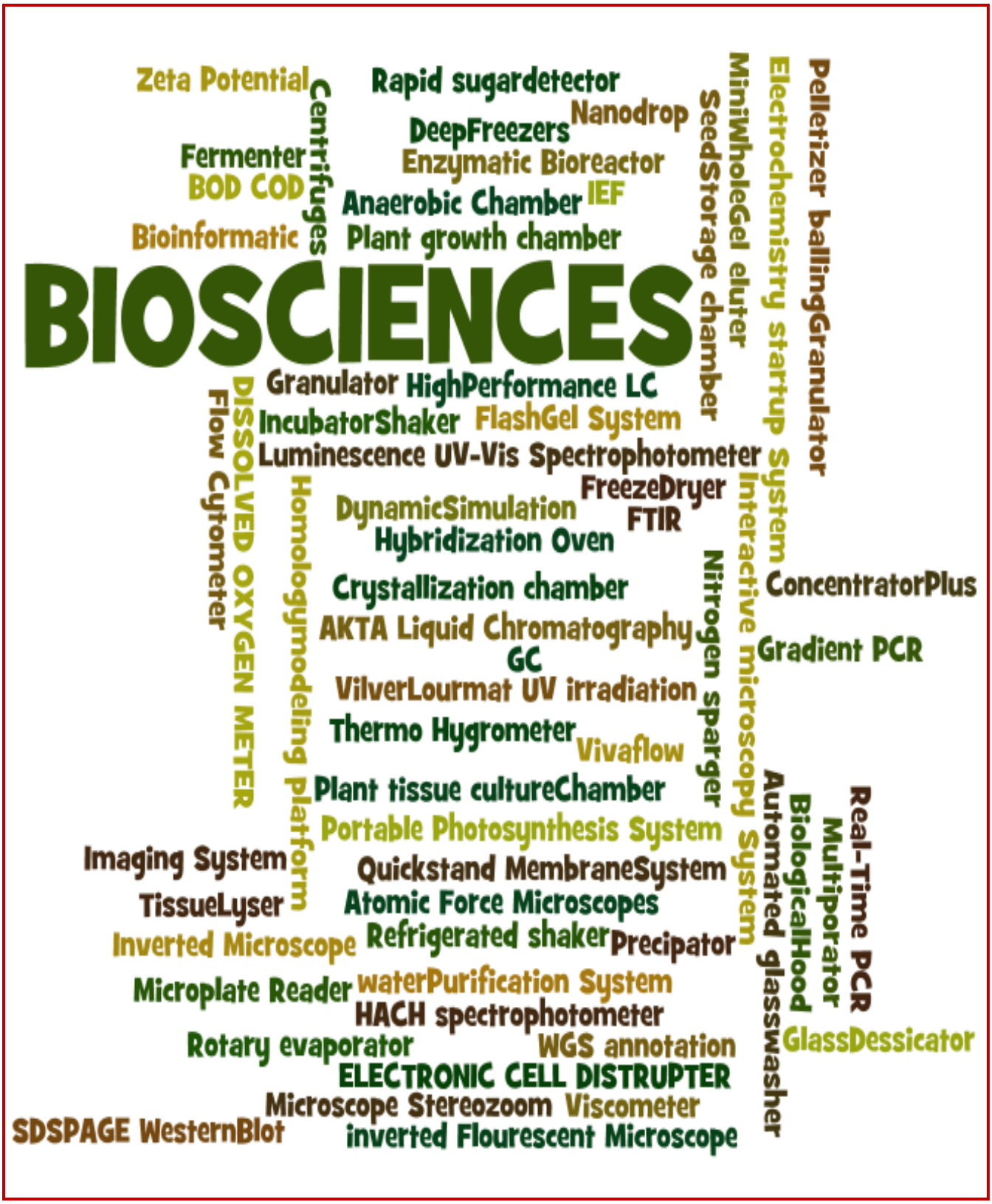
The research facilities available in the faculty are described separately for Biosciences and Medical Engineering.
The equipments, techniques and capabilities available in the area of Biosciences are nano-porous materials and its biological application, biofuel research and renewable energy resources, microbiology, environmental bioengineering, medical Biotechnology, molecular and plant biotechnology, biocatalysis and fermentation technology, Bioinformatics, molecular modeling and biosensor technology. A description of these research facilities are given on page19.
Under biomedical and health sciences, the research facilities available here (in terms of equipments an techniques capabilities) are related to biomedical instrumentation, biosignal processing, biomedical imaging, biomechanics and biomaterials, medical computing, clinical engineering, health care management system, rehabilitation engineering, sports science technology, therapy and rehabilitation technology, motion analysis, physical therapy modalities, electrotherapy modalities, exercise therapy, exercise prescription, assistive technology, orthotics and prosthetics, rehabilitation ergonomics and kinesiotherapy. The detail of the instruments and techniques are summarized on page 20.

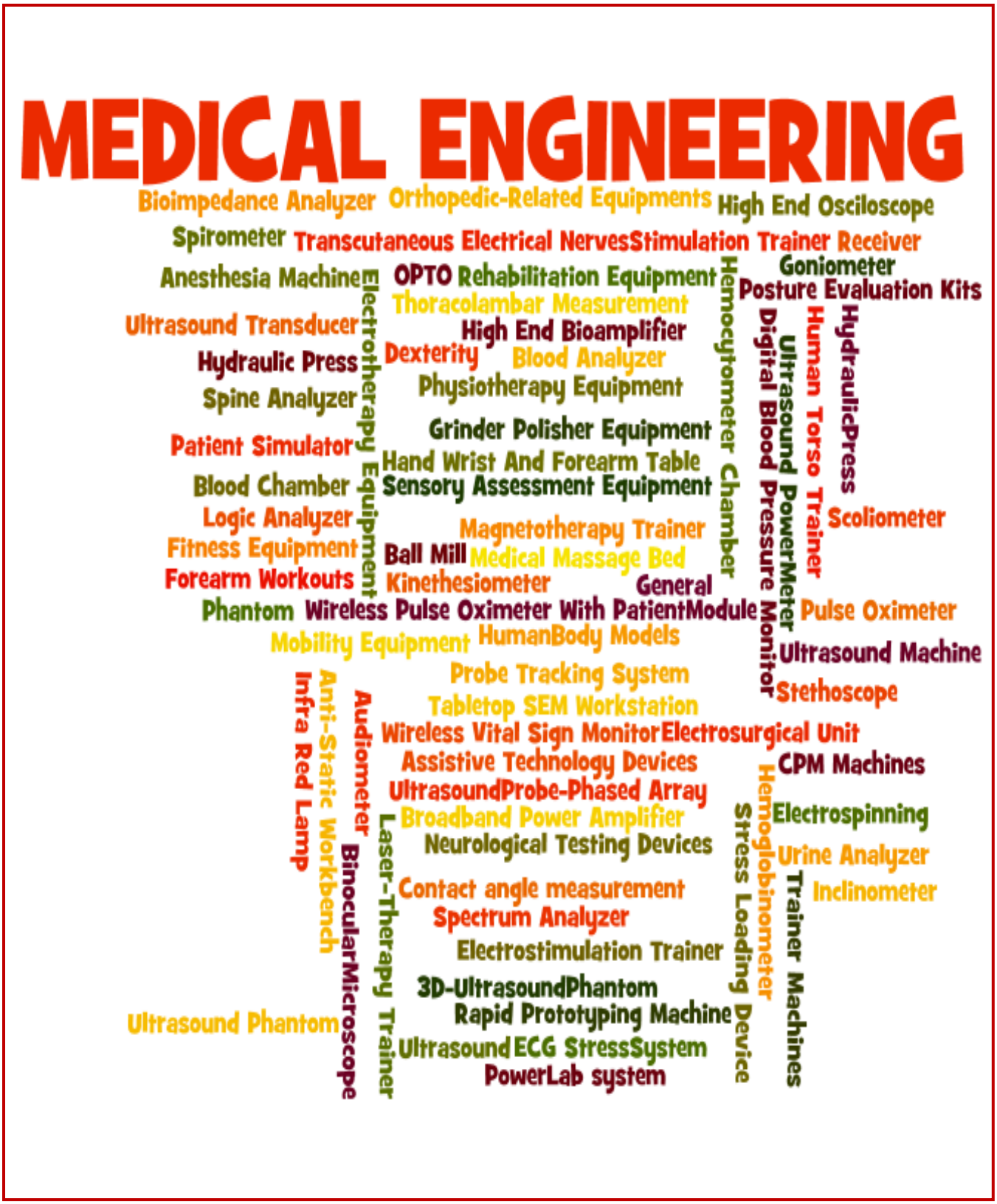
Computing Facilities

The faculty makes available computing facilities for students' research convenience. Postgraduate Research Laboratories are provided with computers making it easy for teaching, learning and presentation purposes. Another alternative for IT resources is the Bioinformatics Laboratories.

Activity Room

Activity room is equipped with tables, chairs, cabinets and sofas for the use of post graduate students. The room also has electrical power outlets and Internet access. Students use this room to conduct general activities such as group discussions or simply to relax.


BIOSCIENCES
Zeta Potential
Centrifuges
Rapid sugardetector
Nanodrop
DeepFreezers
Fermenter
Enzymatic Bioreactor
BOD COD
Anaerobic Chamber
IEF
Bioinformatic
Plant growth chamber
SeedStorage chamber
MiniWholeGel eluter
Electrochemistry startup System
Pelletizer ballingGranulator
Granulator
HighPerformance LC
IncubatorShaker
FlashGel System
Luminescence UV-Vis Spectrophotometer
FreezeDryer
DynamicSimulation
FTIR
Hybridization Oven
DISSOLVED OXYGEN METER
Flow Cytometer
Homologymodeling Platform
Interactive microscopy System
Nitrogen sparger
Crystallization chamber
ConcentratorPlus
AKTA Liquid Chromatography
Gradient PCR
GC
VilverLourmat UV irradiation
Thermo Hygrometer
Vivaflow
Plant tissue cultureChamber
Portable Photosynthesis System
Real-Time PCR
Multiporator
BiologicalHood
Automated glasswasher
Imaging System
Quickstand MembraneSystem
TissueLyser
Atomic Force Microscopes
Inverted Microscope
Refrigerated shaker
Precipator
Microplate Reader
waterPurification System
HACH spectrophotometer
Rotary evaporator
WGS annotation
GlassDessicator
ELECTRONIC CELL DISTRUPTER
Microscope Stereozoom
Viscometer
SDSPAGE WesternBlot
inverted Flourescent Microscope


MEDICAL ENGINEERING
Bioimpedance Analyzer
Orthopedic-Related Equipments
High End Osciloscope
Spirometer
Transcutaneous Electrical NervesStimulation Trainer
Receiver
Anesthesia Machine
OPTO Rehabilitation Equipment
Goniometer
Posture Evaluation Kits
Thoracolambar Measurement
Ultrasound Transducer
High End Bioamplifier
Dexterity
Blood Analyzer
Hydraulic Press
Physiotherapy Equipment
Spine Analyzer
Grinder Polisher Equipment
Patient Simulator
Hand Wrist And Forearm Table
Blood Chamber
Sensory Assessment Equipment
Logic Analyzer
Magnetotherapy Trainer
Fitness Equipment
Ball Mill
Medical Massage Bed
Forearm Workouts
Kinethesiometer
General
Phantom
Wireless Pulse Oximeter With PatientModule
Mobility Equipment
HumanBody Models
Probe Tracking System
Tabletop SEM Workstation
Wireless Vital Sign Monitor
Electrosurgical Unit
Assistive Technology Devices
UltrasoundProbe-Phased Array
Broadband Power Amplifier
Neurological Testing Devices
Contact angle measurement
Spectrum Analyzer
Electrostimulation Trainer
3D-UltrasoundPhantom
Rapid Prototyping Machine
Ultrasound Phantom
Ultrasound ECG StressSystem
PowerLab system
Electrotherapy Equipment
Hemocytometer Chamber
Ultrasound PowerMeter
Digital Blood Pressure Monitor
Human Torso Trainer
HydraulicPress
Scoliometer
Pulse Oximeter
Ultrasound Machine
Stethoscope
CPM Machines
Hemoglobinometer
Electrospinning
Stress Loading Device
Urine Analyzer
Trainer Machines
Inclinometer
Audiometer
Anti-Static Workbench
Infra Red Lamp
BinocularMicroscope
Laser-Therapy Trainer

POSTGRADUATE PROGRAMMES

FACULTY OF BIOSCIENCES AND MEDICAL ENGINEERING (FBME)

POSTGRADUATE PROGRAMMES

Programmes Offered

Faculty of Biosciences and Medical Engineering (FBME) offers 8 **postgraduate programmes** that lead to the award of the **postgraduate degrees** (Master or Doctor of Philosophy) in areas of Biological sciences, Biomedical engineering and Rehabilitation & Health sciences Technology.

Mode of Study

Students may register for the programme by one of the modes of study offered, namely **Taught course**, **Mixed mode** (combination of Taught Course and Research) or **Research**,.

Duration of Study

For **FULL-TIME** Master's and PhD programme, the normal study durations are 2 - 6 semesters (1 - 3 years) and 6 - 14 semesters (3 - 7 years), respectively.

For **PART-TIME** Master's and PhD programme, the normal study durations are 4 - 8 semesters (2 - 4 years) and 8 – 16 semesters (4 - 8 years), respectively.

Additional Requirements

Each programme requires the student to take at least one of the **University compulsory courses** from the following options:

- **UHP 6013** – Seminar on Global Development, Economic and Social Issues
- **UHW 6023** – Philosophy of Science and Social Development
- **UHF 6033** – Dynamics of Leadership

International students are required to take 3 credit hours of university subjects.

- **UHZ 6123** – Malaysian Society and Culture (international students of non-Malay race)
- **UHZ 6323** – Bahasa Malaysia Penulisan Ilmiah (international students of Malay race)

Apart from the above requirements, research students must take a research methodology class:

- UMBP0010- Research Methodology (HW= Hadir Wajib/compulsory courses)

It is offered as an intensive course usually during the one week mid-semester break.

SUMMARY OF POSTGRADUATE PROGRAMMES

Master Degree programmes

Programmes	Code	MODE*	Research Field*
Master of Science (Biotechnology)	MMBT	2	A
Master of Science (Bioscience)	MMBB	3	A
Master of Science (Biomedical Engineering)	MMBC	1	B
Master Of Engineering (Biomedical)	MMBE	3	B
Master Of Philosophy (Rehabilitation Technology)	MMBR	3	C

Doctoral Degree Programmes

Programmes	Code	Research Field*
Doctor of Philosophy (Bioscience)	PMBB	A
Doctor Of Philosophy (Biomedical Engineering)	PMBE	B
Doctor Of Philosophy (Biomedical Engineering) (Double Degree Progmme)	PMBE	B
Doctor Of Philosophy (Health Science)	PMBH	C

***Mode:**

1 = Taught course, 2 = Mixed mode, 3 = Research

*** Research Field:**

A= Biosciences
B= Biomedical Engineering
C= Rehabilitation and Health sciences Technology

MASTER COURSES

By Mixed Mode (*Combination of Taught Course and Research)*

MASTER OF SCIENCE (BIOTECHNOLOGY)

Programme Features

FBME offers the Master of Science (Biotechnology) programme by **mixed mode** (taught course and research).The programme is **offered as full-time and part-time.** For full time programme, MSc (Biotechnology) can be completed within **three semesters (1½ years).**

Students are required to successfully complete a **minimum of 42 credits which include at least: (a) six core courses (18 credits) (b) one compulsory university course (HW*) (c) one university elective course (3 credits) and (d) dissertation (21 credits).**

Lists of research areas and academic staff are available in *Appendix E* and *Appendix F, respectively*.

Admission Requirements

- Bachelor of Science (Biology, Biochemistry, Biotechnology, Microbiology, Bioscience, Chemistry, Chemical Engineering, Bioprocess Engineering, Environmental Engineering, Genetics or equivalent) with CPA ≥ 3.0 will be considered for this programme; **OR**
- Bachelor of Science with CPA < 3.0 and one year working experience in areas related to Biotechnology.
- **English Language Requirements (FOR INTERNATIONAL STUDENTS)**
  An International student candidate is required to have a minimum qualification of the Test of English as a Foreign Language **(TOEFL) of 550 or** International English Language Test System **(IELTS)** of **band 6.0** or Malaysian Universities English Test **(MUET) of band 4.0.** Exemption may be given to those who originate from countries whose native language is English or who graduated from English-speaking countries. Those who do not meet the minimum requirement must attend and pass the Intensive English Programme before they are allowed to proceed with their respective programs of study.

Assessments

Project dissertation has to be submitted at the end of the respective semesters. Course assessment will be conducted via direct (examination, tests, quizzes) and indirect (peer assessment) methods. **Generic skills** will be adapted during teaching and learning process.

Course distributions

The courses are categorized as university electives, core programmes and elective programmes, such as the followings.

SEMESTER 1

CODE	COURSE	CREDIT	PRE-REQUISITE
UMBP0010	Research Methodology	***HW****	**-**
MMBT 1713	Bioinformatics	3	**-**
MMBT 1173	Biochemistry and Microbial Physiology	3	Microbiology, Biochemistry, Molecular Biology
MMBT 1153	Molecular Mechanisms in Gene Expression and Regulation	3	Microbiology, Biochemistry, Molecular Biology
MMBT 1683	Protein Engineering	3	Enzyme Technology, Protein Separation
Total credits		**12**	

***HW = Hadir Wajib/Compulsory Courses**

SEMESTER 2

CODE	COURSE	CREDIT	PRE-REQUISITE
UH*X XXX*3	University Elective Course*	3	-
MMBT 1233	Industrial Technology & Bioreactor Design	3	Microbiology, Biochemistry, Molecular Biology
MMBT 1563	Environmental Bioengineering	3	Microbiology, Biochemistry, Molecular Biology
Total credits		**9**	

***To be selected from the list provided by SPS; *X* = a code number**

SEMESTER 3

CODE	COURSE	CREDIT	PRE-REQUISITE
MMBT 2180	Dissertation	21	-
Total credits		**21**	

Synopsis of courses is available in *Appendix A*. **Programme specification** for MSc. (Biotechnology) is attached in *Appendix B*.

MASTER OF SCIENCE (BIOMEDICAL ENGINEERING)
By Taught Mode

Programme Features

FBME offers the Master of Science (Biomedical Engineering) programme by **taught course mode**. The programme is **offered as full-time and part-time.** For full time programme, MSc (Biomedical Engineering) can be completed within **three semesters (1½ years).**

Students are required to successfully complete a **minimum of 42 credits which include at least: (a) five core courses (15 credits) (b) one compulsory university course (HW*) (c) one university elective course (3 credits) (d) four elective course (12 credits) and (e) dissertation (12 credits). Project dissertation** has a total credit of 12 hours in which it will be divided into 4 credit hours for semester two (Dissertation 1) followed by another 8 credit hours for semester three (Dissertation 2).

Lists of research areas and academic staff are available in *Appendix E* and *Appendix F, respectively*.

Admission Requirements

- Bachelor Degree in Engineering (Biomedical, Electrical, Mechanical, Computer), Science (Physics, Biology, Chemistry, Mathematics, Medical and Health), Medical or other related disciplines from UTM; **OR**
- Other Recognised Higher Learning Institution with CGPA ≥ 3.0 or equivalent. For CGPA < 3.0, relevant work experience is needed.
- English Language Requirements (FOR INTERNATIONAL STUDENTS)
  An International student candidate is required to have a minimum qualification of the Test of English as a Foreign Language **(TOEFL) of 550 or** International English Language Test System **(IELTS)** of **band 6.0** or Malaysian Universities English Test **(MUET) of band 4.0.** Exemption may be given to those who originate from countries whose native language is English or who graduated from English-speaking countries. Those who do not meet the minimum requirement must attend and pass the Intensive English Programme before they are allowed to proceed with their respective programs of study.

Assessments

Project dissertation has to be submitted at the end of the respective semesters. Course assessment will be conducted via direct (examination, tests, quizzes, assignments) and indirect (peer assessment) methods. **Generic skills** will be adapted during teaching and learning process.

Course distributions

This program is offered on full-time and part time mode with a specific subjects being delivered and assessed in each semester. Assessment is based on coursework, final examination and dissertation.

The courses are categorized as university general courses, programme core courses and programme elective courses such as the followings:

SEMESTER 1

CODE	COURSE	CREDIT	PRE-REQUISITE
UMBP0010	Research Methodology	***HW****	**-**
UHX *XXX*3	University Elective Course*	*3*	**-**
MMBC 1003	Technique Biomedical Measurement	3	**-**
MMBC 1013	Diagnostic and Therapeutic Technology	3	-
MMBC 1023	Advanced Biomedical Engineering 3	3	-
MMBC 1*XX*3	Elective 1	3	-
Total credits		**15**	

***To be selected from the list provided by SPS; *X* = a code number**

SEMESTER 2

CODE	COURSE	CREDIT	PRE-REQUISITE
MMBC 1033	Medical Informatics	3	-
MMBC 1043	Biomechanics	3	-
MMBC 1184	Master Project 1	4	-
MMBC 1*XX*3	Elective 2	3	-
MMBC 1*XX*3	Elective 3	3	-
Total credits		**16**	

***X* = a code number**

SEMESTER 3

CODE	COURSE	CREDIT	PRE-REQUISITE
MMBC 1198	Master Project 2	8	-
MMBC 1*XX*3	Elective 4	3	-
Total credits		**11**	

***X* = a code number**

Synopsis of courses is available in *Appendix C*. **Programme specification** for MSc. (Biomedical Engineering) is attached in *Appendix D*.

MASTER COURSES
By *Research*

Faculty of Biosciences and Medical Engineering (FBME) offers the following three master programmes by research mode:

1. Master of Science (Biosciences)
2. Master of Engineering (Biomedical), and
3. Master of Philosophy (Rehabilitation Technology)

Programme Features

FBME offers three programmes for Master by Research; Master of Engineering (Biomedical Engineering), Master of Science (Biosciences) and Master of Philosophy (Rehabilitation Technology). These programmes are **offered as full-time and part-time.**

A student will carry out research in any one of the **areas of research** chosen. Each research project is **supervised by a lecturer of the Graduate Faculty**. A Graduate Faculty member is an academic staff who has a doctoral degree qualification or an academic staff who holds an academic post of at least associate professor and is involved directly or indirectly in the post-graduate programmes. Co-supervisors may also come from a related industry.

Lists of research areas and academic staff are available in *Appendix E* and *Appendix F, respectively*.

Assessments

Assessment is done by examining **first assessment reports** (research proposal), **each semester's progress reports, and thesis examination** (*viva-voce*)**.**

All MEng, MSc and MPhil students must undergo the **first assessment** by presenting their **research proposal**. The first assessment is scheduled according to the student's appropriate semester of study as described below:

Task	Full Time	Part Time
First Assessment	Week 10/11 (Semester 2)	Week 10/11 (Semester 3 or 4)
Progress Report	Week 12 (Every semester)	Week 12 (Every semester)

Students who are submitting the final draft of their thesis should send in the **Notice of Thesis Submission** to the Faculty **at least 3 months** prior to the date of submitting their thesis.

Additional requirements

In addition to the university compulsory course, research students may be required to attend lectures related to their research fields. The courses to be taken shall be determined by the respective department graduate committee from time to time. As part of their training, students

are required to present in seminars and conferences, as well as producing technical reports or papers for publications in proceedings or journals.

ADMISSION REQUIREMENTS

English Language Requirements (FOR INTERNATIONAL STUDENTS)

An International student candidate is required to have a minimum qualification of the Test of English as a Foreign Language **(TOEFL) of 550 or** International English Language Test System **(IELTS)** of **band 6.0** or Malaysian Universities English Test **(MUET) of band 4.0.** Exemption may be given to those who originate from countries whose native language is English or who graduated from English-speaking countries. Those who do not meet the minimum requirement must attend and pass the Intensive English Programme before they are allowed to proceed with their respective programs of study.

GENERAL REQUIREMENT

Master of Engineering (Biomedical Engineering)

- Bachelor of Engineering (Biomedical, Mechanical, Electrical, Chemical, Computer), Bachelor of Science (Biology, Physics, Chemistry), Bachelor of Medicine with CPA ≥3.0 will be considered for this programme; **OR**
- Bachelor of Engineering with CPA < 3.0 and one year working experience in areas related to Medical Engineering

Master of Science (Biosciences)

- Bachelor of Science (Biology, Biochemistry, Biotechnology, Microbiology, Bioscience, Plant Sciences, Chemistry, Chemical Engineering, Bioprocess Engineering, Environmental Engineering, Genetics or equivalent) with CPA ≥3.0 will be considered for this programme; **OR**
- Bachelor of Science with CPA < 3.0 and one year working experience in areas related to Biotechnology

Master of Philosophy (Rehabilitation Technology)

- Bachelor Degree in any field of Allied Health Sciences, related to Therapy and Rehabilitation, Sports Science, engineering field such as Electrical Engineering, Biomedical Engineering, Mechanical Engineering or related disciplines with good honour from Universiti Teknologi Malaysia or other institutions of higher education approved by the Senate; or
- A student candidate with lower qualifications will be considered if the candidate is proven to have adequate academic background and appropriate working experience.

RESEARCH COURSE CODES AND DESCRIPTION

MASTER OF SCIENCE (BIOSCIENCES)

SEMESTER	FULL-TIME	PART-TIME	CREDIT
1	MMBB 1100	MMBB 1110	0
	MMBB 1200	MMBB 1210	0
2	MMBB 2100	MMBB 2110	0
	MMBB 2200	MMBB 2210	0
3	MMBB 3100	MMBB 3110	0
	MMBB 3200	MMBB 3210	0
4		MMBB 4110	0
		MMBB 4210	0

MASTER OF ENGINEERING (BIOMEDICAL ENGINEERING)

SEMESTER	FULL-TIME	PART-TIME	CREDIT
1	MMBE1100	MMBE1110	0
	MMBE1200	MMBE1210	0
2	MMBE2100	MMBE2110	0
	MMBE2200	MMBE2210	0
3	MMBE3100	MMBE3110	0
	MMBE3200	MMBE3210	0
4		MMBE4110	0
		MMBE4210	0

MASTER OF PHILOSOPHY (REHABILITION TECHNOLOGY)

SEMESTER	FULL-TIME	PART-TIME	CREDIT
1	MMBR1100	MMBR1110	0
	MMBR1200	MMBR1210	0
2	MMBR2100	MMBR2110	0
	MMBR2200	MMBR2210	0
3	MMBR3100	MMBR3110	0
	MMBR3200	MMBR3210	0
4		MMBR4110	0
		MMBR4210	0

DOCTOR OF PHILOSOPHY

Faculty of Biosciences and Medical Engineering (FBME) offers three Doctor of Philosophy programmes:

1. Doctor of Philosophy (Biosciences)
2. Doctor of Philosophy (Biomedical Engineering)
3. Doctor of Philosophy (Health Science)

Program Features

FBME offers Doctor of Philosophy (Biomedical Engineering) program by research. This program is offered as full-time and part-time.

A student will carry out research in any one of the **areas of research** chosen. Each research project is **supervised by a lecturer of the Graduate Faculty**. A Graduate Faculty member is an academic staff who has a doctoral degree qualification or an academic staff who holds an academic post at least associate professor and is involved directly or indirectly in the postgraduate programs. Co-supervisor may also come from a related industry.

Lists of research areas and academic staff are available in *Appendix E* and *Appendix F, respectively*.

Assessments

Assessment is done by examining **first assessment report** (research proposal), **each semester's progress reports, and thesis examination** (viva voce).

All PhD students must undergo the **first assessment reports** by presenting their research proposal. The first assessment is scheduled according to the student's appropriate semester of study as described below:

TASK	FULL TIME	PART TIME
First Assessment	Week 10/11 (Semester 2)	Week 10/11 (Semester 3 or 4)
Progress Report	Week 12 (Every semester)	Week 12 (Every semester)

Week 12: Submission of progress report

Students who are submitting the final draft of their thesis should send in the **Notice of Thesis Submission** to the Faculty at least 3 months prior to the date of submitting their thesis.

Additional Requirements

In addition to the university compulsory courses, research students may be required to attend lectures related to their research fields. The courses to be taken shall be determined by the respective department graduate committee from time to time. As part of their training, students are required to present in seminars and conferences, as well as producing technical reports or papers for publications in proceedings or journals.

ADMISSION REQUIREMENTS

English Language Requirements (for international students)

An International student candidate is required to have a minimum qualification of the Test of English as a Foreign Language **(TOEFL) of 550 or** International English Language Test System **(IELTS)** of **band 6.0** or Malaysian Universities English Test **(MUET) of band 4.0.** Exemption may be given to those who originate from countries whose native language is English or who graduated from English-speaking countries. Those who do not meet the minimum requirement must attend and pass the Intensive English Programme before they are allowed to proceed with their respective programs of study.

GENERAL REQUIREMENT

DOCTOR OF PHILOSOPHY (Biosciences)

- Master of Science (Biology, Botany, Plant Sciences, Biochemistry, Biotechnology, Microbiology, Bioscience, Chemistry, Chemical Engineering, Bioprocess Engineering, Environmental Engineering, Genetics or equivalent) with CPA ≥ 3.0 will be considered for this program; **OR**
- Other qualifications equivalent to a Master's degree and experience in the relevant field recognized by the Senate

DOCTOR OF PHILOSOPHY (Biomedical Engineering)

- Master of Engineering (Biomedical Engineering, Mechanical Engineering, Electrical Engineering, Chemical Engineering, Computer Engineering), Master of Science (Biology, Physics, Chemistry), Master of Medicine with CPA ≥3.0 will be considered for this program; **OR**
- Other qualifications equivalent to a Master's degree and experience in the relevant field recognized by the Senate

DOCTOR OF PHILOSOPHY (HEALTH SCIENCE)

- Master of Science (Biology, Biochemistry, Biotechnology, Microbiology, Bioscience, Chemistry, Chemical Engineering, Bioprocess Engineering, Environmental Engineering, Genetics or equivalent) with CPA ≥ 3.0 will be considered for this program; **OR**
- Other qualifications equivalent to a Master's degree and experience in the relevant field recognized by the Senate

RESEARCH COURSE CODES AND DESCRIPTION

DOCTOR OF PHILOSOPHY (BIOSCIENCES)

FULL TIME	PART TIME	DESCRIPTION	CREDIT
PMBB 1100	PMBB 1110	Research	0
PMBB 1200	PMBB 1210	Research	0
PMBB 2100	PMBB 2110	Research	0
PMBB 2200	PMBB 2210	Research	0
PMBB 3100	PMBB 3110	Research	0
PMBB 3200	PMBB 3210	Research	0
PMBB 4100	PMBB 4110	Research	0
PMBB 4200	PMBB 4210	Research	0
PMBB 5100	PMBB 5110	Research	0
PMBB 5200	PMBB 5210	Research	0
PMBB 6100	PMBB 6110	Research	0
PMBB 6200	PMBB 6210	Research	0
PMBB 7100	PMBB 7110	Research	0
PMBB 7200	PMBB 7210	Research	0
	PMBB 8110	Research	0
	PMBB 8210	Research	0
	PMBB 9110	Research	0
	PMBB 9210	Research	0

GENERAL ELECTIVE UNIVERSITY COURSE (COMPULSORY)			
CODE	**NEW CODE**	**COURSE**	KREDIT
UMBP0010	UMBP0010	Research Methodology	HW
UHxxxx3	UHxxxx3	General Elective University Course	3

DOCTOR OF PHILOSOPHY (BIOMEDICAL ENGINEERING)

FULL TIME	PART TIME	DESCRIPTION	CREDIT
PMBE1100	PMBE 1110	Research	0
PMBE1200	PMBE 1210	Research	0
PMBE2100	PMBE 2110	Research	0
PMBE2200	PMBE 2210	Research	0
PMBE3100	PMBE 3110	Research	0
PMBE3200	PMBE 3210	Research	0
PMBE4100	PMBE 4110	Research	0
PMBE4200	PMBE 4210	Research	0
PMBE5100	PMBE 5110	Research	0
PMBE5200	PMBE 5210	Research	0
PMBE6100	PMBE 6110	Research	0
PMBE6200	PMBE 6210	Research	0
PMBE7100	PMBE 7110	Research	0
PMBE7200	PMBE 7210	Research	0
	PMBE 8110	Research	0
	PMBE 8210	Research	0
	PMBE 9110	Research	0
	PMBE 9210	Research	0

GENERAL ELECTIVE UNIVERSITY COURSE (COMPULSORY)			
CODE	**NEW CODE**	**COURSE**	CREDIT
UMBP0010	UMBP0010	Research Methodology	HW
UHxxxx3	UHxxxx3	General Elective University Course	3

DOCTOR OF PHILOSOPHY (HEALTH SCIENCE)

FULL TIME	PART TIME	DESCRIPTION	CREDIT
PMBH1100	PMBH1110	Research	0
PMBH1200	PMBH1210	Research	0
PMBH2100	PMBH2110	Research	0
PMBH2200	PMBH2210	Research	0
PMBH3100	PMBH3110	Research	0
PMBH3200	PMBH3210	Research	0
PMBH4100	PMBH4110	Research	0
PMBH4200	PMBH4210	Research	0
PMBH5100	PMBH5110	Research	0
PMBH5200	PMBH5210	Research	0
PMBH6100	PMBH6110	Research	0
PMBH6200	PMBH6210	Research	0
PMBH7100	PMBH7110	Research	0
PMBH7200	PMBH7210	Research	0
	PMBH8110	Research	0
	PMBH8210	Research	0
	PMBH9110	Research	0
	PMBH9210	Research	0

GENERAL ELECTIVE UNIVERSITY COURSE (COMPULSORY)			
CODE	**NEW CODE**	**COURSE**	KREDIT
UMBP0010	UMBP0010	Research Methodology	HW
UHxxxx3	UHxxxx3	General Elective University Course	3

INTERNATIONAL DOUBLE DEGREE PROGRAMME (BIOMEDICAL ENGINEERING)

Universiti Technologi Malaysia (UTM) and Technical University Ilmenau (TUIL), Germany has started an International Double Degree Programme in Biomedical Engineering. The International Double Degree Program enables students to be awarded with two certificates Details for each programme as below:

CURRICULUM MASTER OF ENGINEERING (BIOMEDICAL)-DOUBLE DEGREE

FULL TIME	DESCRIPTION	CREDIT
MMBE1100	Research	0
MMBE1200	Research	0
MMBE2100	Research	0
MMBE2200	Research	0
MMBE3100	Research	0
MMBE3200	Research	0

GENERAL ELECTIVE UNIVERSITY COURSE (COMPULSORY)			
CODE	**NEW CODE**	**COURSE**	KREDIT
UMBP0010	UMBP0010	Research Methodology	HW
UHxxxx3	UHxxxx3	General Elective University Course	3

Programme Features

- Doctorate Program - Doctor of Philosophy (PhD) degree in Biomedical Engineering from UTM and Doctor in Computer Science and Automation (Dr.-Ing) from Technical University Ilmenau, Germany (TUIL). The students are required to spend at least 9 months at the partner university.

- Master Program - Master in Biomedical Engineering (M.Eng) from UTM and/or Master in Biomedical Engineering (M.Sc) from Germany (TUIL). The students are required to spend at least seven months at the partner university.

For further information, please contact UTM-TUIL program co-ordinator Professor Dr. Ing. Eko Supriyanto (eko@utm.my/eko@biomedical.utm.my).

TUITION FEES (ACADEMIC YEAR 2013/2014)

The tuition fee for Master programmes and Doctor of Philosophy programmes for the academic year 2013/2014 are given in Table 1 and Table 2, respectively.

Table 1

PROGRAMME	MALAYSIAN		INTERNATIONAL
MASTER	FULL TIME (3 SEMESTERS)	PART TIME (4 SEMESTERS)	FULL TIME (3 SEMESTERS)
Taught course	RM 9,110.00	RM 8,030.00	RM 22,085.00
Taught course and Research (Mixed mode)	RM 9,110.00	RM 8,030.00	RM 22,085.00
Research	RM 8,010.00	RM 7,230.00	RM 18,735.00

Table 2

PROGRAMME	MALAYSIAN		INTERNATIONAL
DOCTOR OF PHILOSOPHY	FULL TIME (6 SEMESTERS)	PART TIME (8 SEMESTERS)	FULL TIME (6 SEMESTERS)
Research	RM 15,570.00	RM 14,010.00	RM 37,020.00

*** Amount per semester based on USD1 = RM 3.1 exchange rate. The rates are subject to change.**

For more details, please visit the School of Graduate Studies (SPS) website at www.sps.utm.my

HOW TO APPLY

The latest information on academic calendar, registration forms, application datelines and other related information can be obtained directly from the School of Graduate Studies's website **(www.sps.utm.my).**

Completed application should be sent to:

Dean
School of Graduate Studies
Universiti Teknologi Malaysia
81310 UTM Johor Bahru,
Johor, Malaysia
Website: *http://sps.utm.my/sps/admission/*
Tel. +607-5537783 / 5537831 / 5537814
Fax: +607-5537800

REGULATIONS
AND
ACADEMIC SYSTEM GUIDELINE

FACULTY OF BIOSCIENCES AND MEDICAL ENGINEERING (FBME)

REGULATIONS AND ACADEMIC SYSTEM GUIDELINES PROGRAMME REGISTRATION

Enrolment and Duration of Studies

- A student candidate may choose to enroll as a full-time or part-time student subject to the study program offered by the faculty.
- A student is required to complete his/her study within the duration prescribed as in Table I.

Table I: Duration of Studies

LEVEL OF STUDY	FULL TIME		PART TIME	
	MINIMUM (REGISTERED SEMESTER)	MAXIMUM (SEMESTER)	MINIMUM (REGISTERED SEMESTER)	MAXIMUM (SEMESTER)
Master Degree	2 (1 Year)	6 (3 Years)	4 (2 Years)	8 (4 Years)
*Doctoral Degree	6 (3 Years)	12 (6 Years)	8 (4 Years)	16 (8 Years)

*A doctoral degree student who has successfully published two papers in internationally refereed journals may submit his/her thesis after completing duration of 2 years (4 semesters) of full-time equivalent or 3 years (6 semesters) of part-time equivalent. Refer to (6), PhD by Publication for the minimum study duration.

In the case of a research student (Master or Doctoral) whose supervisor is transferred to UTM and/or if the student has obtained a written approval on the transfer of the research from the previous institution of higher learning, the minimum duration of the study will be determined by the Senate. The maximum duration as given in Table I do not include the duration taken by a candidate to fulfill the pre-requisite for entry requirements of the study programme.

A Research or Taught Course and Research student who has submitted the thesis or dissertation for examination will be given “Examination” status. A student should abide by the decisions made by the Panel of Examiners i.e. the Thesis Examiner and the Panel for Oral Examination. The maximum duration for “Examination” status is three (3) semesters or eighteen (18) months. If a student fails to resubmit the corrected version of the thesis or dissertation within this duration, the student will be considered as “Fail”.

Change of Program of Study, Type of Registration, and Mode of Study

A student who intends to change to another academic program must apply to the School of Graduate Studies with the consent of the faculty to which the application is made subject to approval by the University. The change can only be made after the FIRST (1) semester of study

and only once during the duration of study. Student's academic status must not be KG. The change is subjected to approval by the University.

A student may apply for conversion of his/her mode of registration from Full-Time to Part-Time or vice-versa. The change must take place before the last TWO (2) semesters of study and can be made only once during the duration of study. Conversion of more than once will only be considered in reasonable circumstances with the consent of the faculty. If the application for conversion from Full-Time to Part-Time or vice-versa is approved, the remainder duration of study will be determined by the University.

A student can apply to convert to another mode of study from taught course to taught course and research or full research or vice-versa. The change must take place before the last ONE (1) semester of study and can be made only once during the duration of study. Conversion of more than once will only be considered in reasonable circumstances with the consent of the faculty.

Registration of Courses

A student must register his/her courses every semester within the specified dates determined by the University. Those who fail to register without acceptable reasons will be terminated.

As part of the graduation requirements, international students are required to take either
a) Malay Language, or
b) Malaysian Culture

Exemption may be given to those who have already fulfilled such requirement prior to registration of their respective programmes of study. Late registration fee will be imposed upon registration of courses after the closing date of the course registration.

Withdrawal (TD) of a Course

A student may withdraw (TD) any course registered in the current semester within the prescribed duration subject to the minimum credits. A student who withdraws (TD) all of the courses will be given a deferment of the study.

Attendance

A student is required to attend all classes scheduled for the course including those courses with the status of HW and HS. A student whose attendance is less than 80% will be barred from the final examination. The registration for HS course will be removed if the attendance is less than 80%.

Credit Exemption and Transfer

A student may apply for Credit Exemption in the first semester of his/her study by submitting relevant documents. Only courses equivalent to those at UTM with minimum equivalent grade of

B will be considered for Credit Exemption. Credit Exemption will only be included in the Credit Obtained.
A student may apply for Credit Transfer by submitting relevant documents during the period of study. Only courses equivalent to those at UTM with a minimum grade of B- will be considered for Credit Transfer. Credit Transfer obtained will be included in the Credit Count and Credit Obtained.

The maximum total Credit Exemption and/or Credit Transfer is 50% of the total maximum credits for the taught course components of the study program. The duration of study for a student who is given Credit Exemption and/or Credit Transfer will be determined by the University.

Thesis/Dissertation/Master Project Report

Thesis/dissertation/master project report must follow the guidelines prescribed in the UTM Thesis Manual. A thesis or dissertation submitted for examination must be approved by the supervisor. A master student is required to submit his/her thesis/dissertation/master project report to the faculty for evaluation according to the specified requirements.

For master by research and doctoral programmes:

a) A student should submit Notice For Submission of Thesis approved by the supervisor at least three (3) months prior to submission of the thesis for examination, or three (3) months before expiry of the maximum study duration.

b) A student should submit his/her thesis/dissertation for examination within or before the end of the maximum duration of study. Only a registered student is allowed to submit his/her thesis/dissertation.

c) The final date for submission of thesis/dissertation for examination is the last working day of the examination week of the semester.

d) After the oral examination and fulfilment of all specified requirements, a doctoral or a master student by research/taught course and research is required to submit bound and digital copies of thesis/dissertation according to the specified number and submission date determined by the University.

e) Taking into consideration the evaluation of the thesis and the recommendation of the Panel for Oral Examination, the examination results of a thesis/dissertation will be verified by JKTS for endorsement by the Senate.

University will not accept a thesis/dissertation that has been submitted for the purpose of examination either to UTM or any other institutions of higher learning.

A doctoral thesis/dissertation should not exceed 300 pages excluding appendices. Master thesis/dissertation or the Master project report should not exceed 200 pages excluding appendices.

A thesis/dissertation or Master project report may either be written in Bahasa Melayu or English. All thesis/dissertations/master project reports are the property of the University.

Student Advice and Supervision

Supervisor, Main Supervisor and Co-supervisor, Panel of Supervisors and Program Coordinator

A research student will be supervised by supervisor(s) appointed by the faculty. External supervisor will be appointed by SPS upon recommendation by the faculty.

During the taught course component, Taught Course/Taught Course and Research students will be guided by the Head of Department (Postgraduate Studies)/ Program Coordinator. The university has the right to appoint or change student's supervisor(s).

A student may request for a change of supervisor(s) by providing acceptable reasons to the faculty.

The Main Supervisor should play a greater role in supervision than the Co-supervisor, who is appointed to assist the Main Supervisor.

A student is required to submit a Progress Report within the stipulated period to the faculty every normal semester. A student who fails to submit his/her progress report may be given TM or GG result.

Status of the Supervisor, Main Supervisor, Chairman of the Panel of Supervisors and the Program Coordinator.

The Supervisor, the Main Supervisor, Chairman of the Panel of Supervisors and the Program Coordinator must be a Graduate Faculty who is a full-time staff of the University. A Graduate Faculty who is seconded to another university/institution or retired or a qualified individual from other institutions may only be appointed as a co-supervisor or a member of the panel of supervisors. If a supervisor is a contract lecturer, a co-supervisor must be appointed.

Assessments

Assessments may consist of the following:

- Course examination;
- Evaluation of thesis/dissertation/master project report;
- Oral examination (viva voce);
- Comprehensive examination;

- Portfolio assessment;
- Qualifying examination;
- Special examination;
- Other modes of evaluation.

Final examination may be used as part of assessments for taught course and taught course and research programs.

Assessments for a master and doctoral student by taught course and research shall consist of the following:

- Course assessment;
- Evaluation of research proposal;
- Evaluation of dissertation;
- Oral defense of dissertation.

Assessments for a master and doctoral student by research shall include:

- Evaluation of Research Proposal;
  A student is required to present a research proposal for evaluation purposes within the duration specified by the University, failing which the student may be given a TM status.
- Semesterly evaluation by the supervisor;
- Thesis examination by the Internal and External Examiners;
- Oral defense of thesis to a Panel of Examiners;
- Course evaluation.

Special examination

Special examination can be considered in the following cases:

a) A Student who is unable to sit for the final examination due to illness certified by a medical officer of the university or the government hospital; **or**
b) Student in the final semester and who failed the subject; **or**
c) Any other reasons accepted by University

Special examination cannot be considered in the following cases:

a) Course with NO final examination; **or**
b) A Student who does not sit for the final examination without any acceptable reason by the University; **or**
c) A Student who is prohibited from sitting for the final examination; **or**
d) Oral defense of thesis by a student cannot be held more than twice; **or**
e) Thesis/Dissertation examination for Doctoral and Master degree programs should be made according to the criteria set for the program as approved by the Senate.

Conversion of registration status from Master to Doctor of Philosophy

A master student by research is allowed to apply for conversion to a doctoral program upon achieving excellent research work and recommended by the evaluation panel. Application must be made during the second semester.

Thesis/Dissertation Examiner and Panel of Examiner

Examiners and member of the Panel for Oral Examination for doctoral thesis/dissertation are appointed by the University. Examiners and member of the oral examination panel for master thesis/dissertation are appointed by the faculty.

Master Program by Research:

The Thesis Examiner should consist of at least one Internal and one External Examiner. Panel for Oral Examination should consist of an Internal Examiner and a Chairman. Based on the reports by the examiners, the chairman of the Faculty Postgraduate Studies Committee may determine whether the External Examiner should be present at the oral examination.

Doctor of Philosophy Program:

The Examiners for Ph.D. Thesis/ Dissertation must consist of at least one Internal and one External Examiner;

The Oral Examination Panel consists of a Chairman, Internal Examiner(s), and External Examiner(s). Under certain circumstances, the Dean of School of Graduate Studies can decide whether the Oral Examination is to proceed without the presence of the External Examiner.

Other Doctoral Programmes

The Dissertation Examination Panel consists of Internal and External Examiners. External Examiner(s) must constitute one from the academia and the other if needed may be appointed from industry.

The Oral Examination Panel consists of a Chairman, Internal Examiner(s) and External Examiner(s). Under certain circumstances, the Dean of School of Graduate Studies may decide whether the Oral Examination is to proceed without the presence of the External Examiner.

Thesis/Dissertation Examiners are required to submit to the School of Graduate Studies/faculty the examination reports within the stipulated duration.

Oral examination panel shall consist of a Chairman and at least one examiner. Supervisor is required to attend the oral examination session.

The result of the examination by the Examiners and Panel of Oral Examination must be presented and endorsed by University Senate Standing Committee for Postgraduate Studies before the Senate Meeting.

Grading System

The relationship between marks, grade, points, and achievement levels of a course is as follow:

Table II: The relationship between the Marks, Grade, Points, and Achievement Level

Marks	Grade	Points	Level of Achievement
90 – 100	A+	4.00	Excellent Pass
80 – 89	A	4.00	
75 – 79	A-	3.67	
70 – 74	B+	3.33	Good Pass
65 – 69	B	3.00	
60 – 64	B-	2.67	Pass
55 – 59	C+	2.33	
50 – 54	C	2.00	Fail
45 – 49	C-	1.67	
40 – 44	D+	1.33	
35 – 39	D	1.00	
30 – 34	D-	0.67	
00 – 29	E	0.00	

Other grades are also used as follows:-

i. Pass/Fail for courses with the status of HW.
ii. For a course with HS status, the course registration record will appear in the student's transcript if the student's attendance is more than 80%.
iii. Withdrawal (TD) of a registered course.
iv. Satisfactory (MM)/ Unsatisfactory(TM)/Fail (GG) grade for a research course.

Incomplete Course Status (TS)

The TS status is given to an incomplete course in the final assessment based on reasons acceptable to the University. A student who obtained the TS status for any course is required to sit for a Special Assessment within a prescribed duration.

Academic Standing

The student's academic standing is determined according to the type of study:

i. Taught Course - determined by CGPA;
ii. Taught Course and Research - determined by CGPA and research grade;
iii. Research – determined by research grade.

The academic standing for each semester including short semester for Taught Course programs is determined by GPA as indicated in Table III.

Table III: The Academic Standing for Postgraduate Studies

Academic Standing	Taught Course	Research Grade	Condition to Proceed with the Study	Award of the Degree
Good Pass	CGPA $\geq$ 3.00	Satisfactory (MM)	Qualified	Qualified
Conditional Pass	2.67 $\leq$ CGPA < 3.00	Unsatisfactory (TM)	Qualified	Not Qualified
Fail (KG)	CGPA < 2.67	Fail (GG)	Terminated	Not Qualified

A student in Research or Taught Course and Research program who obtained Conditional Pass (KS) for two (2) consecutive semesters will be terminated.

A Taught Course student who obtained KS status must achieve KB status before the end of maximum duration of study to qualify for the degree award.

With the approval of the faculty, a taught course student is allowed to repeat the course with the grade B- and below to improve the grade. The course repeated must be registered with UG status. The better grade is considered for the computation GPA and CGPA.

A student must redeem the failed core or compulsory course for graduation. The course must be registered with a status of UM. The course grade will only change if the student passes with a better grade. The better grade is considered for the computation GPA and CGPA.

A student may redeem any failed elective course with another elective course. The new elective course must be registered with a status of UM. The better grade is considered for the computation GPA and CGPA.

A student can only re-register if his/her academic status is KG in the first (1) semester. A student is allowed re-register (KGDS) only once in the same program throughout his/her study.

Total Credits for Graduation

A student must pass all the courses specified in the program. The minimum credits required for graduation at postgraduate degree/diploma/certificate are shown in the Table IV.

Table IV: The Minimum Credits for Graduation in Postgraduate Studies

Awards	*Minimum Credits for Graduation
Master Program	40
Master research/Doctoral Program	0

Notes:
For taught course and research and fully research, minimum credit for graduations will depends on the total of student's credit hours.

Conferment of a Postgraduate Degree/Diploma/Certificate

A student is only qualified to be awarded a postgraduate degree/diploma/certificate after fulfilling the following conditions:

a) Obtained the total Credits for Graduation as determined by the curriculum of the program with academic standing of Good Pass (KB);
b) Pass all the courses required by the program and pass thesis/dissertation (if required);
c) Submit an application for conferment of a degree;
d) Paid all fees;
e) Fulfilled other requirements as specified;
f) A taught course, or taught course and research student who withdraws from the program may apply for a lower award if he/she has fulfilled the minimum credits as in Table IV;
g) The University may award a lower degree to a student who fails to fulfill the requirements of the intended degree if the minimum requirements for the lower degree have been fulfilled.

A doctoral degree student who fails to be awarded the intended degree may be awarded a Master degree. A Master degree student who fails to be awarded the intended degree may be awarded a Postgraduate Diploma. A Postgraduate Diploma student who fails may be awarded a Postgraduate Certificate.

Deferment, Suspension and Termination

A student may apply for deferment of study due to health reasons by submitting a medical report certified by a Medical Officer recognised by the University. In such a case the deferment will not be taken into account in the duration of study. A similar status of deferment may be granted to a student due to reasons of interest to the University or the Nation.

A student may apply for deferment of study due to other reasons. Such deferment will be taken into account in the duration of study. Deferment of more than two (2) consecutive semesters is not allowed. A student who fails to register after deferment of two (2) consecutive semesters may be terminated. A student who has been granted a deferment will not be qualified to use any facilities provided by the University

A student who violates the University rules and regulations may be terminated or suspended from the study for a certain period of time. In this case, the suspended period is taken into account in the study duration unless decided otherwise by the University.

APPENDICES

FACULTY OF BIOSCIENCES AND MEDICAL ENGINEERING (FBME)

APPENDIX A: SYNOPSIS OF COURSES
MASTER OF SCIENCE (BIOTECHNOLOGY)

MMBT 1713: Bioinformatics

Objectives

1. Explain the biological aspects in bioinformatics
2. Identify attributes within biology data that is applicable to bioinformatics
3. Use computational methods to analyse biological problems
4. Demonstrate the use of bioinformatics software to solve biological problems
5. Analyze biological problems using computational methods

Synopsis

This is a practical "hands-on" course in Bioinformatics that will emphasize on how to use computers and the web as tools to analyze and represent large collections of biological sequence and structure data. Prerequisites include a basic understanding of protein and nucleic acid structure, and some mathematics and statistics, but no prior knowledge of computer programming or computer hardware is necessary. This course presents the principles and methodology for Bioinformatics. It focuses on the application of computational methods to study biological problems. It will introduce the principles, scope, application and limitations of bioinformatics. This course is designed to introduce bioinformatics at a level appropriate for biology undergraduates having completed an undergraduate core, and for chemistry, computer science, and math undergraduates with an interest in biology. This course is designed so that the content and curricula can rapidly adjust as required to meet changing circumstances during the course of the semester and to evolve with the topics of interest in bioinformatics over time. Students will learn to use conventional software, web-based applications, and software which they download to their machine. By using the well-tested and successful approach of problem-based learning, students will learn through applying the strategies and tools used in bioinformatics to topical problems drawn from ongoing research and applications in a variety of fields. There is to be an integration of the basics of computation and analysis along with chemistry and biology throughout the course.

References

1. *Fundamental Concepts of Bioinformatics* Dan, E. K. & Michael, L. R. (2002*).* Pearson Ed
2. *Bioinformatics Computing* Bergeron, B. (2002). Prentice Hall PTR; 1st ed.
3. *Introduction to Bioinformatics* Attwood,T. ,Smith,D.P. (2001). Prentice Hall
4. *Bioinformatics: Sequence and Genome Analysis,* Mount, D. W. (2001). Cold Spring Harbor Laboratory Press.
5. *Bioinformatics for Dummies.* Jean, M.C. Cedric, N. (2003)
6. *Understanding Bioinformatics by Marketa Zvelebil and Jeremy Baum*
7. *Beginning Perl for Bioinformatics by James Tisdall Genomics, Proteomics, & Bioinformatics by Campbell and Heyer Developing Bioinformatics Computer Skills by Gibas and Jambeck*

MMBT 1173: Biochemistry and Microbial Physiology

Objectives

1. Compare the internal and external structures of prokaryotes and eukaryotes
2. Illustrate DNA replication, DNA repair mechanisms and physiology of plasmids in microorganisms.
3. Compare the chemical structure of carbohydrate, lipid and protein; contrast functional activity of these molecules
4. Elaborate metabolic pathways based on the problem or case-study given in class
5. Conduct relevant laboratory techniques in microbiology and biochemistry

Synopsis

This course is designed to apply knowledge in basic cellular organization of microorganisms, growth and central metabolic processes to their existence in diverse environment. Knowledge on the genetics, growth and metabolism of microorganisms will be integrated to explain cellular growth and metabolism under normal living conditions to various stressful environments. Hands-on experience in laboratory on several aspects of microbial functions will be provided.

References

1. White, D. (1999), *Physiology and Biochemistry of Prokaryotes*, Oxford University Press(2nd ed.)
2. Brock, Madigan, Martinko and Parker (1997), *Biology of Microorganisms*, Prentice Hall (8th ed.)
3. Berg, J.M., Stryer, L., Tymoczko, J.L. (2002), *Biochemistry,* Freeman and Co (5th ed.)
4. Lehninger, A.L., David, L.N., Cox, M.M. (1999), *Principles of Biochemistry*, W.H. Freeman & Co.

MMBT 1153: Molecular Mechanisms in Gene Expression and Regulation

Objectives

1. Describe the definition, structure and function of gene in molecular perspective
2. Compare the work of several operons in gene regulation
3. Differentiate between gene expression and regulation in both prokaryotes and/or eukaryotes
4. Demonstrate the importance of having gene expression and regulation by giving specific examples in a wider context
5. Analyze the importance of having gene expression and regulation by giving specific examples in a wider context
6. Analyze and evaluate existing knowledge in gene expression and regulation, in the form of research articles and scientific findings
7. Express the understanding in gene expression and regulation in both prokaryotes and eukaryotes

Synopsis

This course is designed to expose the master students in understanding the molecular mechanisms in the expression and regulation of gene in both prokaryotes and eukaryotes. A brief introduction will be included and the overview of the molecular genetics will be looked into. The expression and regulation of proteins is the major theme of the lecture. Regulation and the control of gene expression will be discussed by

using several selected operons as model. A general discussion on the biochemical adaptation and gene expression will be given using extreme environmental conditions. Gene expression in recombinant microorganisms will also be discussed.

References

1. Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M and Losick, R (2004). *Molecular Biology of the Gene 5th edition*. Benjamin Cummings, USA
2. Storey, K.B., (2004). *Functional Metabolism: Regulation and Adaptation*. John Wiley& Sons Inc., USA
3. Reece, R.J.,(2004). *Analysis of Genes and Genomes*. John Wiley & Sons Inc, England
4. David V. Goeddel (1990). *Gene Expression Technology in Methods in Enzymology* San Diego. Academic Pr
5. Lewin, B. (1997-2007) GENE VI-IX. Oxford Univ. Press
6. Any related journals

MMBT 1683: Protein Engineering

Objectives

1. Describe the properties of a protein based on the aspects of structures, folding, domains, active site or binding sites.
2. State the name and function of bioinformatics tools related to protein structures and functions.
3. Construct a protein 3D structure model using homology modeling or *de novo* approach.
4. Differentiate protein engineering techniques such as chemical and/or gene modifications.
5. List the methods to perform directed evolution mutagenesis study.
6. Design suitable primers for megaprimer and overlapping extention PCR manually with the help of basic softwares.
7. Display the finding of miniproject with the help of technology.

Synopsis

This course presents an introduction to protein structure and function which is the basis for design of modified proteins for practical use in medicine or biotechnology as well as fundamental studies. The developing discipline of protein engineering and in particular enzyme engineering has concerns ranging from prediction of protein conformation from primary structure to cost-effective recovery and purification of recombinant proteins. Several successfully case studies on protein engineering will also be discussed. Finally students are required to carry out a guided mini project where they will be introduced to protein *in silico* homology modeling and mutagenesis.

References

1. *Proteins Structure and Function*. David Whitford, 2005 Wiley
2. *Techniques in Protein modification*. Roger L. Lundblad. 1995 CRC Press
3. *PCR Technology Current Innovations*. Hugh G. Griffin and Annette M. Griffin. 1994 CRC Press
4. *Protein Purification, Principle, High Resolution Methods, and Applications*. Jan-Christer Janson. 1998 Wiley.
5. Current journals in *Analytical Biochemistry, Protein Engineering Design and Selection (PEDS), Journal of Molecular Catalysis B: Enzymatic*, etc.

MMBT 1233: Industrial Technology and Bioreactor Design

Objectives

1. Compare method used during gene transfer in animal and plant tissue
2. Elaborate the application of animal and plant tissues at industry
3. Analyze the data obtained from the biomaterial properties in miniproject report
4. Analyze kinetic parameters of different fermentation process for industrial application
5. Choose suitable bioreactor for the growth of organism and product formation at industrial level
6. Differentiate the advanced downstream process in industry
7. Describe current good manufacturing practice in industry
8. Display suitable kinetic evaluation microbial fermentation based on the instruction given during lecture.
9. Present information on plant transformation and its application in biotechnology

Synopsis

The course will emphasize on industrial technology and bioreactor design for microbial, plant and animal cell cultures. The gene transfer method into animal and plant tissue culture will be discussed. The physiology of microbial growth and product formation in batch, continuous and fed-batch culture will be explained in detail. The students will have knowledge on bioreactor design for microbial, immobilized cell, plant and animal cell tissue engineering and waste water treatment. Subsequently, student will be exposed to the industrial processes flow sheet and emphasis on advance downstream unit operation such as membrane separation and chromatography. Lastly, current Good Manufacturing Practice (cGMP) will be described. This course offers a combination of theoretical (lecture) and practical work.

References

1. Standbury P.F., Whitaker A. and Hall S.J (1999). Principle *of Fermentation Technology*. 3rd Ed. Pergamon Press.
2. Shuler M.L. and Kargi F. (2002). *Bioprocess Engineering*. Basic concept. Prentice Hall.
3. Halford N. (2006). *Plant Biotechnology: Current and future applications of genetically modified crops*. Chichester, UK: John Wiley & Sons, Ltd.
4. Liang G.H. and Skinner D.Z. (2004). *Genetically Modified Crops: Their development, uses, and risks*. New York: The Haworth Press.
5. Freshney R.I. (2000). *Culture of Animal Cells: A manual of basic technique*,5th ed. New Jersey: John-Wiley & Sons, Inc.
6. Lasic D.D. and Templeton N.S. (2000). *Gene Therapy: Therapeutic Mechanisms and Strategies* Marcel Dekker.
7. El-Mansi E.M.T, Bryce C.F.A, Demain A.L and Allman A.R. (2007). *Fermentation Microbiology and Biotechnology*. CRC, UK.
8. McNei B. and Harvey L.M. (2008). *Practical Fermentation Technology*. Wiley
9. Palson B, Bhatia S. (2004). *Tissue Engineering* Pearson Prentice-Hall

MMBT 1563: Environmental Bioengineering

Objectives

1. Acquire in-depth knowledge related to microbial application for environmental sustainability
2. Apply knowledge in developing solution to waste management and waste-utilization related issues
3. Analyze and evaluate data obtained from laboratory experiment in order to conclude the findings
4. Think critically, logically, creatively and analytically in defining current environmental problem that requires alternative remedy, analyzing selected environmental problem in searching room for improvement and generating innovative and logical idea as alternative approach to remedy the problem

Synopsis

In this course, conventional and recent advances the technology for waste treatment, biodegradation and waste utilization will be discussed. Since pollution is a direct or indirect consequence of waste production, the demand for 'zero discharge' can be interpreted as an unrealistic demand for 'zero waste'. As wastes continues to exist, attempts to abate the subsequent pollution by converting them to less noxious forms are more important. Application of bioengineering will be instilled in biotransformation process of wastes to commodity products or other value-added compounds evaluated based on selected case studies obtained from publications. Bioremediation technologies will be reviewed based on their applicability, performance and limitations. The role of microbes and microbial enzymes used in the processing unit will be described and distinguished. The use of microbiological and molecular techniques in monitoring microbial population and evolution will also be reviewed.

References

1. Atlas, R. M. & Philp, J. Bioremediation Applied Microbial solutions for Real-world Environmental Cleanup. 2005 ASM Press, USA
2. Sikdar, S. K. & Irvine, R. L. Bioremediation: Principles and Practice. Bioremediation Technologies Volume III. 1998 Technomic Publishing Inc., USA
3. Walley, J. J. W. Bioremediation of Recalcitrant Compunds. 2006 CRC Press, USA
4. Relevant journal articles

MMBT 2180: Dissertation

Objectives

1. Prepare a well-planned research proposal to execute independent research
2. Solve research problems and present research results logically, creatively, innovatively and analytically based on scientific facts and research experience
3. Work responsibly with specialized laboratory equipment with appropriate technical, transferable and interpersonal skills.
4. Increase and disseminate research and development in specialized areas of biotechnology
5. Communicate effectively across a range of context and audiences

Synopsis

This research project allows students to be involved in research under the supervision of knowledgeable and widely experienced lecturers in specialized fields such as Molecular Biology and Genetic Engineering, Enzyme Technology, Environmental Biotechnology, Plant Molecular Biology and Tissue Culture. Students must prepare a written research proposal approved by the panel of examiners before executing the research. This enriching research experience will enable students to utilize library facilities for updating literature search, to plan and conduct research independently. Research data are collected and analysed before finalizing the research dissertation. Students must complete a written dissertation on the research project to be evaluated by examiners via *viva-voce*.

APPENDIX B: PROGRAMME SPECIFICATION

MASTER OF SCIENCE (BIOTECHNOLOGY)

1. Awarding Institution	**UTM**
2. Teaching Institution	**UTM**
3. Programme Name	**MSc (Biotechnology)**
4. Final Award	**MSc (Biotechnology)**
5. Programme Code	**MMBT**
6. Professional or Statutory Body of Accreditation	-
7. Language(s) of Instruction	**English**
8. Mode of Study (Conventional, distance learning, etc)	Conventional
9. Mode of operation (Franchise, self-govern, etc)	Self-govern
10. Study Scheme (Full Time/Part Time)	**Full Time**
11. Study Duration	Full-time: Minimum: 1½ years : Maximum: 3 years Part-time: Minimum: 2 years : Maximum: 5 years

Type of Semester	**No. of Semesters**		**No. of weeks**	
	Full Time	**Part Time**	**Full Time**	**Part Time**
Long	3	-	14x3= 42	-
Short	-	-	-	-

12. Entry Requirement	i) Bachelor of Science (Biology, Biochemistry, Biotechnology, Microbiology, Bioscience, Chemistry, Chemical Engineering, Bioprocess Engineering, Environmental Engineering, Genetics or equivalent) with CPA ≥ 3.0 will be considered for this programme. ii) Bachelor of Science with CPA < 3.0 and one year working experience in areas related to Biotechnology.

13. Programme Educational Objectives (PEO)

i. Graduates who are able to contribute to the advancement of science and technology
ii. Graduates who are able to think critically, analytically and innovatively in solving problems.
iii. Graduates who practice good management, leadership and governance.
iv. Graduates who are able to communicate across a broad spectrum of issues effectively.

14. Programme Learning Outcomes (PO)

Intended Learning Outcomes		Teaching and Learning Methods	Assessment
(a) Technical Knowledge and Competencies			
PO1	Possess in-depth knowledge and skills in specific discipline with global perspective.	Lectures, seminars, laboratory works, directed reading, independent study	Examinations, laboratory reports, quizzes, written assignments, oral presentations
PO2	Ability to apply knowledge through intellectual inquiry and to develop critical solutions in new situations.	Lectures, laboratory works, computer hands on session	Examinations, laboratory reports, oral presentations, written assignments, tests, quizzes
PO3	Ability to analyse, and evaluate existing knowledge in order to synthesise scientific findings	Laboratory work, supervised project.	Dissertation, oral presentations, written assignments
Intended Learning Outcomes		**Teaching and Learning Methods**	**Assessment**
(b) Generic Skills			
PO4	Ability to disseminate ideas to the wider community in a confident, effective and coherent manner.	Group assignments, research project supervision, laboratory works	Oral presentations, written assignments, laboratory reports,
PO5	Ability to describe and critically evaluate current aspects of biosciences in order to solve related problems.	Research project supervision, group assignments, laboratory work, lecture	Oral presentations, written assignments, research project presentation, laboratory reports, examinations, computer based exercises
PO6	Ability to create and sustain cooperative networking efficiently	Group assignments, laboratory works	Oral presentations, laboratory reports, peer assessment
PO7	Ability to perform tasks given ethically and with dedication	Lectures, assignments, laboratory works	Examinations, written assignments, laboratory reports
PO8	Possess strong enthusiasm and commitment to continuously acquire and disseminate new knowledge and skills.	Research project supervision, laboratory works	Dissertation, laboratory reports
PO9	Ability to acquire new knowledge and skills from a variety of sources and apply them to solve related problem	Research project supervision, Assignment, laboratory works,	Dissertation, Assignment, laboratory works,

15. Classification of Courses

No.	Classification	Credit Hours	Percentage
i	University a. General b. Language c. Co-curriculum	3	7%
ii.	Faculty Core	-	-
iii.	Programme Core	39	93%
iv.	Programme Electives	-	-
v.	Free Electives	-	-
	Total	**42**	**100%**

For engineering programme please fill up the following classification. (Others please refer to the Statutory Body guidelines)

A		Not Related	
	Total credit hours for Part A		
B		Not Related	
	Total credit hours for Part B		
	Total Credit Hours for Part A and B		

16. Total credit hours to graduate : 42 credit hours

17. Programme structures and features, curriculum and award requirements

1. The programme is offered as full-time and part-time. For full time programme, MSc (Biotechnology) can be completed within three semesters (1½ years). Students are required to register for all six core courses (18 credit hours).
2. Project dissertation has a total credit of 21 hours. Course assessment will be conducted via direct (examination, tests, quizzes) and indirect (peer assessment) methods. Generic skills will be adapted during teaching and learning process
3. Students must complete a total of 42 credit hours with minimum CPA of 3.0.
   Complete the project and submit the dissertation.
4. The courses are categorised as university elective, programme core and programme electives as shown on the following page.

Course Category	Code	Course	Credit
University Elective (1 course)	**UHX XXX3**	(To choose from the list given by School of Graduate Studies)	3
Programme Core (39 credit)	**MMBT 1713** **MMBT 1173** **MMBT 1153** **MMBT 1683** **MMBT 1233** **MMBT 1563** **MMBT 2180**	Bioinformatics Biochemistry and Microbial Physiology Molecular Mechanisms in Gene Expression and Regulation Protein Engineering Industrial Technology and Bioreactor Design Environmental Bioengineering Dissertation	3 3 3 3 3 3 21
TOTAL CREDIT			**42**

18. Mapping of Programme Learning Outcomes (PLO) to Courses

		LEARNING OUTCOMES								
		Knowledge and Competencies in Biotechnology			Generic Skills					
Code	**Course Name**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
PROGRAMME CORE COURSES										
MMBT 1713	Bioinformatics	a	a	a	1	-	-	-	-	-
MMBT 1173	Biochemistry and Microbial Physiology	a	a	a	2	1	-	-	-	-
MMBT 1153	Molecular Mechanisms in Expression and Regulation	a	b	b	1	-	-	2	-	-
MMBT 1233	Industrial Technology & Bioreactor Design	a	a	a	1	1	-	-	-	-
MMBT 1673	Protein Engineering	a	b	b	1	1	-	2	-	-
MMBT 1563	Environmental Bioengineering	a	a	a	2	1	2	-	-	-
MMBT 2180	Dissertation	a	a	a	1	1	-	1	1	1

UNIVERSITY ELECTIVE COURSE									
UHXXX3	University Elective								

Key Technical Skills:
a = major contribution to outcome; **b** = moderate contribution to outcome; **c** = minor contribution to outcome
Generic Skills:
1 = Substantial (with assessment); **2** = not substantial (introduce)

19. Support for students and their learning

Students and their learning are supported by:

- Briefing of all new post-graduate students during registration week.
- Student Prospectus Book for every academic session.
- Information services provided by the Graduate School (SPS) and through the university's web site.
- Student Support provided by counselors and psychologists at 'Unit Perkhidmatan Sokongan Pelajar' (UPSP), UTM Medical Centre, accommodation officers and University Library and others.
- Student Advisors Programme: Selected academic staff provides advice on academic progress and monitoring students' performance and achievements.
- Special programmes on career development conducted by the university to ensure students acquire necessary skills during their academic and future career.

20. Career Prospects

Graduate of the programme can work as:

- research scientist/officer
- science officer
- academician (teacher, tutor, lecturer)
- biotechnologist
- microbiologist
- quality control/assurance officer
- product specialist
- sales executive for biotech product
- environmental safety officer

OR
They can further their education by doing a PhD programme in the related field of study.

21. Regulation of Assessment

Assessment rules and degree classification applies for every course with the minimum passing mark of 60%. To qualify for the degree award, students should complete all of the programme's requirements; achieve passing mark for every courses examination. Dissertation will be examined by a panel of internal examiners appointed by the Department's Post-graduate Committee; their roles include evaluating candidates' *viva-voce* and written project dissertation.

For further information on academic regulations please refer to the graduate school website:
http://www.sps.utm.my/

23. Facilities available

List of laboratories:

- Animal Tissue Culture Laboratory
- Biodiagnostic Laboratory
- Bionanotechnology Laboratory
- Bioprocess Laboratory
- Biosensor Laboratory
- Computational Pharmacy and Molecular Modeling Laboratory
- Environmental Bioengineering Laboratory
- Enzyme Research Laboratory
- Genomics and Proteomics Laboratory
- Mesoporous and Nanoporous Material Laboratory
- Microbiology Research Laboratory
- Pharmacogenetics Laboratory
- Plant Molecular Biology and Tissue Culture Laboratory
- Postgraduate Research Laboratories
- Specific Research Laboratory
- Structural Biology Laboratory
- Tissue Engineering Laboratory
- Virology Laboratory
- Spectrometry and Chromatograpy Room that house analytical equipments such as High Performance Liquid Chromatography (HPLC), luminometer, top range UV-visible spectrophotometers, Gas Chromatography (GC), Total Organic Carbon (TOC) analyzer and Microscopy Room that houses CCTV- phase contrast and stereo microscopes, simple light and stereo microscopes.

APPENDIX C: SYNOPSIS OF COURSES

MASTER OF SCIENCE (BIOMEDICAL ENGINEERING)

MMBC 1003: Biomedical Measurement Technique

Objectives

1. Identify and explain the basic and advances concept of biomedical instrumentation and measurement
2. Analyze physiological properties and design suitable instrumentation for specific purpose to solve biomedical engineering problems.

Synopsis

This course provides the students a complete exposure of various recording mechanism and biomedical parameters measured for diagnostic application. Also introduces students to design biomedical measurement systems and biomedical instrumentation. The architecture of electronic instruments used to measure physiological parameters is addressed, as well as the analysis of major process functions integrated in these instruments.

References

1. *Leslie Cromwell (1997). Biomedical Instrumentation and measurement. Prentice Hall, India, New Delhi.*
2. *John G. Webster (1998). Medical Instrumentation, Application and Design (3rd Ed). John Wiley.*
3. *Khandpur R.S (1997). Handbook of Biomedical Instrumentation Tata McGraw-Hill, New Delhi.*
4. *Joseph J.Carr and John M. Brown (1997). Introduction to Biomedical Equipment Technology. John Wiley and sons, NewYork.*
5. *Geoddes and L.E. Baker (1975).Principles of Applied Biomedical Instrumentation. John Wiley, L.A.*
6. *R.S. Khandpur (2003). Hand-book of Biomedical Instrumentation, TMH, 2nd Ed.*
7. *Mackay, Stuart R (1968). Biomedical Telemetry. John Wiley*

MMBC 1013: Diagnostic and Therapeutic

Objectives

1. Explain knowledge in advanced diagnostic and therapeutic technology in the clinical and hospital environment
2. Analyze and categorize scientific and technical knowledge for research in advanced diagnostic and therapeutic technology.

Synopsis

This course is designed to introduce students on how the bio-signal is measured, recorded and monitored and details on the broad collection of diagnostic and therapeutic equipments. At the end of the course, student will be able to learn various techniques that have been used in healthcare environment, clinical or research.

References

1. *Alan K. David, Scott A. Fields, D. Melessa Phillips, Joseph EScherger and Robert B. Taylor (2008). Taylor's Diagnostic and Therapeutic Challenges: A Handbook. Springer.*
2. *Dyro, J. F. (2004). Clinical Engineering Handbook. Elsevier.*

3. *Geddes, L. A., Baker, L. E. (1989). Principles of Applied Biomedical Instrumentation. Wiley Interscience.*
4. *Khandpur (2003). Handbook of Biomedical Instrumentation.McGraw Hill.*
5. *Stephen McPhee, Maxine Papadakis and Michael W. Rabow (2011). Current Medical Diagnosis and Treatment. McGraw Hil*
6. *Related journal papers*

MMBC 1023 : Advanced Biomedical Engineering

Objectives

1. Explain advanced technology and knowledge used in medical devices to diagnose and treat patients by applying the electronics, signal processing, biomechanics medical and therapy knowledges.
2. Design device used in diagnosis and clinical treatment by combining biological and medical science

Synopsis

This course provides the students with the organization of medical information, the effective management of information using advanced technology, and the impact of such technology on clinical research, rehabilitation engineering, and patient care. The course explores techniques for assessing current information practices, determining the information needs of health care providers and patients, developing interventions using biomedical technology, and evaluating the impact of those interventions.

References

1. Joesph D. Bronzino (2000). The Biomedical Engineering *Handbook. CRC Press LLC.*
2. Dyro, J. F. (2004). Clinical Engineering Handbook.
3. *Geddes, L. A. and Baker, L.E. (1989). Principles of AppliedJ. F. (2004). Biomedical Instrumentation. Wiley Interscience.*
4. Khandpur (2003). Handbook of Biomedical Instrumentation. McGraw Hill

MMBC 1033: Medical Informatics

Objectives

1. Apply medical informatics knowledge to improve the quality of health care, reduce cost, provide better education for providers and patients.

Synopsis

This course provides students with the organization of medical information, the effective management of information using computer technology, and the impact of such technology on medical research, education, and patient care. The course explores techniques for assessing current information practices, determining the information needs of health care providers and patients, developing interventions using computer technology, and evaluating the impact of those interventions.

References

1. *Edward H. Shortliffe and Leslie E. Perreault (2001). Medical Informatics: Computer Applications in Health Care and Biomedicine (2nd edition. Springer-Verlag.*
2. *Davidson, P. (2000). Best Practice Series: Healthcare J. F. (2004). Clinical Engineering Handbook. Elsevier. Information Systems. Auerbach Publications.*
3. Glaser J. (1999). The Strategic Application of Information Technology in Healthcare Organizations. McGraw-Hill.

MMBC 1043: Biomechanics

Objectives

1. Analyze biomechanics knowledge on specific movement patterns from both anatomical and mechanical

Synopsis

This course provides the students with application of the principles of mechanics and the techniques of engineering to the human body. The series of lectures explore the musculoskeletal system and highlights selected applications in the area of orthopedics (gait analysis, joint replacement) and analyzing the various forms of human movement.

References

1. *Nordin, M. & Frankel, V. (2001). Basic Biomechanics of the Musculoskeletal System. Lippincott Williams & Wilkins.*
2. *Humphrey, J.D. & Delange, S.L. (2003). An Introduction to Biomechanics. Solids and Fluids, Analysis & Design. Springer.*
3. Hall, S. J. (2003). Basic Biomechanics. McGraw-Hill Publishers Hall.
4. Abd Rahman Musa (2007). Statics Made Simple. Pearson Prentice Hall.
5. Donald R. Peterson and Joseph D. Bronzino (2008).Biomechanics: Principles and Applications. CRC Press.

MMBC 1053 : Anatomy and Physiology for Engineers

Objectives

1. Identify and relate the structure and function of the tissue, organ, and systems in humans.

Synopsis

This course provides fundamental concepts of the basic structure and function of the human body as an integrated set of systems from an engineering perspective. This course will expand student's knowledge in the engineering approach toward understanding functions and by giving some engineering solutions and increasing the ability of the students to integrate between the engineering technology and multiple related medical disciplines. Engineering principles will be used to analyse anatomical structures and physiological functions at the tissue, organ, and systems levels.

References

1. *Principles of Anatomy and Physiology, 12th Edition, Gerard J. Tortora, Bryan H. Derrickson, 2009*
2. *Hole's human anatomy and physiology, David Shier, Jackie Butler and Ricki Lewis, McGraw-Hill, 2004*
3. *Essentials of anatomy and physiology, Frederic H. Martini and Edwin F. Bartholomew, Prentice Hall, 2000*
4. *Atlas Netter Interactive Atlas of Human Anatomy v3.0, F. Netter.Medical. CD-ROM*

MMBC 1063 : Biomedical Fluid Mechanics

Objectives

1. Explain and cathegorize biomedical fluids mechanic knowledge of mass conservation, energy conservation, and momentum balance to flowing fluids to solve biomedical engineering problem and relate the structure and function of the tissue, organ, and systems in humans.

2. Analyze biomedical problems related to biofluid using current techniques

Synopsis

This course discusses advanced principles of convective diffusion of fluids pertaining to the body, particularly vascular circulation. A combination of lecture and discussion will dominate the learning mode while the major assessment will be done through a final exam. Through this course students will be able to evaluate parameters that involve biomedical fluid mechanics in producing scientific research and development.

References

1. *Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, and Wade W. Huebsch (2009). Fundamentals of Fluid Mechanics.*
2. *John Wiley & Sons Inc.Lee Waite and Jerry Fine (2007). Applied Biofluid Mechanics,McGraw-Hill Professional.*
3. *Gianni Pedrizzetti and Karl Perktold (2004). Cardiovascular Fluid Mechanics, Springer-Verlag New York.*

MMBC 1073 : Biostatistics

Objectives

1. Explain and apply biostatistics knowledge in biomedical engineering

Synopsis

This course provides statistical concepts and methods with emphasis on applications in clinical medicine, epidemiology and public health. This course also explores advanced biostatistical methods that have been used in designing and analyzing biomedical and public health investigations.

References

1. *Bernard Rosner (2005). Fundamental of Biostatistics. Duxbury Press.*
2. *Jerrold Zar (2009). Biostatistical Analysis. Pearson.*
3. *Leon Gordis (2004). Epidemiology. WB Saunders.*
4. *Douglas G. Altman (1990). Practical Statistics for Medical Research. Chapman & Hall, CRC.*

MMBC 1083 : Health Care Technology Management

Objectives

1. To Identify and explain the systems or procedures relating to plan and procurement, utilization and maintenance of healthcare technologies
2. Analyze and adapt the existing health care technology policies in health care management

Synopsis

This course provides the students the ability to develop a systematic process for planning and managing health technology assets to achieve the highest quality care at the best cost. It explains the concepts of health care management and describes the various types of health plan in operation today. This course also covers the strategic planning as well as technology assessment, facilities planning, procurement, and service or maintenance management.

References

1. *Dyro, J. F. (2004). Clinical Engineering Handbook. Elsevier.*
2. *Joseph D Bronzino and Robert J Austin-LaFrance (1992).Management of medical technology: a primer for clinical engineers, Boston: Butterworth-Heinemann.*
3. *David Y, Judd T (1993). Medical technology management, Redmond, WA, SpaceLabs Medical, INC.*

MMBC 1093 : Medical Imaging and Image Processing

Objectives

1. To apply the techniques in image major by using image analysis knowledge.

Synopsis

This course provides students with an overview of the key concepts behind the main imaging modalities used in diagnostic imaging. The course also introduces students in the basic concepts and methods for image analysis and processing in biomedical engineering and medical physics as well as the use of basic software for image analysis and processing in biomedical engineering and medical physics.

References

1. *Rory A. Cooper, Hisaichi Ohnabe and Douglas A. Hobson (2007).An Introduction to Rehabilitation Engineering. Taylor and Francis.*
2. *Rory A. Cooper (1995). Rehabilitation Engineering Applied to Mobility and Manipulation. Institute of Physics Pub.*
3. *Horia-Nicolai Teodorescu (2001). Intelligent System and Technologies in Rehabilitation Engineering. CRC Press.*
4. *Raymond V. Smith and John H. Leslie (1990). Rehabilitation Engineering. CRC Press.*

MMBC 1103 : Neuroscience

Objectives

1. To analyze on various techniques, skills and modern equipment used in neuroscience.

Synopsis

The course demonstrates on neuroanatomy, neurophysiology and neuroimaging. For example, student will be able to learn various modalities that have been used for neuroimaging. Each scope has its own advantages and at the end of the course student able to know different information about brain structure and function.

References

1. *Dale Purves , George J. Augustine, David Fitzpatrick , William C. Hall, Anthony-Samuel Lamantia , James O. McNamara , Leonard E. White (2007). Neuroscience. Sinauer Associates Inc., U.S.*
2. *Mark Bear, Barry Connors, Michael Paradiso, Mark F. Bear, Barry W. Connors Michael A. Paradiso (2002) Neuroscience: Exploring the Brain. Lippincott Williams & Wilkins;*
3. *Larry R. Squire, James L. Roberts, Nicholas C. Spitzer, Michael J. Zigmond, Susan K. McConnell, Floyd E. Bloom (2002).Fundamental Neuroscience. Academic Pres*

MMBC 1184 : Master Project 1

Objectives

1. To apply engineering knowledge in professional practices in overcome biomedical engineering issues.

2. Solve research problems and present research results logically, creatively, innovatively and analytically based on scientific facts and research experience.
3. Communicate effectively across a range of context and audiences.

Synopsis

The research project proposal emphasizes integration and application of knowledge to solve a biomedical engineering problem. The student must identify a thesis advisor, conduct preliminary research, write research proposal and make a presentation which will be evaluated. For seminar, student will attend paper presentation to expose themselves into research and to gain new knowledge.

References

1. *School of Graduate Study. UTM Thesis Manual.http://www.sps.utm.*

MMBC 1198 : Master Project 2

Objectives

1. To apply engineering knowledge in professional practices in overcome biomedical engineering issues.
2. Solve research problems and present research results logically, creatively, innovatively and analytically based on scientific facts and research experience
3. Communicate effectively across a range of context and audiences.
4. Work responsibly with specialized laboratory equipment with appropriate technical, transferable and interpersonal skills

Synopsis

The research project thesis emphasizes integration and application of knowledge to solve a biomedical engineering problem. The student must conduct research, document the findings and make a presentation which will be evaluated.

References

1. *School of Graduate Study. UTM Thesis Manual.http://www.sps.utm.*

APPENDIX D: PROGRAMME SPECIFICATION

MASTER OF SCIENCE (BIOMEDICAL ENGINEERING)

1. Program Name	Master of Science (Biomedical Engineering) by Taught Course
2. Final Award	Master of Science (Biomedical Engineering)
3. Awarding Institution	UTM
4. Teaching Institution	UTM
5. Professional or Statutory Body of Accreditation	Malaysian Qualification Agency (MQA)
6. Language(s) of Instruction	English
7. Mode of Study (Conventional, distance learning, etc)	Conventional (Course Work)
8. Mode of operation (Franchise, self-govern, etc)	Self-govern
9. Study Scheme (Full Time/Part Time)	Full Time and Part Time
10. Study Duration	Full-time : Minimum : 1.5 years : Maximum : 3 years Part-time : Minimum : 2 years : Maximum : 4 years

Type of Semester	No. of Semesters		No. of weeks per semester	
	Full Time	Part Time	Full Time	Part Time
Normal	3	4	14	14
Short	-	-	-	-

11. Entry Requirement	Candidate must hold a Bachelor Degree in Engineering (Biomedical, Electrical, Mechanical, Computer), Science (Physics, Biology, Chemistry, Mathematics, Medical and Health), Medical or other related disciplines from UTM or other Recognised Higher Learning Institution with CGPA ≥ 3.0 or equivalent. For CGPA < 3.0, relevant work experience is needed.

12. Program Objectives

The objectives of this programme are to produce profesional that are able to:

i. Establish themselves as practicing professionals with high responsibilities in biomedical engineering discipline.
ii. Function effectively and efficiently in managing an organization through effective communication skills and high ethics within the biomedical engineering network.
iii. Continue education through special training, professional licensure, or additional certifications; or engaged in post-graduate study towards a doctoral degree in biomedical field.

13. Program Outcomes (PO)

(a) Technical Knowledge and Competencies

Program Outcomes (PO)	Intended Outcomes	Teaching and Learning Methods	Assessment
PO1 (Knowledge)	Ability to integrate both theory and applications of advanced biomedical engineering principles.	Lecture and Discussion, Co-operative Learning, Independent Study, Group Project, Problem Based Learning.	Examinations, tests, quizzes, dissertation, presentation and assignments.
PO2 (Research Skills and Scientific Methods)	Ability to carry out forefront research and development biomedical engineering projects through organized and systematic approach.	Lecture and Discussion, Co-operative Learning, Independent Study, Group Project, Problem Based Learning, Case Studies.	Dissertation, presentation and assignments.

(b) Generic Skills

Program Outcomes (PO)	Intended Outcomes	Teaching and Learning Methods	Assessment
PO3 (Critical Thinking and Problem Solving)	Ability to adapt and utilize advanced techniques and scientific thinking skills in solving biomedical engineering problems.	Lecture and Discussion, Co-operative Learning, Independent Study, Group Project, Problem Based Learning.	Examinations, tests, quizzes, dissertation, presentation and assignments.
PO4 (Communication Skills)	Ability to communicate effectively through rational arguments via oral and written means to experts in the biomedical engineering field as well as to public.	Lecture and Discussion, Co-operative Learning, Group Project, Problem Based Learning	Dissertation, presentations and assignments.
PO5 (Team Working)	Ability to work in a team to achieve higher organizational goals.	Co-operative Learning, Group Project, Problem Based Learning	Assignment and presentation.
PO6 (Ethics and Professionalism)	Ability to evaluate and make appropriate professional decisions by taking into accounts social and environmental responsibilities, and related ethics.	Lecture and Discussion, Co-operative Learning, Independent Study, Group Project, Problem Based Learning.	Examinations, tests, quizzes, dissertation, presentation and assignments.
PO7 (Lifelong Learning)	Ability to continually adapt with the latest development and explore specializations within the biomedical engineering field.	Lecture and Discussion, Group Project.	Assignment and presentation.

PO8 (Entrepreneurship)	Ability to manage project effectively and identify business opportunities.	Group Project.	Presentation and assignment.
PO9 (Leadership skills)	Ability to achieve higher confidence and positive attitude as a leader in a team.	Group Project.	Presentation and assignment.

14. Classification of Courses

No.	Classification		Credit Hours	Percentage
i.	Faculty Core	Courses	15	35.7%
ii.	Faculty Elective Course		12	28.6%
iii.	Master Project		12	28.6%
iv.	University General Elective Course		3	7.1%
	Total		**42**	**100**

15. Total credit hours to graduate	42 credit hours

16. Program structures and features, curriculum and award requirements

This program is offered on full-time and part time mode with a specific subjects being delivered and assessed in each semester. Assessment is based on coursework, final examination and dissertation.

The courses are categorized as university general courses, programme core courses and programme elective courses such as the followings:

Classification	Credit
University General Elective Courses (UHAX XXX3)(to choose from the list given by School of Graduate Studies)	3
Programme Core Courses	
Biomedical Measurement Technique	3
Diagnostic and Therapeutic Technology	3
Advanced Biomedical Engineering	3
Medical Informatics	3
Biomechanics	3
Programme Elective Courses	
Anatomy and Physiology for Engineers	3
Biomedical Fluid Mechanics	3
Biostatistics	3

Medical Imaging and Image Processing	3
Health Care Technology Management	3
Neuroscience	3
Pathophysiology	3
Advance Biosignal Processing	3
Quantitative System Physiology & Simulation	3
Rehabilitation Engineering	3
Speech Processing	3
Tissue Engineering	3
Ultrasound and Electromagnetic in Medicine	3
Choose 4 courses only	**12**
Master Project	
Master Project 1	4
Master Project 2	8
Total Credit	**42**

Semester	Course Code	Course	Credit
1	MKBB 1003	Biomedical Measurement Technique	3
	MKBB 1013	Diagnostic and Therapeutic Technology	3
	MKBB 1023	Advanced Biomedical Engineering	3
	MKBB 1XX3	Elektif 1	3
	UHAX XXX3	University General Elective Course	3
	Total credits for semester 1		15
2	MKBB 1033	Medical Informatics	3
	MKBB 1043	Biomechanics	3
	MKBB 1184	Master Project 1	4
	MKBB 1XX3	Elektif 2	3
	MKBB 1XX3	Elektif 3	3

	Total credit for semester 2		16
3	MKBB 1198	Master Project 2	8
	MKBB 1XX3	Elektif 4	3
	Total credits for semester 3		11
Total credit for all semester 3			**42**

Award requirements:

For the award of Master of Science (Biomedical Engineering), students should achieve a total minimum of 42 credit hours with minimum CPA of 3.00.

17. Mapping of Programme Learning Outcomes (PLO) to Courses

		LEARNING OUTCOMES								
		Knowledge and Competencies in Biotechnology			**Generic Skills**					
Code	**Course Name**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
PROGRAMME CORE COURSES										
MKBB 1003	Biomedical Measurement Technique	a	a	-	1	-	-	-	-	1
MKBB 1013	Diagnostic and Therapeutic Technology	a	a	-	2	-	-	-	-	-
MKBB 1023	Advanced Biomedical Engineering	a	b	b	-	-	1	-	-	-
MKBB 1033	Medical Informatics	a	a	-	1	-	-	-	-	-
MKBB 1043	Biomechanics	a	b	-	1	-	-	-	-	-
PROGRAMME ELECTIVE COURSES										
MKBB 1053	Anatomy and Physiology for Engineers	a	a	-	1	-	-	-	-	-

MKBB 1063	Biomedical Fluid Mechanics	**a**	**a**	**a**		-	-	-	-	-
MKBB 1073	Biostatistics	**a**	**b**	**-**	**1**	-	-	-	-	-
MKBB 1083	Health Care Technology Management	**a**	**a**	**-**	-	-	**1**	-	**1**	-
MKBB 1093	Medical Imaging and Image Processing	**a**	**b**	**a**	-	-	-	-	-	-
MKBB 1103	Neuroscience	**a**	**-**	**a**	-	**1**	-	-	-	-
MKBB 1113	Pathophysiology	**a**	**a**	**-**	**1**	-	-	-	-	-
MKBB 1123	Advance Biosignal Processing	**a**	**-**	**a**	**1**	-	-	-	-	-
MKBB 1133	Quantitative System Physiology &Simulation	**a**	**a**	**a**	-	-	-	-	-	-
MKBB 1143	Rehabilitation Engineering	**a**	**-**	**a**	**1**	**1**	**1**	-	-	-
MKBB 1153	Cardiovascular Engineering	**a**	**a**	**-**	**1**	**1**	-	-	-	**1**
UNIVERSITY ELECTIVE COURSE										
UHXXX3	University Elective									

Key Technical Skills:
a = major contribution to outcome; **b** = moderate contribution to outcome; **c** = minor contribution to outcome
Generic Skills:
1 = Substantial (with assessment); **2** = not substantial (introduce)

18. Our Uniqueness

i. Special program designed to produce professional that can apply engineering to solve biomedical problem.
ii. Multidisciplinary lecturers with focus on biomedical application.
iii. State of the arts facilities and research laboratories.
iv. Double degree program.
v. This programme focuses more on areas instrumentation.
vi. Selected courses will be conducted in form of Modular Class (3 credits course within 1 week)

19. Career Prospects and Career Paths

Graduates of the program can work as a senior engineer, specialist, technical executive, manager, auditor, researcher or consultant in various public and private institutions or industries, and as academicians at tertiary institutions or higher education.

20. Cross Campus Program

Possibility for Double Degree Program With Technical University Ilmenau, Germany.

21. UTM Degree ++ Program

22. Facilities available

i. Laboratories
ii. Postgraduate room
iii. Library
iv. Medical Centre
v. Sport Centre
vi. Smart Classroom and Lecture Room

23. Support for Students and Their Learning

i. E-learning system
ii. Extensive library and other learning resources and facilities
iii. Lab facilities for research
iv. Each student is allocated with a supervisor for their master project
v. Student counseling

24. Methods for Evaluating and Improving the Quality and Standards of Teaching and Learning Mechanisms for Review and Evaluation of Teaching, Learning, Assessment, the Curriculum and Outcome Standard

i. Curriculum review and improvement
ii. Industrial Advisory Panel (IAP) reports
iii. External examiner evaluation and reports
iv. Teaching evaluation by students
v. Academic Committee meetings and reports
vi. Staff expected to attain Doctorate degree or higher qualifications
vii. Staff appraisal scheme and institutional staff development courses
viii. Course team meetings and comprehensive annual review and planning for

25. Regulation of Assessment

Summary of grades, marks and their interpretation are as follows:

Marks	Grade	Evaluation Point	Interpretation
90-100	A+	4.00	Excellent Pass
80-89	A	4.00	
75-79	A-	3.67	
70.74	B+	3.33	Good Pass
65-69	B	3.00	
60-64	B-	2.67	Pass
55-59	C+	2.33	Fail
50-54	C	2.00	
45-49	C-	1.67	
40-44	D+	1.33	
35-39	D	1.00	
30-34	D-	0.67	
00-29	E	0.00	

26. Assessment Tools

Measurement Tools	**Learning Outcomes**						**Duration**	**Action by**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**		
Test, Quiz, Final Exam	/			/			1st sem and 2nd sem	Lecturer
Assignment		/		/			//	Lecturer
Group Presentation			/	/			//	Lecturer
Course outcome survey	/	/	/	/			End of sem	Lecturer
Course outcome report	/	/	/	/			End of sem	Lecturer
Evaluation form	/	/					End of 2nd sem and 3rd sem	Supervisor
PO survey by postgraduate students	/	/	/	/	/	/	End of sem	Faculty
Alumni Survey	/	/	/	/	/	/	Once/3 years	Head of Dept
Employer Survey	/	/	/	/	/	/	Once/3 years	Head of Dept

APPENDIX E: AREAS OF RESEARCH

FACULTY OF BIOSCIENCES AND MEDICAL ENGINEERING (FBME)

Biomedical Engineering

There are **nine** major areas of research offered related to Biomedical Engineering. Each research area is focused on several aspects of the research as listed below:

1. Biomedical Instrumentation
2. Biosignal Processing
3. Biomedical Imaging
4. Biomechanics and Biomaterials
5. Medical Computing
6. Clinical Engineering
7. Health Care Management System
8. Rehabilitation Engineering
9. Sports Science Technology

Biosciences

There are **eight** major areas of research offered related to Biosciences. Each research area is focused on several aspects of the research as listed below:

1. Nanoporous Materials for Biological Application Research
2. Biofuel and Renewable Energy
3. Environmental Bioengineering Research
4. Medical Biotechnology
5. Molecular and Plant Biotechnology
6. Biocatalysis and Fermentation Technology
7. Bioinformatics and Molecular Modeling
8. Biosensor Technology

Health Sciences and Rehabilitation Technology

There are **ten** major research areas of related to rehabilitation and therapy. Each research area is focused on several aspects of the research as listed below:

1. Therapy and Rehabilitation Technology
2. Motion Analysis
3. Physical Therapy Modalities
4. Electrotherapy Modalities
5. Exercise Therapy
6. Exercise Prescription
7. Assistive Technology
8. Orthotics and Prosthetics
9. Rehabilitation Ergonomics
10. Kinesiotherapy

APPENDIX F: ACADEMIC STAFF INFORMATION

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Do's and Dont's For International Students

1. General rules and regulations
2. Student pass
3. Permission to work part-time
4. Drugs and poison
5. Weapons and dangerous materials
6. Traffic Rules and Regulations
7. Use of force
8. Assembly
9. Academic Integrity
10. Accomodation
11. Safety and Emergency

General rules and regulations

- A student must abide by Malaysian law at all the times.
- A student has committed a case of misconduct when:

    - He is found guilty of criminal charges by the court;
    - He is involved in any jobs, trades or the like, on part-time or full time basis, which are deemed illegal in the Immigration Ordinance 1959 and the Immigration Rules and Regulations 1963 or other laws or that which could affect his studies.
- A student is to abide by all the rules and regulations that are enforced by the institution.
- A student must at all times respect the culture, norms and beliefs of the locals.

Student pass

- Any international student who wishes to study in Malaysia is required to obtain a Student Pass.
- Application has to be made through the Respective Educational Institution prior to entry.

Permission to work part-time

- A student is permitted to do part-time work for 20 hours per week during semester breaks or any holiday exceeding 7 days.
- A student is permitted to work part-time in Restaurants, Petrol Kiosks, Mini Markets and Hotels only (excluding singer, masseur, musician, GRO and other activities deemed immoral) as long as the student pass remains valid.
- Students are not permitted to work as cashier.
- Permission to work part-time is extendable by the Immigration Department depending on the student's attendance and academic reports.
- Application from students studying in Private Higher Educational Institutions must be submitted by the respective institutions to the
- Immigration headquarters in Putrajaya; while for students from Public Higher Educational Institutions to the nearest Immigration Office.

Drugs and poison

It is considered a serious offence if a student:

- is found to be in possession of any kind of drugs or poisons. The term 'drug' is as defined in the Dangerous Drug Act 1952;
- is found to provide, to supply, to distribute, to offer or to prepare any of the above drugs or poisons to other parties;
- is involved in drug abuse of any kind.

Weapons and dangerous materials

It is considered a serious offence if a student is found to be in possession or in supervision of any dangerous weapons or explosive materials. 'Weapon' is as defined in the Weapons Act 1971.

Traffic rules and regulations

A student who owns or uses any type of vehicle must:

- fulfil the requirements under the Road Transportation Act 1987 and all subsections under the Act, on campus and public roads.

Use of force

It is considered an offence if a student:

- partakes in any kind of activities that involve force, extortion, molestation, harassment or any form of disturbance among themselves or towards others;
- involves directly in any form of ragging or bullying, or abuse or the like inside or outside of campus;
- uses force, aggression or threat to cause hurt to others;
- engages in any physical aggression such as riots or fights, or commits an assault on any parties;
- exhibits verbal and/or physical behaviour of a racist or prejudiced nature towards any other member of the community inside or outside the campus.

Assembly

- It is considered a serious offence if any groups of students or organisations of students plan, organise, attend or take part in any assembly or meeting at any given places without permission from the relevant authorities. A student is to abide by all the rules and regulations that are enforced in his institution.

Academic integrity

- A student is not allowed any form of falsification and plagiarism i.e copying or allowing people to copy, plagiarize during exams, lab assignments, preparation of coursework or thesis and the like.

Accommodation

- Students who reside in an on-campus residence are to abide by the rules of accommodation set by their respective institutions.
- Students who reside off-campus need to take on an even greater obligation of respecting the neighborhood standards and watching out for neighbors.
- Students are advised not to cause trouble or emit noises in any way that are of disturbance to others.

Safety and Emergency

- Be safety conscious, especially in the first few weeks as you get used to your new environment and culture.
- Take extra care of your safety in high risk areas, especially if you need to go out late at night. If you are encountered with a real emergency, the first point of contact would be the International Office or your contact at your Institution.
- Call 999 - police, ambulance, fire stations and civil defence rescue units if you are in trouble. (Warning: Under Section 233 of the Communications and Multimedia Act 1998, the penalty for misuse of the communication network isa fine of RM50 000, or one year's jail, or both).

- For further assistance, you may call Student Affairs and Development Division, Department of Higher Education's general line at 603-88835939 during office hours.

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