

School of Biomedical Engineering and Health Sciences FACULTY OF ENGINEERING UNIVERSITI TEKNOLOGI MALAYSIA



POSTGRADUATE HANDBOOK 2021/2022

https://engineering.utm.my/biomedical/

School of Biomedical Engineering and Health Sciences (SBEHS)

Faculty of Engineering



ORGANIZATIONAL CHART



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INTRODUCTION

Postgraduate Programmes Offered

The School of Biomedical Engineering and Health Sciences offers **5** (**five**) **postgraduate programmes** that lead to the award of **postgraduate degrees** including Master of Science, Master of Philosophy and Doctor of Philosophy in the areas of Biomedical Engineering, Rehabilitation Technology and Health Sciences.

Students may register for the programme by choosing one of these modes of which are either **course work** or **research**.

For **full-time** Master and PhD programmes, the normal study durations are 3 to 8 semesters (1.5 - 4 years) and 6 to 12 semesters (3 - 6 years), respectively.

Additional Requirements

Each programme requires the student to take at least one **University compulsory course** from (but not limited to) the following options:

- UANP 6013 Informatics in Society
- **UBSS 6013** Organization Behaviour and Development
- **UBSS 6023** Business Ethics, Responsibility and Sustainability
- **UECS 6013** IT Project Management
- **UHPS 6013** Dynamics of Leadership
- **UHSM 6013** Seminar on Global Development, Economic and Social Issues
- **URTS 6013** Environmental Ethics
- **UHIS 6013** Philosophy of Science and Civilization
- **UECS 6023** Introduction to Technopreneurship

International students are encouraged to take at least one 3 credit hours University compulsory course from (but not limited to) the following options:

- UHLM 6013 Malay Language for Academic Writing
- UHMZ 6023 Malaysian Society and Culture

International students are required to register for courses that have been labelled as "For International Students" since some of the other courses are conducted in the Malay language.

For the full list of University compulsory courses, students may visit the School of Graduate Studies' website at https://sps.utm.my/academic-related-resources/.

Apart from the above requirements, research students must take a research methodology class (**Compulsory attendance**). Research Methodology course is

also offered as an intensive course during the mid-semester break and must be completed prior to the proposal defence.

Master Degree Programmes

Programmes	Code	Mode*	Research Field**
Master of Science (Biomedical Engineering)	MEBC	1	А
Master of Philosophy, Field of Research: Biomedical Engineering	MMBE	2	А
Master of Philosophy, Field of Research: Biomedical Engineering-Double Degree	MMBE	2	А
Master of Philosophy, Field of Research: Rehabilitation Technology	MMBR	2	В

Doctoral Degree Programmes

Programmes	Code	Mode*	Research Field**
Doctor of Philosophy, Field of Research: Biomedical Engineering	PMBE	2	А
Doctor of Philosophy, Field of Research: Biomedical Engineering-Double Degree	PMBE	2	А
Doctor of Philosophy, Field of Research: Health Science	PMBH	2	С

*Mode:

1 = Course work, 2 = Research

* Research Field:

A= Biomedical Engineering

B= Rehabilitation Technology

C= Health Sciences

Master of Science (Biomedical Engineering)

Programme Specifications

SBEHS offers the **Master of Science (Biomedical Engineering)** programme by course work mode offered in full-time. The MSc (Biomedical Engineering) can be completed within three (3) semesters $(1\frac{1}{2}$ years).

General Information

1. Awarding Institution	Universiti Teknologi Malaysia
2. Teaching Institution	Universiti Teknologi Malaysia
3. Programme Name	Master of Science
	(Biomedical Engineering)
4. Final Award	Master of Science
4. Tillal Awara	(Biomedical Engineering)
5. Programme Code	MEBC
6. Professional or Statutory Body of Accreditation	MQA
7. Language(s) of Instruction	English
8. Mode of Study (Conventional, distance learning, etc)	Conventional (Course work)
9. Mode of operation (Franchise, self-govern, etc)	Self-governing
10. Study Scheme (Full Time/Part Time)	Full Time
11. Study Duration	Minimum : 1.5 years Maximum : 3 years

Entry Requirement

- ullet Bachelor Degree in Engineering (Biomedical, Electrical, Mechanical or Computer), Science (Physics, Biology, Chemistry, Mathematics, Medical and Health), Medical or other related disciplines from UTM; or any other institution of higher learning recognised by the Senate with CGPA \geq 2.50. For CGPA < 2.50, at least 5 years relevant work experience is needed.
- Candidates do not have colour blindness or have physical disabilities which can affect the practical works.

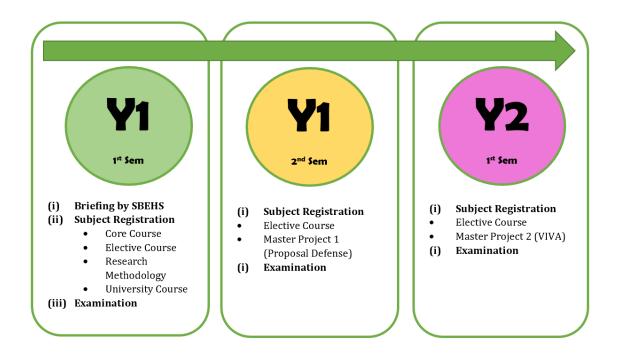
- An international student candidate is required to have a minimum qualification of the Test of English as a Foreign Language (TOEFL) of \geq 60 marks, or International English Language Test System (IELTS) of Band 6.0 and above, or Certified Intensive English Program (CIEP) of Level 108 or 109.
- 1. Intensive English Program (IEP) is organized by Akademi Bahasa, UTM or
- 2. Certified Intensive English Program (CIEP) organized by ELS Training Center

Award Requirements

In order for the students to be awarded with Master of Science (Biomedical Engineering) degree, they are required to complete and achieve a minimum cumulative of 45 credit hours with a minimum CGPA of 3.00.

Overall Programme Flowchart

This programme flowchart can be used as a guideline for students to ensure that they are well informed on action items which need to be fulfilled during their active semester. This is also to avoid any late subject registration at the beginning of every semester and to assist all students with their research timeline towards graduate on time (GOT).



Programme Educational Objectives (PEO)

PEO measures the quality of the programme by describing the expected achievement of working graduates within three to five years after graduation.

PEO	Programme Educational Objectives
PEO1	Mastery of knowledge and competency in advanced areas of Biomedical Engineering field.
PEO2	Practice professionalism and high standards of ethical conducts within organization and society.
PEO3	Responsive to changing situations by continuously acquiring new knowledge and skills

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

PLO	Intended Learning Outcomes	Skill Classification
PLO1	(Knowledge and Understanding) - Attain new frontiers of knowledge in the field of Biomedical Engineering.	Technical
PLO2	(Cognitive skills) - Solve complex problems critically and integratively using systematic approaches.	Technical
PLO3	(Practical Skills) - Apply practical skills to solve problems in the field of Biomedical Engineering.	Technical
PLO4	(Interpersonal skills) - Demonstrate effective collaboration with stakeholders professionally.	Generic
PLO5	(Communication skills) - Communicate effectively the knowledge, skills, and ideas using appropriate methods to peers, experts and communities.	Generic
PLO6	(Digital Skills) - Use digital technologies and appropriate softwares competently to enhance study and practice.	Technical
PLO7	(Numeracy Skills) - Evaluate numerical and graphical data critically using quantitative or qualitative tools in solving problems.	Technical
PLO8	(Leadership, Autonomy and Responsibility) - Demonstrate leadership, autonomy and responsibility in managing resources.	Generic
PLO9	(Personal Skills) - Engage self-advancement through continuous learning or professional development.	Generic

PLO10	(Entrepreneurial Skills) - Initiate entrepreneurial projects supported by relevant knowledge and skills.	Generic
PLO11	(Ethics and Professionalism Skills) - Demonstrate respectable ethical conducts and professionalism skills in an organization and society.	Generic

Course Classification

Students are required to successfully complete a minimum of **45 credits** which include at least:

Code	Course	Credit		
University Course (A)				
U**S 6**3	University General Courses (to choose from the list given by School of Graduate Studies) https://sps.utm.my/academic-related-resources/	3		
Total Credit (3		
Core Course (В)			
MEBC 0013	Research Methodology in Biomedical Engineering	3		
MEBC 1003	Biomedical Measurement Technique	3		
MEBC 1013	Diagnostic and Therapeutic Technology	3		
MEBC 1023	Advanced Biomedical Engineering	3		
MEBC 1033	Medical Informatics	3		
MEBC 1043	C 1043 Biomechanics			
Total Credit (B)		18		
Elective Cours	ses (Choose 4 courses only)			
MEBC 1053	Anatomy and Physiology for Engineers	3		
MEBC 1063	Biomedical Fluid Mechanics	3		
MEBC 1073	Introduction to Biostatistics	3		
MEBC 1083	Healthcare Technology Management	3		
MEBC 1093	Medical Imaging and Image Processing	3		

MEBC 1103	Neuroscience	3
MEBC 1113	Pathophysiology	3
MEBC 1123	Advanced Biosignal Processing	3
MEBC 1143	Rehabilitation Engineering	3
MEBC 1153	Cardiovascular Engineering	3
MEBC 1163	Tissue Engineering	3
MEBC 1173	Biomedical Electronic System Design	3
MEBC 1183	Biomaterials Characterization and Analysis	3
MEBC 1193 Genetic Engineering		3
Total Credit (C)		12
Master Projec	t	
MEBC 1184	Master Project 1	4
MEBC 1198 Master Project 2		8
Total Credit (D)		12
Total Credit (A + B + C + D)		45

Percentage of Course Classification

No.	Classification	Credit Hours	Percentage
i.	Core Courses	18	39.9%
ii.	Elective Course	12	26.7%
iii.	Master Project	12	26.7%
iv.	University Course	3	6.7%
Total		45	100%

Marking and Assessment

Marks	Grade	Evaluation Point	Interpretation
90-100	A+	4.00	Excellent Pass
80-89	Α	4.00	
75-79	A-	3.67	
70.74	B+	3.33	Good Pass
65-69	В	3.00	
60-64	B-	2.67	Pass
55-59	C+	2.33	
50-54	С	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	

July Intake

YEAR 1: SEMESTER 1				
Code Course		Credit	Pre- requisite	
MEBC 1003	Biomedical Measurement Technique	3		
MEBC 1013	Diagnostic and Therapeutic Technology	3		
MEBC 1023	Advanced Biomedical Engineering	3		
MEBC 1**3	Elective 1	3		
U**S 6**3	University General Courses	3		
MEBC 0013 Research Methodology in Biomedical Engineering		3		
Total Credit		18		
Cumulative Credits 18				

YEAR 1: SEMESTER 2				
Code	Course	Credit	Pre- requisite	
MEBC 1033	Medical Informatics	3		
MEBC 1043	Biomechanics	3		
MEBC 1184	Master Project 1	4		
MEBC 1**3	Elective 2	3		
MEBC 1**3	MEBC 1**3 Elective 3			
Total Credit	16			
Cumulative Cred	34			

YEAR 2: SEMESTER 1				
Code	Course	Credit	Pre- requisite	
MEBC 1198	Master Project 2	8		
MEBC 1**3	Elective 4	3		
Total Credit	11			
Cumulative Cred	its	45		

February Intake

Code	YEAR 1: SEMESTER 1 Course	Credit	Pre- requisite
MEBC 1033	Medical Informatics	3	
MEBC 1043	Biomechanics	3	
MEBC 1**3	Elective 1	3	
MEBC 1**3	Elective 2	3	
U**S 6**3	University General Elective Course	3	
MEBC 0013	Research Methodology in Biomedical Engineering	3	
Total Credit		18	
Cumulative Credits		18	

Code	YEAR 1: SEMESTER 2 Course	Credit	Pre- requisite
MMBC 1003	Biomedical Measurement Technique	3	
MMBC 1013	Diagnostic and Therapeutic Technology	3	
MMBC 1023	Advanced Biomedical Engineering	3	
MMBC 1**3	Elective 3	3	
MMBC 1184	Master Project 1	4	
Total Credit		16	
Cumulative C	edits	34	

Code	YEAR 2: SEMESTER 1 Course	Credit	Pre- requisite
MMBC 1198	Master Project 2	8	
MMBC 1**3	Elective 4	3	
Total Credit	11		
Cumulative Cred	its	45	

Elective Course	
Code	Course
MEBC 1053	Anatomy and Physiology for Engineers
MEBC 1063	Biomedical Fluid Mechanics
MEBC 1073	Introduction to Biostatistics
MEBC 1083	Healthcare Technology Management
MEBC 1093	Medical Imaging and Image Processing
MEBC 1103	Neuroscience
MEBC 1113	Pathophysiology
MEBC 1123	Advanced Biosignal Processing
MEBC 1143	Rehabilitation Engineering
MEBC 1153	Cardiovascular Engineering
MEBC 1163	Tissue Engineering
MEBC 1173	Biomedical Electronic System Design
MEBC 1183	Biomaterials Characterization and Analysis
MEBC 1193	Genetic Engineering
University Genera	I Course
Code	Course
UECS 6013	IT Project Management
UHPS 6013	Dynamics of Leadership
UHMS 6013	Seminar on Global Development, Economic and Social Issues
UHMZ 6023	Malaysian Society and Culture
UHLM 6013	Malay Language for Post Graduates
UHIS 6013	Philosophy of Science and Civilization
UBSS 6013	Organization Behavior and Development

Graduation Checklist

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

No.	Code	Course	Credit Earned (Jkd)	Credit Counted (Jkk)	Tick (√) If Passed
1	MEBC 1003	Biomedical Measurement Technique	3	3	
2	MEBC 1013	Diagnostic and Therapeutic Technology	3	3	
3	MEBC 1023	Advanced Biomedical Engineering	3	3	
4	MEBC 0013	Research Methodology for Biomedical Engineering	3	3	
5	MEBC 1**3	Elective 1	3	3	
6	MEBC 1033	Medical Informatics	3	3	
7	MEBC 1043	Biomechanics	3	3	
8	MEBC 1184	Master Project 1	4	4	
9	MEBC 1**3	Elective 2	3	3	
10	MEBC 1**3	Elective 3	3	3	
11	MEBC 1198	Master Project 2	8	8	
12	MEBC 1**3	Elective 4	3	3	
13	U**S 6**3	University General Course	3	3	
Tota	l Credit		45	45	

Course Synopsis

MEBC 1003: Biomedical Measurement Technique

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.

MEBC 1013: Diagnostic and Therapeutic Technology

This course is designed to introduce students to Diagnostic and Therapeutic Technology and their respective details on the broad collection of various related equipment. At the end of the course, students are able to describe the diagnostic methods and therapeutic technologies used in growing healthcare fields and be able to design a simple diagnostic/ therapeutic method which can be used in healthcare environment, clinical and research.

MEBC 1023: Advanced Biomedical Engineering

This course provides the students with the introduction to advanced technologies of biomedical engineering in the field of bioinstrumentation, biophysics, biomaterials and biomechanics. The impact of technologies on clinical research, rehabilitation engineering, and patient care will be dealt along with professional ethics. 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.

MEBC 1033: Medical Informatics

This course introduces and exposes the students to the organization of biomedical informatics, in terms of fundamentals and applications of biomedical informatics. It ranges from data acquisition, decision making, cognitive science, computing, system design, standards, and ethics, to Electronic Health Record (EHR), imaging, information management, data retrieval, Patient Care and Monitoring, and Bioinformatics. Basic theory and applications will be exposed through teaching and discussion. Practical work in medical informatics will be introduced as part of individual and group assignments.

MEBC 1043: Biomechanics

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

MEBC 1053: Anatomy and Physiology for Engineers

This course provide student with knowledge of Human Anatomy and Physiology with an emphasis on how each system plays a vital role in homeostasis. Each of the major body systems will be covered in detail as well as their relevance in the maintenance of the human body as a unit. Applied experiences will include the common areas that have relation to biomedical course. It will not be as details as in the medical courses, rather than, it will cover the most interesting areas that the biomedical research focus in the current era. The course is designed to prepare students for work in the biomedical fields or research. The course is planned to give a conceptual and some practical insight to the human body and its normal function and to the some of the abnormalities might disturbs the body homeostasis.

MEBC 1063: Biomedical Fluid Mechanics

This course provides the students with application of the principles of mechanics and the engineering techniques which is the fluid mechanics to the biological fluid flow, in particular cardiovascular system. Other system related to biological flow will be explored such as respiratory flow, flow around body, and bird flight mechanism. By the end of the course, student should be able to understand fluid mechanics and its pertinent application to flow in the biological system – cardiovascular system, respiratory system and the likes. Other outcome of this course would be for the student to apply fluid mechanics analysis of human circulation, as well as artificial organs implanted within human body for disease treatment.

MEBC 1073: Introduction to Biostatistics

This course will introduce and teach the application of statistics to biomedical engineering and health care field. The students will be taught the biostatistical principle, concepts, and application of statistical principle in health field as well as biomedical engineering. Lecture topics include descriptive statistics, study design, probability, comparing sample means and proportions, and sample size/power calculations. Student will also be expected to receive lecture and tutorial in computer lab to supplement what they learn into practical application by using statistical package computer software to describe and analyse data.

MEBC 1083: Healthcare Technology Management

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.

MEBC 1093: Biomedical Imaging & Image Processing

This course expose students with students to the advancements of biomedical imaging and image processing. It focuses on understanding analytical point of view of biomedical imaging modalities technology, starting from signal generation to biomedical applications of various imaging modalities. Image processing technique and the fundamental will be covered. MATLAB will be used extensively for better understanding in solving the biomedical image problem.

MEBC 1103: Neuroscience

This Neuroscience course is a comprehensive introduction to the mammalian nervous system, focusing on the structure and function of the human brain. Anatomical, cellular, chemical, physiological, and molecular aspects of neuroscience will be discussed. Topics that will be covered include: neurons and glia, neuroanatomy, action potentials, synaptic transmission, neurotransmitters, sensory systems (vision, hearing, and touch), motor systems, behavioural responses, development, learning and memory, aging, mental illness, neurodegenerative diseases, and genomics. An inquiry-based approach will be taken to facilitate student learning of the material.

MEBC 1184: Master Project 1

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.

MEBC 1198: Master Project 2

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.

MEBC 0013: Research Methodology in Biomedical Engineering

This course covers the general principles of Research Methodology that are applicable to any discipline. It discusses the fundamental process in conducting an academic research. The theoretical and practical aspects of preparing a research proposal presented. Amongst topics that will be covered are introduction to research and its philosophy, problem formulation and research objective, literature review, research methodology and design, data collection procedures, data analysis, research proposal and thesis preparation and research management.

Master of Philosophy

Programme Specifications

School of Biomedical Engineering and Health Sciences (SBEHS) offers the following three master programmes by research mode:

- 1. Master of Philosophy (Rehabilitation Technology)
- 2. Master of Philosophy (Biomedical Engineering)
- 3. Master of Philosophy (Biomedical Engineering-Double Degree) *

*Universiti Teknologi Malaysia (UTM) and Technical University Ilmenau (TUIL) Germany have collaborated to offer an International Double Degree programme in Biomedical Engineering. The student will be awarded with 2 certificates, which are Master in Engineering (Biomedical) from UTM and/or Master in Biomedical Engineering (MSc) from TUIL. The students are required to spend at least 7 months at the partner university. Limited scholarships from German's government are available for selected students.

Programme Features

The three Master by research programmes above are offered full-time. A student will carry out research in any one of the research areas 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-supervisor(s) should be appointed from among Graduate Faculty members or may also come from a related industry.

General Information

1. Awarding Institution	Universiti Teknologi Malaysia
2. Teaching Institution	Universiti Teknologi Malaysia
3. Programme Code and Name	ММВЕ
	Master of Philosophy, Field of Research: Biomedical Engineering
	Master of Philosophy, Field of Research: Biomedical Engineering (Double Degree)
	MMBR
	Master of Philosophy, Field of Research: Rehabilitation Technology

4. Final Award	Master of Philosophy, Field of Research: Biomedical Engineering
	Master of Philosophy, Field of Research: Biomedical Engineering (Double Degree)
	Master of Philosophy, Field of Research: Rehabilitation Technology
5. Professional or Statutory Body of Accreditation	Malaysia Qualification Agency
6. Language(s) of Instruction	English
7. Mode of Study (Conventional, distance	Conventional (Research)
8. Mode of operation (Franchise, self-govern,	Self-governing
9. Study Scheme (Full Time/Part Time)	Full Time
10. Study Duration	Minimum: 1.5 years (3 semesters) Maximum: 4 years (8 semesters)

Entry Requirement

Master of Philosophy (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
- An International student candidate is required to have a minimum qualification
 of the Test of English as a Foreign Language (TOEFL) of 525 or TOEFL-IBT of
 69 or International English Language Test System (IELTS) of band 5.5.

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
- An International student candidate is required to have a minimum qualification
 of the Test of English as a Foreign Language (TOEFL) of 525 or TOEFL-IBT of
 69 or International English Language Test System (IELTS) of band 5.5.

Award Requirements

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

All students registered for MPhil programmes must undergo first assessment – report and presentation by presenting their research proposal after having completed General Elective University Course and Research Methodology Course. They must also undergo second assessment – report and presentation (mini viva) in the middle of their study to present their progress. Finally, all master by research students must undergo the thesis examination after completing all their research work and fulfilling publication requirements.

Students who opted for the double degree programme must undergo the first assessment at their home university and only the second assessment at their partner university. To be inaugurated by any degree, all students must undergo thesis examination which can be done at least two-months after the second assessment.

The assessments are scheduled according to the student's appropriate semester of study as follows:

Assessment	Full Time
Progress Report	Week 12 (every semester)
First Assessment – report and presentation (Proposal defence)	Semester 2
Second Assessment – report and presentation (Mini Viva)	Semester 3
Thesis Examination (Viva Voce)	Semester 4

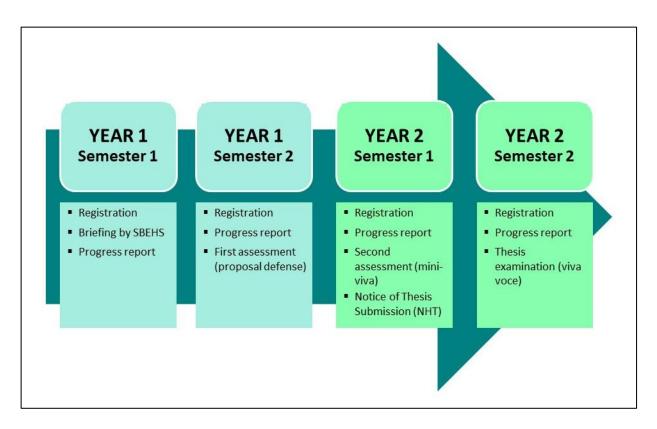
Students who are submitting the final draft of their thesis should send in the Notice of Thesis Submission to the Faculty at least 3 months prior to the date of submitting their thesis.

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.

Overall Programme Flowchart

This programme flowchart can be used as a guideline for students to ensure that they are well informed on action items which need to be fulfilled during their active semester. This is also to avoid any late subject registration at the beginning of every semester and to assist all students with their research timeline towards graduate on time (GOT).



Master of Philosophy (Biomedical Engineering)

Programme Educational Objectives (PEO)

PEO measures the quality of the programme by describing the expected achievement of working graduates within three to five years after graduation.

PEO	Programme Educational Objectives
PEO1	Knowledgeable and competent in research on advanced areas of Biomedical Engineering.
PEO2	Practice professionalism and high standards of ethical conducts within organization and society.
PEO3	Responsive to changing situations by continuously acquiring new knowledge and skills

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

PLO	Intended Learning Outcomes	Skill Classification
PLO1	Integrate and generate in-depth relevant knowledge independently dan using innovative techniques, tools, and skills for decision-making to manage basis and resolve a complex problem in the field of Biomedical Engineering as a for research.	Technical
PLO2	Construct a critical and innovative solution for complex problems or issues in the field of Biomedical Engineering through research using the latest development techniques and skills.	Technical
PLO3	Devise standard research methodology that are based on the forefront knowledge and latest development in the field of Biomedical Engineering to solve research problems with reasonable degree of originality.	Technical
PLO4	Demonstrate effective collaboration with peers, scholarly communities and society at large in the relevant field of expertise and research.	Generic
PLO5	Communicate the knowledge, skills, ideas clearly using appropriate methods to peers, experts, and non-experts through various medium.	Generic
PLO6	Use a broad range of suitable digital technologies, media, and software to design, manage, analyse and report research studies.	Generic

PLO7	Demonstrate skills in designing, planning evaluation activities, and analysing numerical and graphical data using quantitative or qualitative tools in solving problems.	Generic
PLO8	Demonstrate leadership, autonomy and responsibility in conducting and managing own research and resources.	Generic
PLO9	Demonstrate the ability to manage and enhance own self-advancement for academic development, professional development and research skills using lifelong learning strategies.	Generic
PLO10	Develop potential commercialisation research output.	Generic
PLO11	Demonstrate adherence to legal, ethical and professional codes of practice in the field of Biomedical Engineering and research activities.	Generic

Year	Code	Description	Credit
1	MMBE 1100	Research	0
	MMBE 1200	Research	0
2	MMBE 2100	Research	0
	MMBE 2200	Research	0
3	MMBE 3100	Research	0
	MMBE 3200	Research	0
4	MMBE 4100	Research	0
	MMBE 4200	Research	0

General Elective University Course (Compulsory)		ılsory)
Code Course Cred		Credit
UMBP 0010 Research Methodology		HW
U*** ***3 General Elective University Course		3

Master of Philosophy (Rehabilitation Technology)

Programme Educational Objectives (PEO)

PEO measures the quality of the programme by describing the expected achievement of working graduates within three to five years after graduation.

PEO	Programme Educational Objectives
PEO1	Knowledgeable and competent in research on advanced areas of Rehabilitation Technology.
PEO2	Practice professionalism and high standards of ethical conducts within organization and society.
PEO3	Responsive to changing situations by continuously acquiring new knowledge and skills.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

PLO	Intended Learning Outcomes	Skill Classification
PLO1	Integrate and generate in-depth relevant knowledge independently dan using innovative techniques, tools and skills for decision-making to manage basis and resolve a complex problem in the field of Rehabilitation Technology as a for research.	Technical
PLO2	Construct a critical and innovative solution for complex problems or issues in the field of Rehabilitation Technology through research using the latest development techniques and skills.	Technical
PLO3	Devise standard research methodology that are based on the forefront knowledge and latest development in the field of Rehabilitation Technology to solve research problems with reasonable degree of originality.	Technical
PLO4	Demonstrate effective collaboration with peers, scholarly communities and society at large in the relevant field of expertise and research.	Generic
PLO5	Communicate the knowledge, skills, ideas clearly using appropriate methods to peers, experts, and non-experts through various medium.	Generic
PLO6	Use a broad range of suitable digital technologies, media, and software to design, manage, analyse and report research studies.	Generic

PLO7	Demonstrate skills in designing, planning evaluation activities, and analysing numerical and graphical data using quantitative or qualitative tools in solving problems.	Generic
PLO8	Demonstrate leadership, autonomy and responsibility in conducting and managing own research and resources.	Generic
PLO9	Demonstrate the ability to manage and enhance own self-advancement for academic development, professional development and research skills using lifelong learning strategies.	Generic
PLO10	Develop potential commercialisation research output.	Generic
PLO11	Demonstrate adherence to legal, ethical and professional codes of practice in the field of Rehabilitation Technology and research activities.	Generic

Year	Code	Description	Credit
1	MMBR 1100	Research	0
	MMBR 1200	Research	0
2	MMBR 2100	Research	0
	MMBR 2200	Research	0
3	MMBR 3100	Research	0
	MMBR 3200	Research	0
4	MMBR 4100	Research	0
	MMBR 4200	Research	0

General Elective University Course (Compulsory)		
Code Course Credit		Credit
UMBP 0010	Research Methodology	HW
U*** ***3	General Elective University Course	3

Master of Philosophy Thesis Submission Requirement

1. Notice of Thesis Submission (NHT)

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

Notice of Thesis Submission valid period is for one (1) year from the date of JAPSU approval.

When submitting the NHT, students should ensure that their work has reached 60% completion. Students will be required to submit proof of their progress (current thesis draft) through their supervisor.

2. Publication Requirement for Thesis Submission

A master by research candidate may submit his/her thesis for viva-voce provided that he/she has produced **at least one (1) accepted or published** publication from the journal article, conference proceeding or book chapter

Doctor of Philosophy

Programme Specifications

The School of Biomedical Engineering and Health Sciences (SBEHS) offers four Doctor of Philosophy programmes:

- 1. Doctor of Philosophy (Health Science)
- 2. Doctor of Philosophy (Biomedical Engineering)
- 3. Doctor of Philosophy (Biomedical Engineering) Double Degree*

*Universiti Teknologi Malaysia (UTM) and Technical University Ilmenau (TUIL) Germany have collaborated to offer an International Double Degree programme in Biomedical Engineering. This doctorate double degree programme enables student to be awarded with 2 certificates, which are 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). Students are required to spend at least nine (9) months at the partner university.

Programme Features

The three Doctor of Philosophy by research programmes above are offered full-time. A student will carry out research in any one of the research areas 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-supervisor(s) should be appointed from among Graduate Faculty members or may also come from a related industry.

General Information

1. Awarding Institution	Universiti Teknologi Malaysia
2. Teaching Institution	Universiti Teknologi Malaysia
3. Programme Code and Name	PMBE
	Doctor of Philosophy, Field of Research: Biomedical Engineering
	Doctor of Philosophy, Field of Research: Biomedical Engineering - Double Degree
	РМВН
	Doctor of Philosophy, Field of Research: Health Sciences

4. Final Award	Doctor of Philosophy, Field of Research: Biomedical Engineering
	Doctor of Philosophy, Field of Research: Biomedical Engineering - Double Degree
	Doctor of Philosophy, Field of Research: Health Sciences
5. Professional or Statutory Body of Accreditation	Malaysia Qualification Agency
6. Language(s) of Instruction	English
7. Mode of Study (Conventional, distance	Conventional (Research)
8. Mode of operation (Franchise, self-govern,	Self-governing
9. Study Scheme (Full Time/Part Time)	Full Time
10. Study Duration	Minimum: 3 years (6 semesters) Maximum: 8 years (16 semesters)

Entry Requirement

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; OR
- Candidates who are currently registered in a Master's Degree programme at Universiti Teknologi Malaysia, and approved by the Graduate Studies Committee of the respective faculty and the Senate.
- An International student candidate is required to have a minimum qualification of the Test of English as a Foreign Language (TOEFL) of 525 or TOEFL-IBT of 69 or International English Language Test System (IELTS) of band 5.5.

Doctor of Philosophy (Health Science)

- Master's Degree in Rehabilitation Technology, Electrical Engineering, Biomedical Engineering, Mechanical Engineering, Medical Physics, Health Sciences, Sport Sciences with CPA ≥3.0 will be considered for this program; OR
- Related fields with good honour from Universiti Teknologi Malaysia or any other institution of higher learning recognised by the Senate
- An International student candidate is required to have a minimum qualification
 of the Test of English as a Foreign Language (TOEFL) of 525 or TOEFL-IBT of
 69 or International English Language Test System (IELTS) of band 5.5.

Award Requirements

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

All PhD students must undergo first assessment – report and presentation by presenting their research proposal after having completed General Elective University Course and Research Methodology Course. They must also undergo second assessment – report and presentation (mini viva) in the middle of their study to present their progress. Finally, all master by research students must undergo the thesis examination after completing all their research work and fulfilling publication requirements.

Students who opted for the double degree programme must undergo the first assessment at their home university and only the second assessment at their partner university. To be inaugurated by any degree, all students must undergo thesis examination which can be done at least two-months after the second assessment.

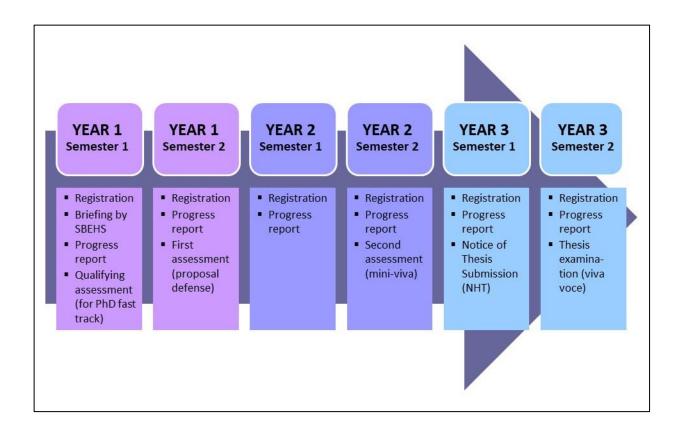
The assessments are scheduled according to the student's appropriate semester of study as follows:

Assessment	Full Time
Progress Report	Week 12 (every semester)
First Assessment – report and presentation (Proposal defence)	Semester 2
Second Assessment – report and presentation (Mini Viva)	Semester 4
Thesis Examination (Viva Voce)	Semester 6

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.

Overall Programme Flowchart

This programme flowchart can be used as a guideline for students to ensure that they are well informed on action items which need to be fulfilled during their active semester. This is also to avoid any late subject registration at the beginning of every semester and to assist all students with their research timeline towards graduate on time (GOT).



Doctor of Philosophy, Field of Research: Biomedical Engineering

Educational Objectives (PEO)

PEO measures the quality of the programme by describing the expected achievement of working graduates within three to five years after graduation.

PEO	Programme Educational Objectives
PEO1	Mastery of knowledge and competency in advanced areas of Biomedical Engineering.
PEO2	Professionalism and high standards of ethical conducts within organization and society.
PEO3	Responsive to changing situations by continuously acquiring new knowledge and skills.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

PLO	Intended Learning Outcomes	Skill Classification
PLO1	Synthesize, critique, apply, and extend in-depth relevant knowledge independently using innovative techniques, tools, and skills in the field of Biomedical Engineering as a basis for research to produce new ideas and solution.	Technical
PLO2	Create new knowledge/theories/ solutions/practice through independent research and originality that satisfies international standards within the field of Biomedical Engineering using the latest techniques, tools, and skills.	Technical
PLO3	Integrate highly advanced, specialized research methodologies based on the forefront knowledge and latest development in the field of Biomedical Engineering to solve complex research problems with a reasonable degree of originality.	Technical
PLO4	Demonstrate decent collaboration with peers, scholarly communities and society at large in the relevant field of expertise and research.	Generic
PLO5	Communicate effectively the knowledge, skills, ideas and research findings using appropriate methods to peers, scholarly communities, and societies through various medium.	Generic

PLO6	Use, improve existing or develop new appropriate tools or methodologies using a broad range of digital technology, media, and software to support and enhance research activities.	Generic
PLO7	Demonstrate skills in designing, critical evaluation, and analysing numerical and graphical data using quantitative or qualitative tools to support and enhance research activities.	Generic
PLO8	Demonstrate leadership, professionalism and management skills, and take full responsibility for own work, and significantly for others in the research organization.	Generic
PLO9	Demonstrate the ability to manage and enhance own self- and where relevant be accountable for overall management of one's research organization and professional development.	Generic
PLO10	Develop potential commercialisation research output.	Generic
PLO11	Demonstrate adherence to legal, professional and contribute to the development of ethical sound codes of practice.	Generic

Year	Code Description		Credit
1	PMBE 1100	Research	0
	PMBE 1200	Research	0
2	PMBE 2100	Research	0
	PMBE 2200	Research	0
3	PMBE 3100	Research	0
	PMBE 3200	Research	0
4	PMBE 4100	Research	0
	PMBE 4200	Research	0
5	PMBE 5100	Research	0
	PMBE 5200	Research	0
6	PMBE 6100	Research	0
	PMBE 6200	Research	0
7	PMBE 7100	Research	0
	PMBE 7200	Research	0
8	PMBE 8100	Research	0
	PMBE 8200	Research	0

General Elective University Course (Compulsory)				
Code Course Credit				
UMBP 0010	Research Methodology	HW		
U*** ***3	3			

Doctor of Philosophy, Field of Research: Health Science

Educational Objectives (PEO)

PEO measures the quality of the programme by describing the expected achievement of working graduates within three to five years after graduation.

PEO	Programme Educational Objectives
PEO1	Mastery of knowledge and competency in advanced areas of Engineering and Health Science.
PEO2	Professionalism and high standards of ethical conducts within organization and society.
PEO3	Responsive to changing situations by continuously acquiring new knowledge and skills.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

PLO	Intended Learning Outcomes	Skill Classification
PLO1	Synthesize, critique, apply, and extend in-depth relevant knowledge independently using innovative techniques, tools, and skills in the field of Health Science as a basis for research to produce new ideas and solution.	Technical
PLO2	Create new knowledge/theories/ solutions/practice through independent research and originality that satisfies international standards within the field of Health Science using the latest techniques, tools, and skills.	Technical
PLO3	Integrate highly advanced, specialized research methodologies based on the forefront knowledge and latest development in the field of Health Science to solve complex research problems with a reasonable degree of originality.	Technical
PLO4	Demonstrate decent collaboration with peers, scholarly communities, and society at large in the relevant field of expertise and research.	Generic
PLO5	Communicate effectively the knowledge, skills, ideas and research findings using appropriate methods to peers, scholarly communities, and societies through various medium.	Generic

PLO6	Use, improve existing or develop new appropriate tools or methodologies using a broad range of digital technology, media, and software to support and enhance research activities.	Generic
PLO7	Demonstrate skills in designing, critical evaluation, and analysing numerical and graphical data using quantitative or qualitative tools to support and enhance research activities.	Generic
PLO8	Demonstrate leadership, professionalism, and management skills, and take full responsibility for own work, and significantly for others in the research organization.	Generic
PLO9	Demonstrate the ability to manage and enhance own self- and where relevant be accountable for overall management of one's research organization and professional development.	Generic
PLO10	Develop potential commercialisation research output.	Generic
PLO11	Demonstrate adherence to legal, professional and contribute to the development of ethical sound codes of practice.	Generic

Year	Code Description		Credit
1	PMBH 1100	Research	0
	PMBH 1200	Research	0
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	PMBH 4200	Research	0
5	PMBH 5100	Research	0
	PMBH 5200	Research	0
6	PMBH 6100	Research	0
	PMBH 6200	Research	0
7	PMBH 7100	Research	0
	PMBH 7200	Research	0
8	PMBH 8100	Research	0
	PMBH 8200	Research	0

General Elective University Course (Compulsory)				
Code Course Credit				
UMBP 0010	Research Methodology	HW		
U*** ***3	3			

Doctor of Philosophy Thesis Submission Requirement

1. Notice of Thesis Submission (NHT)

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

Notice of Thesis Submission valid period is for one (1) year from the date of JAPSU approval.

When submitting the NHT, students should ensure that their work has reached 60% completion. Students will be required to submit proof of their progress (current thesis draft) through their supervisor.

2. Publication Requirement for Thesis Submission

<u>Publication Requirement for Regular Thesis Submission (6th to 16th semester)</u>
A doctoral candidate may submit his/her thesis for viva-voce when he/she has produced at least one (1) article accepted or published in a journal indexed in Web of Science OR at least two (2) articles accepted or published in a journal indexed in SCOPUS/ERA/Journal listed in myJurnal (Malaysian Journal Management System) from MyCite (Malaysian Citation Centre).

Publication Requirement for Early Thesis Submission (5th semester)

A doctoral candidate may submit his/her thesis for viva-voce when he/she has produced at least two (2) articles accepted or published in a journal indexed in Web of Science/SCOPUS/ERA.

Details on English Language Requirements for Postgraduate Programmes

An International student candidate is required to have a minimum qualification of the Test of English as a Foreign Language (TOEFL) of 525 or TOEFL-IBT of 69 or International English Language Test System (IELTS) of band 5.5.

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.

Applicants who do not meet the English proficiency requirements of their chosen programme at Universiti Teknologi Malaysia (UTM) can improve their English at Intensive English Programme (IEP) at Language Academy, UTM or CIEP at ELS Language Centers in Malaysia.

UTM accepts IELTS Level 5.5 and above upon completion of IEP conducted by Language Academy, UTM or ELS English Certificate (level 107) as an ENGLISH LANGUAGE ENTRY REQUIREMENTS FOR INTERNATIONAL STUDENTS.

Students who choose to attend IEP (Language Academy, UTM) must attain IELTS 5.5 or attend ELS and must pass the required English Course(s) before starting their programmes in UTM.

Candidates who did their Bachelor or Master or PhD from the following countries are exempted from the UTM English language requirements. The countries are as follows:

Anguilla	Antigua and Barbuda	Australia	Bangladesh	Bermuda
British Virgin Island	Bahamas	Barbados	Canada	Cayman Island
Christmas Island	Cook Island	Falkland Islands	Fiji	Guernsey
Guam	Gibraltar	Grenada	Guyana	Ghana
Hong Kong	India	Isle of Man	Ireland	Liberia
Jersey	Jamaica	Kiribati	Kenya	Montserrat
Malawi	Malta	Marshall Islands	Mauritius	Niue
Micronesia	Namibia	Nauru	New Zealand	Philippines
Nigeria	Norfolk Island	Papua New Guinea	Pakistan	Saint Kitts and Nevis
Puerto Rico	Palau	Rwanda	Singapore	Seychelles
Saint Lucia	Saint Vincent and the Grenadines	St Helena	Samoa	Swaziland
Sierra Leone	Solomon Island	South Africa	Sudan	Uganda
Tanzania	Tonga	Trinidad & Tobago	Turks and Caicos Island	United Kingdom
US Virgin Islands	United States of America	Zambia	Zimbabwe	

Exemption for candidates from Indonesia, Brunei and other nations that use Malay as medium of communication are exempted from UTM English language requirements based on the following conditions:

- The candidate intends to register for a MSc. And PhD programme by research.
- The candidate declares that the thesis/dissertation will be written in Malay and approved by the supervisor.

SKBSK Postgraduate Handbook 2021/2022 Editorial Board

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