Department of Biomedical Engineering and Health Sciences (DBEHS)

Faculty of Electrical Engineering

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INTRODUCTION

Postgraduate Programmes Offered

The Department 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 **coursework** or **research**.

For the full-time Master of Science taught course programme, the normal study duration is 3 to 6 semesters while the study duration for Master and Doctor of Philosophy programmes are 3 to 8 semesters (1.5 - 4 years) and 6 to 16 semesters (3 - 8 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:

- UANP6013 Informatics in Society
- UBSS6013 Organization Behaviour and Development
- UBSS6023 Business Ethics, Responsibility and Sustainability
- UECS6013 IT Project Management
- UHPS6013 Dynamics of Leadership
- UHSM6013 Seminar on Global Development, Economic and Social Issues
- URSP6023 ICT Ethics and Society
- URTS6013 Environmental Ethics

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

- UHLM6013 Malay Language for Postgraduates
- UHMZ6023 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**): **UMBP0010** - Research Methodology. Research Methodology course is offered as an intensive course during the mid-semester break and must be completed prior to the proposal defense.

Master Degree Programmes

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

Doctoral Degree Programmes

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

***Mode:**

1 = Coursework, 2 = Research

*** Research Field:**

A= Biomedical Engineering
B= Rehabilitation Technology
C= Health Sciences

MASTER OF PHILOSOPHY (BY RESEARCH)

Programme Specifications

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

1. Master of Philosophy, Field of Research: Rehabilitation Technology
2. Master of Philosophy, Field of Research: Biomedical Engineering
3. Master of Philosophy, Field of Research: 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 two certificates, which are Master of Philosophy, Field of Research: Biomedical Engineering from UTM and/or Master in Biomedical Engineering (MSc) from TUIL. The students are required to spend at least seven (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	**MMBE** ▪ 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	**MMBE** ▪ 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
5. Professional or Statutory Body of Accreditation	Malaysia Qualification Agency
6. Language(s) of Instruction	English
7. Mode of Study (Conventional, distance learning, etc)	Conventional (Research)
8. Mode of operation (Franchise, self-govern, etc)	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

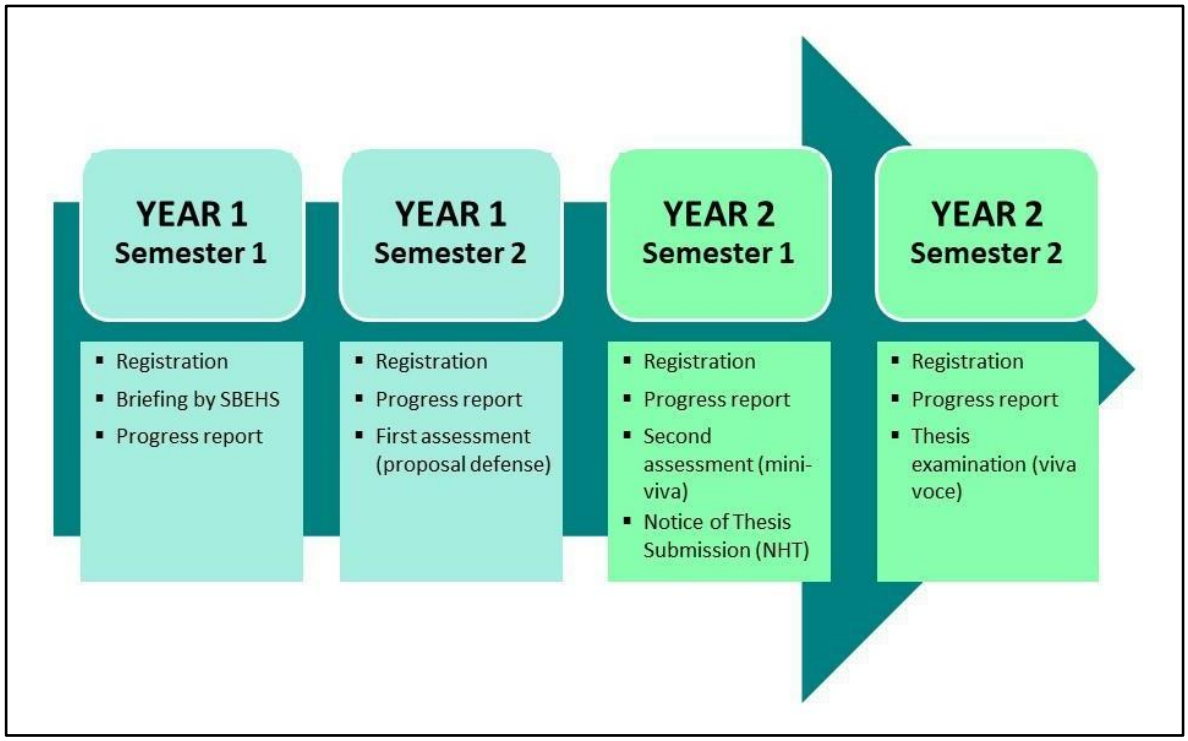
Students should send in the Notice of Thesis Submission to the School/Faculty at least three (3) months prior to the date of submitting their thesis.

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).



Flowchart for Master of Philosophy Programmes

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

Course Menu

Master of Philosophy (Biomedical Engineering)

Year	Code	Description	Credit
1	MMBE1100	Research	0
	MMBE1200	Research	0
2	MMBE2100	Research	0
	MMBE2200	Research	0
3	MMBE3100	Research	0
	MMBE3200	Research	0
4	MMBE4100	Research	0
	MMBE4200	Research	0

General Elective University Course (Compulsory)		
Code	**Course**	**Credit**
UMBP0010	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

Master of Philosophy (Rehabilitation Technology)

Year	Code	Description	Credit
1	MMBR1100	Research	0
	MMBR1200	Research	0
2	MMBR2100	Research	0
	MMBR2200	Research	0
3	MMBR3100	Research	0
	MMBR3200	Research	0
4	MMBR4100	Research	0
	MMBR4200	Research	0

General Elective University Course (Compulsory)		
Code	**Course**	**Credit**
UMBP0010	Research Methodology	HW
U* ***3**	General Elective University Course	3

Master 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 (BY RESEARCH)

Programme Specifications

The Department of Biomedical Engineering and Health Sciences (DBEHS) offers four Doctor of Philosophy programmes:

1. Doctor of Philosophy, Field of Research: Health Science
2. Doctor of Philosophy, Field of Research: Biomedical Engineering
3. Doctor of Philosophy, Field of Research: 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, Field of Research: 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 **PMBH** ▪ Doctor of Philosophy, Field of Research: Health Sciences
4. Final Award	**PMBE** ▪ Doctor of Philosophy, Field of Research: Biomedical Engineering ▪ Doctor of Philosophy, Field of Research: Biomedical Engineering - Double Degree **PMBH** ▪ 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 learning, etc)	Conventional (Research)
8. Mode of operation (Franchise, self-govern, etc)	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 the 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 a 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

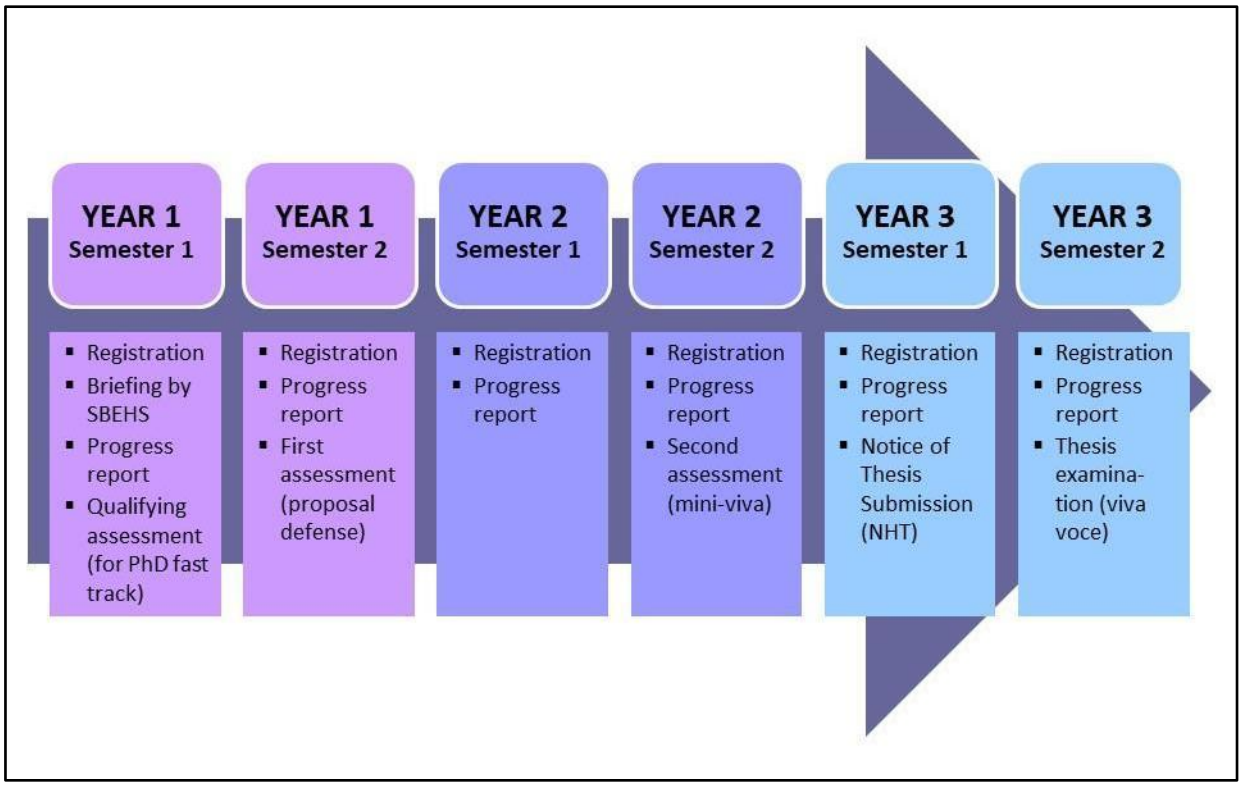
Students should send in the Notice of Thesis Submission to the Faculty/School at least three (3) months prior to the date of submitting their thesis.

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).



Flowchart for Doctor of Philosophy Programmes

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 conduct 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 solutions.	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

Course Menu

Doctor of Philosophy, Field of Research: Biomedical Engineering

Year	Code	Description	Credit
1	PMBE1100	Research	0
	PMBE1200	Research	0
2	PMBE2100	Research	0
	PMBE2200	Research	0
3	PMBE3100	Research	0
	PMBE3200	Research	0
4	PMBE4100	Research	0
	PMBE4200	Research	0
5	PMBE5100	Research	0
	PMBE5200	Research	0
6	PMBE6100	Research	0
	PMBE6200	Research	0
7	PMBE7100	Research	0
	PMBE7200	Research	0
8	PMBE8100	Research	0
	PMBE8200	Research	0

General Elective University Course (Compulsory)		
Code	**Course**	**Credit**
UMBP0010	Research Methodology	HW
U* ***3**	General Elective University Course	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 conduct 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 solutions.	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

Course Menu

Doctor of Philosophy, Field of Research: Health Science

Year	Code	Description	Credit
1	PMBH1100	Research	0
	PMBH1200	Research	0
2	PMBH2100	Research	0
	PMBH2200	Research	0
3	PMBH3100	Research	0
	PMBH3200	Research	0
4	PMBH4100	Research	0
	PMBH4200	Research	0
5	PMBH5100	Research	0
	PMBH5200	Research	0
6	PMBH6100	Research	0
	PMBH6200	Research	0
7	PMBH7100	Research	0
	PMBH7200	Research	0
8	PMBH8100	Research	0
	PMBH8200	Research	0

General Elective University Course (Compulsory)		
Code	**Course**	**Credit**
UMBP0010	Research Methodology	HW
U* ***3**	General Elective University Course	3

PhD 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 doctoral candidate may submit his/her thesis for viva-voce provided that he/she has produced at least one (1) refereed article or two (2) indexed conference proceedings accepted or published in SCOPUS/ERA and WOS index.

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 a PhD programme by research.
- The candidate declares that the thesis/dissertation will be written in Malay and approved by the supervisor.

MASTER OF SCIENCE (BIOMEDICAL ENGINEERING)

MASTER OF SCIENCE (BIOMEDICAL ENGINEERING)

Programme Specifications

DBEHS offers the MSc (Biomedical Engineering) programme by coursework mode and in full-time. The MSc (Biomedical Engineering) can be completed within three (3) semesters (1½ 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 (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 (Taught Courses)
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

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

Classification	Credit
University General Elective Courses (U**S6**3) (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
Research Methodology for Biomedical Engineering	3
Programme Elective Courses	
Anatomy and Physiology for Engineers	3
Biomedical Fluid Mechanics	3
Introduction to Biostatistics	3
Medical Imaging and Image Processing	3
Healthcare Technology Management	3
Neuroscience	3
Pathophysiology	3
Advanced Biosignal Processing	3
Rehabilitation Engineering	3
Tissue Engineering	3
Cardiovascular Engineering	3
Genetic Engineering	3
Choose 4 courses only	12
Master Project	
Master Project 1	4
Master Project 2	8
Total Credit	**45**

Course Classification

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

Regulation of Assessment

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	

Course Menu

OCTOBER INTAKE

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
MEBC1003	Biomedical Measurement Technique	3	
MEBC1013	Diagnostic and Therapeutic Technology	3	
MEBC1023	Advanced Biomedical Engineering	3	
MEBC1**3	Elective 1	3	
U**S6**3	University General Course	3	
MEBC0013	Research Methodology for Biomedical Engineering	3	
Total Credit		**18**	
Cumulative Credits		**18**	

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
MEBC1033	Medical Informatics	3	
MEBC1043	Biomechanics	3	
MEBC1184	Master Project 1	4	
MEBC1**3	Elective 2	3	
MEBC1**3	Elective 3	3	
Total Credit		**16**	
Cumulative Credits		**34**	

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
MEBC1198	Master Project 2	8	
MEBC1**3	Elective 4	3	
Total Credit		**11**	
Cumulative Credits		**45**	

FEBRUARY INTAKE

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
MEBC1033	Medical Informatics	3	
MEBC1043	Biomechanics	3	
MEBC1**3	Elective 1	3	
MEBC1**3	Elective 2	3	
U**S6**3	University General Elective Course	3	
MEBC0013	Research Methodology for Biomedical Engineering	3	
Total Credit		**18**	
Cumulative Credits		**18**	

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
MEBC1003	Biomedical Measurement Technique	3	
MEBC1013	Diagnostic and Therapeutic Technology	3	
MEBC1023	Advanced Biomedical Engineering	3	
MEBC1**3	Elective 3	3	
MEBC1184	Master Project 1	4	
Total Credit		**16**	
Cumulative Credits		**34**	

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
MEBC1198	Master Project 2	8	MEBC1198
MEBC1**3	Elective 4	3	MEBC1**3
Total Credit		**11**	
Cumulative Credits		**45**	

Elective Course	
Code	**Course**
MEBC1053	Anatomy and Physiology for Engineers
MEBC1063	Biomedical Fluid Mechanics
MEBC1073	Introduction to Biostatistics
MEBC1083	Healthcare Technology Management
MEBC1093	Medical Imaging and Image Processing
MEBC1103	Neuroscience
MEBC1113	Pathophysiology
MEBC1123	Advanced Biosignal Processing
MEBC1143	Rehabilitation Engineering
MEBC1153	Cardiovascular Engineering
MEBC1163	Tissue Engineering
MEBC1173	Biomedical Electronic System Design
MEBC1183	Biomaterials Characterization and Analysis
MEBC1193	Genetic Engineering
University Elective Course	
U**S6**3	University Elective

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.

Code	Intended Educational Objectives
PEO1	Mastery of knowledge and competency in advanced areas of Biomedical Engineering field.
PEO2	Practice professionalism and high standards of ethical conduct 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:

Code	Intended Learning Outcomes
PLO1	Attain new frontiers of knowledge in the field of Biomedical Engineering.
PLO2	Solve complex problems critically and integratively using systematic approaches.
PLO3	Apply practical skills to solve problems in the field of Biomedical Engineering.
PLO4	Demonstrate effective collaboration with stakeholders professionally.
PLO5	Communicate effectively the knowledge, skills, and ideas using appropriate methods to peers, experts and communities.
PLO6	Use digital technologies and appropriate softwares competently to enhance study and practice.
PLO7	Evaluate numerical and graphical data critically using quantitative or qualitative tools in solving problems.
PLO8	Demonstrate leadership, autonomy and responsibility in managing resources.
PLO9	Engage self-advancement through continuous learning or professional development.
PLO10	Initiate entrepreneurial projects supported by relevant knowledge and skills.
PLO11	Demonstrate respectable ethical conduct and professionalism skills in an organization and society.

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 courses are not allowed to graduate.

No.	Code	Course	Credit Earned (Jkd)	Credit Counted (Jkk)	Tick (√) If Passed
Engineering Courses					
1	MEBC1003	Biomedical Measurement Technique	3	3	
2	MEBC1013	Diagnostic and Therapeutic Technology	3	3	
3	MEBC1023	Advanced Biomedical Engineering	3	3	
4	MEBC1**3	Elective 1	3	3	
5	MEBC1033	Medical Informatics	3	3	
6	MEBC1043	Biomechanics	3	3	
7	MEBC1184	Master Project 1	4	4	
8	MEBC1**3	Elective 2	3	3	
9	MEBC1**3	Elective 3	3	3	
10	MEBC1198	Master Project 2	8	8	
11	MEBC1**3	Elective 4	3	3	
12	MEBC0013	Research Methodology in Biomedical Engineering	3	3	
		Total Credit	**42**	**42**	
University General Courses					
Kluster 1: Penghayatan Falsafah, Nilai & Sejarah (Faculty of Social Sciences and Humanities)					
1	U***S6**3	University General Course	3	3	
		Total Credit	**45**	**45**	

COURSE SYNOPSIS

MEBC1003 Biomedical Measurement Technique

Synopsis

This course provides the students a complete exposure of various recording mechanisms 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.

MEBC1013 Diagnostic and Therapeutic

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 equipment. At the end of the course, students will be able to learn various techniques that have been used in the healthcare environment, clinical or research.

MEBC1023 Advanced Biomedical Engineering

Synopsis

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.

MEBC1033 Medical Informatics

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.

MEBC1043 Biomechanics

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 orthopaedics (gait analysis, joint replacement) and analysing the various forms of human movement.

MEBC1184 Master Project 1

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 a research proposal and make a presentation which will be evaluated. For the seminar, students will attend paper presentations to expose themselves to research and to gain new knowledge.

MEBC1198 Master Project 2

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.

MEBC0013 Research Methodology for Biomedical Engineering

Synopsis

This course covers the general principles of Research Methodology that are applicable to any discipline. It discusses the fundamental process in conducting 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.

ELECTIVE COURSES

MEBC1053 - Anatomy and Physiology for Engineers

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.

MEBC1063 Biomedical Fluid Mechanics

Synopsis

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

MEBC1073 Introduction to Biostatistics

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 analysing biomedical and public health investigations.

MEBC1083 Healthcare Technology 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 strategic planning as well as technology assessment, facilities planning, procurement, and service or maintenance management.

MEBC1093 Medical Imaging and Image Processing

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 to 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.

MEBC1103 Neuroscience

Synopsis

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, ageing, mental

illness, neurodegenerative diseases, and genomics. An inquiry-based approach will be taken to facilitate student learning of the material.

MEBC1113 Pathophysiology

Synopsis

This course provides concepts of physiology of altered health state, specifically, the changes that accompany injury, syndrome or diseases. Clinical features will be described to provide an overview of pathological aspects of common physiological disorders in the human body. Discussion on the basis of the illustration of the systemic approach for understanding diseases and rational therapeutic design of their diagnosis/treatment through an engineering approach will be addressed in this course.

MEBC1123 Advanced Biosignal Processing

Synopsis

This course presents two fundamental concepts of signal processing: linear systems and stochastic processes. Various estimation, detection and filtering methods are taught and demonstrated on biomedical signals. All methods will be developed to answer concrete questions on specific biomedical signals such as ECG, EEG and etCO2. The focus of the course is a series of labs that provide practical experience in processing biomedical data, with examples from cardiology, neurology, respiratory and speech processing.

MEBC1143 Rehabilitation Engineering

Synopsis

This course will focus on the principles and application of rehabilitation sciences & assistive technology from the rehabilitation engineering perspective. It aims to provide the students with in-depth understanding pertaining to important issues in rehabilitation engineering and equip students with knowledge and skills for the application of science, technology and engineering to the design and development of assistive (adaptive) technology and rehabilitation systems. It will also provide students with an understanding of the nature of problems confronting people with disabilities and an ability to provide technical solutions for these problems. Interdisciplinary interaction and teamworking for optimal disability management will be stressed, with emphasis being given to the role of the rehabilitation engineering professional in the team.

MEBC1153 Cardiovascular Engineering

Synopsis

Cardiovascular Engineering integrates physiology, cell and molecular biology, bioelectricity and biomechanics to describe, understand, and re-engineer the cardiovascular systems. The objective of this course is to provide the students with tools for modelling and understanding of cardiovascular disease development and treatment, and for designing appropriate systems and devices for diagnosis and intervention.

MEBC1173 Biomedical Electronic System Design

Synopsis:

Biomedical Electronic system design covers the design scope from front-end analog circuit design down to back-end digital computation architecture design to form a complete system targeted for biomedical or health care application. The front-end analog circuit design includes signal acquisition and conditioning circuit design, which involves amplifier, analog filter, analog to digital converter and so on. On the other hand, the back-end digital system design involves the design methodology from high-level algorithm down to low-level computing architecture using Register Transfer Level (RTL) design approach to generate a synthesizable circuit. The digital system will be verified in terms of simulation or prototyping on the Field Programmable Gate Array (FPGA) platform.

MEBC1183 Biomaterial Characterization and Analysis

Synopsis

This course is intended to expose the students with the most important characterization instruments to analyze the physico-chemical properties of biomaterials. A range of advanced techniques for the materials characterization analysis, including materials composition, surface morphological, thermal, spectroscopy and chromatography analyses are introduced by discussing the basic underlying principle and the analysis procedures. Several case studies and recording data are evaluated and analyzed to improve the student's understanding in selecting types of characterization instruments in analyzing biomaterials. Depending on the availability and functionality of instruments, lab visits and demonstrations will be scheduled following the class.

MEBC1193 Genetic Engineering

Synopsis

This course will provide students with recent knowledge of genetic engineering. Participants are given information related to cellular and molecular function and those responsible for DNA transcription and translation processes. Additionally, this course will focus on recombinant DNA technology, DNA manipulation, transgenic animals, and the ethics of genetic engineering. The participants will be equipped with basic emphasis on assembling a gene for expression in a cell. More advanced studies of genes appear in high-level classes and may include subjects such as Mendelian genetics, speciation, and evolutionary genetics. This course also equips the participants with social responsibility and ethics for the development of effective genetic manipulation for beneficial purposes.