UTM
UNIVERSITI TEKNOLOGI MALAYSIA

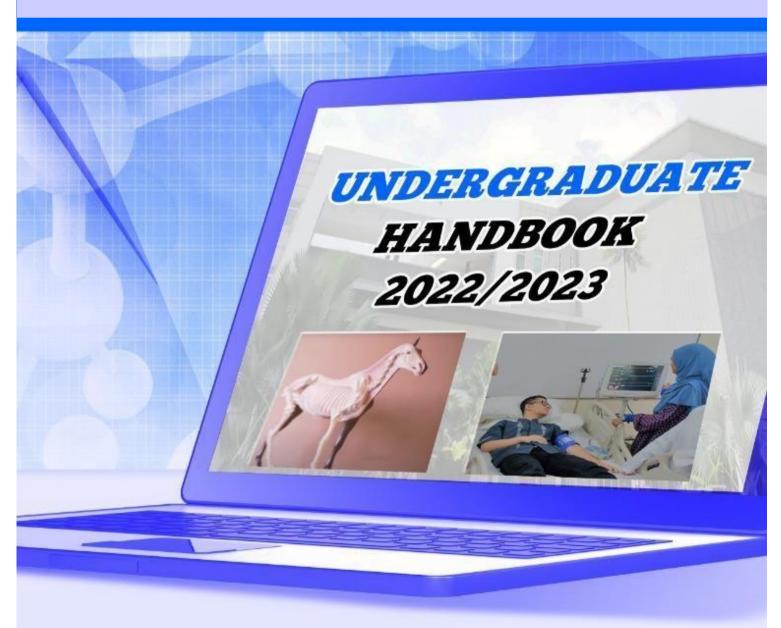**DEPARTMENT OF BIOMEDICAL ENGINEERING AND HEALTH SCIENCES**

FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MALAYSIA

UNDERGRADUATE HANDBOOK 2022/2023

REVISED VERSION 4.0

https://engineering.utm.my/biomedical

TABLE OF CONTENTS

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4

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Bachelor of Biomedical Engineering With Honours (SEBBH)

BACHELOR OF BIOMEDICAL ENGINEERING WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Biomedical Engineering with Honours is offered on a full-time basis. The full-time programme is offered only at the UTM Johor Bahru campus. Student enrolment for full-time programme is subject to the student's entry qualifications and the duration of study is between four (4) to six (6) years.

The curriculum is planned based on a 2-semester per academic session. Generally, students are expected to undertake courses between twelve (12) to eighteen (18) credit hours per semester or equivalent for credit exemption. Assessment is based on coursework and final examinations given throughout the semester.

General Information

1. Awarding Institution	Universiti Teknologi Malaysia
2. Teaching Institution	Universiti Teknologi Malaysia
3. Programme Name	Bachelor of Biomedical Engineering
4. Final Award	Bachelor of Biomedical Engineering with Honours
5. Programme Code	SEBBH-02
6. Professional or Statutory Body of Accreditation	Malaysian Qualification Agency Engineering Accreditation Council
7. Language(s) of Instruction	English and Bahasa Melayu
8. Mode of Study (Conventional, distance learning, etc)	Conventional
9. Mode of operation (Franchise, self-govern, etc)	Self-governing
10. Study Scheme (Full Time/Part Time)	Full Time
11. Study Duration	Minimum: 4 years Maximum: 6 years

COURSE CLASSIFICATION

NO	CLASSIFICATION	CREDIT HOURS	PERCENTAGE
i.	**University Courses** Malaysia Core Value Value & Identity Global Citizen Communication Skills Enterprising Skills	 4 2 2 6 2	 11.6%
ii.	Faculty & Programme Core	106	77.4%
iii.	Programme Electives	9	6.6%
iv.	Free Electives	6	4.4%
	TOTAL CREDITS	**137**	**100%**
A	**Engineering Courses** a) Lecture/ Project/ Laboratory b) Industrial Training c) Final Year project	 93 5 6	 75.9%
	Total Credit Hours for Part A	**104**	
B	**Related Courses** a) Management/ Law/ Humanities/ Ethics/ Economy b) Language c) Co-Curriculum d) Free Electives (cross Faculty)	 19 6 2 6	 24.1%
	Total Credit Hours for Part B	**33**	
	Total Credit Hours for Part A and B	**137**	100%
	Total Credit Hours to Graduate	**137 credit hours**	

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Biomedical engineers with competency to work in biomedical industry.
PEO2	Biomedical engineers with leadership positions in the biomedical engineering sector.
PEO3	Biomedical engineers embrace professional development through biomedical engineering practice and life-long learning.
PEO4	Biomedical engineers who conduct their professional work ethically and contribute towards societal responsibilities.

Programme Learning Outcomes (PLO)

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

Code	Intended Learning Outcomes
PLO1	Apply knowledge of science and engineering fundamentals to the solution of complex biomedical engineering problems.
PLO2	Identify, formulate and solve complex biomedical engineering problems through structured literature research and scientific approach using first principles of mathematics, natural sciences and engineering sciences.
PLO3	Design solutions for complex biomedical engineering problems with consideration for public health and safety, cultural, societal, and environmental needs.
PLO4	Conduct investigation into complex Biomedical Engineering problems using research-based knowledge and methodology to provide scientific conclusions.
PLO5	Select and apply appropriate techniques, resources, and modern medical engineering and IT tools, to complex biomedical engineering activities, with an understanding of the limitations.
PLO6	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues to professional biomedical engineering practice.
PLO7	Understand the role of biomedical engineers in society regarding social, cultural, environmental and global responsibilities for sustainable development.
PLO8	Ability to evaluate and make appropriate professional decisions by taking into account ethical principles, social and environmental responsibilities.
PLO9	Communicate effectively on complex engineering activities through written, oral, visual and graphical forms to colleagues and society at large.

PLO10	Develop leadership attributes and be committed in achieving common goals in a multi-disciplinary setting using good team working skills.
PLO11	Ability to adapt with the latest development within the biomedical engineering field for life-long learning and continuous knowledge improvement.
PLO12	Demonstrate knowledge and understanding of management and financial aspects of biomedical engineering and develop entrepreneurship skills

Entry Requirements

For Malaysian Students

STPM Holders:
1. A pass with credit in Bahasa Melayu/ Bahasa Malaysia at SPM level, **and**
2. A pass in Malaysian Higher School Certificate (STPM) with at least C grade (CGPA 2.00) in General Paper and C grade (CGPA 2.00) in any two of the taken subjects in the STPM, **and**
3. Attained a minimum Band 2 in Malaysian University English Test (MUET).

STAM Holders:
1. A pass with credit in Bahasa Melayu/ Bahasa Malaysia at SPM level, **and**
2. A pass in STAM Qualification for at least Jayyid level, **and**
3. Attained a minimum Band 2 in Malaysian University English Test (MUET).

Matric/ Asasi Holders:
1. A pass with credit in Bahasa Melayu/ Bahasa Malaysia at SPM level, **and**
2. A pass in Malaysian Matriculation Certificate / Foundation with minimum CGPA of 2.00, **and**
3. Attained a minimum Band 2 in Malaysian University English Test (MUET).

A-Level /IB/ Ausmat Holders:
1. A pass with credit in Bahasa Melayu/Bahasa Malaysia at SPM level / Equivalent, **and**
2. Hold A – Level / International Baccalaureate / Australian Matriculation (Ausmat) Certificate, **and**
3. Attained a minimum Band 2 in Malaysian University English Test (MUET)/ Band 5.5 in IELTS/ Score of 500 in TOEFL PBT/ Score of 59 in TOEFL IBT.

Diploma Holders:
1. A pass with credit in Bahasa Melayu/ Bahasa Malaysia at SPM level, **and**
2. Hold Diploma / Equivalent recognized by Malaysian government and approved by the University Senate or a pass in Malaysian Higher School Certificate (STPM) with at least C Grade (CGPA 2.00) in General Paper and C Grade (CGPA 2.00) in any two of the taken subject in the STPM, **and**
3. Attained a minimum Band 2 in Malaysian University English Test (MUET).

Diploma Vokasional Holders:
1. Hold Sijil Vokasional Malaysia (SVM) equivalent to Sijil Pelajaran Malaysia (SPM) with at least Academic PNGK 2.00, at least PNGK 2.67 and competent vokasional modules and credit in Bahasa Melayu SVM kod 1104, **and**
2. Hold Diploma Vokasional recognized by Malaysian government and approved by the University Senate, **and**

3. Attained a minimum Band 2 in Malaysian University English Test (MUET).

<u>Special Requirements for the Programme</u>
1. Comply to university general requirements, **and**
2. Comply with special requirements for the programme.
3. Do not have any physical disabilities

Please refer to *https://admission.utm.my/entry-requirements-ug- malaysian/* for further details.

For International Students

<u>General Entry Requirements:</u>

1. A Senior High School Certificate or equivalent pre - university qualifications. Refer to https://admission.utm.my/general-entry-requirement/ for the entry requirements based on country, **and**
2. Pass the English proficiency requirements.
3. Attained a minimum Band 3 in Malaysian University English Test (MUET)/ Band 5.5 in IELTS/ Score of 46 in TOEFL iBT.
4. Pass the health requirements.

<u>Health Requirements:</u>

International students are required to undergo a compulsory medical check up in Malaysia (managed by the University) and you must be certified as being in good health and free from contagious/ infectious diseases or illness that will adversely affect your study. International students from the yellow fever endemic areas without a valid immunisation certificate will be immediately quarantined on arrival for 6 days minus the period of travel. The university has the right to withdraw this offer or to terminate you from your study if you are found to suffer from or to be a carrier of contagious/ infectious diseases, or to suffer from a medical condition requiring continuous medical care that will adversely affect your study at UTM. Refer to https://admission.utm.my/health-requirements/ for the details health requirements.

<u>English Language Requirements</u>

Please refer to https://admission.utm.my/english-language-requirements-3/ for details on English Language Requirements.

Note: -
Year of entry and duration of study will be based on the credit exemptions or credit transfer awarded by the university.

Marking and Assessment

The Relationship Involving Marks, Grades and Point Values			
Marks	**Grade**	**Point**	**Result Status**
90 - 100	A+	4.00	PASS
80 - 89	A	4.00	
75 - 79	A-	3.67	
70 - 74	B+	3.33	
65 - 69	B	3.00	
60 - 64	B-	2.67	
55 - 59	C+	2.33	
50 - 54	C	2.00	
45 - 49	C-	1.67	
40 - 44	D+	1.33	
35 - 39	D	1.00	FAIL
30 - 34	D-	0.67	
00 - 29	E	0.00	

Award Requirements

To graduate, students must:
- Attain a total of not less than 136 credit hours with a minimum CGPA of 2.0.
- Professional Skill Certificate (PSC) – **Three** compulsory courses and **two** elective courses.

To pass each course, students must:
- Attain passing grade which is D+ (40 marks and above); and attain 20% and above in final examination.
- Attain HL (Passing) grade in course registered with Pass-Fail status (HW).

Professional Skills Certificate (PSC)

Students must enroll in **three (3)** compulsory and **two (2)** elective courses offered by the Centres of Excellence For Academic and Experiential Learning (CAEL) in the University as part of the award requirement. These certificate courses can be referred in the following table:

No	Course Name (Compulsory)	Course Code
1	Design Thinking for Entrepreneur	GLRB0010
2	Talent and Competency Management	GLRM0010
3	English Communications Skill for Graduating Students (ECS)	GLRL0010

No	Course Names (Electives)	Course Code
1	Data Analytics for Organization	GLRT0010
2	Professional Ethics and Integrity	GLRM0020
3	Construction Measurement (Mechanical & Electrical)	GLRT0020
4	OSHE For Engineering Industry and Laboratory	GLRT0030
5	OSHE For Construction Industry and Laboratory Works	GLRT0040
6	Quality Management for Built Environment and Engineering Professionals	GLRT0050
7	Safety and Health Officer Introductory Course	GLRT0060

Student Exchange Programme

Student Exchange programme is a programme which will allow the students to spend one or two semesters at universities abroad and take courses in a regular semester with credit transfer opportunities. Students are encouraged to study at universities partners all around the world.

Students who choose to undertake a Student Exchange programme will do so on an Exchange-basis, i.e., students' study overseas at one of UTM's many partner universities for one or two semesters. In the student exchange programme, the student will study overseas at one of UTM's many partner universities which students usually entitled for tuition fees waiver depend on the available quotas.

The programme is open to the undergraduates with the following conditions:

(i)   Registered as an active student at Universiti Teknologi Malaysia
(ii)   Must complete at least one-semester study in UTM (one semester) and must NOT be in the last semester of study in UTM.
(iii)   Have a grade point average of 3.0 or higher. The students with grade point average lower than 3.0 are required to provide UTM international with a supporting letter/approval letter from the respective faculty.

For detailed information, please refer to UTM international website at https://www.utm.my/international/

Study Abroad Programme

Student Abroad programme is a programme which will allow the students to spend one or two semesters at universities abroad and take courses in a regular semester with credit transfer opportunities. Students are encouraged to study at universities partners all around the world.

Students who choose to undertake a Study Abroad programme will study overseas at a non-partner university of their choice and need to pay tuition fees to the host university. The students apply to the host university with the assistance of the UTM International and will continue to pay the tuition fees to UTM.

The programme is open to the undergraduates with the following conditions:

(i) Registered as an active student at Universiti Teknologi Malaysia

(ii) Must complete at least one-semester study in UTM (one semester) and must NOT be in the last semester of study in UTM.

(iii) Have a grade point average of 3.0 or higher. The students with grade point average lower than 3.0 are required to provide UTM international with a supporting letter/approval letter from the respective faculty.

For detailed information, please refer to UTM international website at https://www.utm.my/international/

COURSE MENU- October Intake Semester 1, 2022/2023

YEAR 1 (SEMESTER 1)			
Code	**Courses**	**Credit**	**Pre-req**
SEBB1012	Introduction to Biomedical Engineering	2	
SEBB1513	Basic Anatomy and Physiology	3	
SEBB1313	Statics and Dynamics	3	
SSCE1693	Engineering Mathematics 1	3	
SEEU/SEE1023	Circuit Theory	3	
ULRS1012	Value and Identity	2	
*UHLB1112	English Communication Skills	(2)	HL
TOTAL CREDIT HOURS		**16 (18)**	

Not applicable to students with MUET band 4 and above or equivalent (HL).

YEAR 1 (SEMESTER 2)			
Code	**Courses**	**Credit**	**Pre-req**
SEBB1523	Advanced Anatomy and Physiology	3	SEBB 1513
SEEU/SEEE 1223	Digital Electronics	3	
SSCE1793	Differential Equations	3	
SEEU/SEEE1063	Electronic Devices	3	
*ULRS1182	Appreciation of Ethics and Civilizations	2	
UHLM1012	Malay Language for Communication 2 *(For International students ONLY)*	(2)	
TOTAL CREDIT HOURS		**14(16)**	

For International students:
Choose 1 (one) course from 2 (two) options: either ULRS 1182 (Year 1 Semester 2) or ULRS 1022 (Year 2 Semester 2)

YEAR 2 (SEMESTER 1)			
Code	**Courses**	**Credit**	**Pre-req**
SEBB2033	Computer Programming for Biomedical Engineer	3	
SEEU/SEEE2073	Signals and Systems	3	
SEBB3023	Biomedical Imaging	3	
SEBB2712	Laboratory 1	2	
SSCE1993	Engineering Mathematics 2	3	SSCE 1693
UKQF2XX2	Service Learning & Community Engagement Course	2	
UHLB2122	Professional Communication Skills 2	2	UHLB 1112
TOTAL CREDIT HOURS		**18**	

YEAR 2 (SEMESTER 2)			
Code	Courses	Credit	Pre-req
SEEU/SEEE3133	System Modelling and Analysis	3	SEEU/SEEE2073
SEEU/SEEE2523	Electromagnetic Field Theory	3	SSCE1993
SSCE2193	Engineering Statistics	3	
SEBB3033	Microprocessor Systems	3	
UHLB2122	Basic Rehabilitation	3	
*ULRS1022	Philosophy and Current Issues	2	
TOTAL CREDIT HOURS		**17**	

*For International students:

Choose 1 (one) course from 2 (two) options: either ULRS 1182 (Year 1 Semester 2) or ULRS 1022 (Year 2 Semester 2)

YEAR 3 (SEMESTER 1)			
Code	Courses	Credit	Pre-req
SEBB3423	Clinical Engineering	3	
SEBB3712	Laboratory 2	2	
SEEU/SEEE3533	Communication Principles	3	SEEU/SEE2073
SSCE2393	Numerical Methods	3	
UHLB3132	Professional Communication Skills 2	2	UHLB 2122
UHL*1112	Elective: Communication Foreign Language	2	
S***XXX3	Free Electives (Cross Faculty)	3	
TOTAL CREDIT HOURS		**18**	

YEAR 3 (SEMESTER 2)			
Code	Courses	Credit	Pre-req
SEBB3323	Solid Mechanics	3	
SEEU/SEEE3063	Electronic Circuits and Systems	3	SEEU/SEEE1063
SEBB3722	Laboratory 3	2	
SEBB3313	Biomedical Materials	3	
SEBB3043	Instrumentation and Measurement in Biomedical	3	
ULRS3032	Entrepreneurship and Innovation	2	
S***XXX3	Free Electives (Cross Faculty)	3	
TOTAL CREDIT HOURS		**19**	

*Approved by Director

SHORT SEMESTER			
Code	**Courses**	**Credit**	**Pre-req**
SEBB4915	Industrial Training (HW)	5	SEBB 3423
	TOTAL CREDIT HOURS	**5**	

YEAR 4 (SEMESTER 1)			
Code	**Courses**	**Credit**	**Pre-req**
SEBB4313	Biomedical Systems Design	3	SEBB3722
SEBB4413	Biochemistry for Biomedical Engineers	3	
SEBB4712	Laboratory 4	2	
SEBB4812	Project Part 1	2	
SEBB4023	Biomedical Signal Processing	3	SEEU/SEEE2073
SEBB4**3	Elective 1	3	
SEBB5**3	PRISMS Elective 1		
	TOTAL CREDIT HOURS	**16**	

YEAR 4 (SEMESTER 2)			
Code	**Courses**	**Credit**	**Pre-req**
SEBB4824	Project Part 2	4	SEBB 4812
SEBB4**3	Elective 2	3	
SEBB5**3	PRISMS Elective 2		
SEBB4**3	Elective 3	3	
SEBB5**3	PRISMS Elective 3		
SHAS4542	Engineering Management	2	
SEBB4032	Professional Biomedical Engineering Practice	2	
	TOTAL CREDIT HOURS	**14**	

TOTAL CREDIT = 137

COURSE MENU- March Intake Semester 2, 2022/2023

Code	Courses	Credit	Pre-req
YEAR 1 (SEMESTER 1) – Semester 2 2022/2023			
SEEU/SEEE1223	Digital Electronics	3	
SEBB1513	Basic Anatomy and Physiology	3	
SEBB1313	Statics and Dynamics	3	
SSCE1693	Engineering Mathematics 1	3	
ULRS1012	Value and Identity	2	
*UHLB1112	English Communication Skills	(2)	HL
TOTAL CREDIT HOURS		**14 (16)**	

Not applicable to students with MUET band 4 and above or equivalent (HL).

Code	Courses	Credit	Pre-req
YEAR 1 (SEMESTER 2) – Semester 1 2023/2024			
SEBB1523	Advanced Anatomy and Physiology	3	SEBB 1513
SEBB1012	Introduction to Biomedical Engineering	2	
SSCE1793	Differential Equations	3	
SEEU/SEEE1023	Circuit Theory	3	
SEEU/SEEE2073	Signals and Systems *(Student dropped)*		
*ULRS1182	Appreciation of Ethics and Civilizations	2	
UHLM1012	Malay Language for Communication 2 *(For International students ONLY)*	(2)	
TOTAL CREDIT HOURS		**13(15)**	

Code	Courses	Credit	Pre-req
YEAR 2 (SEMESTER 3) – Semester 2 2023/2024			
SEEU1063	Electronic Devices	3	
SEBB2513	Basic Rehabilitation	3	
SEEU/SEEE2073	Signals and Systems	3	
SSCE2193	Engineering Statistics	3	
*ULRS1022	Philosophy and Current Issues	2	
UKQF2XX2	Service Learning & Community Engagement Course	2	
UHLB2122	Professional Communication Skills 1	2	UHLB 1112
TOTAL CREDIT HOURS		**18**	

For International students:
Choose 1 (one) course from 2 (two) options: either ULRS 1182 (Year 1 Semester 2) or ULRS 1022 (Year 2 Semester 3)

YEAR 2 (SEMESTER 4) – Semester 1 2024/2025			
Code	Courses	Credit	Pre-req
SEEU/SEEE3133	System Modelling and Analysis	3	SEEU/SEEE2073
SEEU/SEEE3533	Communication Principles	3	SEEU/SEEE2073
SSCE2393	Numerical Methods	3	
SEBB2033	Computer Programming for Biomedical Engineer	3	
SSCE1993	Engineering Mathematics 2	3	SSCE1693
SEBB2712	Laboratory 1	2	
UHLB3132	Professional Communication Skills 2	2	UHLB2122
	TOTAL CREDIT HOURS	**19**	

Approved by Director

YEAR 3 (SEMESTER 5) – Semester 2 2024/2025			
Code	Courses	Credit	Pre-req
SEBB3323	Solid Mechanics	3	
SEBB3423	Clinical Engineering	3	
SEEU/SEEE3063	Electronics Circuits and Systems	3	SEEU/SEEE1063
SEBB3033	Microprocessor Systems	3	
SEBB3043	Instrumentation and Measurement in Biomedical	3	
SEEU/SEEE2523	Electromagnetic Field Theory	3	SSCE1993
	TOTAL CREDIT HOURS	**18**	

YEAR 3 (SEMESTER 6) - Semester 1 2025/2026			
Code	Courses	Credit	Pre-req
SEBB3023	Biomedical Imaging	3	
SEBB3712	Laboratory 2	2	
SEBB4023	Biomedical Signal Processing	3	SEEU/SEEE2073
SEBB3313	Biomedical Material	3	
UHL*1112	Elective: Communication Foreign Language	2	
S***XXX3	Free Electives (Cross Faculty)	3	
ULRS3032	Entrepreneurship and Innovation	2	
	TOTAL CREDIT HOURS	**18**	

SHORT SEMESTER			
Code	**Courses**	**Credit**	**Pre-req**
SEBB4915	Industrial Training (HW)	5	SEBB 3423
TOTAL CREDIT HOURS		**5**	

YEAR 4 (SEMESTER 7) – Semester 2 2025/2026			
Code	**Courses**	**Credit**	**Pre-req**
SEBB3722	Laboratory 3	2	
SEBB4812	Project Part 1	2	
SHAS4542	Engineering Management	2	
SEBB4032	Professional Biomedical Engineering Practice	2	
SEBB4413	Biochemistry for Biomedical Engineers	3	
SEBB4**3	Elective 1	3	
SEBB5**3	PRISMS Elective 1		
SEBB4**3	Elective 2	3	
SEBB5**3	PRISM Elective 2		
TOTAL CREDIT HOURS		**17**	

YEAR 4 (SEMESTER 8) – Semester 1 2026/2027			
Code	**Courses**	**Credit**	**Pre-req**
SEBB4824	Project Part 2	4	SEBB4812
SEBB4712	Laboratory 4	2	
SEBB4**3	Elective 3	3	
SEBB5**3	PRISMS Elective 3		
SEBB4313	Biomedical System Design	3	SEBB3722
S***XXX3	Free Electives (Cross Faculty)	3	
TOTAL CREDIT HOURS		**15**	

TOTAL CREDIT = 137

Elective Courses

Code	Courses	Credit	Pre-req
SEBB4043	Biomedical Image Processing	3	SEBB3023
SEBB4053	Biosystem Modelling	3	
SEBB4063	Advanced Biomedical Signal Processing	3	SEBB 4023
SEBB4073	Biosensor and Transducers	3	
SEBB4083	Artificial Intelligence	3	
SEBB4323	Biomedical Devices	3	
SEBB4343	Cell and Tissue Engineering	3	
SEBB4433	Biomedical Instrumentation Management	3	
SEBB4513	Rehabilitation Engineering	3	SEBB 2513
SEBB4113	Bio-Fabrication	3	
SEBB4123	Bio-Material Characterization and Analysis	3	
SEBB4133	Machining and Testing for Biomedical Engineer	3	
SEBB4153	Electronic CAD Digital System Design	3	
SEBB4163	Advance Computer Programming and Data Structure	3	
SEBB5003	Biomedical Measurement Technique	3	
SEBB5013	Diagnostic and Therapeutic Technology		
SEBB5023	Advanced Biomedical Engineering	3	
SEBB5033	Medical Informatics	3	
SEBB5043	Biomechanics	3	

**Choose three (3) courses from this group.

COMMUNICATION FOREIGN LANGUAGE

(to select 1 course)

Code	Courses	Credit	Pre-req
UHLA1112	Arabic I	2	
UHLJ1112	Japanese I	2	
UHLJ1122	Japanese for Communication I	2	
UHLK1112	Korean I	2	
UHLC1112	Mandarin I	2	
UHLF1112	French I	2	

Total Credits Earned: 137

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 (ü) IF PASSES
BIOMEDICAL ENGINEERING COURSES					
1	SEBB1012	Introduction to Biomedical Engineering	2	2	
2	SEBB1513	Basic Anatomy and Physiology	3	3	
3	SEEU/SEEE1023	Circuit Theory	3	3	
4	SEBB1313	Statics and Dynamics	3	3	
5	SEBB1523	Advanced Anatomy and Physiology	3	3	
6	SEBB2513	Basic Rehabilitation	3	3	
7	SEEU/SEEE1223	Digital Electronics	3	3	
8	SEEU/SEEE1063	Electronic Devices	3	3	
9	SEBB2033	Computer Programming for Biomedical Engineer	3	3	
10	SEEU/SEEE2073	Signals and Systems	3	3	
11	SEEU/SEEE2523	Electromagnetic Field Theory	3	3	
12	SEBB2712	Laboratory 1	2	2	
13	SEEU/SEEE3133	System Modelling and Analysis	3	3	
14	SEEU/SEEE3063	Electronic Circuits and Systems	3	3	
15	SEBB3033	Microprocessor Systems	3	3	

16	SEBB3423	Clinical Engineering	3	3	
17	SEBB3712	Laboratory 2	2	2	
18	SEEU/SEEE3533	Communication Principles	3	3	
19	SEBB3323	Solid Mechanics	3	3	
20	SEBB3023	Biomedical Imaging	3	3	
21	SEBB3722	Laboratory 3	2	2	
22	SEBB3313	Biomedical Materials	3	3	
23	SEBB3043	Instrumentation and Measurement in Biomedical	3	3	
24	SEBB4915	Industrial Training (HW)	5	HL	
25	SEBB4313	Biomedical Systems Design	3	3	
26	SEBB4333	Biological Inspired Devices	3	3	
27	SEBB4413	Biochemistry for Biomedical Engineers	3	3	
28	SEBB4423	Biomedical Informatics	3	3	
29	SEBB4523	Sports Technology in Exercise Rehabilitation	3	3	
30	SEBB4712	Laboratory 4	2	2	
31	SEBB4812	Project Part 1	2	2	
32	SEBB4023	Biomedical Signal Processing	3	3	
33	SEBB4**3	Elective 1			
34	SEBB5**3	PRISMS Elective 1	3	3	
35	SEBB4824	Project Part 2	4	4	

36	SEBB4**3	Elective 2	3	3	
37	SEBB5**3	PRISMS Elective 2			
38	SEBB4**3	Elective 3	3	3	
39	SEBB5**3	PRISMS Elective 3			
40	SHAS4542	Engineering Management	2	2	
41	SEBB4032	Professional Biomedical Engineering Practice	2	2	
TOTAL CREDIT OF BIOMEDICAL ENGINEERING COURSES (a)			**100**	**95**	

APPLIED SCIENCE / MATHEMATICS / COMPUTER COURSES					
1	SSCE1693	Engineering Mathematics 1	3	3	
2	SSCE1793	Differential Equations	3	3	
3	SSCE1993	Engineering Mathematics 2	3	3	
4	SSCE2193	Engineering Statistics	3	3	
5	SSCE2393	Numerical Methods	3	3	
TOTAL CREDIT OF APPLIED SCIENCE / MATHEMATICS / COMPUTER COURSES (b)			**15**	**15**	

UNIVERSITY GENERAL COURSES					
Cluster 1: Malaysian Core Value					
1	ULRS1022	Philosophy and Current Issues[1]	2	2	
2	UHMS1182	Appreciation of Ethics and Civilization[1]	2	2	
3	UHLM1012	Malay Language Communication 2	(2)	(2)	

Note:

Total credit for cluster 1 courses is **4 credits**

1. International students:

    *a. UHLM 1012 is compulsory for international students; **AND***

    b. Choose 1 (one) course from 2 (two) options: (ULRS 1022 or UHMS 1182)

2. Malaysian students:

    a. ULRS 1022 and UHMS 1182 are compulsory for Malaysian students.

		Cluster 2: Value and Identity				
1	ULRS1012	Value and Identity	2	2	
		Cluster 3: Global Citizen				
1	UKQF2**2	Service Learning & Community Engagement	2	2	
		Cluster 4: Communication Skills				
1	UHLB2122	Professional Communication Skills 1	2	2	
2	UHLB3132	Professional Communication Skills 2	2	2	
3	UHL*1112	Foreign Language for Communication	2	2	
		Cluster 5: Enterprising Skills				
1	ULRS3032	Entrepreneurship & Innovation	2	2	
		Free Electives				
1	S***xxx3	Free Electives (2 subjects) *(Selection from cross faculty to be offered from time to time)*	3	3	
2	S***xxx3		3	3	
TOTAL CREDIT OF UNIVERSITY GENERAL COURSES + FREE ELECTIVES (c)			**22**	**22**	
TOTAL CREDIT TO GRADUATE (a + b + c)			**137**	**132**	

OTHER COMPULSORY COURSES – PROFESSIONAL SKILLS CERTIFICATE (PSC)			
Students are required to enroll and pass FIVE (5) PSC courses, to be eligible to graduate. Enroll the PSC courses as follows:			
COMPULSORY PSC COURSES (Enrol All 3 Courses)			
1	GLRB0010	Design Thinking for Entrepreneur	
2	GLRM0010	Talent and Competency Management	
3	GLRL0010	English Communication Skills for Graduating Students (ECS)	
ELECTIVE PSC COURSES (Choose Any 2 Courses only)			
1	GLRT0010	Data Analytics for Organization	
2	GLRM0020	Professional Ethics and Integrity	
3	GLRT0020	Construction Measurement (Mechanical & Electrical)	
4	GLRT0030	OSHE for Engineering Industry and Laboratory	
5	GLRT0040	OSHE for Construction Industry and Laboratory Works	

6	GLRT0050	Quality Management for Build Environment and Engineering Professionals	
7	GLRT0060	Safety and Health Officer Introductory Course	
8	GLRT0070	Industrial Machinery and Lubrication	26

Or any other elective PSC courses offered by UTM iLeague

Information on PSC Courses: https://ileague.utm.my/utm-professional-skills-certificate-utm-psc/

Online PSC Registration: https://elearnpsc.utmspace.edu.my/

COURSE SYNOPSIS

CORE COURSES

SEEU/SEEE 1023 - Circuit Theory

This course introduces students to the basic laws, theorems and methods of DC and AC circuit analysis such as Ohms law, Kirchhoff Current and Voltage Laws, Thevenin and Norton theorems, concept of series and parallel circuits etc. Based on these, the students are expected to be able to solve variables in any given DC and AC electric circuits. With the knowledge learned, the student would be able to apply the basic laws, theorems and methods of analysis for solving various problems in circuit analysis with confidence.

SEEU/SEEE 1223 - Digital Electronics

This course emphasises on the design, analysis, planning and implementation of complex digital systems using programmable logic, with specific focus on programmable logic devices. In order to facilitate the learning process, computer-aided design (CAD) software is used throughout the course. Some practical or almost actual environmental problems and solutions are provided. With the knowledge learned, the student would be able to analyse the counter and register circuits completely with confidence and design synchronous counters.

SEEU/SEEE 2073 - Signals and Systems

This course introduces the students to the different types of signals and systems. Emphasis mainly will be on continuous signals. Signal representation in both the time (Fourier series) and frequency domain (Fourier and Laplace transform) will be discussed. The concept of transfer function is introduced and the applications of the Laplace transform (such as for the solution of differential equations, and circuit analysis) is presented. Finally, the use of Bode plot in filter design will be covered.

SEEU/SEEE 1063 - Electronics Devices

This is the first course in the field of electronics. It consists of basic electronic devices such as the diode, the bipolar junction transistor, and the field effect transistor. Course content will include the devices' basic structure, biassing and basic applications. With the knowledge learned, the student would be able to apply the basic laws, theorems and methods of analysis for solving various basic biassing circuits using a data sheet with confidence.

SEBB 2033 - Computer Programming Techniques for Biomedical Engineer

As a fundamental course, this course equips the students with theory and practice on problem solving techniques by using the structured approach. From this course, the student will be equipped with skills of programming to solve simple to moderate problems. The course covers the following: preprocessor directives, constants and variables, data types, input and output statements, text files, control structures: sequential, selection and loop, built-in and user-defined functions, one dimensional and two dimensional arrays.

SEEU/SEEE 2523 - Electromagnetic Field Theory

This course introduces students to some major views and theories in the area of electrostatic, magnetostatics and electromagnetic fields. This elementary electromagnetic field theory is summarised in Maxwell's equations for static and time varying fields in integral and differential forms, and also a time domain analysis of wave propagation.

SEEU/SEEE 3133 - System Modelling and Analysis

This course introduces the students to the fundamental ideas and definitions of control systems such as block diagrams, plants or processes, open loop and close loop control systems, transfer functions and transient and steady state responses. Students will be taught how to obtain mathematical models of actual physical systems such as electrical, mechanical, electromechanical and simple fluid flow systems in transfer function and state-space equations. Methods of system representation such as block diagram representation and signal flow graphs will be examined. The students will also be exposed to techniques of analysing control systems such as time domain analysis and stability. Finally, an introduction to the design and analysis of control systems using MATLAB will also be given.

SEEU/SEEE 3063 - Electronic Circuits and System

This course introduces students to some major views and theories in amplifiers and its application. It will examine some key issues in basic definition, construction of analogue amplifiers, operational amplifiers and analogue system with special focus on analysis of transistor amplifiers through small signal equivalent circuits. This course also covers some topics in functional electronic circuits. The circuits are derived from a diverse electronic circuitry existing in many electronic instrumentations. The course will also provide practice in carrying out a computer simulation and modelling of the amplifier's circuits using PSPICE or MultiSim software. The function, the behaviour and the characteristics of the functional circuits are analysed.

SEEU/SEEE 3533 - Communication Principles

This course introduces the students to the basic principles of communication systems. The fundamental concepts of analogue modulation in particular amplitude and frequency modulations will be strongly emphasised. Topics include types of modulated waveforms, transmitter and receiver structures. The two most significant limitations on the performance of a communications system; bandwidth and noise will be discussed. The concept of sampling, quantization and line coding techniques in rendering an information signal to be compatible with a digital system are explained prior to the study of coded pulse modulation and pulse code modulation (PCM). The waveforms and spectral analysis of bandpass digital modulations are introduced. The system performance in terms of bit error rate (BER) will also be covered. Finally, multiplexing, a method to utilise the communication resource efficiently is studied where two techniques will be explored; time-division and frequency-division multiplexing.

SEBB 3033 - Microprocessor System

This course introduces the principles and applications of microprocessors. Topics emphasized are processor architecture in detail incorporation with HLL language and fundamentals of designing and implementing the embedded system. This course emphasizes on understanding the fundamentals of microprocessor operation, writing coherent and error-free HLL programmes, and designing basic microprocessor-based circuits. With the knowledge learned, the student would be able to design microprocessor-based systems using HLL programmes completely.

SEBB 2712 - Laboratory 1

The course includes the experiments on basic electrical, electronic, signal processing, technical drawing and programming that are related to biomedical engineering. It exposes the students to some common electrical and electronic components, circuits and theorems such as Thevenin and Norton theorem, RLC circuits and MSI circuits. On the other hand, this teaching laboratory also provides the skill of programming for embedded systems, digital signal processing in Matlab and technical drawing using software.

SEBB 3712 - Laboratory 2

The purpose of this course is to provide students with practical experience in using lab electrical instruments, equipment, analyse experimental results, read components data sheets, and develop report-writing skills. Minimum 10 experiments from participating third year laboratories included but not limited to Basic Electronic, instrumentation, Microcontroller, Neuroscience, Physiotherapy, Biomaterials and Biomechanics. The students should be able to improve their communication skills and team-working environment.

SEBB 3722 - Laboratory 3

The course provides students with the opportunity to integrate technical knowledge and generic skills attained in the earlier years. This is to be achieved within the context of a medical engineering project conducted in a small team (typically six students) under the supervision of an academic staff. Topics supplementing this course include Bioinstrumentation, Biomechanics and Biomaterial, Medical Imaging, Biomedical Signal Processing and Clinical engineering. The laboratory is conducted based on Conceive-Design-Implement-Operate (CDIO) in which students are required to solve real and complex engineering problems by collecting information and feedback from the end user, design suitable experimental procedures for their innovations, present their innovations and finally submit the report.

SEBB 4712 - Laboratory 4

This course involves experiments in many different areas of biomedical engineering including but not limited to Bioinstrumentation, Biomechanics & Biomaterials, Medical Imaging, Biomedical Signal Processing and Clinical Engineering. This laboratory session is conducted as a Problem-Based Learning (PBL) approach. The students are grouped into 4-5 students per a group, and they will be given problems to solve that require them to do pre-labs and conduct experiments within 4 weeks. The students are required to solve the given problems as a team, design suitable experimental procedures, conduct the experiments, present the problem solutions and submit a full formatted report.

SSCE 1693 - Engineering Mathematics 1

This course is about multivariable calculus of real and vector-valued functions. The basic theory of partial derivatives and multiple integrals of real functions with their applications are discussed. This theory is extended to vector valued functions to describe motion in space, directional derivatives, gradient, divergence and curl, line integrals, surface integrals and volume integral. Related theorems, namely Green's Theorem, Stokes' Theorem and Gauss Divergence Theorem and their applications are discussed in detail.

SSCE 1793 - Differential Equations

This is an introductory course on differential equations. Topics include first order ordinary differential equations (ODEs), linear second order ODEs with constant coefficients, the Laplace transform and its inverse, Fourier series, and partial differential equations (PDEs). Students will learn how to classify and solve first order ODEs, use the techniques of undetermined coefficients, variation of parameters and the Laplace transform to solve ODEs with specified initial and boundary conditions, and use the technique of separation of variables to solve linear second order PDEs.

SSCE 1993 - Engineering Mathematics 2

This course is about multivariable calculus of real and vector-valued functions. The basic theory of partial derivatives and multiple integrals of real functions with their applications are discussed. This theory is extended to vector valued functions to describe motion in space, directional derivatives, gradient, divergence and curl, line integrals, surface integrals and volume integral. Related theorems, namely Green's Theorem, Stokes' Theorem and Gauss Divergence Theorem and their applications are discussed in detail.

SSCE 2193 - Engineering Statistics

This course begins with basic statistics, elementary probability theory and properties of probability distributions. Introduction to sampling distribution, point and interval estimation of parameters and hypothesis testing are also covered. Simple linear regression and one-way analysis of variance are also taught in this course. Students are also introduced to some nonparametric methods in analysing data.

SSCE 2393 - Numerical Methods

This course discusses problem solving using numerical methods that involve non-linear equations, systems of linear equations, interpolation and curve fitting, numerical differentiation and numerical integration, Eigenvalue problems, ordinary differential equations and partial differential equations.

SEBB 1513 - Basic Anatomy and Physiology

This course is a study of anatomical terminologies, body's structures, orientation and physiological events of human body systems through lectures, models and diagrams. Knowledge in anatomy is fundamental in biomedical engineering programmes because it provides the pathway to integrate between the engineering technology and multiple related medical disciplines. Emphasis is placed on the most important systems of organs (respiration, heart and circulation, nervous system, digestion, secretion, skeleton and muscles, immune system, reproductive system and sensory organs). Each topic is preceded by some comments concerning evolution and/or embryology and a few topics in applied physiology will be presented. The content of the lectures is adapted to engineers, an emphasis is placed on medical terminology and the project component is mainly focusing on biomedical technology related to human physiology and structure. Even after graduation, knowledge in anatomy is still applicable in many medical disciplines such as research and technology developments, medical technology consultancy, hospital management and healthcare industries.

SEBB 1012 - Introduction to Biomedical Engineering

This is a course specially designed to introduce biomedical and health science engineering and motivate students to understand the programme of biomedical engineering at UTM. This course introduces the programme offered and gives an opportunity for students to comprehend what they are entitled to for the next 4 years. It also gives an overview on how to cope with the university environment. Lastly, this course will facilitate the students to plan their career path towards a biomedical engineer.

SEBB 1523 - Advanced Anatomy and Physiology

This course is an advanced study of anatomical terminologies, body structures, orientation and physiological events of human body systems through lectures, models and diagrams. Knowledge in anatomy & physiology are fundamental in biomedical engineering programmes because it provides the pathway to integrate between the engineering technology and medical disciplines. Even after graduation, knowledge in anatomy & physiology can be applicable in many medical disciplines such as research and technology developments, medical technology consultancy, hospital management and healthcare industries.

SEBB 1313 - Statics and Dynamics

Mechanics & biology have always fascinated humankind. In Biomedical Engineering programmes, statics and dynamics are two basic important subjects to equip undergraduates with the necessary tools to solve bio-mechanic related problems. This course covers the concepts and principles of statics and dynamics that are applied in the biomedical field. Covered in the course will be explanations of point and rigid body behaviour under static loads and during motion. Emphasis is placed on the importance of satisfying equilibrium, analysing structure, biomechanics of human joints, kinematics and kinetics of rigid bodies.

SEBB 2513 - Basic Rehabilitation

This course aims to introduce students to the basics of rehabilitation so that they can understand important rehabilitation concepts and issues in disability management, within the context of rehabilitation engineering. It will equip students with basic knowledge and skills for the application of science, technology and engineering to the design and development of assistive (adaptive) technology and rehabilitation techniques. It will provide students with an understanding of the nature of problems confronting people with disabilities and an ability to provide technical solutions for these problems.

SEBB 3313 - Biomedical Materials

This course provides an introduction to the fundamentals of and recent advances in biomedical materials. It covers a broad spectrum of biomedical materials which include metals, ceramics, polymers and composites. It takes an interdisciplinary approach to describing the chemistry and physics of materials, their biocompatibility, and the consequences of implantation of devices made of these materials into the human body. The course is also designed to familiarise students with failure of materials through fracture, fatigue, wear and corrosion.

SEBB 3323 - Solid Mechanics

The course provides students with the knowledge to determine the strength and stiffness of structures being used. The structures that will be studied in this course are bars, pins, bolts, shafts and beams and the types of applied loading are axial forces, deformations due to the change in temperature, torsional loads, transverse loads and combination of these loads. At the end of the course, students should be able to determine the mechanical properties of the materials with respect to their strength and stiffness. Students should be able to calculate stresses, strains and deformations in structures due to various types of loading conditions. The students should also be able to use the acquired knowledge to solve real problems either coming from research problems, or from real-world biomedical problems.

SEBB 3023 - Biomedical Imaging

A course is for introducing and exposing students to the world of medical tomography. It focuses on physical, operation and signal formation of medical tomography techniques from various imaging modalities such as MRI, ultrasound, CT-scan, nuclear medicine and X-ray.

SEBB 3423 - Clinical Engineering

This course introduces students to major principles of clinical engineering as part of the preparation for industrial training. The scope of clinical engineering covers pre-market, market and post-market life-cycle of medical devices as well as risk and personnel management. These include procurement planning, incident investigation, equipment management, productivity, cost effectiveness, information systems integration, and patient safety activities. Students will also be exposed to the related law, standard and regulation for medical devices. Other than that, principle of medical devices will also be discussed in the course

SEBB 3043 - Instrumentation and Measurement In Biomedical

This course introduces students to biomedical measurement systems and biomedical instrumentation design. 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.

SEBB 4915 - Industrial Training (HW)

Industrial Training Programme is a compulsory component of the undergraduate curriculum at the Faculty of Biomedical & Health Science Engineering. Placements at the participating industries are structured for undergraduates in the third semester of their third year study. The industries where the students will be attached to during their training is listed in the supporting document (LI-CL). These industries cover all areas in Biomedical Engineering such as biomedical instrumentation and signal processing, clinical science and engineering, therapy and rehabilitation and biomechanics and biomaterials. The nature of jobs involved in the training includes designing, manufacturing, testing, maintaining, fabricating, etc.

SEBB 4812 - Project Part I

The aim of the Final Year Project (FYP) is to give students an opportunity to apply the knowledge that they have gained while studying in FKBSK to solve practical engineering problems. By doing so, it is hoped that the students will gain knowledge and experience in solving problems systematically thus when they graduate, they will be ready to work as reliable and productive engineers.

SEBB 4824 - Project Part II

This course is a continuation from SEBB 4812.Students must submit a project thesis and present it at the end of the semester. Grades will be given for both.

ELECTIVE COURSES

SEBB 4043 - Biomedical Image Processing

This course introduces students to introductory and intermediate levels of image processing techniques. The area of coverage would be the digitization process as a means to acquire the digital image. Next would be the enhancement and restoration processes which are to improve the quality of the image for next stage processing. Both the spatial domain and frequency domain approaches will be covered. The next stage would be the segmentation process. This is an important step towards advanced level processing. Finally, the topic of compression and coding will be covered. MATLAB will be used extensively for better understanding. By adapting this knowledge, students will be able to develop essential technical skills in solving biomedical image problems with some degree of accuracy. It focuses on medical image processing of images obtained from the various imaging modalities such as MRI, ultrasound, CT-scan, nuclear medicine and X-ray.

SEBB 4053 - Biosystem Modelling

The objective of this course is to introduce students to the mathematical model, methods and their biological application, and model of subsystems in the human body. This course introduces students to some major views and theories in modelling the subsystem in the human body. It is almost impossible to cover all subsystems in the human body. As guidance, topics may include: the maintenance of cell homeostasis, excitation and conduction in nerve fibres, synaptic transmission and the neuromuscular junction, properties of muscles, the lung - physical and mechanical aspects of respiration, volume and composition of body fluids - the kidney, the cardiovascular systems, the heart as a pump, neural control of the heart and circulation, and the autonomic nervous system. The course will also provide practice in carrying out a computer simulation and modelling of a bio system using Matlab/Simulink/LabView software.

SEBB 4063 - Advanced Biomedical Signal Processing

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.

SEBB 4073 - Biosensors and Transducers

This course is intended to introduce the function of biosensor and a transducer in the medical electronics industry. An overview of biosensors and an in-depth and quantitative view of device design including fabrication technique. Discussion of the current state of the art biosensor to enable continuation into advanced biosensor design and fabrication. Topics emphasise biomedical, bio-processing, military, environmental, food safety, and bio-security applications.

SEBB 4083 - Artificial Intelligence

This course introduces students to the fundamentals of two techniques of artificial intelligence (AI), namely, fuzzy logic and neural networks. Both techniques have been successfully applied by many industries in consumer products and industrial systems. Fuzzy logic offers flexibility in developing rule-based systems using natural language type of rules. Neural networks on the other hand, have strong generalisation and discriminant properties and offer a simple way of developing system models and function approximation. They are highly applicable for many pattern recognition applications. This course gives the students appropriate knowledge and

skills to develop, design and analyse effectively these two AI techniques for practical problems with some degree of accuracy. The students will also be given hands-on programming experience in developing fuzzy logic and neural networks systems to effectively solve real world problems.

SEBB 4323 - Biomedical Devices

A biomedical device is a product which is used for medical purposes in patients, in diagnosis, therapy or surgery. It includes a wide range of products varying in complexity and application and sometimes categorised into either passive or active devices. Examples include tongue depressors, medical thermometers, blood sugar metres, total artificial hearts, joint replacement devices, fibrin scaffolds, stents and X-ray machines. The global market of biomedical devices reached roughly 209 billion US Dollar in 2006 and is expected to grow with an average annual rate of 6 - 9% through 2010. Due to its importance, this course will introduce to students some of the many types of devices that are currently being used in the medical field.

SEBB 4333 - Biological Inspired Devices

The course provides students with an overview of non-conventional engineering approaches in biology, and to show how these approaches can be used to design and develop better (simpler, more robust, energy-efficient) solutions, especially in the development of novel biomedical devices. The focus of the course will be mainly on the physical part (i.e., the structure and function) of organisms or parts of the organism, rather than the signal processing part. The students will practice on implementing bio-inspired mechanisms in solving engineering problems.

SEBB 4343 - Cell and Tissue Engineering

Tissue engineering integrates principles of engineering and life sciences towards the fundamental understanding of structure-function relationships in normal and pathological tissues. The course will cover the introduction and fundamentals of tissue engineering, extracellular matrix, cells, biomaterials in tissue engineering, scaffold in tissue engineering, in vitro and in vivo strategies, clinical applications of tissue engineering and ethical and regulatory issues in tissue engineering

SEBB 4423 - Biomedical Informatics

The course provides the student with the basic theoretical knowledge and practical experience from the area of medical informatics and radiobiology. The medical informatics knowledge covers area of processing of medical data, fundamentals of medical information system design, computer-aided medical diagnostics, and telemedicine. The radiobiology covers the physics of radiation, application of radiation in diagnostic and therapeutic, and radiation safety.

SEBB 4513 - Rehabilitation Engineering

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 team working for optimal disability management will be stressed, with emphasis being given to the role of the rehabilitation engineering professional in the team.

SEBB 4523 - Sports Technology in Exercise Rehabilitation

The course provides fundamental concepts of sports science, technology and exercise rehabilitation. It focuses on total fitness, the biomechanics of sports, common injuries that occur in sport and how to prevent it. The application of technology in the process of exercise rehabilitation, assessment of injury, sports massage and psychological aspects of injuries are also addressed.

SEBB 4433 - Biomedical Instrumentation Management

Healthcare technology management provides an overview of a systematic process in which qualified health care professionals, typically clinical engineers, in partnership with other healthcare leaders, plan for and manage health technology assets to achieve the highest quality care at the best cost. It explains the basic concepts of managed care and describes the various types of health plan in operation today. This course will cover the strategic planning as well as technology assessment and facilities planning proceed with technology procurement and conclude with service or maintenance management.

SEBB 4113 - Bio-Fabrication

This subject provides the importance of additive manufacturing and its role in prototyping, development, transplant, implant and innovation of biomedical products. Different process technologies for additive manufacturing and bioprinting devices, systems, capabilities, materials and applications will be covered. It takes an interdisciplinary approach to describing the chemistry and physics of devices, materials, their compatibility, and the applications of additive manufacturing and machining of advanced materials in a wide range of applications of biomedical products.

SEBB 4123 - Bio-Material Characterization and Analysis

This course is intended to expose the students with the most important characterization instruments to analyse the physico-chemical properties of a biomaterial. 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 analysed to improve the student's understanding in selecting types of characterization instruments in analysing a biomaterial. Depending on the availability and functionality of instruments, lab visits and demonstrations will be scheduled following the class.

SEBB 4133 - Machining and Testing for Biomedical Engineer

This course is designed for students to learn and experience the process of machining, testing and advanced analysis. This course will be focusing on selected biomedical related parts and carry out course learning using conventional and advanced manufacturing techniques such as using 3D printed machines, and Computer Numerical Control (CNC) machining techniques. Once parts are manufactured, mechanical testing will be carried out using conventional and advanced methods employing Universal Testing Machine (UTM) to determine mechanical properties of parts. Further analysis will also be done to corroborate findings with the theoretical foundation of material.

SEBB 4153 - Electronic CAD Digital System Design

This course presents design methods to construct digital systems, including combinational circuits and sequential circuits. Topics include: (1) Computer-Aided Design (CAD) tools for design, (2) Hardware Description Languages (HDL) for simulation and synthesis, and (3) state machine specification, design, and simulation. In this course, some of the important features of

HDL will be examined. The course will enable students to design, simulate, model and analyse digital designs. The dataflow, structural, and behavioural modelling techniques will be discussed and related to how they are used to design combinational and sequential circuits. The use of test benches to exercise and verify the correctness of hardware models will also be described. Practical experience is gained by implementing various designs on a prototype FPGA board.

SEBB 4163 - Advance Computer Programming and Data Structure

This course discusses programming problems, why they are problems, and the approach C++ has taken to solve such problems using object-oriented programming approach (OOP). From this course, the students will be equipped with skills of advanced C++ programming language to solve moderate to advanced problems that are related with biomedical engineering or healthcare application using OOP approach. It will also cover some basic data structure such as list structure and tree structure. The course covers the following syllabus: Introduction to objects, fast recap of C language syntax, data abstraction, class and object implementation, object initialization and clean up, function and operator overloading, constants, inline functions, inline functions, name controls, etc. This course covers hands-on tutorial to expose the students to some modern C++ Integrated Development Environment (IDE) for biomedical and healthcare application development. This course also applies to the group design project. The students will be divided into groups to propose a group project to solve complex problems that are related with biomedical engineering or healthcare application. Before attending this course, the students should have prior knowledge in C programming language, number representation (binary, octal, hexadecimal, decimal), signed/unsigned number arithmetic (1's complement and 2's complement), and simple logic functions (AND, OR, XOR, NOT, etc).

SEBB 5003 - Biomedical Measurement Technique

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.

SEBB 5023 - 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.

SEBB 5033 - Medical Informatics

This course introduces and exposes the students to the organization of biomedical informatics, in terms of fundamentals and applications of biomedical informatics in healthcare. 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.

SEBB 5013 - 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 the healthcare environment, clinical and research.

SEBB 5043 - 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.

Correction Notes:

Revised Version 2.0
Revised and updated the Course Menu (March Intake)

Revised Version 3.0
Revised the total number of credits from 136 to 137

Revised Version 4.0
Revised and updated the Course Menu (March Intake)
and pre-requisite for SEEU/SEEE courses

DEPARTMENT OF BIOMEDICAL ENGINEERING AND HEALTH SCIENCES

FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MALAYSIA