



**OBE IMPLEMENTATION OF  
BACHELOR OF MECHATRONICS ENGINEERING  
WITH HONOURS (BELM) PROGRAMME  
EAC Standard 2024  
Curriculum Session 2024/2025**

**FACULTY OF ELECTRICAL TECHNOLOGY AND  
ENGINEERING (FTKE)  
UNIVERSITI TEKNIKAL MALAYSIA MELAKA  
(UTeM)**

## 1 PROGRAMME EDUCATIONAL OBJECTIVES

Programme Educational Objective (PEO) are specific goals describing the expected achievement of graduates in their career and professional life after 3 to 5 years of graduation. Three main concepts for PEO for Engineering's Bachelor Programme consist of apply engineering knowledge and contribution to respected field, the achievement in technical career as well as lifelong learning.

The objectives of this programme are to produce graduates who:

- i. Practise mechatronics engineering knowledge creatively and innovatively in broad applications.
- ii. Attain a successful career, possess leadership qualities, able to work independently, act professionally and practice ethical conduct.
- iii. Engage with life-long learning and adapt to constantly evolving technology and entrepreneurial skills in decision making.

## 2 PROGRAMME OUTCOMES

Generally, Programme Outcomes (PO) as shown in Table 1 are statements that describe what students are expected to know and be able to perform or attain by the time of graduation. These relate to the skills, knowledge, and behaviour that students have acquired through the programme. For BELM programme, students are expected to attain the following 11 attributes based on the EAC Standard 2024:

Table 1 – Programme Outcomes for BELM Programme

No.	PROGRAMME OUTCOMES (PO)
PO1	Engineering Knowledge - Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization as specified in WK1 to WK4 respectively to develop solutions to complex engineering problems
PO2	Problem Analysis - Identify, formulate, conduct research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences with holistic considerations for sustainable development (WK1 to WK4).
PO3	Design/Development of Solutions - Design creative solutions for complex engineering problems and design systems, components or processes that meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required (WK5).

No.	PROGRAMME OUTCOMES (PO)
PO4	Investigation - Conduct investigation of complex engineering problems using research methods including research-based knowledge and research methods, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions (WK8).
PO5	Tool Usage - Create, select, and apply, and recognise limitation of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations (WK2 and WK6).
PO6	The Engineer and the World – Analyze and evaluate sustainable development impacts to society, the economy, sustainability, health and safety, legal frameworks, and the environment, in solving complex engineering problems (WK1, WK5 and WK7).
PO7 (*PO8)	Ethics - Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (WK9).
PO8 (*PO10)	Individual and Collaborative Teamwork - Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multidisciplinary, face-to-face, remote and distributed settings (WK9).
PO9	Communication - Communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences.
PO10 (*PO12)	Project Management and Finance - Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects in multidisciplinary environments.
PO11	Lifelong Learning - Recognize the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (WK8)

\*Refer to previous programme's PO setting.

### 3 RELATIONSHIP BETWEEN PO AND PEO

The Programme Outcomes (PO) are generally by product of the Programme Educational Objectives (PEO) set for this program. These POs are consequently related and aligned with the vision and mission of university. The relation between the PO and PEO are mapped as shown in the Table 2.

Table 2: The Matrix of PO and PEO

No.	Programme Outcomes (PO)	PEO 1	PEO2	PEO3
PO1	Engineering Knowledge - Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization as specified in WK1 to WK4 respectively to develop solutions to complex engineering problems	✓		
PO2	Problem Analysis - Identify, formulate, conduct research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences with holistic considerations for sustainable development (WK1 to WK4).	✓		
PO3	Design/Development of Solutions - Design creative solutions for complex engineering problems and design systems, components or processes that meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required (WK5).	✓		
PO4	Investigation - Conduct investigation of complex engineering problems using research methods including research-based knowledge and research methods, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions (WK8).	✓		
PO5	Tool Usage - Create, select, and apply, and recognise limitation of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations (WK2 and WK6).	✓		
PO6	The Engineer and the World – Analyze and evaluate sustainable development impacts to society, the economy, sustainability, health and safety, legal frameworks, and the environment, in solving complex engineering problems (WK1, WK5 and WK7).		✓	
PO7 (*PO8)	Ethics - Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (WK9).		✓	
PO8 (*PO10)	Individual and Collaborative Teamwork - Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multidisciplinary, face-to-face, remote, and distributed settings (WK9).		✓	
PO9	Communication - Communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences.		✓	
PO10 (*PO12)	Project Management and Finance - Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects in multidisciplinary environments.			✓

No.	Programme Outcomes (PO)	PEO 1	PEO2	PEO3
PO11	Lifelong Learning - Recognize the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (WK8)			✓

\*Refer to previous programme's PO setting

#### 4 RELATIONSHIP BETWEEN COURSES AND PO

The details of mapping between courses and the PO are as tabulated Table 3. From the table, the balanced curriculum is reflected through the distribution of technical and non-technical courses. The breadths and depths of the courses are reflected through or embedded in the LO considering the levels and domains of the learning taxonomy. This is control by program coordinator using the OBE procedure and system.

Table 3: Matrix of Courses vs Programme Outcomes (PO)

No.	Code	Course	Cat.	Programme Outcomes (PO)											
				1	2	3	4	5	6	7	8	9	10	11	
1	BLLW 1XX2	THIRD LANGUAGE / MALAY COMMUNICATION*	UNIV.										✓		
2	BKKX XXX1	CO-CURRICULUM I	UNIV.							✓	✓				
3	BMIG 1313	ENGINEERING MATHEMATICS I	CORE	✓											
4	BELM 2342	INTRODUCTION TO MECHATRONICS SYSTEM	CORE	✓	✓	✓		✓							
5	BELG 1413	DIGITAL ELECTRONICS	CORE	✓	✓	✓									
6	BELM 1123	STATICS & MECHANICS OF MATERIAL	CORE	✓	✓										
7	BITG 1233	COMPUTER PROGRAMMING	CORE	✓				✓							
8	BKKX XXX1	CO-CURRICULUM II	UNIV.							✓	✓				
9	BLLW 1142	ENGLISH FOR ACADEMIC PURPOSE	UNIV.									✓			
10	BMKC 1013	DIFFERENTIAL EQUATIONS	CORE	✓											
11	BELM 1243	DYNAMICS AND VIBRATION	CORE	✓	✓										
12	BELU 1123	ELECTRIC CIRCUIT I	CORE	✓	✓										
13	BMIG 1213	ENGINEERING MATERIALS	CORE	✓	✓										
14	BELM 2321	MECHANICAL ENGINEERING LABORATORY	CORE		✓			✓			✓	✓			
15	BLLW 1762	PHILOSOPHY AND CURRENT ISSUES	UNIV.							✓					
16	BELG 2443	ENGINEERING MATHEMATICS II	CORE	✓											
17	BELC 2453	COMMUNICATION SYSTEM	CORE	✓	✓										
18	BELC 2342	INTRODUCTION TO EMBEDDED SYSTEM	CORE	✓		✓		✓			✓	✓			
19	BELG 1233	PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT	CORE	✓											
20	BELE 2343	PRINCIPLE OF ANALOGUE ELECTRONICS	CORE	✓	✓										
21	BELB 1231	ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY	CORE		✓			✓			✓	✓			
22	BLLW 2452	ACADEMIC WRITING	UNIV.									✓			
23	BERN 2143	ENGINEERING STATISTICS	CORE	✓	✓										
24	BELC 2433	SIGNAL AND SYSTEMS	CORE	✓	✓										
25	BELM 2433	THEORY OF MACHINES AND MECHANISM	CORE	✓	✓	✓									
26	BELU 2333	ELECTRIC CIRCUIT II	CORE	✓	✓										
27	BMKU 1313	ENGINEERING GRAPHICS AND CAD	CORE	✓				✓				✓			

No.	Code	Course	Cat.	Programme Outcomes (PO)											
				1	2	3	4	5	6	7	8	9	10	11	
28	BLLW 3462	ENGLISH FOR PROFESSIONAL INTERACTION	UNIV.										✓		
29	BMIG 3212	ENGINEERING ECONOMY AND MANAGEMENT	CORE		✓		✓					✓		✓	
30	BELM 3562	MECHATRONICS SYSTEM DESIGN	CORE		✓	✓	✓						✓	✓	
31	BELM 3453	MICROCONTROLLER TECHNOLOGY	CORE	✓	✓	✓		✓					✓		
32	BELG 2433	ELECTRICAL SYSTEMS	CORE	✓	✓										
33	BELC 3533	INTRODUCTION TO CONTROL SYSTEM	CORE	✓	✓	✓									
34	BELC 2421	CONTROL SYSTEM ENGINEERING LABORATORY	CORE		✓			✓				✓	✓		
35	#BLHW 2772	APPRECIATION OF ETHICS AND CIVILISATIONS	UNIV.								✓				
	*BLHW 2752	MALAYSIAN CULTURE	UNIV.								✓				
36	BELM 3653	INTEGRATED DESIGN PROJECT	CORE			✓	✓	✓	✓		✓	✓	✓		
37	BELM 3543	ELECTROMECHANICAL SYSTEMS	CORE	✓	✓	✓									
38	BELM 3643	THERMOFLUIDS	CORE	✓	✓										
39	BELC 4753	PLC AND AUTOMATION	CORE	✓		✓		✓					✓		
40	BELU 3695	INDUSTRIAL TRAINING	CORE	✓							✓	✓	✓		✓
41	BLLW 2792	INTERGRITY AND ANTI CORRUPTION	UNIV								✓				
42	BELU 4861	ENGINEERING SEMINAR	CORE						✓	✓					
43	BELU 4792	FINAL YEAR PROJECT I	CORE		✓		✓						✓	✓	✓
44	BELM 4763	ROBOTICS	CORE	✓	✓	✓									
45	BELM 4723	HYDRAULIC AND PNEUMATIC SYSTEMS	CORE	✓	✓					✓					
46	BELM 4741	MECHATRONIC SYSTEM ENGINEERING LABORATORY	CORE				✓	✓				✓	✓		
47	BTMW 4012	TECHNOPRENEURSHIP	UNIV.										✓	✓	✓
48	BELU 4322	ENGINEER AND SOCIETY	CORE						✓	✓			✓		
49	BELU 4894	FINAL YEAR PROJECT II	CORE		✓	✓	✓	✓	✓	✓			✓	✓	✓
50	BELM 5233	SYSTEM DYNAMICS	ELEC.												
51	BELC 5133	MODERN CONTROL DESIGN	ELEC.												
52	BELE 5143	ADVANCED ELECTRICAL MACHINES AND DRIVES	ELEC.												
53	BELM 5113	ADVANCED MECHATRONIC SYSTEM DESIGN	ELEC.												
54	BELM 5123	APPLIED SYSTEM MODELING AND SIMULATION	ELEC.												
55	BELC 4643	SMART MANUFACTURING	ELEC.												
56	BELM 4743	AUTONOMOUS MOBILITY	ELEC.												
57	BELC 4843	ADVANCED INDUSTRIAL AUTOMATION	ELEC.												
58	BELM 4843	THERMAL AND FLUID MACHINERY	ELEC.												
59	BELM 4863	INDUSTRIAL ROBOTICS	ELEC.												
60	BELC 4653	MODEN CONTROL ENGINEERING	ELEC.												
61	BELC 4663	ARTIFICIAL INTELLIGENCE FOR ENGINEERS	ELEC.												
62	BELC 4733	DIGITAL IMAGE PROCESSING	ELEC.												
63	BELM 4753	BIO MECHATRONICS	ELEC.												
64	BELC 4683	DIGITAL CONTROL SYSTEM	ELEC.												
65	BELC 4633	INDUSTRIAL CONTROL NETWORK	ELEC.												
66	BELM 4733	TELERBOTIC	ELEC.												
67	BELC 4833	ADVANCED SENSORS	ELEC.												
68	BITI 2513	INTRODUCTION TO DATA SCIENCE	ELEC.												

No.	Code	Course	Cat.	Programme Outcomes (PO)												
				1	2	3	4	5	6	7	8	9	10	11		
69	BELC 4883	INDUSTRIAL MACHINE VISION	ELEC.													
70	BTMT 3323	CONTEMPORARY BUSINESS MANAGEMENT	ELEC.													
71	BTMT 3263	BUSINESS FINANCE	ELEC.													
72	BTMP 3383	HIGH TECHNOLOGY MARKETING STRATEGY	ELEC.													
73	BTMP 2243	STRATEGIC INNOVATION MANAGEMENT	ELEC.													

## 5 COURSES VS KNOWLEDGE PROFILES (WK)

Based on EAC Standard 2024, faculty has planned for curriculum improvement by having a clear mapping between courses and required knowledge profiles (see Appendix 1) and Table 4 provides the related information.

Table 4: Matrix of Courses vs Knowledge Profiles

No.	Code	Course	Cat	Knowledge Profile (WK)												
				1	2	3	4	5	6	7	8	9				
1	BLLW 1XX2	THIRD LANGUAGE / MALAY COMMUNICATION*	UNIV.													✓
2	BKKX XXX1	CO-CURRICULUM I	UNIV.		✓											
3	BMIG 1313	ENGINEERING MATHEMATICS I	CORE		✓	✓		✓	✓							
4	BELM 2342	INTRODUCTION TO MECHATRONICS SYSTEM	CORE			✓		✓								
5	BELG 1413	DIGITAL ELECTRONICS	CORE			✓										
6	BELM 1123	STATICS & MECHANICS OF MATERIAL	CORE		✓				✓							
7	BITG 1233	COMPUTER PROGRAMMING	CORE													✓
8	BKKX XXX1	CO-CURRICULUM II	UNIV.													✓
9	BLLW 1142	ENGLISH FOR ACADEMIC PURPOSE	UNIV.													
10	BMKC 1013	DIFFERENTIAL EQUATIONS	CORE		✓											
11	BELM 1243	DYNAMICS AND VIBRATION	CORE			✓		✓								
12	BELU 1123	ELECTRIC CIRCUIT I	CORE			✓										
13	BMIG 1213	ENGINEERING MATERIALS	CORE	✓		✓										
14	BELM 2321	MECHANICAL ENGINEERING LABORATORY	CORE		✓	✓			✓							✓
15	BLLW 1762	PHILOSOPHY AND CURRENT ISSUES	UNIV.													✓
16	BELG 2443	ENGINEERING MATHEMATICS II	CORE		✓											
17	BELC 2453	COMMUNICATION SYSTEM	CORE			✓										
18	BELC 2342	INTRODUCTION TO EMBEDDED SYSTEM	CORE		✓	✓		✓	✓							✓
19	BELG 1233	PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT	CORE			✓										
20	BELE 2343	PRINCIPLE OF ANALOGUE ELECTRONICS	CORE	✓		✓										
21	BELB 1231	ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY	CORE		✓				✓							✓
22	BLLW 2452	ACADEMIC WRITING	UNIV.													
23	BERN 2143	ENGINEERING STATISTICS	CORE		✓											
24	BELC 2433	SIGNAL AND SYSTEMS	CORE			✓										
25	BELM 2433	THEORY OF MACHINES AND MECHANISM	CORE			✓		✓								
26	BELU 2333	ELECTRIC CIRCUIT II	CORE			✓										
27	BMKU 1313	ENGINEERING GRAPHICS AND CAD	CORE		✓	✓			✓							

No.	Code	Course	Cat	Knowledge Profile (WK)									
				1	2	3	4	5	6	7	8	9	
28	BLLW 3462	ENGLISH FOR PROFESSIONAL INTERACTION	UNIV.										
29	BMIG 3212	ENGINEERING ECONOMY AND MANAGEMENT	CORE			✓						✓	✓
30	BELM 3562	MECHATRONICS SYSTEM DESIGN	CORE	✓			✓	✓			✓		
31	BELM 3453	MICROCONTROLLER TECHNOLOGY	CORE		✓		✓	✓	✓				
32	BELG 2433	ELECTRICAL SYSTEMS	CORE	✓		✓							
33	BELC 3533	INTRODUCTION TO CONTROL SYSTEM	CORE		✓	✓		✓					
34	BELC 2421	CONTROL SYSTEM ENGINEERING LABORATORY	CORE		✓	✓			✓				✓
35	#BLHW 2772	APPRECIATION OF ETHICS AND CIVILISATIONS	UNIV.										✓
	*BLHW 2752	MALAYSIAN CULTURE	UNIV.										✓
36	BELM 3653	INTEGRATED DESIGN PROJECT	CORE	✓	✓		✓	✓	✓	✓	✓	✓	✓
37	BELM 3543	ELECTROMECHANICAL SYSTEMS	CORE			✓		✓					
38	BELM 3643	THERMOFLUIDS	CORE	✓		✓							
39	BELC 4753	PLC AND AUTOMATION	CORE		✓		✓	✓	✓				
40	BELU 3695	INDUSTRIAL TRAINING	CORE				✓						✓
41	BLLW 2792	INTERGRITY AND ANTI CORRUPTION	UNIV										✓
42	BELU 4861	ENGINEERING SEMINAR	CORE	✓				✓		✓			✓
43	BELU 4792	FINAL YEAR PROJECT I	CORE				✓					✓	
44	BELM 4763	ROBOTICS	CORE				✓	✓					
45	BELM 4723	HYDRAULIC AND PNEUMATIC SYSTEMS	CORE	✓			✓	✓		✓			
46	BELM 4741	MECHATRONIC SYSTEM ENGINEERING LABORATORY	CORE		✓				✓		✓	✓	
47	BTMW 4012	TECHNOPRENEURSHIP	UNIV.									✓	
48	BELU 4322	ENGINEER AND SOCIETY	CORE	✓				✓		✓			✓
49	BELU 4894	FINAL YEAR PROJECT II	CORE	✓	✓		✓	✓	✓	✓	✓	✓	✓
50	BELM 5233	SYSTEM DYNAMICS	ELEC.										
51	BELC 5133	MODERN CONTROL DESIGN	ELEC.										
52	BELE 5143	ADVANCED ELECTRICAL MACHINES AND DRIVES	ELEC.										
53	BELM 5113	ADVANCED MECHATRONIC SYSTEM DESIGN	ELEC.										
54	BELM 5123	APPLIED SYSTEM MODELING AND SIMULATION	ELEC.										
55	BELC 4643	SMART MANUFACTURING	ELEC.										
56	BELM 4743	AUTONOMOUS MOBILITY	ELEC.										
57	BELC 4843	ADVANCED INDUSTRIAL AUTOMATION	ELEC.										
58	BELM 4843	THERMAL AND FLUID MACHINERY	ELEC.										
59	BELM 4863	INDUSTRIAL ROBOTICS	ELEC.										
60	BELC 4653	MODEN CONTROL ENGINEERING	ELEC.										
61	BELC 4663	ARTIFICIAL INTELLIGENCE FOR ENGINEERS	ELEC.										
62	BELC 4733	DIGITAL IMAGE PROCESSING	ELEC.										
63	BELM 4753	BIO MECHATRONICS	ELEC.										
64	BELC 4683	DIGITAL CONTROL SYSTEM	ELEC.										
65	BELC 4633	INDUSTRIAL CONTROL NETWORK	ELEC.										
66	BELM 4733	TELEROBOTIC	ELEC.										
67	BELC 4833	ADVANCED SENSORS	ELEC.										
68	BITI 2513	INTRODUCTION TO DATA SCIENCE	ELEC.										
69	BELC 4883	INDUSTRIAL MACHINE VISION	ELEC.										
70	BTMT 3323	CONTEMPORARY BUSINESS MANAGEMENT	ELEC.										
71	BTMT 3263	BUSINESS FINANCE	ELEC.										

No.	Code	Course	Cat	Knowledge Profile (WK)									
				1	2	3	4	5	6	7	8	9	
72	BTMP 3383	HIGH TECHNOLOGY MARKETING STRATEGY	ELEC.										
73	BTMP 2243	STRATEGIC INNOVATION MANAGEMENT	ELEC.										

## 6 COURSES VS COMPLEX PROBLEM SOLVING (WP) AND COMPLEX ENGINEERING ACTIVITIES (EA)

In general, all courses mapped to the PO that have a complex engineering problems elements such as PO1 to PO7 which require a depth emphasis on the complex problem solving elements/attributes (see Appendix 2). The assessment method must be able to measure the attainment of the learning outcome based on the complex engineering problems. The assessment of LO must shows some evident of the chosen complex problem solving attributes. The lecturer has some flexibility to select the suitable complex problem solving attributes in order to measure the outcome based on their expertise and creativity. However, the Faculty has set some specific minimum requirement for special courses as tabulated in Table 5 and Table 6 for the selected courses versus compulsory Complex Problem Solving (WP) and Complex Engineering Activities (EA) criteria respectively. These courses are chosen based on their delivery approach, used methods which involve complex engineering activities (see Appendix 3) and engineering responsibilities.

Table 5 : Matrix of Courses vs Complex Problem Solving (WP)

No.	Code	Course	Category	Problem Solving (WP)							
				1	2	3	4	5	6	7	
1	BELM 2342	Introduction to Mechatronic System	Core	✓	✓	✓					
2	BELC 2342	Introduction to Embedded System	Core	✓		✓	✓				
3	BELM 3453	Microcontroller Technology	Core	✓		✓					✓
4	BELM 3543	Electromechanical Systems	Core	✓	✓	✓					✓
5	BELM 3653	Integrated Design Project	Core	✓	✓	✓	✓	✓	✓		
6	BELC 4753	PLC & Automation	Core	✓		✓	✓				
7	BELU 3695	Industrial Training	Core	✓	✓			✓	✓		
8	BELU 4792	Final Year Project I	Core	✓	✓	✓					
9	BELM 4763	Robotics	Core	✓	✓		✓				
10	BELU 4322	Engineer And Society	Core	✓				✓	✓		
11	BELU 4894	Final Year Project II	Core	✓	✓	✓	✓	✓	✓	✓	✓

Table 6 : Matrix of Courses vs Complex Engineering Activities (EA)

No.	Code	Course	Category	Engineering Activity (EA)				
				1	2	3	4	5
1	BELM 2342	Introduction to Mechatronic System	Core	✓		✓		
2	BELC 2342	Introduction to Embedded System	Core	✓		✓		
3	BELM 3453	Microcontroller Technology	Core	✓		✓		
4	BELC 4753	PLC & Automation	Core	✓	✓	✓		
5	BELM 3653	Integrated Design Project	Core	✓	✓	✓	✓	✓
6	BELU 3695	Industrial Training	Core		✓			✓
7	BELU 4792	Final Year Project I	Core	✓	✓	✓		
8	BELU 4322	Engineer And Society	Core	✓	✓		✓	
11	BELU 4894	Final Year Project II	Core	✓	✓	✓	✓	✓
12	BELU 1231	Electrical & Electronics Engineering Laboratory	Core	✓	✓			
13	BELM 4741	Mechanical Engineering Laboratory	Core	✓	✓			
14	BELC 2421	Control System Engineering Laboratory	Core	✓		✓		
15	BELM 3641	Mechatronic System Engineering Laboratory	Core	✓		✓	✓	

Table 7: The Matrix of PO and MQF 2.0

No.	C1	C2	C3A	C3B	C3C	C3D	C3E	C3F	C4A	C4B	C5
PO1	✓										
PO2		✓									
PO3		✓					✓				
PO4		✓									
PO5			✓								
PO6				✓				✓			
PO7											✓
PO8								✓			
PO9					✓						
PO10									✓	✓	
PO11						✓	✓				

## 7 COURSES VERSUS STUDENT LEARNING TIME (SLT)

Table 7 and 8 summarise time allocation for each course in the BELM programme, where students learning time (SLT) is derived based on the delivery method of each course. The distribution of the engineering and non-engineering courses for this programme is based on areas recommended by EAC. A total of 102 credit hours stipulated for engineering courses and 33 credit hours for general education courses. Mostly, the courses have direct contact students-lecturer/instructors through lectures, tutorials, and laboratory/workshop sessions. For courses with 3 credit hours, a 120 hours SLT is allocated while for 2 and 1 credit hours their allocation is 80 and 40 hours, respectively. Student will undergo industrial training program for 10 weeks with 5 credits for this course. Final

Year Project I and II each contributes to 2 and 4 credits hours respectively and one 3 credit hours is allocated for Integrated Design Project

Table 7: Student Learning Time of Engineering Courses for BELM Programme

Grouping	Course Code	Course Name	Course Type	Student Learning Time						Credits Hours	
				Guided Learning					Self-Learn	Others Eg:	Credits
				Lecture	Lab/Workshop	Project	PBL/Design	Tutorial			
Circuit And Signal	BEKU 1123	Electric Circuit I	Core	42				5.5	67.5	5	3
	BEKU 2333	Electric Circuit II	Core	42				5.5	67.5	5	3
	BEKC 2433	Signal and Systems	Core	42				5.5	67.5	5	3
Instrumentation And Control	BEKG 1233	Principles Of Instrumentation and Measurement	Core	42				5.5	67.5	5	3
	BEKC 3533	Introduction to Control System	Core	42				5.5	67.5	5	3
	BEKC 2342	Introduction to Mechatronic Systems	Core	28				3.25	45.25	3.5	2
	BEKC 3643	Control System Engineering	Core	42				5.5	67.5	5	3
Digital And Analog Electronics	BEKG 1123	Principle Of Electrical and Electronics	Core	42				5.5	67.5	5	3
	BENG 1413	Digital Electronics	Core	36			6	5.5	67.5	5	3
	BEKE 2422	Analogue Electronics Applications	Core	28				3.25	45.25	3.5	2
Machines and Drives	BEKM 3543	Electromechanical Systems	Core	42				5.5	67.5	5	3
Electrical Energy Utilization	BEKG 2443	Electrical Systems	Core	42				5.5	67.5	5	3
Communication System	BEKC 2453	Communication System	Core	42				5.5	67.5	5	3
Computer Aided Engineering	BITG 1233	Computer Programming	Core	28	20			3.25	63.25	5.5	3
	BMCG 1253	Engineering Graphic And CAD	Core	28	20			3.25	63.25	5.5	3
Electronics and Microprocessor	BEKC 3543	Microprocessor	Core	36			6	5.5	67.5	5	3
	BEKM 3463	Microcontroller Technology	Core	36			6	5.5	67.5	5	3
Manufacturing/ Production	BEKC 4753	PLC & Automation	Core	42				5.5	67.5	5	3
	BMCG 3643	Hydraulic and Pneumatic System	Core	42				5.5	67.5	5	3
Solid Mechanics	BMCG 1253	Dynamics & Mechanism	Core	42				5.5	67.5	5	3

Grouping	Course Code	Course Name	Course Type	Student Learning Time						Credits Hours	
				Guided Learning					Self-Learn	Others Eg:	Credits
				Lecture	Lab/Workshop	Project	PBL/Design	Tutorial			
Thermodynamics and Heat Transfer	BMCG 3653	Thermodynamics and Heat Transfer	Core	42				5.5	67.5	5	3
Fluid Mechanics	BMCG 2372	Fluid Mechanics	Core	28				3.25	45.25	3.5	2
Statics and Dynamic	BMCG 1123	Statics & Mechanic of Materials	Core	42				5.5	67.5	5	3
	BEKM 4763	Robotics	Core	42				5.5	67.5	5	3
Material Engineering	BMFG 1213	Engineering Materials	Core	42				5.5	67.5	5	3
Laboratory / Workshop	BEKB 1131	Engineering Practice I	Core		20				18	2	1
	BEKB 1231	Engineering Practice II	Core		20				18	2	1
	BEKU 1231	Electrical & Electronics Laboratory	Core		20				18	2	1
	BEKM 2321	Mechanical Engineering Laboratory	Core		20				18	2	1
	BEKC 2421	Control Systems Laboratory	Core		20				18	2	1
	BEKM 3641	Mechatronic System Engineering Laboratory I	Core		20				18	2	1
	BEKM 4751	Mechatronic System Engineering Laboratory II	Core		20				18	2	1
Ethics And Responsibility	BEKU 4861	Engineering Seminar	Core	14				6	18	2	1
	BENG 4882	Engineer And Society	Core	22			6	3	45.5	3.5	2
Capstone Project	BEKM 3653	Integrated Design Project	Core	3			39		73	5	3
Electives	BEKM 4783	Machine Vision	Elective	42				5.5	67.5	5	3*
	BEKC 4773	Intelligent Control System / Ai	Elective	42				5.5	67.5	5	3*
	BEKC 4683	Digital Control Systems	Elective	42				5.5	67.5	5	3*
	BEKM 4863	Industrial Robotics	Elective	42				5.5	67.5	5	3*
	BEKM 4823	Data Communications and Computer Networking	Elective	42				5.5	67.5	5	3*
<b>Total Credits</b>										<b>91</b>	
Industrial Training	BEKU 3695	Industrial Training	Core						200		5

Grouping	Course Code	Course Name	Course Type	Student Learning Time						Credits Hours	
				Guided Learning					Self-Learn	Others Eg:	Credits
				Lecture	Lab/Workshop	Project	PBL/Design	Tutorial			
Final Year Project	BEKU 4792	Final Year Project I	Core	3			6.5		67	3.5	2
	BEKU 4894	Final Year Project II	Core	4			7		141.75	7.25	4
<b>Total Credits</b>										<b>11</b>	
<b>Total Credits for Engineering Courses</b>										<b>102</b>	

\*Choose Two (2) of the Elective Specialization Courses

Table 8: Student Learning Time of General Education Courses for BELM Programme

Sem	Code	Course name	Face-to-face learning				Self-learning activities	Formal assessment	TOTAL
			Teacher centered (TC)	Student Centered Learning (SCL)			Student direct learning/revision/exercise	Continuous learning + final exam	
				Lecture	Tuto	Prac			
1	BLLW 1XX2	THIRD LANGUAGE / MALAY COMMUNICATION*	22	3		6	45.5	3.5	80
	BKKX XXX1	CO-CURRICULUM I				16	22	2	40
	BMIG 1313	ENGINEERING MATHEMATICS I	42	5.5			67.5	5	120
	BELM 2342	INTRODUCTION TO MECHATRONICS SYSTEM	22	3		6	45.5	3.5	80
	BELG 1413	DIGITAL ELECTRONICS	36	5.5		6	67.5	5	120
	BELM 1123	STATICS & MECHANICS OF MATERIAL	42	5.5			67.5	5	120
	BITG 1233	COMPUTER PROGRAMMING	28		28		59	5	120
2	BKKX XXX1	CO-CURRICULUM II				16	22	2	40
	BLLW 1142	ENGLISH FOR ACADEMIC PURPOSE	22	3		6	45.5	3.5	80
	BMKC 1013	DIFFERENTIAL EQUATIONS	42	5.5			67.5	5	120
	BELM1243	DYNAMICS AND VIBRATION	42	5.5			67.5	5	120
	BELU1123	ELECTRIC CIRCUIT I	42	5.5			67.5	5	120
	BMIG1213	ENGINEERING MATERIALS	42	5.5			67.5	5	120
	BELM2321	MECHANICAL ENGINEERING LABORATORY			20		18	2	40
3	BLLW1762	PHILOSOPHY AND CURRENT ISSUES	22	3		6	45.5	3.5	80
	BELG2443	ENGINEERING MATHEMATICS II	42	5.5			67.5	5	120
	BELC2453	COMMUNICATION SYSTEM	42	5.5			67.5	5	120
	BELC2342	INTRODUCTION TO EMBEDDED SYSTEM	22	3		6	45.5	3.5	80
	BELG1233	PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT	42	5.5			67.5	5	120
	BELE2343	PRINCIPLE OF ANALOGUE ELECTRONICS	42	5.5			67.5	5	120

Sem	Code	Course name	Face-to-face learning				Self-learning activities	Formal assessment	TOTAL
			Teacher centered (TC)	Student Centered Learning (SCL)			Student direct learning/revision/exercise	Continuous learning + final exam	
				Lecture	Tuto	Prac			
	BELB1231	ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY			20		18	2	40
4	BLLW2452	ACADEMIC WRITING	22	3		6	45.5	3.5	80
	BERN2143	ENGINEERING STATISTICS	42	5.5			67.5	5	120
	BELC2433	SIGNAL AND SYSTEMS	42	5.5			67.5	5	120
	BELM2433	THEORY OF MACHINES AND MECHANISM	42	5.5			67.5	5	120
	BELU2333	ELECTRIC CIRCUIT II	42	5.5			67.5	5	120
	BMKU 1313	ENGINEERING GRAPHICS AND CAD	28		28		59	5	120
5	BLLW3462	ENGLISH FOR PROFESSIONAL INTERACTION	22	3		6	45.5	3.5	80
	BMIG3212	ENGINEERING ECONOMY AND MANAGEMENT	42	5.5		9	67.5	5	129
	BELM3562	MECHATRONICS SYSTEM DESIGN	22	5			48	5	80
	BELM3453	MICROCONTROLLER TECHNOLOGY	36	5.5		6	67.5	5	120
	BELG2433	ELECTRICAL SYSTEMS	42	5.5			67.5	5	120
	BELC3533	INTRODUCTION TO CONTROL SYSTEM	42	5.5			67.5	5	120
	BELC2421	CONTROL SYSTEM ENGINEERING LABORATORY			20		18	2	40
6	#BLHW 2772 OR *BLHW 2752	APPRECIATION OF ETHICS AND CIVILISATIONS OR MALAYSIAN CULTURE	22	3		6	45.5	3.5	80
	BELM3653	INTEGRATED DESIGN PROJECT	39		27	20	29	5	120
	BELM3543	ELECTROMECHANICAL SYSTEMS	42	5.5			67.5	5	120
	BELM3643	THERMOFLUIDS	42	5.5			67.5	5	120
	BELC4753	PLC AND AUTOMATION	36	5.5		6	67.5	5	120
	BXXX4XX3	ELECTIVE I (PROGRAM)	42	5.5			67.5	5	120
SPECIAL SEM ESTER	BELU3695	INDUSTRIAL TRAINING					200		200
7	BLLW2792	INTERGRITY AND ANTI CORRUPTION	22	3		6	45.5	3.5	80
	BELU4861	ENGINEERING SEMINAR	14	6			18	2	40
	BELU4792	FINAL YEAR PROJECT I	3			6.5	67	3.5	80
	BELM4763	ROBOTICS	42	5.5			67.5	5	120
	BELM4723	HYDRAULIC AND PNEUMATIC SYSTEMS	36	5.5		6	67.5	5	120
	BELM4741	MECHATRONIC SYSTEM ENGINEERING LABORATORY			20		18	2	40

Sem	Code	Course name	Face-to-face learning				Self-learning activities	Formal assessment	TOTAL
			Teacher centered (TC)	Student Centered Learning (SCL)			Student direct learning/revision/exercise	Continuous learning + final exam	
				Lecture	Tuto	Prac			
	BXXXXXX3	ELECTIVE II (PROGRAM)	42	5.5			67.5	5	120
8	BTMW4012	TECHNOLOGY ENTREPRENEURSHIP	22	3		6	45.5	3.5	80
	BELU4322	ENGINEER AND SOCIETY	22	3		6	45.5	3.5	80
	BELU4894	FINAL YEAR PROJECT II	4			7	141.75	7.25	160
	BXXXXXX3	ELECTIVE III (PROGRAM)	42	5.5			67.5	5	120
	BXXXXXX3	ELECTIVE IV (PROGRAM)	42	5.5			67.5	5	120

## Appendix 1: Knowledge Profile (WK)

A programme that builds this type of knowledge and develops the attributes listed below is typically achieved in 4 to 5 years of study, depending on the level of students at entry.

No.	Knowledge Profile
WK1	A systematic, theory-based understanding of the <b>natural sciences</b> applicable to the discipline <b>and awareness of relevant social sciences.</b>
WK2	Conceptually-based <b>mathematics</b> , numerical analysis, <b>data analysis</b> , statistics and formal aspects of computer and information science to support <b>detailed</b> analysis and modelling applicable to the discipline.
WK3	A systematic, theory-based formulation of <b>engineering fundamentals</b> required in the engineering discipline.
WK4	Engineering <b>specialist knowledge</b> that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
WK5	Knowledge, <b>including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts</b> , that supports <b>engineering design</b> in a practice area.
WK6	Knowledge of <b>engineering practice</b> (technology) in the practice areas in the engineering discipline.
WK7	<b>Knowledge</b> of the role of engineering in society and identified issues in engineering practice in the discipline, such as professional responsibility of an engineer to public safety and sustainable development (represented by the 17 UN Sustainable Development Goals (UN-SDG)).
WK8	Engagement with selected knowledge in the <b>current research literature</b> of the discipline, <b>awareness of the power of critical thinking and creative approaches to evaluate emerging issues.</b>
WK9	<b>Ethics, inclusive behavior and conduct.</b> Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

## Appendix 2: Complex Problem Solving

The range of **Complex Engineering Problem** is defined as follows:

No.	Attribute	<b>Complex Engineering Problems</b> have characteristic WP1 and some or all of WP2 to WP7:
WP1	Depth of Knowledge Required	Cannot be resolved without in-depth engineering knowledge at the level of one or more of WK3, WK4, WK5, WK6 or WK8 which allows a fundamental-based, first principles analytical approach.
WP2	Range of conflicting requirements	Involve wide-ranging and/or conflicting technical, non-technical issues (such as ethical, sustainability, legal, political, economic, societal) and consideration of future requirements.
WP3	Depth of analysis required	Have no obvious solution and require abstract thinking, creativity and originality in analysis to formulate suitable models.
WP4	Familiarity of issues	Involve infrequently encountered issues or novel problems.
WP5	Extent of applicable codes	Address problems not encompassed by standards and codes of practice for professional engineering.
WP6	Extent of stakeholder involvement and level of conflicting requirements	Involve collaboration across engineering disciplines, other fields, and/or diverse groups of stakeholders with widely varying needs.
WP7	Interdependence	Address high level problems with many components or sub-problems that may require a systems approach.

## Appendix 3: Complex Engineering Activities

The range of **Complex Engineering Activities** is defined as follows:

No.	Attribute	<b>Complex activities</b> mean (engineering) activities or projects that have some or all of the following characteristics:
EA1	Range of resources	Involve the use of diverse resources including people, data and information, natural, financial and physical resources and appropriate technologies including analytical and/or design software.
EA2	Level of interactions	Require optimal resolution of interactions between wide ranging and/or conflicting technical, non-technical, and engineering issues.
EA3	Innovation	Involve creative use of engineering principles, innovative solutions for conscious purpose, and research-based knowledge.
EA4	Consequences to society and the environment	Have significant consequences in a range of contexts, characterised by difficulty of prediction and mitigation.
EA5	Familiarity	Can extend beyond previous experiences by applying principles-based approaches.