OBE IMPLEMENTATION OF BACHELOR OF ELECTRICAL ENGINEERING WITH HONOURS (BELG) 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 electrical 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 BELG programme, students are expected to attain the following 11 attributes:

Table 1 – Programme Outcomes for BELG 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, research literature and analyze 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 to 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, 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 recognize limitation of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, (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	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	Individual and Collaborative Team Work – 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	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	Life Long Learning – Recognise 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).

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, research literature and analyze 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 to 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, 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 recognize limitation of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, (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	**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	**Individual and Collaborative Team Work –** 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	**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	**Life Long Learning –** Recognise 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).			√

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	Core/ Elective	Programme Outcomes										
				1	2	3	4	5	6	7	8	9	10	11
1	BLHL 1XX2	Third Language	W									√		
2	BKKX XXX1	Co-Curriculum I	W							√	√			
3	BMIG 1313	Engineering Mathematics 1	P	√										
4	BITG 1233	Computer Programming	P	√		√		√						
5	BELU 1131	Engineering Practice I	P	√				√			√	√		
6	BELU 1123	Electric Circuit I	P	√	√									
7	BMKU 1312	Engineering Graphics And Cad	P	√				√				√		
8	#BLHW 1762	Philosophy And Current Issues	W							√				
9	*BLHW 1742	Malaysian Studies	W							√				
10	BLHW1442	English For Academic Purpose	W									√		
11	BKKX XXX1	Co-Curriculum II	W							√	√			
12	BMKC 1013	Differential Equations	P	√										
13	BELG 1413	Digital Electronics	P	√	√	√								
14	BELG 1233	Principles Of Instrumentation And Measurements	P	√										
15	BELE 1123	Electronic Devices	P	√										
16	BELU 1231	Engineering Practice II	P	√				√			√	√		
17	BLLW 2152	Academic Writing	W									√		
18	BELG 2443	Engineering Mathematics 2	P	√										
19	BELE 2333	Analogue Electronics	P	√	√	√						√		
20	BELC 2433	Signals And Systems	P	√	√									
21	BELU 2331	Electrical Engineering Laboratory I	P		√			√			√	√		
22	BELU 2333	Electric Circuit Ii	P	√	√									
23	BLHW 2792	Kursus Integriti Anti Rasuah	W							√				
24	#BLHW 2772	Penghayatan Etika Dan Peradaban	W							√				
25	*BLHW 2752	Malaysian Culture								√				
26	BERN 2143	Engineering Statistics	P	√	√									
27	BELG 2433	Electrical Systems	P	√	√									
28	BMKU 2432	Introduction To Mechanical Engineering	P	√	√									
29	BELP 2453	Electromagnetic Theory	P	√	√									
30	BELC 2453	Communication System	P	√	√									
31	BELU 2431	Electrical Engineering Laboratory II	P		√			√			√	√		
32	BLLW 3162	English For Professional Interaction	W									√		
33	BELE 3533	Electrical Machines	P	√	√									

No.	Code	Course	Core/ Elective	Programme Outcomes										
				1	2	3	4	5	6	7	8	9	10	11
34	BELC 3523	Control Systems Engineering	P	√	√									
35	BELC 3553	Embedded Systems	P		√	√		√			√	√		
36	BELE 3543	Power Electronics	P	√	√	√								
37	BELP 3553	Power Systems Engineering	P	√	√									
38	BELE 3653	Electrical Drives	P	√		√	√	√						
39	BELC 3683	Control Systems Design	P	√		√								
40	BELG 3661	Integrated Design Project I	P			√			√		√	√	√	√
41	BELU 3551	Electrical Engineering Laboratory III	P				√	√			√	√		
42	BELP 3673	Power System Analysis	P	√	√									
43	BELP 3693	High Voltage Engineering	P	√	√	√								
44	BMIU 3213	Engineering Economy And Management	P		√		√				√		√	
45	BELU 3695	Industrial Training	P	√						√	√	√		√
46	BELU 4861	Engineering Seminar	P						√	√				
47	BELG 4763	Integrated Design Project Ii	P			√	√	√	√	√	√	√	√	√
48	BELU 4792	Final Year Project I	P		√		√					√	√	√
49	BELP 4853	Energy Utilization And Conservation	P		√	√	√		√			√		
50	BEKX XXX3	Elective I (Program)	E											
51	BEKX XXX3	Elective II (Program)	E											
52	BTMW 4012	Technology Entrepreneurship	W									√	√	√
53	BELU 4322	Engineer And Society	P						√	√		√		
54	BELU 4894	Final Year Project Ii	P		√	√	√	√	√	√		√	√	√
55	BELP 4843	Renewable Energy	P		√	√			√					
56	BEKX XXX3	Elective III (Program)	E											

List of Elective Courses

No.	Code	Course	Core/ Elective	Programme Outcomes											
				1	2	3	4	5	6	7	8	9	10	11	12
1	BELP 3693	Distribution Systems Design	E		√	√			√						
2	BELP 4873	Power System Protection	E		√	√									
3	BELE 3663	Power Electronics System	E		√	√		√							
4	BELE 3673	Industrial Power Electronics	E		√	√									
5	BELE 4763	Modern Electrical Drives	E		√	√		√							
6	BELE 4873	Special Machines	E		√	√									
7	BELC 4743	Intelligent Control Systems	E		√	√		√							
8	BELC 3673	Industrial Control And Automation	E		√	√									
9	BELM 4863	Industrial Robotics	E		√	√								√	
10	BELC 4683	Digital Control System	E		√	√		√							
11	BELC 4XX3	PLC and Automation	E		√	√		√			√	√			

5 COURSES VS KNOWLEDGE PROFILES (WK)

Based on EAC Standard 2020, 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	Category	Knowledge Profile (WK)								
				1	2	3	4	5	6	7	8	9
1	BLHL 1XX2	Third Language	W									
2	BKKX XXX1	Co-Curriculum I	W									√
3	BMIG 1313	Engineering Mathematics 1	P		√							
4	BITG 1233	Computer Programming	P		√				√			
5	BELU 1131	Engineering Practice I	P		√	√			√			√
6	BELU 1123	Electric Circuit I	P			√						
7	BMKG 1XX2	Engineering Graphics And Cad	P		√	√			√			
8	#BLHW 1762	Philosophy And Current Issues	W									√
9	*BLHW 1742	Malaysian Studies	W									√
10	BLHW1442	English For Academic Purpose	W									
11	BKKX XXX1	Co-Curriculum II	W									√
12	BMKC 1013	Differential Equations	P		√							
13	BELG 1413	Digital Electronics	P			√		√				
14	BELG 1233	Principles Of Instrumentation And Measurements	P			√						
15	BELE 1123	Electronic Devices	P	√		√						
16	BELU 1231	Engineering Practice II	P		√	√			√			√
17	BLLW 2152	Academic Writing	W									
18	BELG 2443	Engineering Mathematics 2	P		√							
19	BELE 2333	Analogue Electronics	P			√		√				
20	BELC 2433	Signals And Systems	P			√						
21	BELU 2331	Electrical Engineering Laboratory I	P		√	√			√			√
22	BELU 2333	Electric Circuit Ii	P			√						
23	BLHW 2792	Kursus Integriti Anti Rasuah	W									√
24	#BLHW 2772	Penghayatan Etika Dan Peradaban	W									√
25	*BLHW 2752	Malaysian Culture										√
26	BERN 2143	Engineering Statistics	P		√							
27	BELG 2433	Electrical Systems	P			√						
28	BMKU 2432	Introduction To Mechanical Engineering	P			√						
29	BELP 2453	Electromagnetic Theory	P	√								
30	BELC 2453	Communication System	P			√						
31	BELU 2431	Electrical Engineering Laboratory II	P		√	√			√			√
32	BLLW 3162	English For Professional Interaction	W									
33	BELE 3533	Electrical Machines	P			√						
34	BELC 3523	Control Systems Engineering	P			√						
35	BELC 3553	Embedded Systems	P		√	√		√	√		√	√
36	BELE 3543	Power Electronics	P				√	√				
37	BELP 3553	Power Systems Engineering	P				√	√				
38	BELE 3653	Electrical Drives	P		√		√	√	√		√	
39	BELC 3683	Control Systems Design	P				√	√				
40	BELG 3661	Integrated Design Project I	P	√				√		√	√	√
41	BELU 3551	Electrical Engineering Laboratory III	P		√				√		√	√
42	BELP 3673	Power System Analysis	P		√		√	√				
43	BELP 3693	High Voltage Engineering	P	√			√	√				
44	BMIU 3213	Engineering Economy And Management	P			√					√	√
45	BELU 3695	Industrial Training	P				√				√	√
46	BELU 4861	Engineering Seminar	P	√				√		√		√
47	BELG 4763	Integrated Design Project II	P	√	√			√	√	√	√	√

No.	Code	Course	Category		Knowledge Profile (WK)							
				1	2	3	4	5	6	7	8	9
48	BELU 4792	Final Year Project I	P				√				√	
49	BELP 4853	Energy Utilization And Conservation	P	√			√	√		√	√	
50	BEKX XXX3	Elective Ii (Program)	E									
51	BEKX XXX3	Elective I (Program)	E									
52	BTMW 4012	Technology Entrepreneurship	W								√	
53	BELU 4322	Engineer And Society	P	√				√		√		√
54	BELU 4894	Final Year Project II	P	√	√		√	√	√	√	√	√
55	BELP 4843	Renewable Energy	P	√			√	√		√		
56	BEKX XXX3	Elective IIII (Program)	E									

List of Elective Courses

No.	Code	Course	Category		Knowledge Profile (WK)							
				1	2	3	4	5	6	7	8	9
1	BELP 3693	Distribution Systems Design	E	√			√	√		√		
2	BELP 4873	Power System Protection	E				√	√				
3	BELE 3663	Power Electronics System	E		√		√	√	√			
4	BELE 3673	Industrial Power Electronics	E				√	√				
5	BELE 4763	Modern Electrical Drives	E		√		√	√	√			
6	BELE 4873	Special Machines	E				√	√				
7	BELC 4743	Intelligent Control Systems	E		√		√	√	√			
8	BELC 3673	Industrial Control And Automation	E				√	√				
9	BELM 4863	Industrial Robotics	E				√	√			√	
10	BELC 4683	Digital Control System	E		√		√	√	√			
11	BELC 4XX3	PLC and Automation	E		√		√	√	√			√

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 PO6 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	Core/ Elective	Problem Solving (WP)						
				1	2	3	4	5	6	7
1	BELC 3553	Embedded System	Core	√	√	√	√			
2	BELP 4853	Energy Utilization and Conservation	Core	√	√			√	√	√
3	BELP 3693	High Voltage Engineering	Core	√		√				√
4	BELP 4843	Renewable Energy	Core	√			√	√	√	
5	BELU 3695	Industrial Training	Core	√	√			√	√	
6	BELG 3661	Integrated Design Project I	Core	√	√	√	√	√	√	√
7	BELG 4763	Integrated Design Project II	Core	√	√	√	√	√	√	√
8	BELU 4322	Engineer And Society	Core	√				√	√	
9	BELU 4792	Final Year Project I	Core	√	√	√	√	√	√	√
10	BELU 4894	Final Year Project II	Core	√	√	√	√	√	√	√

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

No.	Code	Course	Core/ Elective	Engineering Activities (EA)				
				1	2	3	4	5
1	BELU 1131	Engineering Practice I	Core	√	√			
2	BELU 1231	Engineering Practice II	Core	√	√	√		
3	BELU 2331	Electrical Engineering Laboratory I	Core	√	√			
4	BELU 2431	Electrical Engineering Laboratory II	Core	√	√			
5	BELU 3551	Electrical Engineering Laboratory III	Core	√	√			√
6	BELC 3553	Embedded System	Core	√		√		
7	BELP 4853	Energy Utilization and Conservation	Core	√	√		√	
8	BELU 3695	Industrial Training	Core		√			√
9	BELG 3661	Integrated Design Project I	Core	√	√	√	√	
10	BELG 4763	Integrated Design Project II	Core	√	√	√	√	√
11	BELU 4322	Engineer And Society	Core	√	√		√	
12	BELU 4792	Final Year Project I	Core	√	√	√		
13	BELU 4894	Final Year Project II	Core	√	√	√	√	√

7 COURSES VERSUS STUDENT LEARNING TIME (SLT)

Table 7 and 8 summarize time allocation for each course in the BELG 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 BELG Programme

Grouping	Course Code	Course Name	Course Type	Student Learning Time						Credits Hours	
				Guided Learning					Self-Learni	Other s Eg:	Credits
				Lec.	Lab/ Workshop	Proj.	PBL /Design	Tuto.			
Circuit And Signal	BELU 1123	Electric Circuit I	Core	42				5.5	67.5	5	3
	BELU 2333	Electric Circuit II	Core	42				5.5	67.5	5	3
	BELC 2433	Signal and Systems	Core	42				5.5	67.5	5	3
Electromagnetic Fields and Waves	BELP 2453	Electromagnetic Theory	Core	42				5.5	67.5	5	3
Instrumentation And Control	BELG 1233	Principles Of Instrumentation and Measurement	Core	42				5.5	67.5	5	3
	BELC 3523	Control Systems Engineering	Core	42				5.5	67.5	5	3
	BELC 3683	Control Systems Design	Core	42				5.5	67.5	5	3
Digital And Analog Electronics	BELE 1123	Electronic Devices	Core	42				5.5	67.5	5	3
	BELG 1413	Digital Electronics	Core	36			6	5.5	67.5	5	3
	BELE 2333	Electronic Analog	Core	36			6	5.5	67.5	5	3
Power Electronics	BELE 3543	Power Electronics	Core	42				5.5	67.5	5	3
Machines And Drive	BELE 3533	Electrical Machines	Core	42				5.5	67.5	5	3
Electronic Drives And Applications	BELE 3653	Electric Drives	Core	33			9	5.5	67.5	5	3
Power System Analysis	BELP 3553	Power Systems Engineering	Core	42				5.5	67.5	5	3
	BELP 3673	Power System Analysis	Core	42				5.5	67.5	5	3
Electrical Energy Utilization	BELG 2433	Electrical Systems	Core	42				5.5	67.5	5	3
	BELP 4853	Energy Utilization and Conservation	Core	42				5.5	67.5	5	3
Electrical Power	BELP 3693	High Voltage Engineering	Core	42				5.5	67.5	5	3

Grouping	Course Code	Course Name	Course Type	Student Learning Time						Credits Hours	
				Guided Learning					Self-Learni	Others Eg:	Credits
				Lec.	Lab/ Workshop	Proj.	PBL /Design	Tuto.			
Generation And High Voltage Engineering	BELP 4843	Renewable Energy	Core	42				5.5	67.5	5	3
Communication System	BELC 2453	Communication System	Core	42				5.5	67.5	5	3
Computer Applications	BITG 1233	Computer Programming	Core	28	20			3.25	63.25	5.5	3
	BELC 3553	Embedded Systems	Core	36	6			5.5	67.5	5	3
	BMKG 1XX2	Engineering Graphics And Cad	Core	14	20	8			32	6	2
Laboratory / Workshop	BELU 1131	Engineering Practice I	Core		20				18	2	1
	BELU 1231	Engineering Practice II	Core		20				18	2	1
	BELU 2331	Electrical Engineering Lab I	Core		20				18	2	1
	BELU 2431	Electrical Engineering Lab II	Core		20				18	2	1
	BELU 3551	Electrical Engineering Lab III	Core		20				18	2	1
Ethics And Responsibility	BELU 4861	Engineering Seminar	Core	14				6	18	2	1
	BELU 4322	Engineer And Society	Core	22			6	3	45.5	3.5	2
Capstone Project	BELG 3661	Integrated Design Project I	Core	1			13		21	5	3
	BELG 4763	Integrated Design Project II	Core	1			41		73	5	3
Mechanical / Material Engineering	BMFG 1213	Engineering Materials	Core	42				5.5	67.5	5	3
	BMKU 2432	Introduction To Mechanical Engineering	Core	28				3.25	45.25	3.5	2
Electives	BELC 4XX3	PLC and Automation	Elective	42				5.5	67.5	5	3*
	BELC 4743	Intelligent Control Systems	Elective	42				5.5	67.5	5	3*
	BELC 4683	Digital Control Systems	Elective	42				5.5	67.5	5	3*
	BELM 4863	Industrial Robotics	Elective	42				5.5	67.5	5	3*
	BEKE 4873	Electrical Machine Design	Elective	42				5.5	67.5	5	3*
	BELE 3673	Industrial Power Electronics	Elective	42				5.5	67.5	5	3*

Grouping	Course Code	Course Name	Course Type	Student Learning Time						Credits Hours	
				Guided Learning					Self-Learni	Others Eg:	Credits
				Lec.	Lab/ Workshop	Proj.	PBL /Design	Tuto.			
	BELE 4763	Modern Electrical Drives	Elective	42				5.5	67.5	5	3*
	BELE 3663	Power Electronic System	Elective	42				5.5	67.5	5	3*
	BELP 4873	Power System Protection	Elective	42				5.5	67.5	5	3*
	BELP 3693	Distribution System Design	Elective	42				5.5	67.5	5	3*
Total Credits										**91**	
Industrial Training	BELU 3695	Industrial Training	Core						200		5
Final Year Project	BELU 4792	Final Year Project I	Core	3			6.5		67	3.5	2
	BELU 4894	Final Year Project II	Core	4			7		141.75	7.25	4
Total Credits										**11**	
Total Credits for Engineering Courses										**102**	

*Choose Three (3) of the Elective Specialization Courses

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

Grouping	Course Code	Course	Course Type	Student Learning Time							Credits
				Guided Learning					Self-learni	Others Eg:	
				Lec.	Lab/ Workshop	Proj.	PBL /Design	Tuto.			
Applied Science/ Maths/ Computer	BMIG 1313	Engineering Mathematics 1	Core	42				5.5	67.5	5	3
	BMKC 1013	Differential Equation	Core	42				5.5	67.5	5	3
	BELG 2443	Engineering Mathematics 2	Core	42				5.5	67.5	5	3
	BERN 2143	Engineering Statistic	Core	42				5.5	67.5	5	3
Total Credits											**12**
Management / Law/ Accountancy	BMIU 3213	Engineering Economy and Management	Core	42				5.5	67.5	5	3
	BTMW 4012	Entrepreneurship Technology	Core	22			6	3	45.5	3.5	2
Total Credits											**5**
Communication Skills/ Humanities/ Ethics	#BLHW 1762	Philosophy and Current Issues	Univ.	22			6	3	45.5	3.5	2
	BLHW 1442	English For Academic Purpose	Univ.	22			6	3	45.5	3.5	2
	BLHW 2792	Anti-Corruption Integrity Course	Univ.	22			6	3	45.5	3.5	2
	BLHL 1XX2	Third Language	Univ.	22			6	3	45.5	3.5	2
	BLLW 2152	Academic Writing	Univ.	22			6	3	45.5	3.5	2
	BLLW 3162	English For Professional Interaction	Univ.	22			6	3	45.5	3.5	2
	#BLHW 2772* orBLHW 2752	#Appreciation Of Ethics And Civilization OR *Malaysian Culture	Univ.	22			6	3	45.5	3.5	2
Total Credits											**14**
Co-Curriculum	BKKK xxx1	Co-Curriculum I	Univ.				16		22	2	1
	BKKK xxx1	Co-Curriculum II	Univ.				16		22	2	1
Total Credits											**2**
Total Credits for Non-Engineering Courses											**33**

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 **natural sciences** applicable to the discipline and awareness of relevant **social sciences**.
WK2	Conceptually-based **mathematics**, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
WK3	A systematic, theory-based formulation of **engineering fundamentals** required in the engineering discipline.
WK4	Engineering **specialist knowledge** 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, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports **engineering design** in a practice area.
WK6	Knowledge of **engineering practice** (technology) in the practice areas in the engineering discipline.
WK7	**Knowledge 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 current **research literature** of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
WK9	**Ethics, inclusive behavior and conduct.** 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 problem solving** is defined as follows:

No.	Attribute	**Complex Engineering Problems** 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**	**Complex activities** mean (engineering) activities or projects that have some or all of the following characteristics:
EA1	Range of resources	Involve the use of diverse resources (and for this purpose resources includes people, money, equipment, materials, information and technologies).
EA2	Level of interactions	Require resolution of significant problems arising from interactions between wide ranging or conflicting technical, engineering or other issues.
EA3	Innovation	Involve creative use of engineering principles and research-based knowledge in novel
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.