OBE IMPLEMENTATION OF BACHELOR OF ELECTRICAL ENGINEERING WITH HONOURS (BELG) PROGRAMME

EAC STANDARD 2020

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 twelve (12) attributes as in Standard 2020 are mapped to the new eleven (11) attributes as in Standard 2024:

Table 1 – Programme Outcomes for BELG Programme based on Standard 2020 and Standard 2024

Standard 2024	Standard 2020	PROGRAMME OUTCOMES (PO 12)
PO1	PO1	Engineering Knowledge - Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialisation as specified in WK1 to WK4 respectively to the solution of complex engineering problems
PO2	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 (WK1 to WK4).
PO3	PO3	Design/Development of Solutions - Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (WK5).
PO4	PO4	Investigation - Conduct investigation of complex engineering problems using research-based knowledge (WK8) and research methods, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
PO5	PO5	Modern Tool Usage - Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations (WK6).
PO6	PO6	The Engineer and Society - Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems (WK7).
	PO7	Environment and Sustainability - Understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts (WK7)
PO7	PO8	Ethics - Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7).
PO9	PO9	Communication - Communicate effectively 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, and give and receive clear instructions.
PO8	PO10	Individual and Teamwork - Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
PO11	PO11	Lifelong Learning - Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PO10	PO12	Project Management and Finance - Demonstrate 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, to manage projects in multidisciplinary environments.

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, engineering fundamentals and an engineering specialisation as specified in WK1 to WK4 respectively to the solution of 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 (WK1 to WK4).	√		
PO3	**Design/Development of Solutions** Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (WK5).	√		
PO4	**Investigation** Conduct investigation of complex engineering problems using research-based knowledge (WK8) and research methods, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.	√		
PO5	**Modern Tool Usage** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations (WK6).	√		
PO6	**Engineer and Society** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems (WK7).		√	
PO7	**Environment and Sustainability** Understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts (WK7)	√		
PO8	**Ethics** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7).		√	
PO9	**Communication** Communicate effectively 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		√	

No	Programme Outcomes (PO)	PEO 1	PEO2	PEO3
	documentation, make effective presentations, and give and receive clear instructions.			
PO10	**Individual and Team Work** Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.		√	
PO11	**Life-long Learning** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.			√
PO12	**Project Management and Finance** Demonstrate 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, to manage projects in multidisciplinary environments.			√

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	12
1	BMIG 1313	Engineering Mathematics 1	Core	√											
2	BITG 1233	Computer Programming	Core	√				√							
3	BELG 1123	Principles of Electrical and Electronics	Core	√											
4	BMIG 1213	Engineering Materials	Core	√	√										
5	BELU 1131	Engineering Practice I	Core	√				√					√		
6	BLLW 1XX2	Elective I (University)	Univ.									√			
7	BKKX XXX1	Co-Curriculum I	Univ.						√				√		
8	BLHW 1762	Philosophy And Current Issues	Univ.						√	√					
9	BMKG 1013	Differential Equations	Core	√											
10	BERG 1413	Digital Electronics	Core	√	√										
11	BELG 1233	Principles of Instrumentation and Measurements	Core	√											
12	BELU 1123	Electric Circuit I	Core	√	√										
13	BELU 1231	Engineering Practice II	Core	√				√					√		
14	BLLW 1142	English For Academic Purposes	Univ.									√			
15	BKKX XXX1	Co-Curriculum II	Univ.						√				√		
16	BELG 2443	Engineering Mathematics 2	Core	√											
17	BMKG 1523	Engineering Graphics and Computer Aided Design	Core	√				√				√			
18	BELU 2333	Electric Circuit II	Core	√	√										

No.	Code	Course	Core/ Elective	Programme Outcomes											
				1	2	3	4	5	6	7	8	9	10	11	12
19	BELE 2333	Electronics Analog	Core	√	√	√						√			
20	BELC 2433	Signal And Systems	Core	√	√										
21	BELU 2331	Electrical Engineering Laboratory I	Core		√			√				√	√		
22	BLLW 2152	Academic Writing	Univ.									√			
23	BERG 2143	Engineering Statistics	Core	√	√										
24	BELG 2433	Electrical System	Core	√	√										
25	BMKG 2432	Introduction To Mechanical Engineering	Core	√	√										
26	BELC 2453	Communication System	Core	√	√										
27	BELP 2453	Electromagnetic Theory	Core	√	√										
28	BELU 2431	Electrical Engineering Laboratory II	Core		√			√				√	√		
29	BLHW 2772 / *BLHW 2752	Appreciation Of Ethics and Civilization / *Malaysian Culture	Univ.						√	√					
30	BELE 3533	Electrical Machines	Core		√	√									
31	BELC 3523	Control Systems Engineering	Core	√	√										
32	BELC 3543	Microprocessor	Core		√	√	√	√				√	√		
33	BELE 3543	Power Electronics	Core	√		√									
34	BELP 3673	Power System Analysis	Core		√	√									
35	BLLW 3162	English For Professional Interaction	Univ.									√			
36	BELE 3653	Electrical Drives	Core	√		√	√	√							
37	BELC 3663	Control And Instrumentation	Core	√		√									
38	BELP 3683	High Voltage Engineering	Core	√	√	√									
39	BELG 3673	Integrated Design Project	Core			√		√		√			√		√
40	BELU 3551	Electrical Engineering Laboratory III	Core				√	√				√	√		
41	BEKX XXX3	Elective 1 (Program)	Core												
42	BELU 3695	Industrial Training	Core	√							√	√	√	√	
43	BMIG 3213	Engineering Economy and Management	Core		√		√						√		√
44	BELU 4861	Engineering Seminar	Core						√	√	√				
45	BELU 4792	Final Year Project I	Core		√		√					√		√	
46	BELP 4843	Renewable Energy	Core	√	√	√									
47	BEKX XXX3	Elective II (Program)	Core												
48	BIPW XXX2	Elective II (University)	Univ.							√					
49	BERG 4322	Engineer And Society	Core						√	√	√				
50	BELP 4853	Energy Utilization and Conservation	Core		√	√	√		√						
51	BEKU 4894	Final Year Project II	Core		√	√	√		√		√	√		√	
52	BEKX XXX3	Elective III (Program)	Core												
53	BTMW 4012	Entrepreneurship Technology	Univ.									√		√	√
	Elective Program (EP)														
1	BELP 3683	Distribution Systems Design	EP		√	√			√						
2	BELP 4873	Power System Protection	EP		√	√									
3	BELE 3663	Power Electronics System	EP		√	√		√							
4	BELE 3673	Industrial Power Electronics	EP		√	√									
5	BELE 4763	Modern Electrical Drives	EP		√	√		√							
6	BELE 4873	Special Machines	EP		√	√									
7	BELC 4773	Intelligent Control Systems	EP		√	√		√							
8	BELC 3673	Industrial Control And Automation	EP		√	√									
9	BELM 4863	Industrial Robotics	EP		√	√									
10	BELC 4683	Digital Control System	EP		√	√		√							

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
1	BMIG 1313	Engineering Mathematics 1	Core		√						
2	BITG 1233	Computer Programming	Core		√				√		
3	BELG 1123	Principles of Electric and Electronics	Core	√		√					
4	BMIG 1213	Engineering Materials	Core	√		√					
5	BELU 1131	Engineering Practice I	Core			√			√		
6	BLLW 1XX2	Elective I (University)	Univ.								
7	BKKX XXX1	Co-Curriculum I	Univ.							√	
8	BLHW 1762	Differential Equations	Core		√						
9	BMKG 1013	Digital Electronics	Core			√		√			
10	BERG 1413	Principles of Instrumentation and Measurements	Core			√					
11	BELG 1233	Electric Circuit I	Core			√					
12	BELU 1123	Engineering Practice II	Core			√			√		
13	BELU 1231	Philosophy And Current Issues	Univ.							√	
14	BLLW 1142	English For Academic Purpose	Univ.								
15	BKKX XXX1	Co-Curriculum II	Univ.							√	
16	BELG 2443	Engineering Mathematics 2	Core		√						
17	BMKG 1523	Engineering Graphics and Computer Aided Design	Core			√			√		
18	BELU 2333	Electric Circuit II	Core			√					
19	BELE 2333	Electronics Analog	Core			√		√			
20	BELC 2433	Signal And Systems	Core			√					
21	BELU 2331	Electrical Engineering Laboratory I	Core			√			√		
22	BLLW 2152	Academic Writing	Univ.								
23	BERG 2143	Engineering Statistics	Core		√						
24	BELG 2433	Electrical System	Core			√					
25	BMKG 2432	Introduction To Mechanical Engineering	Core			√					
26	BELC 2453	Communication System	Core			√					
27	BELP 2453	Electromagnetic Theory	Core	√		√					
28	BELU 2431	Electrical Engineering Laboratory II	Core			√			√		
29	BLHW 2772 / *BLHW 2752	Appreciation of Ethics and Civilization / *Malaysian Culture	Univ.							√	
30	BELE 3533	Electrical Machines	Core	√	√	√	√	√			
31	BELC 3523	Control Systems Engineering	Core			√					
32	BELC 3543	Microprocessor	Core			√		√	√		√
33	BELE 3543	Power Electronics	Core				√	√			
34	BELP 3673	Power System Analysis	Core				√	√			
35	BLLW 3162	English For Professional Interaction	Univ.								
36	BELE 3653	Electrical Drives	Core				√	√	√		√
37	BELC 3663	Control and Instrumentation	Core				√	√			
38	BELP 3683	High Voltage Engineering	Core	√			√	√			
39	BELG 3673	Integrated Design Project	Core					√	√	√	
40	BELU 3551	Electrical Engineering Laboratory III	Core						√		√
41	BEKX XXX3	Elective 1 (Program)	Core								
42	BELU 3695	Industrial Training	Core				√			√	

No.	Code	Course	Category	Knowledge Profile (WK)							
				1	2	3	4	5	6	7	8
43	BMIG 3213	Engineering Economics and Management	Core			√					√
44	BELU 4861	Engineering Seminar	Core							√	
45	BELU 4792	Final Year Project I	Core			√	√				√
46	BELP 4843	Renewable Energy	Core				√	√			
47	BEKX XXX3	Elective II (Program)	Core								
48	BIPW XXX2	Elective II (University)	Univ.								
49	BERG 4322	Engineer And Society	Core							√	
50	BELP 4853	Energy Utilization and Conservation	Core				√	√		√	√
51	BEKU 4894	Final Year Project II	Core			√	√	√		√	√
52	BEKX XXX3	Elective III (Program)	Core								
53	BTMW 4012	Entrepreneurship Technology	Univ.								
	Elective Program (EP)										
1	BELP 3683	Distribution Systems Design	EP				√	√		√	
2	BELP 4873	Power System Protection	EP				√	√			
3	BELE 3663	Power Electronics System	EP				√	√	√		
4	BELE 3673	Industrial Power Electronics	EP				√	√			
5	BELE 4763	Modern Electrical Drives	EP				√	√	√		
6	BELE 4873	Special Machines	EP				√	√			
7	BELC 4773	Intelligent Control Systems	EP				√	√	√		
8	BELC 3673	Industrial Control And Automation	EP				√	√			
9	BELM 4863	Industrial Robotics	EP				√	√			
10	BELC 4683	Digital Control System	EP				√	√	√		

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	Core/ Elective	Problem Solving (WP)						
				1	2	3	4	5	6	7
1	BELC 3543	Microprocessor	Core	√	√	√	√			
2	BELP 4853	Energy Utilization and Conservation	Core	√	√			√	√	√
3	BELP 4883	High Voltage Engineering	Core	√		√				√
4	BELP 4843	Renewable Energy	Core	√			√	√	√	
5	BELU 3695	Industrial Training	Core	√	√			√	√	
6	BELG 3673	Integrated Design Project	Core	√	√	√	√	√	√	√
7	BELU 4792	Final Year Project I	Core	√	√	√				
8	BERG 4322	Engineer And Society	Core	√				√	√	
9	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 3543	Microprocessor	Core	√		√		
7	BELP 4853	Energy Utilization and Conservation	Core	√	√		√	
8	BELP 4843	Renewable Energy	Core	√	√		√	
9	BELU 3695	Industrial Training	Core		√			√
10	BELB 3673	Integrated Design Project	Core	√	√	√	√	√
11	BELU 4792	Final Year Project I	Core	√	√	√		
12	BERG 4322	Engineer And Society	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	Others Eg:	Credits
				Lec.	Lab/ Workshop	Proj.	PBL /Design	Tuto.			
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
Electromagnetic Fields and Waves	BEKP 2453	Electromagnetic Theory	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 3553	Control Systems Engineering	Core	42				5.5	67.5	5	3
	BEKC 3663	Control and Instrumentation	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 2333	Electronic Analog	Core	36			6	5.5	67.5	5	3
Power Electronics	BEKE 3543	Power Electronics	Core	42				5.5	67.5	5	3
Machines And Drive	BEKE 3533	Electrical Machines	Core	42				5.5	67.5	5	3
Electronic Drives And Applications	BEKE 4753	Electric Drives	Core	33			9	5.5	67.5	5	3
Power System Analysis	BEKP 4773	Power System Analysis	Core	42				5.5	67.5	5	3
Electrical Energy Utilization	BEKG 2443	Electrical Systems	Core	42				5.5	67.5	5	3
	BEKP 4853	Energy Utilization and Conservation	Core	42				5.5	67.5	5	3
Electrical Power Generation And High	BEKP 4883	High Voltage Engineering	Core	42				5.5	67.5	5	3
	BEKP 4843	Renewable Energy	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.			
Voltage Engineering											
Communication System	BEKC 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
	BEKC 3543	Microprocessor	Core	36	6			5.5	67.5	5	3
	BMCG 1253	Engineering Graphic And CAD	Core	28	20			3.25	63.25	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
	BEKB 2331	Electrical Engineering Lab I	Core		20				18	2	1
	BEKB 2431	Electrical Engineering Lab II	Core		20				18	2	1
	BEKB 3551	Electrical Engineering Lab III	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	BEKB 3673	Integrated Design Project	Core	1			41		73	5	3
Mechanical / Material Engineering	BMFG 1213	Engineering Materials	Core	42				5.5	67.5	5	3
	BMCG 2342	Introduction To Mechanical Engineering	Core	28				3.25	45.25	3.5	2
Electives	BEKC 3673	Industrial Control And Automation	Elective	42				5.5	67.5	5	3*
	BEKC 4773	Intelligent Control Systems	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*
	BEKE 4873	Electrical Machine Design	Elective	42				5.5	67.5	5	3*
	BEKE 3673	Industrial Power Electronics	Elective	42				5.5	67.5	5	3*
	BEKE 4673	Modern Electrical Drives	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.			
	BEKE 3663	Power Electronic System	Elective	42				5.5	67.5	5	3*
	BEKP 4873	Power System Protection	Elective	42				5.5	67.5	5	3*
	BEKP 3683	Distribution System Design	Elective	42				5.5	67.5	5	3*
Total Credits										**91**	
Industrial Training	BEKU 3695	Industrial Training	Core						200		5
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
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	BMFG 1313	Engineering Mathematics 1	Core	42				5.5	67.5	5	3
	BMCG 1013	Differential Equation	Core	42				5.5	67.5	5	3
	BEKG 2443	Engineering Mathematics 2	Core	42				5.5	67.5	5	3
	BENG 2143	Engineering Statistic	Core	42				5.5	67.5	5	3
Total Credits											**12**
Management / Law/ Accountancy	BMFG 4623	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	BIPW 1132	Philosophy and Current Issues	Univ.	22			6	3	45.5	3.5	2
	BLLW 1142	English For Academic Purpose	Univ.	22			6	3	45.5	3.5	2
	BIPW 2132/	Appreciation Of Ethics and Civilization/	Univ.	22			6	3	45.5	3.5	2

	*BLHW 2752	*MALAYSIAN CULTURE									
	BLHL 1xx2	Elective I (University)	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
	BXXX XXX2	Elective II (University)	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.
WK2	Conceptually-based **mathematics**, numerical analysis, statistics and formal aspects of computer and information science to support 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 that supports **engineering design** in a practice area.
WK6	Knowledge of **engineering practice** (technology) in the practice areas in the engineering discipline.
WK7	**Comprehension of** the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the professional responsibility of an engineer to public safety; the impacts of engineering activity: economic, social, cultural, environmental and sustainability.
WK8	Engagement with selected knowledge in the **research literature** of the discipline.

Appendix 2: Complex Problem Solving

The range of **complex problem solving** is defined as follows:

No.	Attribute	**Complex 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 or conflicting technical, engineering and other issues.
WP3	Depth of analysis required	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models.
WP4	Familiarity of issues	Involve infrequently encountered issues.
WP5	Extent of applicable codes	Are outside problems encompassed by standards and codes of practice for professional engineering.
WP6	Extent of stakeholder involvement and level of conflicting requirements	Involve diverse groups of stakeholders with widely varying needs.
WP7	Interdependence	Are high level problems including many component parts or sub- problems.

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.