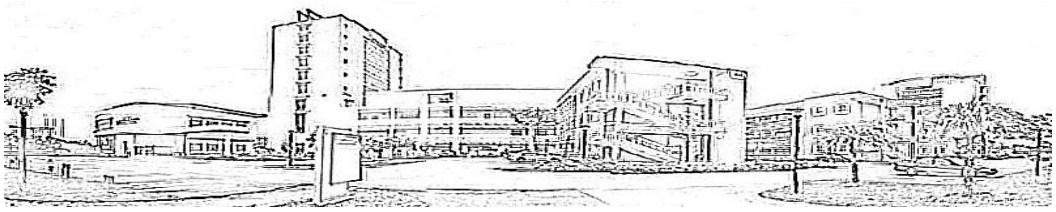
DISCOVERING
OUTCOME-BASED EDUCATION
IN FKAAS



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FKAAS OBE COMMITTEE

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1 INTRODUCTION

1.1 Background

Outcome-based Education (OBE) has been the emphasis in the Civil and Environmental Engineering Faculty (hereafter abbreviated as FKAAS) primarily in curriculum design and delivery. OBE is simply a concept that sets each part of an educational system around targeted goals or outcomes. These targeted goals or outcomes which should be tangible and measurable are then translated into a quantity with the purpose to reflect the quality of the educational system. Every student is deemed to have achieved these targeted goals or outcomes by the end of their educational experience in FKAAS.

FKAAS esteem in highlighting the achieved outcomes of our Bachelor in Civil Engineering with Honours (BFF) programme. Hence, this OBE Annual Report is a common best practice of FKAAS OBE Committee to showcase our OBE related achievements on a yearly basis in line with the Vision and Mission of FKAAS which is "Aspires to lead the application of civil and environmental engineering knowledge in providing innovative and sustainable solutions for the benefits of mankind" and "To produce and train professionals who are creative, innovative, competent and responsible to fulfil the societal and environmental needs in a progressive and sustainable manner", respectively.

The hierarchy flow of OBE implementation can be summarized in Fig. 1-1 with the Vision and Mission of UTHM, and subsequently Vision and Mission of FKAAS down through to the Programme Educational Objectives (PEO), Programme Learning Outcomes (PLO) and finally Course Learning Outcomes (CLO). The model best practiced in OBE implementation for Formulation, Delivery, Assessment, and Continuous Quality Improvement (CQI) is illustrated in Fig. 1-2. This model shows the formulation of PEO as a result of demands or requirements from Stakeholders which after produces outcomes that will then feedback into the Stakeholders. The Stakeholders here includes parties from professional bodies, government and non-government agencies, industries, community, parents, and etc. Within the circle of outcome production emerge the continuing operations of Delivery, Assessment and Continuous Quality Improvement.

FKAAS prides with its OBE logo shown in Fig. 1-3 with a motto of "All for OBE" designed by Mr. Ahmad Fahmy bin Kamarudin and its OBE tagline of "A call for quality and accountability in education".

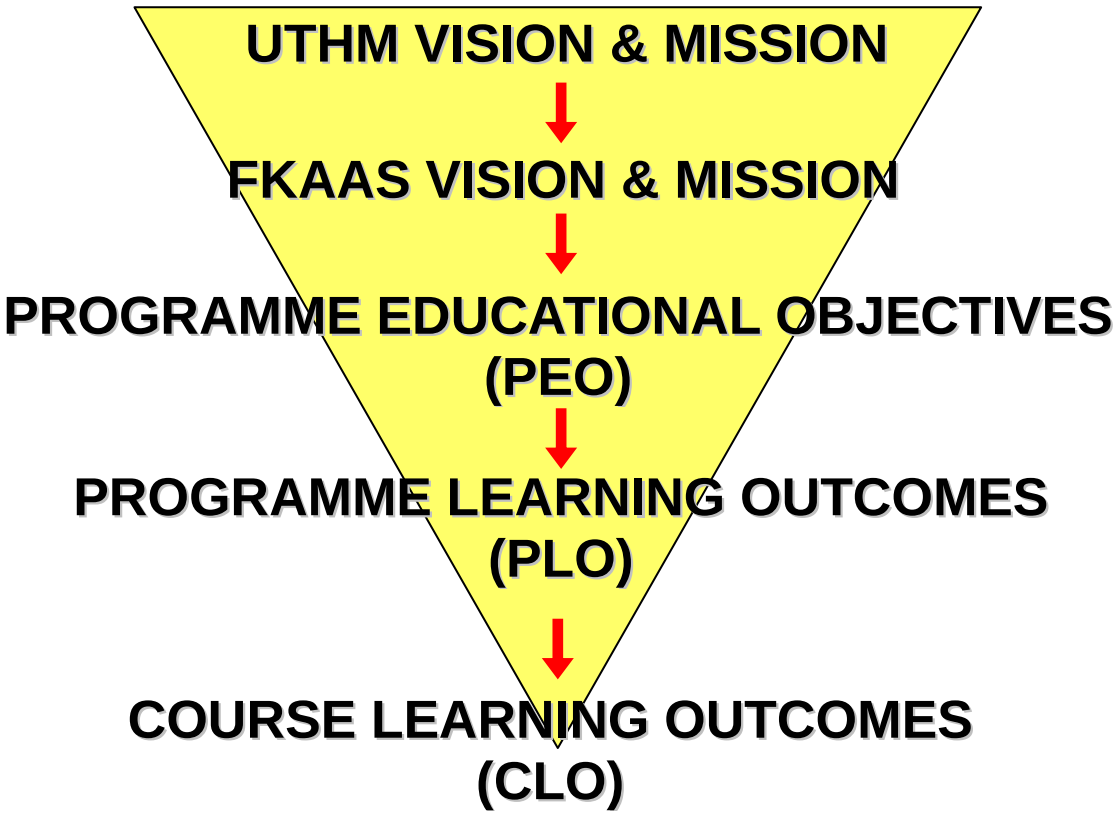


Fig. 1-1. Hierarchy flow of OBE implementation

1.2 Objective of Discovering OBE in FKAAS

The primary objective of Discovering OBE in FKAAS is to highlight all activities and assessments carried out for Programme Educational Objectives (PEO) and Programme Learning Outcomes (PLO) for the aforementioned BFF programme. The methodologies adopted for the assessments of both PEO and PLO are described in the following chapters. The implementation of Complex Engineering Problem (CEP) and Problem-based Learning (PBL) components is explained. The findings of these assessments presented graphically together with relevant Continuous Quality Improvements (CQI) are also presented. The strength of OBE in FKAAS is showcased in a direct measurement

method commonly known as the Fundamental Civil Engineering Examination (FCEE). All these synergized together as concrete evidence of excellent OBE practice in FKAAS.

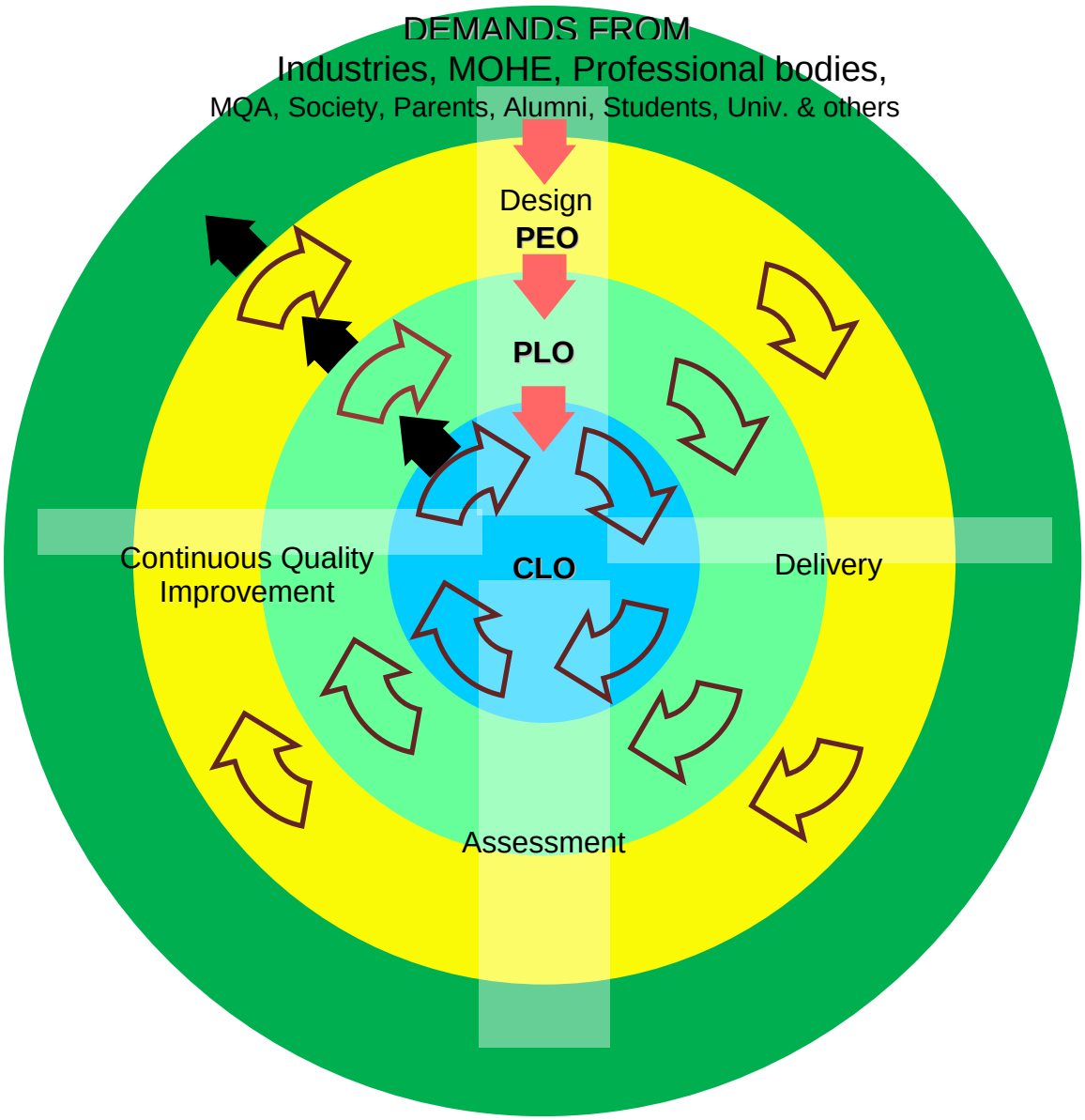


Fig. 1-2. Model of OBE implementation

Fig. 1-3. Logo of OBE

1.3 Organisation and Flow of Report

The organisation and flow of this book is given in Fig. 1-4.

1.4 OBE related activities for 2015 and early 2016

OBE related activities apart from teaching and learning activities carried out throughout year 2015 and early 2016 are summarised in Table 1-1.

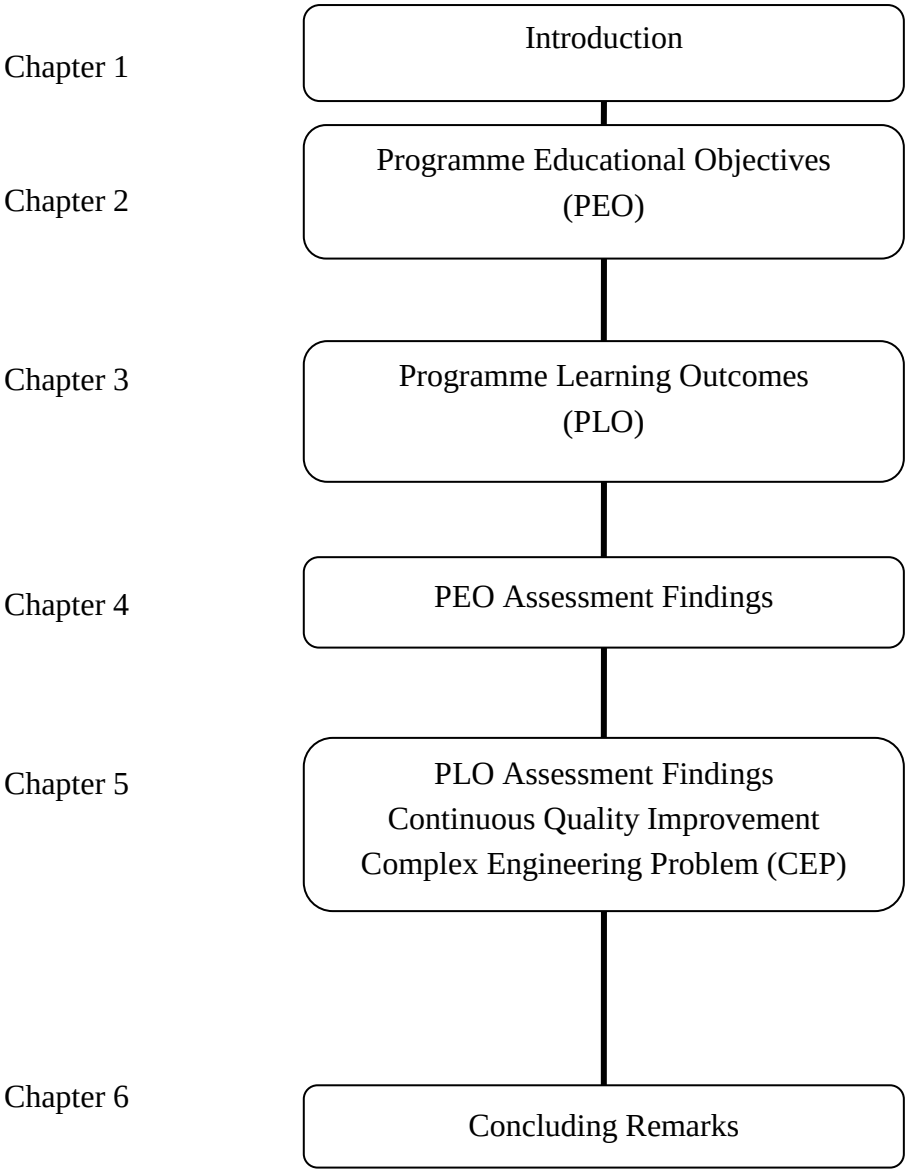


Fig. 1-4. Organisation and flow of book

Table 1-1. Summary of FKAAS OBE activities throughout year 2015 and early 2016

	Activity	**Date and venue**	**Objective and Outcomes**
1.	OBE workshop	25-28/01/2015	Preparation of OBE annual report for BFF Program, FKAAS
2.	Awareness meeting for new staffs in FKAAS	13/04/2015	Brief to new staffs about PLO and OBE and increase the awareness level.
3.	Workshop on OBE for Tracer Study and Exit Survey	15/04/2015	Revision of tracer study and exit survey questionnaire
4.	Activity of sending tracer study by using Google Form through email	15/6/2015-15/7/2015	To collect data for tracer study. Tracer study data collected
5.	Complex Engineering Problem briefing	01/9/2015	Briefing and explanation on implementation of Complex Engineering Problem to all management Faculty staff.
6.	OBE Committee meeting FKAAS	28 to 30/7/2015	1. Key in data of CLO –PLO into TCIS system for all courses in BFF program according to new syllabus Nov 2014, 13 PLO. 2. Key in emails of alumni FKAAS from 1997-2014. 3. Determination of course involved with Complex Engineering Problem (CEP) and prepare 3 matrix Course-KP, Course-CEA, Course-CPS. 4. Revision of FCEE questions to evaluate cognitive domain and other 7 courses will be used to evaluate psychomotor and affective domain, 5. Prepare and combine OBE report from year 2011-2014 for printing. 6. Checking on translation for 13PLO from English to Malay
7.	Benchmarking visitation to ke Fakulti	04/8/2015	Inspection on audit procedure in their faculty and determined important components in accreditation.

	Kejuruteraan Awam, Universiti Teknologi Mara		
8.	Activities of Exit survey by Graduates	26/9 to 2/10/2015	To collect data for exit survey. Exit survey data collected at the end.
9.	Meeting of tracer study and exit survey analysis year 2014-2015	04/11/2015	To analysis data of tracer study and exit survey
10	Symposium program of FKAAS & Stakeholders	13/12/2015	To explain about OBE in FKAAS to Stakeholders
11	Complex Engineering Problem Workshop	25/1/2016 and 1/2/2016	Workshop to introduce and explain the implementation of CEP in selected courses. Participated by Faculty staff. CEP Form for the Faculty is introduced and used.
12	OBE Awareness for Non-Academic Staff	26/1/2016	Half day session with forum on OBE. The objective of the session was to instil awareness of OBE and implementation of OBE values in everyday work for non-academic staff of the Faculty.

2 PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

2.1 PEO for BFF Programme

FKAAS offers one undergraduate programme named as Bachelor in Civil Engineering with Honours (BFF). It is a 4 year programme that carries a total of 136 credits. This programme is developed with a framework to establish 4 Programmed Educational Objectives (PEO) as shown in Table 2-1. The mapping relationship of PEO to Programme Learning Outcomes (PLO) is also presented in the same table.

Table 2-1. Programme Educational Objectives (PEO) of Bachelor of Civil Engineering with Honours

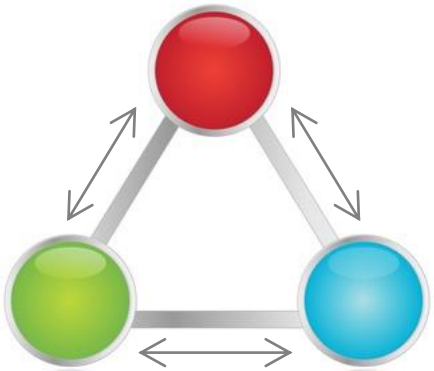
PEO	Educational Objectives of BFF Programme are to produce civil engineers who are	Mapping of PEO to PLO
1	Knowledgeable and technically competent in civil engineering discipline in-line with the industry requirement	PLO 1, 2, 10
2	Effective in communication and demonstrate good leadership quality in an organization	PLO 3, 5, 9, 13
3	Capable to solve civil engineering problems innovatively, creatively and ethically through sustainable approach	PLO 4, 8, 11, 12
4	Able to demonstrate entrepreneurship skills and recognize the need of lifelong learning for successful career advancement	PLO 6, 7

2.2 PEO Assessment Methodology

According to best practice, the achievement of PEO in graduates is normally measured on FKAAS Alumni that have already graduated between 3 to 5 years. FKAAS adopts a triangular-shaped PEO assessment methodology which comprised of two types of measurement namely indirect and direct measurements, as illustrated in Fig. 2-1. These two types of measurement targets two groups of respondents – the Employer and the Alumni. The assessment methods are: (1) Employer Survey (an indirect measurement); (2) Alumni Survey (an indirect measurement); and (3) Alumni Survey (a direct measurement). An indirect measurement refers to measurement based on the perception

of respondent towards the Alumni, while a direct measurement refers to real or actual achievement of the Alumni.

1. **Employer Survey**
(indirect measurement)
KPI: 50% employer respondents agree to rating ≥ 4 (Good and Excellent)



2. **Alumni Survey**
(indirect measurement)
KPI: 50% alumni respondents agree to rating ≥ 4 (Good and Excellent)

3. **Alumni Survey**
(direct measurement)
KPI: Given in Table 2-2

Fig. 2-1. PEO Assessment Methodology in FKAAS

2.3 PEO Assessment Questionnaire

Three methods of assessment for PEO have been described in the previous section as shown in Fig. 2-1, one for Employer (indirect measurement), and two for Alumni (indirect and direct measurement). As such two sets of Questionnaire Survey, each for Employer and Alumni are presented in Appendix 2-1 and Appendix 2-2, respectively. The questions inside these surveys have been reviewed and improved thoroughly as a result of the many years of OBE practice in FKAAS. The tool used to disseminate the Questionnaire Survey is Google Form. This tool allows flexible and easy respondent access as well as easy and fast analysis on the part of OBE team in FKAAS.

Table 2-2. Direct measurement PEO achievement KPI

PEO	KPI Success Criteria
1 KNOWLEDGE; TECHNICALLY COMPETENT	Any TWO of the following criteria to be satisfied for the fulfilment of this PEO: i. 50% of respondents have been promoted OR offered a better position. ii. 50% of respondent involved in research OR construction/design project proposal either as member or leader. iii. 5% of respondents are already Professional Engineer (PE). iv. 50% of respondents have published papers in conference/ journal OR written technical reports either as main author or co-author.
2 COMMUNICATION; LEADERSHIP	Any TWO of the following criteria to be satisfied for the fulfillment of this PEO: i. 50% of respondent involved in research OR construction/design project proposal either as member or leader. ii. 50% of respondents have published papers in conference/ journal OR written technical reports either as main author or co-author. iii. 50% of respondents have held leadership positions for a taskforce OR project within an organization, either as main leader or as co-leader.
3 PROBLEM SOLVING	Any ONE of the following criteria to be satisfied for the fulfillment of this PEO: i. 50% of respondents have been involved in construction/design projects, either direct or indirect involvement. ii. 50% of respondents have been involved in research projects related to civil engineering, either direct or indirect involvement.
4 ENTREPRENEURSHIP LIFE-LONG LEARNING	Any ONE of the following criteria to be satisfied for the fulfillment of this PEO: i. 50% of respondents are: a. furthering or have furthered their studies; OR b. have been attending professional development courses ii. 5% of respondents are developing or have started a company or partnership business of any form

2.4 PEO Achievement Key Performance Indicator

The key performance indicators (KPI) for direct measurement PEO achievement are consistently reviewed with the recent most continuous quality improvement resulting in a better and more realistic success criteria as presented in Table 2-2. This direct measurement refers to the Alumni Survey explained in Fig. 2-1. For indirect measurement, the KPI of Employer Survey is at least 50% of employer respondents agree to a rating of no less than 4 (Likert-type scale for "Good") for every PEO; and the KPI of Alumni Survey is at least 50% of alumni respondents agree to a rating of no less than 4 (Likert-type scale for "Good") for every PEO. These KPI for indirect measurement are illustrated in Fig. 2-1.

3 PROGRAMME LEARNING OUTCOMES (PLO)

3.1 PLO for BFF Programme

Programme Learning Outcomes (PLO) 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 acquire through the programme.

BFF programme in FKAAS adheres to 13 PLO, of which 12 PLO has direct reference to the Engineering Accreditation Council (EAC) Manual 2012, and 1 PLO on entrepreneurial skills referenced to the Malaysian Qualifications Framework 2011. Table 3-1 elaborates all the 13 PLO in detail relating each PLO to one Primary Domain and linking the FKAAS PLO numbering to the PLO numbering in the EAC Manual 2012. The relationship and distribution of courses under BFF programme to PLO is presented in Fig. 3-1 to Fig. 3-4.

Table 3-1. Programme Learning Outcomes (PLO) of Bachelor of Civil Engineering with Honours

PLO	Key Outcome	Description of Learning Outcome
1	Engineering Knowledge (K)	Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialisation to the solution of complex civil engineering problems. Primary Domain: COGNITIVE PLO 1 in EAC Manual
2	Practical / Technical Skills/ Modern Tool Usage (PS)	Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex civil engineering activities, with an understanding of the limitations. Primary Domain: PSYCHOMOTOR PLO 5 in EAC Manual

3	Communication Skills (CS)	Communicate effectively on complex civil 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. Primary Domain: PSYCHOMOTOR PLO 9 in EAC Manual
4	Critical Thinking and Problem Solving / Investigation (CTPS)	Conduct investigation into complex problems using research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. Primary Domain: COGNITIVE PLO 4 in EAC Manual
5	Individual and Team Work (TW)	Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings Primary Domain: AFFECTIVE PLO 10 in EAC Manual
6	Life Long Learning (LL)	Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Primary Domain: AFFECTIVE PLO 11 in EAC Manual
7	Entrepreneurship Skills (ES)	Self-motivate and enhance entrepreneurship skills for career development Primary Domain: PSYCHOMOTOR In MQF
8	Ethics and Professionalism Values (ET)	Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. Primary Domain: AFFECTIVE PLO 8 in EAC Manual

9	Leadership Skills / Project Management and Finance (LS)	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. Primary Domain: PSYCHOMOTOR PLO 12 in EAC Manual
10	Design / Development of Solutions (DDS)	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. Primary Domain: COGNITIVE PLO 3 in EAC Manual
11	Problem Analysis (PA)	Identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. Primary Domain: COGNITIVE PLO 2 in EAC Manual
12	Environment and Sustainability (ESus)	Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development. Primary Domain: AFFECTIVE PLO 7 in EAC Manual
13	The Engineer and Society (ESoc)	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice. Primary Domain: AFFECTIVE PLO 6 in EAC Manual

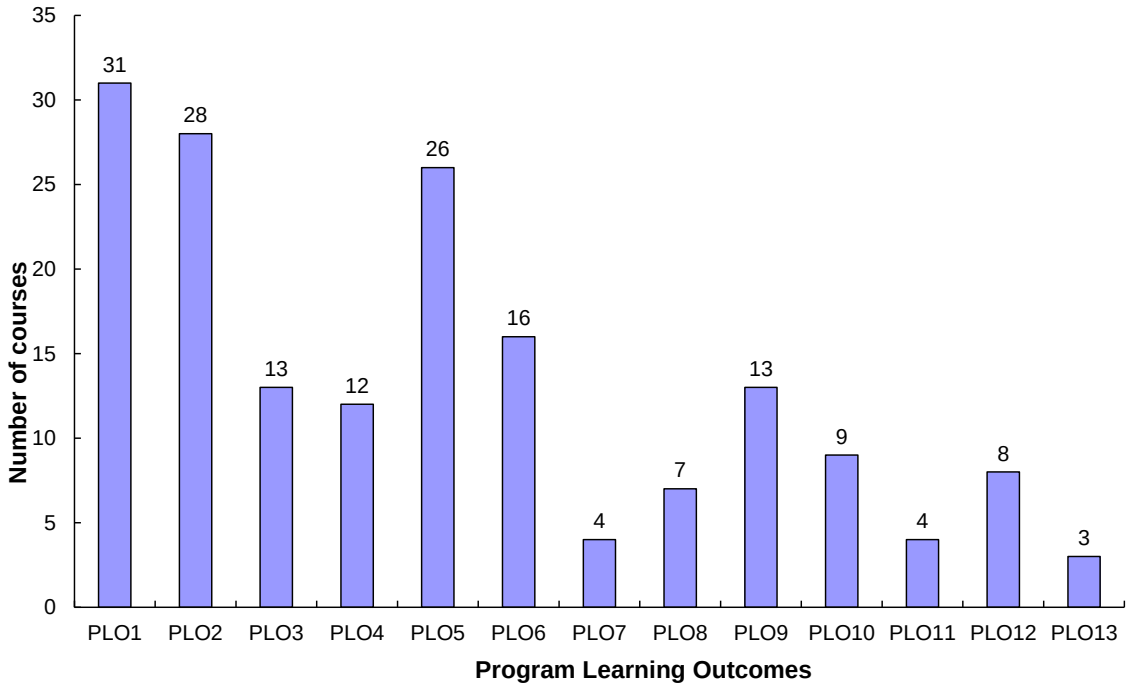


Fig. 3-1. Relationship of number of courses to PLO in BFF programme

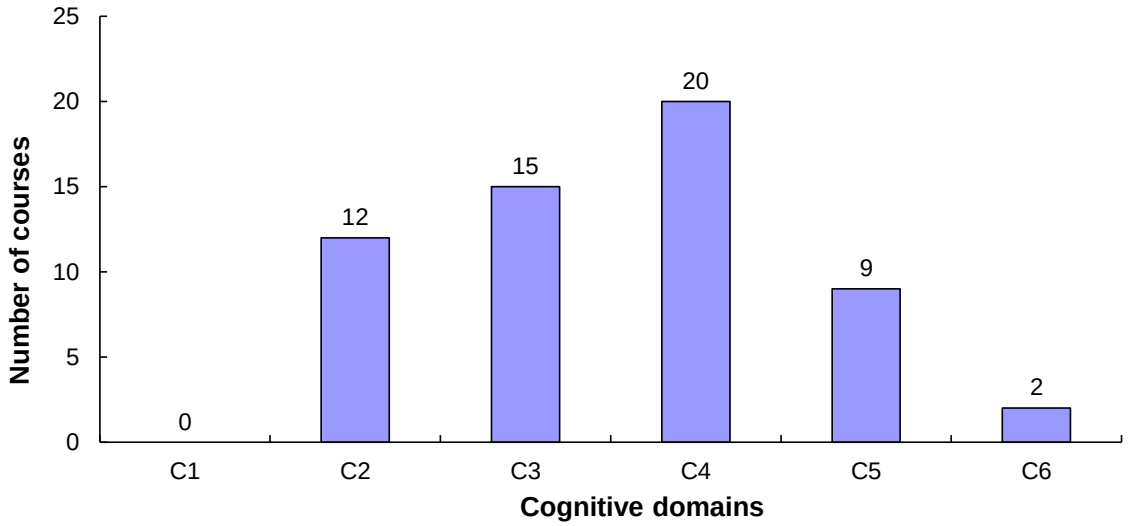


Fig. 3-2. Relationship of number of courses to levels in cognitive domain

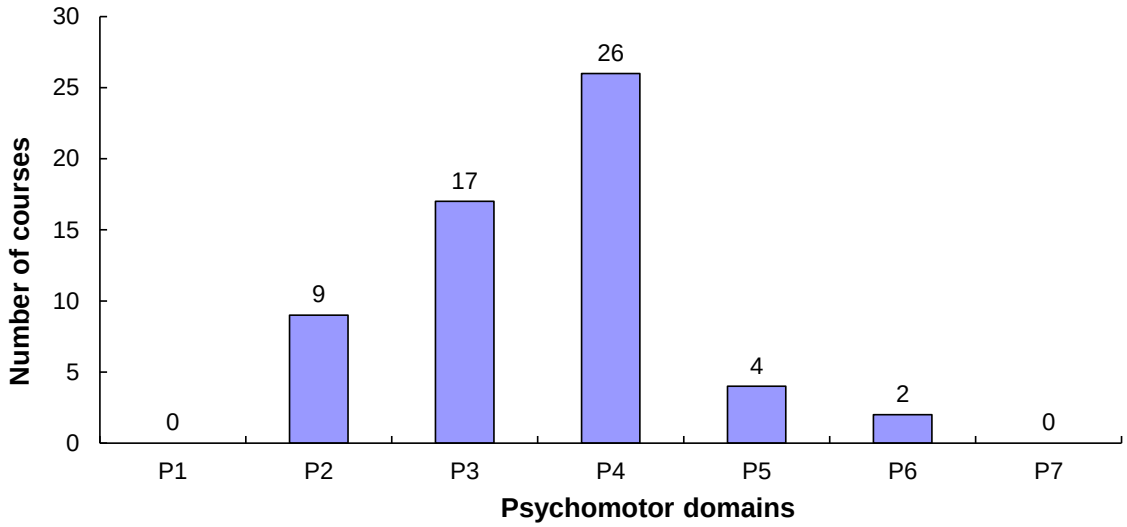


Fig. 3-3. Relationship of number of courses to levels in psychomotor domain

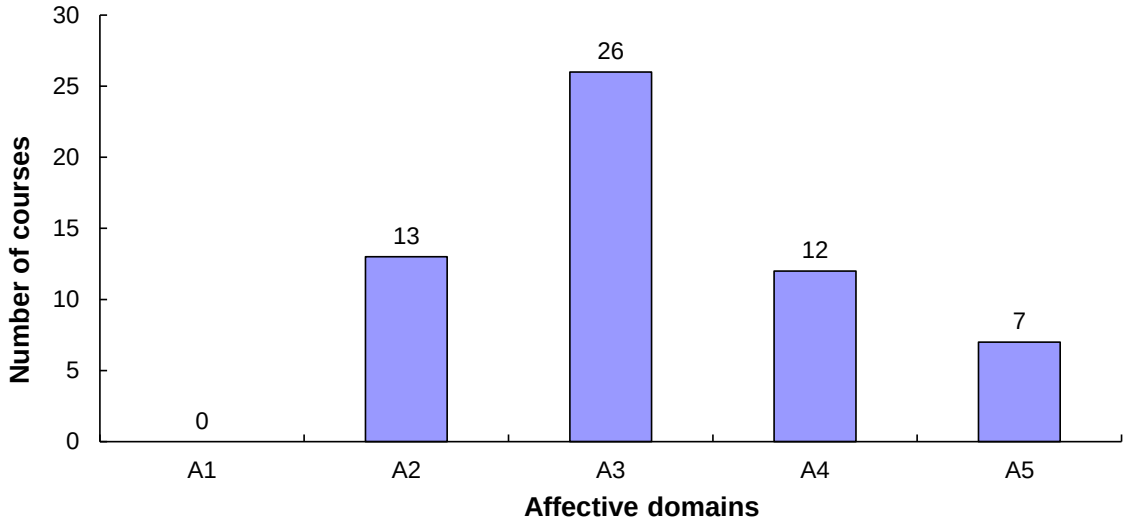
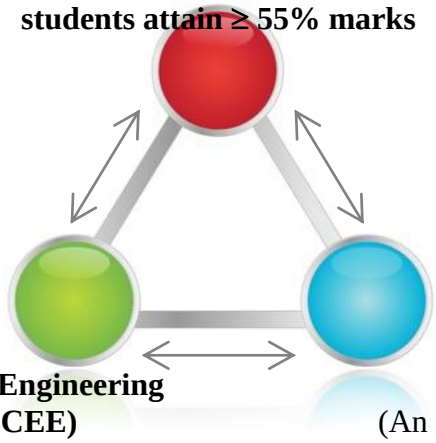


Fig. 3-4. Relationship of number of courses to levels in affective domain

3.2 PLO Assessment Methodology

Similar to PEO assessment methodology, the assessment method for PLO also applies to a triangular-shaped concept as shown in Fig. 3-5 which includes (1) Course Learning Outcome versus Programme Learning Outcome (CLO-PLO) Assessment; (2) Fundamental Civil Engineering Exam (FCEE); and (3) Exit Survey.

1. **CLO-PLO Assessment** (Compulsory pass)
(a continuous direct measurement in every semester)
KPI: Achievement in each course with ≥ 50% of students attain ≥ 55% marks



2. **Fundamental Civil Engineering Examination (FCEE)**
(A one-off direct measurement)
KPI: Achievement in each PLO ≥ 55%

3. **Exit Survey**
(An indirect measurement)
KPI: 80% of respondents agree to rating ≥ 4 (good and excellent)

Fig. 3-5. PLO assessment methodology in FKAAS

3.3 Course Learning Outcome versus Programme Learning Outcome (CLO-PLO) Assessment

CLO-PLO assessment is performed all through the semester within every course. For every course, there are 3 CLO mapped one PLO each for domain Cognitive (C), Psychomotor (P) and Affective (A), respectively. Fig. 3-6 shows a sample of CLO-PLO mapping for a course highlighted in a course syllabus. The level of Taxonomy Domain is also shown. The assessment tool generally used includes quiz, assignment, project, test and examination. Table 3-2 provides a typical sample of assessment tool and marks distribution for CLO.

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

Fakulti/Pusat Pengajian *(Faculty/Centre)* : **FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING**				**Mukasurat** *(Page)*: **1 / 3**
Kod Kursus *(Course Code)*: **BFC 43003**	**Nama Kursus** *(Course Name)* : **STRUCTURAL STEEL AND TIMBER DESIGN**			
Kursus Pra Syarat *(Course Prerequisite)* : **BFC 21403: STRUCTURAL ANALYSIS**	**Kredit** *(Credit)* : **3**	**Kuliah** *(Lecture)* : **2**	**Tutorial** *(Tutorial)*: **0**	**Amali** *(Practical)*: **2**
Edisi *(Edition)* : **6**	**Tarikh Keluaran** *(Date of Issue)* : **1 NOVEMBER 2014**			

MATLAMAT (*GOALS*):

To provide the knowledge and understanding of steel and timber structures designs according to the recognized code of practices.

HASIL PEMBELAJARAN (*LEARNING OUTCOMES*):

Upon completion of this course, students will be able to:

1. Design the steel and timber structure elements according to BS EN 1993 and BS EN 1995. [PLO10, C5]
2. Manipulate structural design processes to complete the assigned project. [PLO9, P4]
3. Organize the design works report in group affectively which comprise of ideas and problem solving. [PLO5, A4]

Fig. 3-6. CLO-PLO mapping for a course in a course syllabus

The marks for all the aforementioned assessments are keyed into a management system known as Student Assessment System (SAS) as shown in Fig. 3-7. The SAS for each course is first established by the course coordinator in an interface called Course Coordinator Module (Fig. 3-8) and after, the marks of students per section are keyed-in by all lecturers who are teaching the corresponding section of the course (Fig. 3-9).

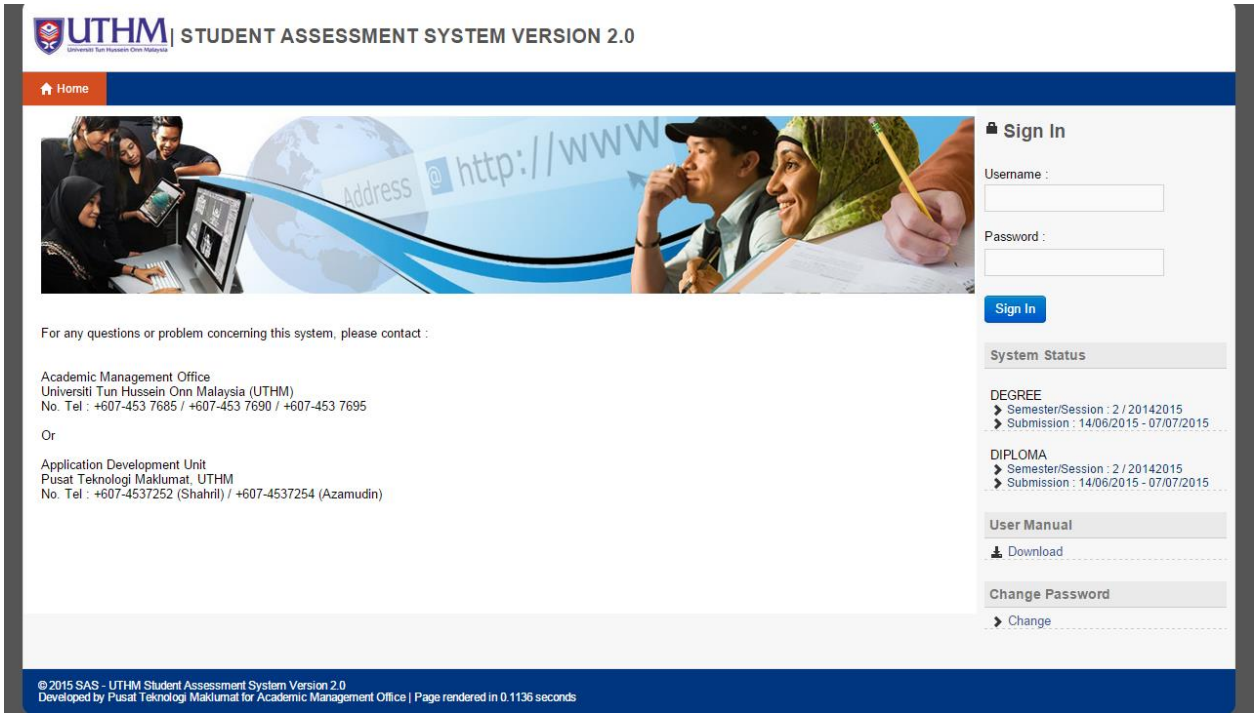
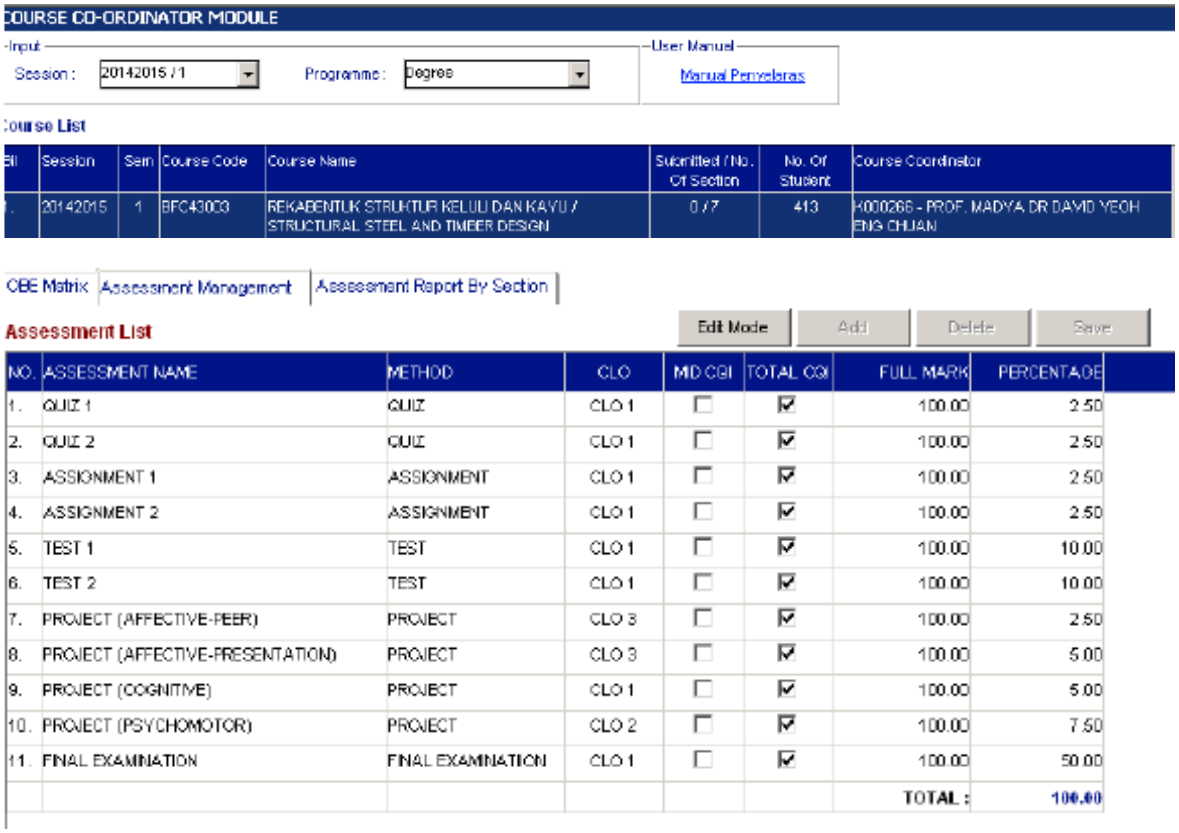


Fig. 3-7. Student Assessment System (SAS)

Table 3-2. Typical assessment tool and marks distribution for CLO

CLO	PLO	Domain	Assessment Tool	Marks (%)
1	1st PLO	Cognitive	Quizzes	5
			Assignments	5
			Tests	20
			Project	5
			Exam	50
2	2nd PLO	Psychomotor	Project	7.5
3	3rd PLO	Affective	Project	7.5
			Total	100



COURSE CO-ORDINATOR MODULE

Input — Session : 20142015 / 1 — Programme : Degree — User Manual — Manual Penyelaras

Course List

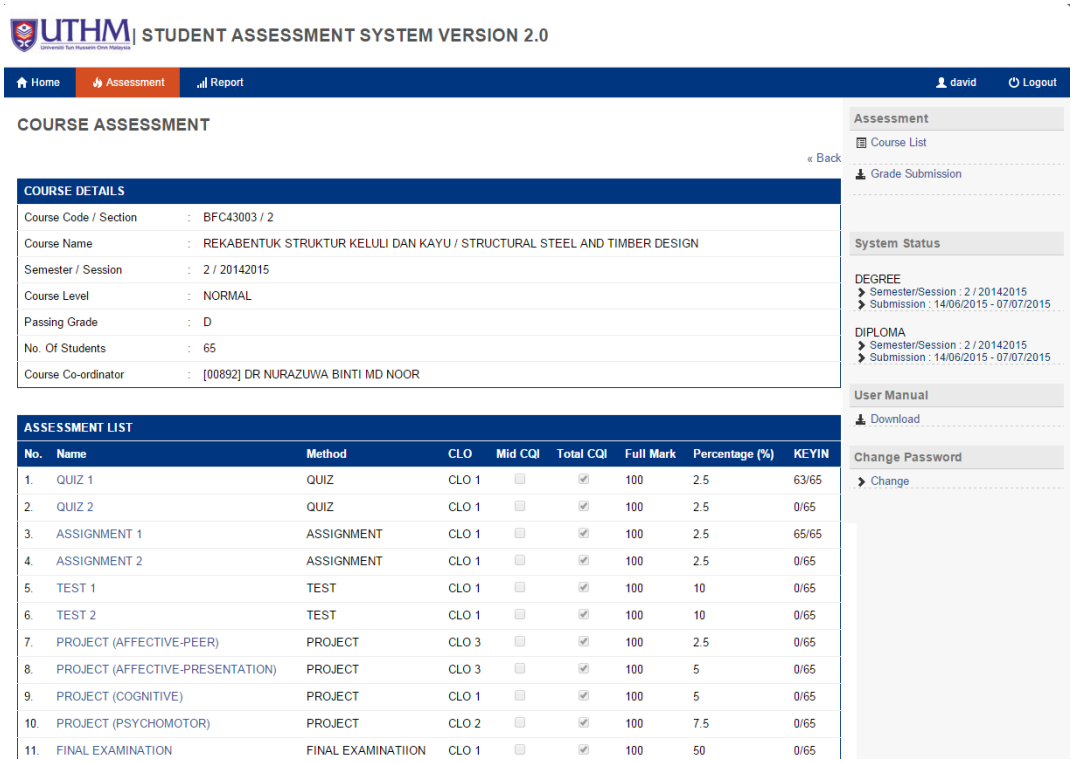
Bil	Session	Sem	Course Code	Course Name	Submitted / No. Of Section	No. Of Student	Course Coordinator
1.	20142015	1	BFC43003	REKABENTUK STRUKTUR KELULI DAN KAYU / STRUCTURAL STEEL AND TIMBER DESIGN	0 / 7	413	000266 - PROF. MADYA DR DAVID YEOH ENG CHUAN

CBE Matrix | Assessment Management | Assessment Report By Section

Assessment List — Edit Mode | Add | Delete | Save

NO.	ASSESSMENT NAME	METHOD	CLO	MID CQI	TOTAL CQI	FULL MARK	PERCENTAGE
1.	QUIZ 1	QUIZ	CLO 1	☐	☑	100.00	2.50
2.	QUIZ 2	QUIZ	CLO 1	☐	☑	100.00	2.50
3.	ASSIGNMENT 1	ASSIGNMENT	CLO 1	☐	☑	100.00	2.50
4.	ASSIGNMENT 2	ASSIGNMENT	CLO 1	☐	☑	100.00	2.50
5.	TEST 1	TEST	CLO 1	☐	☑	100.00	10.00
6.	TEST 2	TEST	CLO 1	☐	☑	100.00	10.00
7.	PROJECT (AFFECTIVE-PEER)	PROJECT	CLO 3	☐	☑	100.00	2.50
8.	PROJECT (AFFECTIVE-PRESENTATION)	PROJECT	CLO 3	☐	☑	100.00	5.00
9.	PROJECT (COGNITIVE)	PROJECT	CLO 1	☐	☑	100.00	5.00
10.	PROJECT (PSYCHOMOTOR)	PROJECT	CLO 2	☐	☑	100.00	7.50
11.	FINAL EXAMINATION	FINAL EXAMINATION	CLO 1	☐	☑	100.00	50.00
						TOTAL :	100.00

Fig. 3-8. Course Coordinator Module in SAS



UTHM | STUDENT ASSESSMENT SYSTEM VERSION 2.0

Home | Assessment | Report — david | Logout

COURSE ASSESSMENT

« Back

COURSE DETAILS

Course Code / Section	:	BFC43003 / 2
Course Name	:	REKABENTUK STRUKTUR KELULI DAN KAYU / STRUCTURAL STEEL AND TIMBER DESIGN
Semester / Session	:	2 / 20142015
Course Level	:	NORMAL
Passing Grade	:	D
No. Of Students	:	65
Course Co-ordinator	:	[00892] DR NURAZUWA BINTI MD NOOR

ASSESSMENT LIST

No.	Name	Method	CLO	Mid CQI	Total CQI	Full Mark	Percentage (%)	KEYIN
1.	QUIZ 1	QUIZ	CLO 1	☐	☑	100	2.5	63/65
2.	QUIZ 2	QUIZ	CLO 1	☐	☑	100	2.5	0/65
3.	ASSIGNMENT 1	ASSIGNMENT	CLO 1	☐	☑	100	2.5	65/65
4.	ASSIGNMENT 2	ASSIGNMENT	CLO 1	☐	☑	100	2.5	0/65
5.	TEST 1	TEST	CLO 1	☐	☑	100	10	0/65
6.	TEST 2	TEST	CLO 1	☐	☑	100	10	0/65
7.	PROJECT (AFFECTIVE-PEER)	PROJECT	CLO 3	☐	☑	100	2.5	0/65
8.	PROJECT (AFFECTIVE-PRESENTATION)	PROJECT	CLO 3	☐	☑	100	5	0/65
9.	PROJECT (COGNITIVE)	PROJECT	CLO 1	☐	☑	100	5	0/65
10.	PROJECT (PSYCHOMOTOR)	PROJECT	CLO 2	☐	☑	100	7.5	0/65
11.	FINAL EXAMINATION	FINAL EXAMINATIION	CLO 1	☐	☑	100	50	0/65

Assessment
- Course List
- Grade Submission

System Status
DEGREE
- Semester/Session : 2 / 20142015
- Submission : 14/06/2015 - 07/07/2015

DIPLOMA
- Semester/Session : 2 / 20142015
- Submission : 14/06/2015 - 07/07/2015

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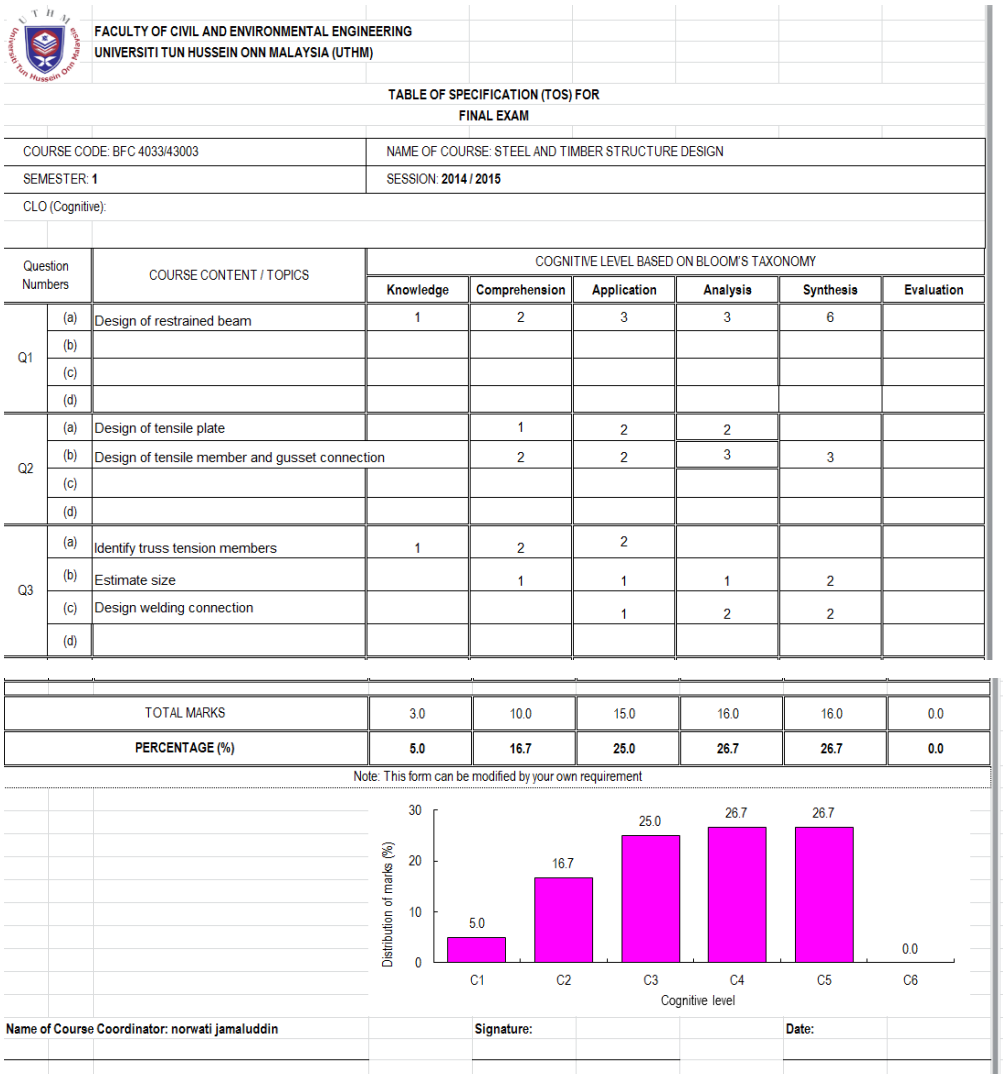
Fig. 3-9. Course assessment interface in SAS

The preparation of Test and Examination Papers in FKAAS go through a detail and stringent dual evaluation process. Both Test and Exam Papers carry equal difficulty level checked using a form system known as Table of Specification (TOS) which covers the different cognitive domain levels as presented in Fig. 3-10.



FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING
UNIVERSITI TUN HUSSEIN ONN MALAYSIA (UTHM)

TABLE OF SPECIFICATION (TOS) FOR
FINAL EXAM

COURSE CODE: BFC 4033/43003	NAME OF COURSE: STEEL AND TIMBER STRUCTURE DESIGN
SEMESTER: **1**	SESSION: **2014 / 2015**
CLO (Cognitive):	

Question Numbers		COURSE CONTENT / TOPICS	COGNITIVE LEVEL BASED ON BLOOM'S TAXONOMY					
			Knowledge	**Comprehension**	**Application**	**Analysis**	**Synthesis**	**Evaluation**
Q1	(a)	Design of restrained beam	1	2	3	3	6	
	(b)							
	(c)							
	(d)							
Q2	(a)	Design of tensile plate		1	2	2		
	(b)	Design of tensile member and gusset connection		2	2	3	3	
	(c)							
	(d)							
Q3	(a)	Identify truss tension members	1	2	2			
	(b)	Estimate size		1	1	1	2	
	(c)	Design welding connection			1	2	2	
	(d)							

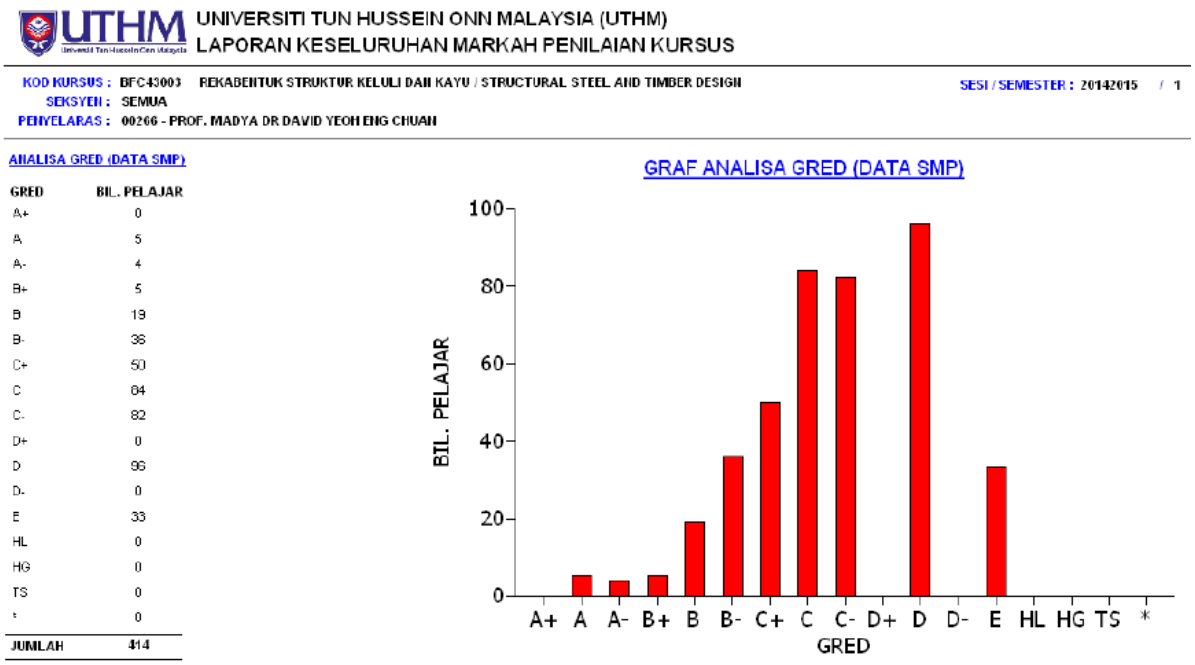
TOTAL MARKS	3.0	10.0	15.0	16.0	16.0	0.0
PERCENTAGE (%)	**5.0**	**16.7**	**25.0**	**26.7**	**26.7**	**0.0**

Note: This form can be modified by your own requirement

Name of Course Coordinator: norwati jamaluddin **Signature:** **Date:**

Fig. 3-10. Table of Specification

The CLO-PLO results for each course are automatically generated by a university centralised system known as Total Campus Integrated System (TCIS) which links with SAS. Statistical distribution in tabulated and graph formats are given as shown in Fig. 3-11 for course marks overall report and Fig. 3-12 for course OBE overall report.



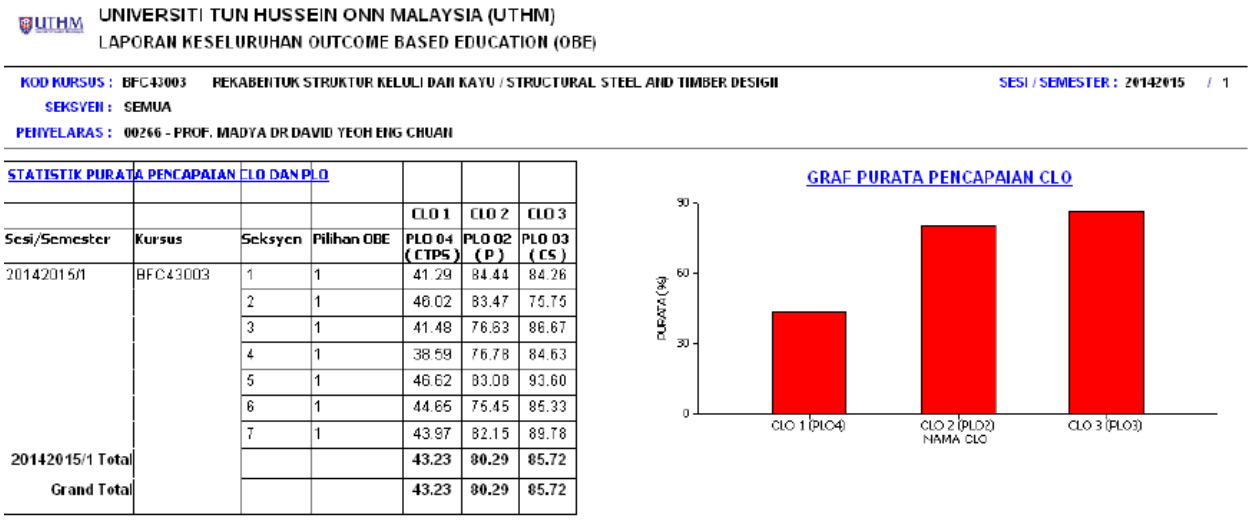
UNIVERSITI TUN HUSSEIN ONN MALAYSIA (UTHM)
LAPORAN KESELURUHAN MARKAH PENILAIAN KURSUS

KOD KURSUS : BFC43003 REKABENTUK STRUKTUR KELULI DAN KAYU / STRUCTURAL STEEL AND TIMBER DESIGN SESI / SEMESTER : 20142015 / 1
SEKSYEN : SEMUA
PENYELARAS : 00266 - PROF. MADYA DR DAVID YEOH ENG CHUAN

ANALISA GRED (DATA SMP)

GRED	BIL. PELAJAR
A+	0
A	5
A-	4
B+	5
B	19
B-	36
C+	50
C	84
C-	82
D+	0
D	96
D-	0
E	33
HL	0
HG	0
TS	0
*	0
JUMLAH	414

Fig. 3-11. Course marks overall report



UNIVERSITI TUN HUSSEIN ONN MALAYSIA (UTHM)
LAPORAN KESELURUHAN OUTCOME BASED EDUCATION (OBE)

KOD KURSUS : BFC43003 REKABENTUK STRUKTUR KELULI DAN KAYU / STRUCTURAL STEEL AND TIMBER DESIGN SESI / SEMESTER : 20142015 / 1
SEKSYEN : SEMUA
PENYELARAS : 00266 - PROF. MADYA DR DAVID YEOH ENG CHUAN

STATISTIK PURATA PENCAPAIAN CLO DAN PLO

				CLO 1	CLO 2	CLO 3
Sesi/Semester	Kursus	Seksyen	Pilihan OBE	PLO 04 (CTPS)	PLO 02 (P)	PLO 03 (CS)
20142015/1	BFC43003	1	1	41.29	84.44	84.26
		2	1	46.02	83.47	75.75
		3	1	41.48	76.83	86.67
		4	1	38.59	76.78	84.63
		5	1	46.62	83.08	93.60
		6	1	44.65	75.45	86.33
		7	1	43.97	82.15	89.78
20142015/1 Total				**43.23**	**80.29**	**85.72**
Grand Total				**43.23**	**80.29**	**85.72**

Fig. 3-12. Course OBE overall report

3.4 Fundamental Civil Engineering Exam (FCEE)

The Fundamental Civil Engineering Exam (FCEE) is a one-off direct measure of final year students' understanding on the fundamental of civil engineering disciplines. The

FCEE is one of the three tools used to measure students' achievement on the Learning Outcomes (PLO) of Bachelor of Civil Engineering with Honours (see Fig. 3-5).

The FCEE paper consists of 40 multiple-choice questions and the duration for the exam is 2 hours. Each PLO consists of 10 questions. The exam is open book in nature. The FCEE constitutes 20% of the grade in the Integrated Design Project course (IDP). Different set of FCEE is administered each semester. The paper covers most Civil Engineering disciplines including Construction Management, Structures and Material, Highway, Geotechnical, Environmental, Hydraulics and Hydrology, and Surveying as shown in Table 3-3 . Out of the 40 questions, 20% (8 questions) were designed in the Taxonomy level of 1 & 2 (Knowledge and Comprehension), 70% (28 questions) are in the Taxonomy level of 3 & 4 (Application and Analysis) and 10% (4 questions) are in the Taxonomy level of 5 & 6 (Synthesis and Evaluation).

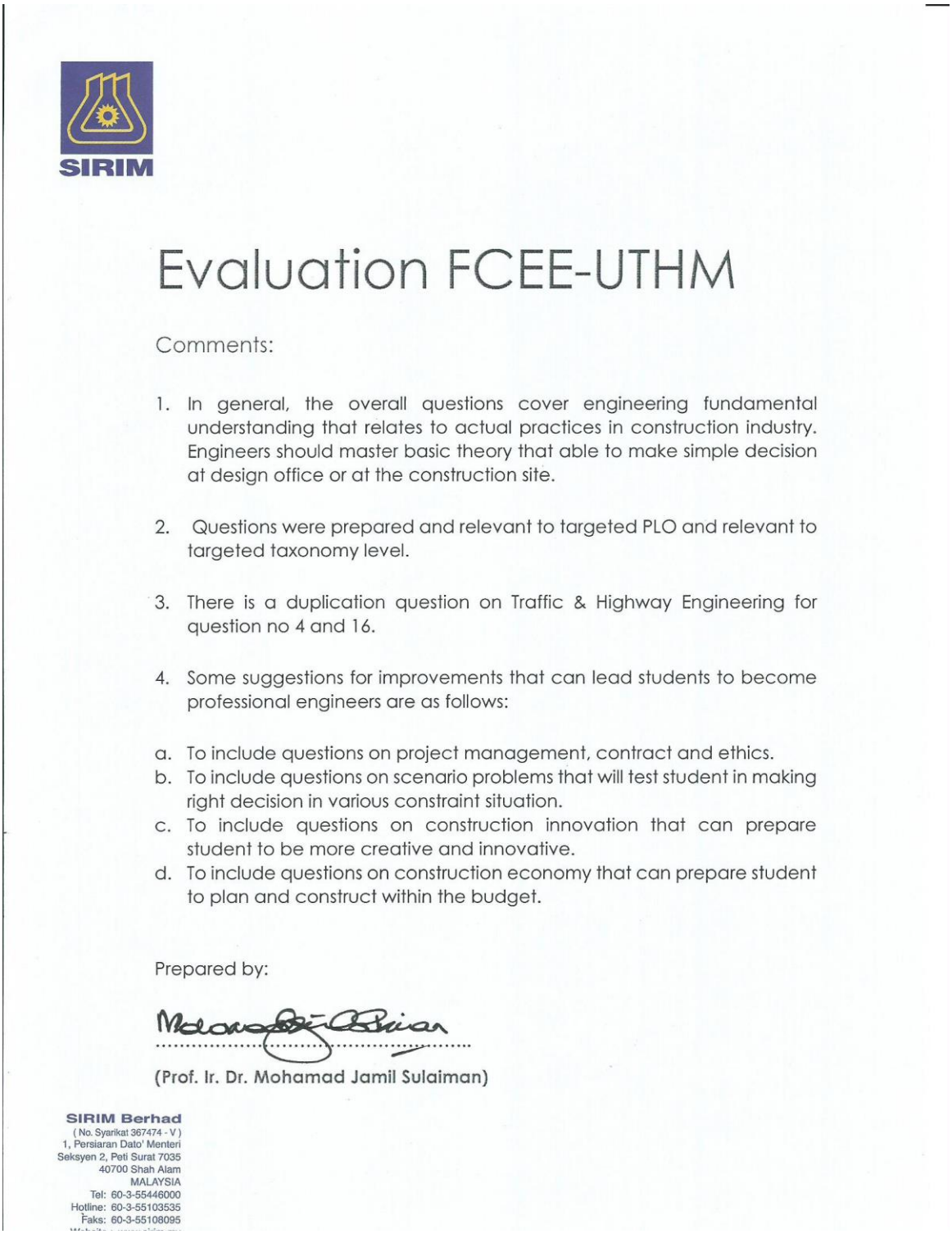
Table 3-3. Breakdown of questions in FCEE

Item	Discipline	Number of Question
1	Structures and Materials Engineering	10
2	Water Resources & Environmental Engineering	10
3	Geomatic, Geology, Geotechnical Engineering, Traffic and Highway Engineering	10
4	Construction Engineering & Sustainable Management	10
	Total	40

70% of the FCEE questions were designed in Taxonomy level 3 & 4 is because most of the young graduated engineers will be involved in the works required the skills of application and analysis

In the effort of benchmarking and CQI, the FCEE questions were reviewed by the Adjunct Professor of FKAAS, Professor Ir. Dr. Mohamad Jamil Sulaiman. Fig. 3-13 shows the report of such effort for year 2015. Panel industry comprising of Professional Engineers from various engineering consultant firms have been approached to provide review of the FCEE questions. Fig. 3-14 to Fig. 3-17 show the feedback responses of 3

panel industry. These reviews have been taken into consideration to perform continuous quality improvement to the FCEE questions and implementation.



SIRIM

Evaluation FCEE-UTHM

Comments:

1. In general, the overall questions cover engineering fundamental understanding that relates to actual practices in construction industry. Engineers should master basic theory that able to make simple decision at design office or at the construction site.

2. Questions were prepared and relevant to targeted PLO and relevant to targeted taxonomy level.

3. There is a duplication question on Traffic & Highway Engineering for question no 4 and 16.

4. Some suggestions for improvements that can lead students to become professional engineers are as follows:

a. To include questions on project management, contract and ethics.
b. To include questions on scenario problems that will test student in making right decision in various constraint situation.
c. To include questions on construction innovation that can prepare student to be more creative and innovative.
d. To include questions on construction economy that can prepare student to plan and construct within the budget.

Prepared by:

(Prof. Ir. Dr. Mohamad Jamil Sulaiman)

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Hotline: 60-3-55103535
Faks: 60-3-55108095

Fig. 3-13. FCEE review report 2015 by Professor Ir. Dr. Mohamad Jamil Sulaiman

From : **Ir. Syed Mohd Yusof Bin Syed Hussin**
To : **Prof Madya Ir. Dr. Abdul Halim Abdul Ghani**

Assalamualaikum wbt Prof..

We are sorry for inconveniences caused for unable to respond earlier to your e-mail dated July 13, 2016.

We have vet thoroughly your copy of FCE questions and found out that the questions are very challenging and its covers all major disciplines in Civil engineering fields/scope of works.

Followings are our comments based on information given:-

[1] Almost all questions cover major disciplines of civil engineering and we trust it benefits the students.

[2] Young engineers may require this basic knowledge in order for them to face and get involved in real industrial and design/working scenario.

[3] We believe, these set of questions are adequate and fair to be asked, however, the student with less preparation may find it very tough and difficult to answer. Open book test or exam may give further challenging and pressure since the test period of 2 hours is considered short.

[4] Getting additional session and evaluation from industrial panel may give some credits to the student since they will initiate and prepare themselves before entering the room. We found Q&A sessions may also useful for the student. Most of the student takes this opportunity to ask on the current demanding working disciplines and we are glad to share our knowledge and working experiences with them.

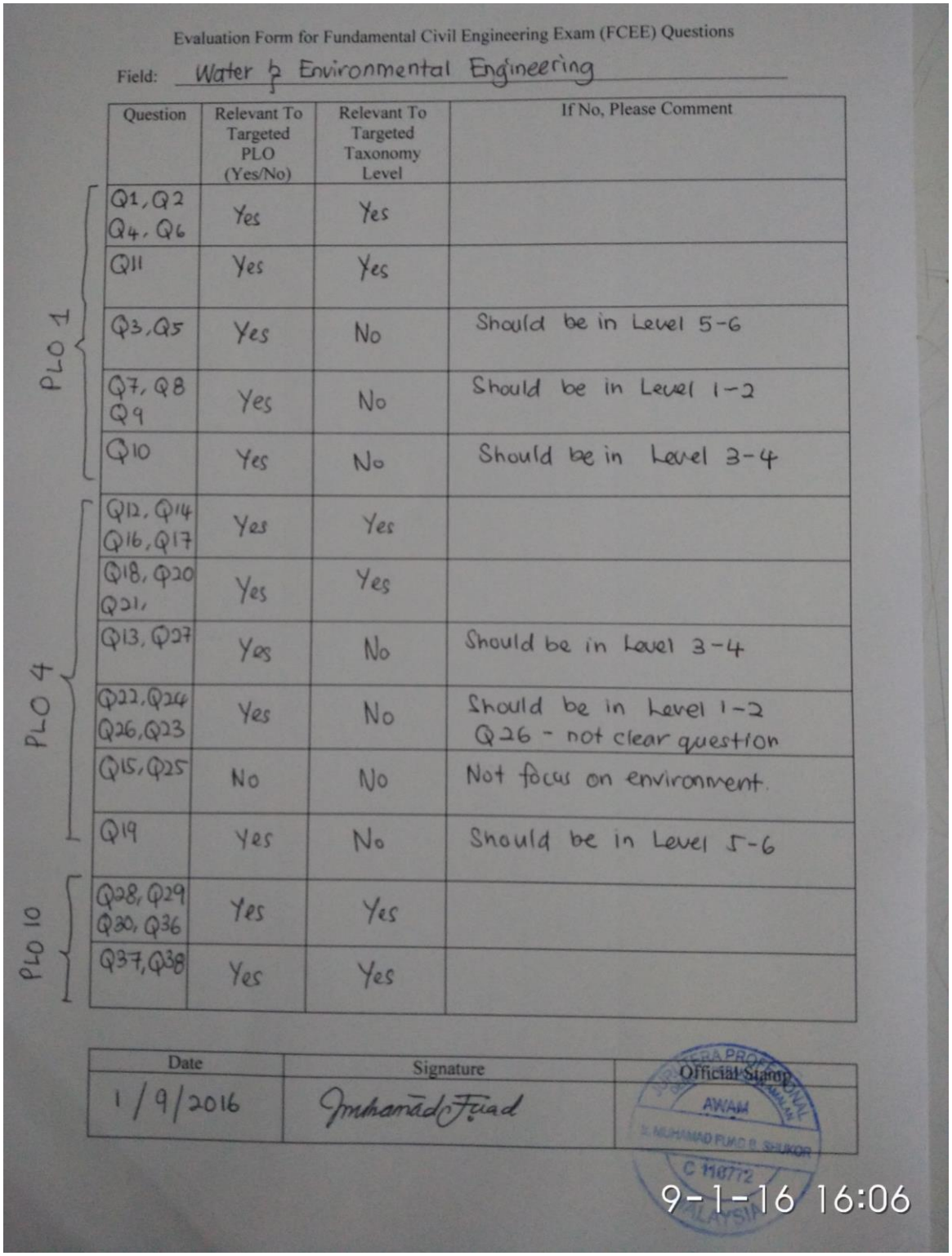
[5] We personally feel that session with panel industry will contributes toward better self confident to the respective students and they may find clear direction where to work after graduating from UTHM.

Best Regards and

Thank You.

Ir. Syed Mohd Yusof Bin Syed Hussin,
MSc, BSc Civil.
amibak.consult@gmail.com

Fig. 3-14. FCEE review report 2015 by Panel Industry 1



Evaluation Form for Fundamental Civil Engineering Exam (FCEE) Questions

Field: Water & Environmental Engineering

	Question	Relevant To Targeted PLO (Yes/No)	Relevant To Targeted Taxonomy Level	If No, Please Comment
PLO 1	Q1, Q2 Q4, Q6	Yes	Yes	
	Q11	Yes	Yes	
	Q3, Q5	Yes	No	Should be in Level 5-6
	Q7, Q8 Q9	Yes	No	Should be in Level 1-2
	Q10	Yes	No	Should be in Level 3-4
PLO 4	Q12, Q14 Q16, Q17	Yes	Yes	
	Q18, Q20 Q21,	Yes	Yes	
	Q13, Q27	Yes	No	Should be in Level 3-4
	Q22, Q24 Q26, Q23	Yes	No	Should be in Level 1-2 Q26 - not clear question
	Q15, Q25	No	No	Not focus on environment.
	Q19	Yes	No	Should be in Level 5-6
PLO 10	Q28, Q29 Q30, Q36	Yes	Yes	
	Q37, Q38	Yes	Yes	

Date	Signature	Official Stamp
1/9/2016	Muhamad Fuad	AWAM

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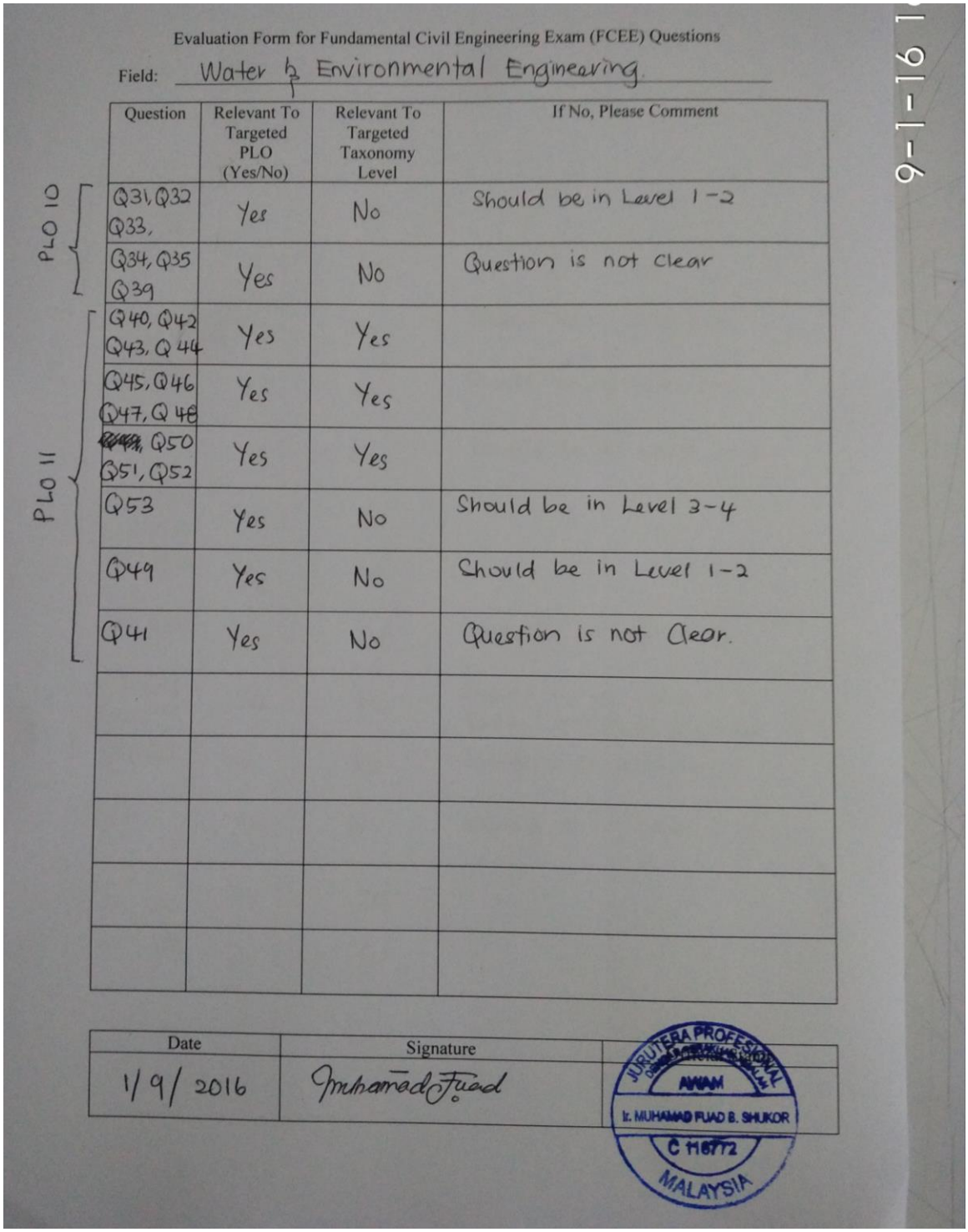
Fig. 3-15. FCEE review report 2015 by Panel Industry 2



Evaluation Form for Fundamental Civil Engineering Exam (FCEE) Questions

Field: Water & Environmental Engineering

	Question	Relevant To Targeted PLO (Yes/No)	Relevant To Targeted Taxonomy Level	If No, Please Comment
PLO 10	Q31, Q32 Q33,	Yes	No	Should be in Level 1-2
	Q34, Q35 Q39	Yes	No	Question is not clear
PLO 11	Q40, Q42 Q43, Q44	Yes	Yes	
	Q45, Q46 Q47, Q48	Yes	Yes	
	Q50 Q51, Q52	Yes	Yes	
	Q53	Yes	No	Should be in Level 3-4
	Q49	Yes	No	Should be in Level 1-2
	Q41	Yes	No	Question is not clear.

Date	Signature	
1/9/2016	Muhamad Fuad	

JURUTERA PROFESIONAL
AWAM
Ir. MUHAMAD FUAD B. SHUKOR
C 116772
MALAYSIA

9-1-16

Fig. 3-16. FCEE review report 2015 by Panel Industry 2 (continued)

From: "salmizi" <msjayie@yahoo.com>
To: "Assoc. Prof. Ir Dr Abdul Halim Abdul Ghani" <abdhalim.g@gmail.com>
Cc: abdulhalim@uthm.edu.my
Sent: Thursday, 1 September, 2016 20:55:07
Subject: FCEE

FCEE

Dear Ir Dr Halim,

I have reviewed the report of FCEE and my comments are as below:

1) The program is crucial for final year students in order to strengthen their fundamental in engineering before being an engineer.

2) By introducing a test, students are able to refresh their skill or engineering knowledge.

3) To ensure the students are always be prepared to the upcoming tasks.

Therefore, my opinion, the test is good to be continued. Thank you

Ir Muhd Salmizi Jaafar

Fig. 3-17. FCEE review report 2015 by Panel Industry 3

3.5 Exit Survey

Exit Survey is an indirect measurement of self-assessment of the PLO based on individual perception as presented in Appendix 3-1. The main objectives of the survey are (1) To determine students' perception on the achievement of PLO in oneself; (2) To determine students' perception on their achievement of soft-skills attributes listed within the PLO; and (3) To evaluate students' satisfaction level towards learning and teaching aspects, academic management, and university facilities. The tool used to perform this survey is Google Form. This survey is normally completed by all graduating students during their convocation.

3.6 PLO Achievement Key Performance Indicator

The key performance indicator (KPI) set for CLO-PLO Assessment is that at least 50% of students obtain no less than 55% marks for every course. This is the KPI for CLO-PLO Assessment. For each PLO across all courses, the KPI is set at no less than 55% marks. The KPI set for FCEE Assessment is that every PLO obtains no less than 55% marks. The KPI set for Exit Survey is that 80% of respondents agree to rating of no less than 4, which is equivalent to a "Good" rating.

With the three Assessment Methods for PLO described in Fig. 3-5, in order to show that every PLO for BFF programme has been achieved, the overall average of all three assessments must be no less than 55%.

4 PEO ASSESSMENT FINDINGS

4.1 The Surveys

Two surveys were conducted to assess PEO achievement as described in Fig. 2-1: (1) Employer Survey and (2) Alumni Survey.

For Employer Survey in 2015, a number of 69 sets of responses were received via the Google Form given out through visits to civil-engineering related companies. The respondents were from senior positions in the company such as Executives, Directors, Project Engineers, Senior Engineers, Managers, etc. The findings from the employer survey are reported in the following manner:

i. Employers' feedback on PEO attainment of Alumni working in the company
ii. Employers' feedback on the employability attributes of Alumni

For Alumni Survey, it consists of two parts which are indirect and direct measurements of PEO achievement. This was done by sending Google Form questionnaires to a total number of 2000 email addresses who are UTHM Alumni from year 2004 to 2014. From the 2000 emails sent, only 320 recipients responded showing a 16% response rate. And out of 320 responses, only 233 respondents have given valid feedbacks. The analyses of the survey were divided into three categories of respondents, which are based on their working experience of (1) less than 3 years; (2) 3 to 5 years and (3) 5 to 10 years.

The indirect measurement of the survey is based on self-evaluation or self-perception of the Alumni on the attainment of PEO within oneself. In the direct measurement survey, the attainment of PEO is evaluated based on 3 criteria:

i. Employment history since graduated;
ii. Actual or real professional achievement and contribution; and
iii. Features of professional development and entrepreneurship.

4.2 What employer says about UTHM Alumni?

In Employer Survey, employers were asked to provide feedback on graduate attainment of the PEO's and their strength of their attributes contributed in the organisation on a Likert-scale of 1 (very poor) to 5 (excellent). Each category of PEO is supported by at least two other questions to improve the validity of the outcome. The rating of all responses were analysed and converted into percentage of the total respondents, hence the unit used in the following graphs is percentage. Subsequently, an average index rating is calculated to represent the assessed attribute. This average index rating is interpreted as 5 being excellent and 1 being very poor as given in Table 4-1.

Table 4-1. Interpretation to average index (AI) rating

Average Index (AI)	Interpretation
4.5 to 5.0	Excellent
3.5 to 4.49	Good
2.5 to 3.49	Average
1.5 to 2.49	Poor
1.0 to 1.49	Very Poor

4.2.1 PEO 1 – Knowledge and Technically Competent

Fig. 4-1 summarises the feedbacks of the employers' perception on the alumni's attainment for PEO 1 and Fig. 4-2 presents their strength based on civil engineering knowledge and are they technically competent in the company.

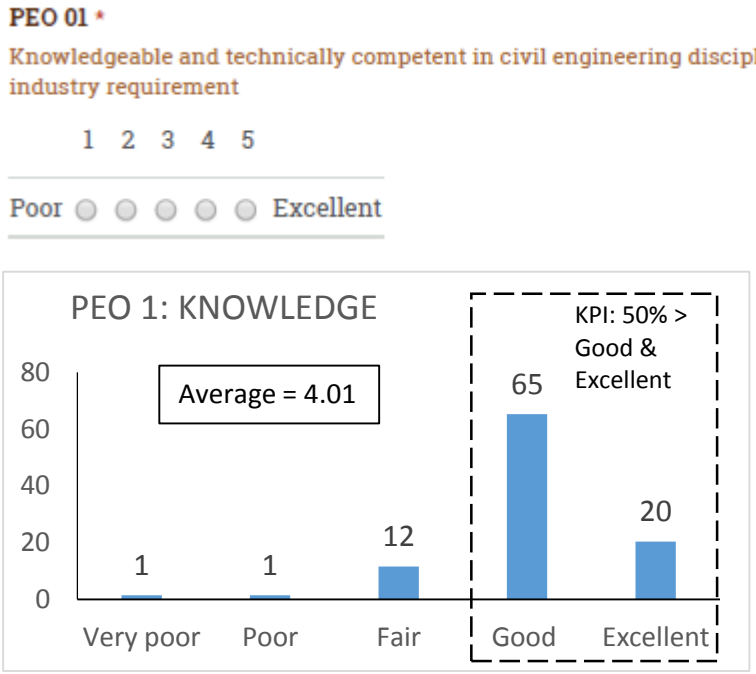


Fig. 4-1. Percentage of respondents expressing their perception on Alumni: Attainment on PEO 1: Knowledgeable and technically competent in civil engineering discipline

The Employer's perception on the Alumni's attainment on PEO 1 showed promising results where 85% of them responded good and excellent scores which achieve the KPI of 50%. The attainment of PEO 1 among the alumni is also supported by the employer's perception on two other strength attributes. The strength attributes on civil engineering knowledge shown by the graduates and also if they are technically competent were supported by the employers respectively, where 75% of the respondents gave good and excellent scores for both attributes. Again, this passes the KPI of 50% where the respondents' feedbacks are on the scale of good and excellent scores.

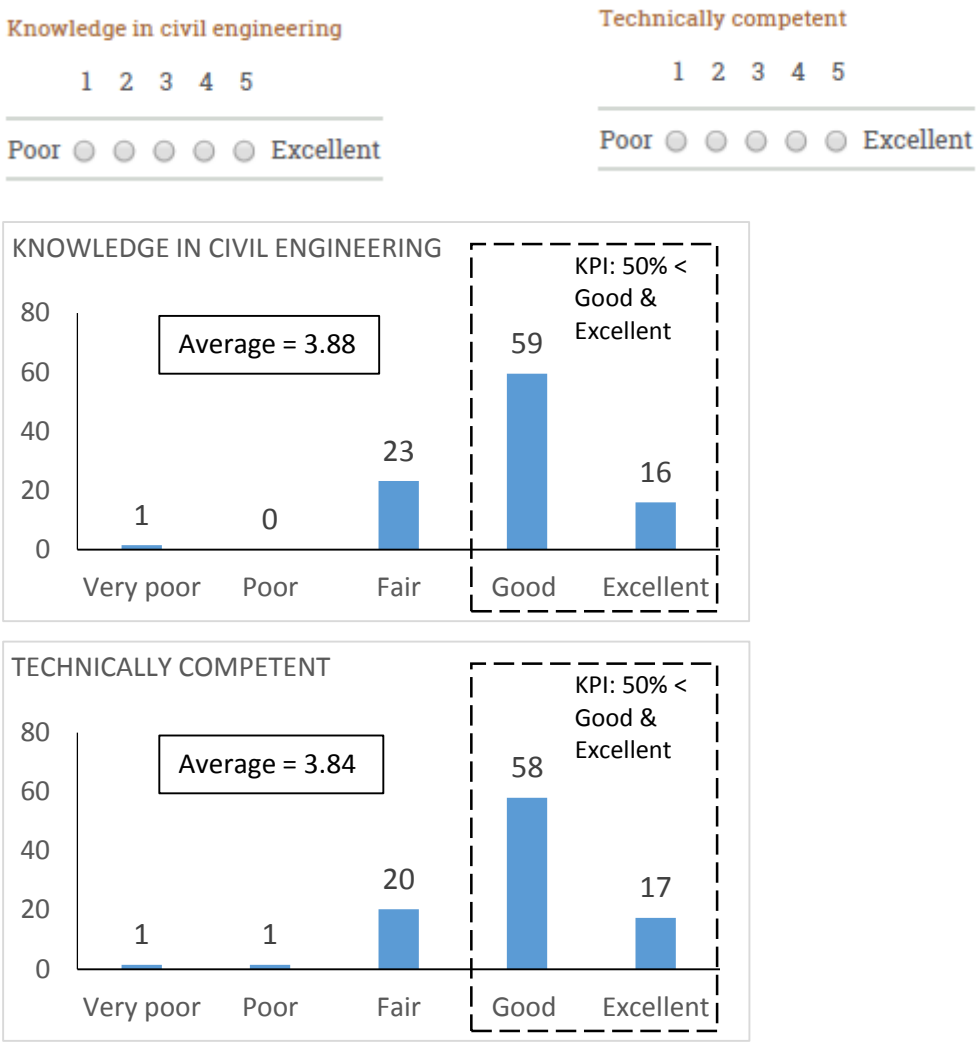


Fig. 4-2. Percentage of respondents expressing their perception on Alumni: Capability on civil engineering knowledge, and Attributes if they are technically competent – supporting strength attributes to PEO 1

4.2.2 PEO 2 – Communication and Leadership Skills

Fig. 4-3 shows the respondents feedback on the attainment of the alumni on PEO 2 which focuses on effective communication and demonstrates good leadership quality in an organization. This was also supported by obtaining the feedback of the respondents based on other strength attributes which are communication and leadership skills that the graduates think that they have contributed to the company, as shown in Fig. 4-4.

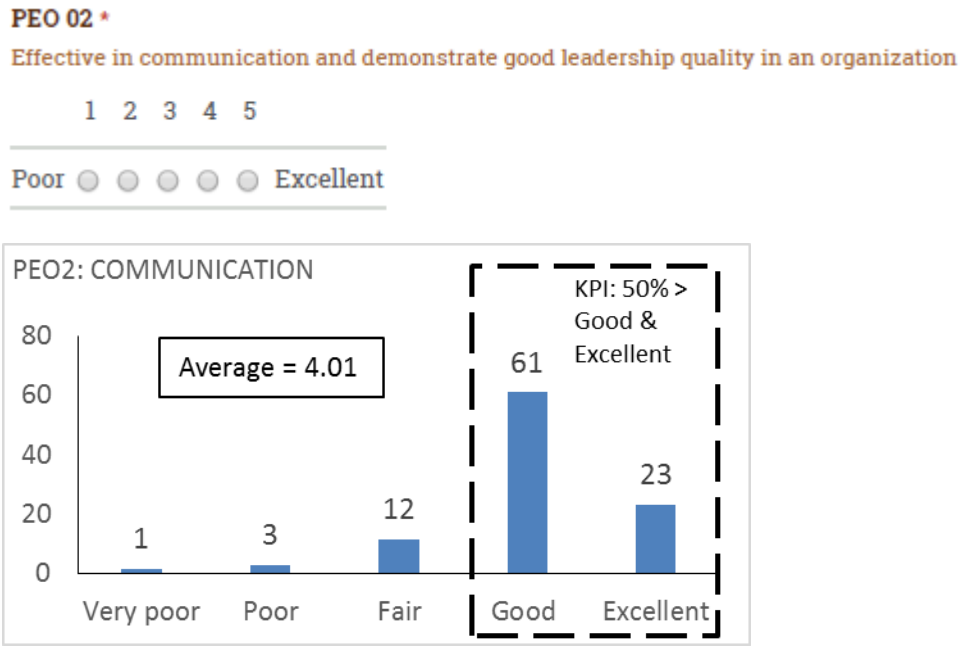


Fig. 4-3. Percentage of respondents expressing their perception on Alumni: Attainment on PEO 2: Effective in communication and demonstrate good leadership quality in an organization

Based on the results, 83% of the respondents showed that the alumni have successfully attained PLO 2 in fulfilment of the KPI. The respondents have also agreed that the graduates show high attributes in communication skills where 75% agreed on this. 76% of the respondents have also agreed that the graduates have either good or excellent leadership skills in the company.

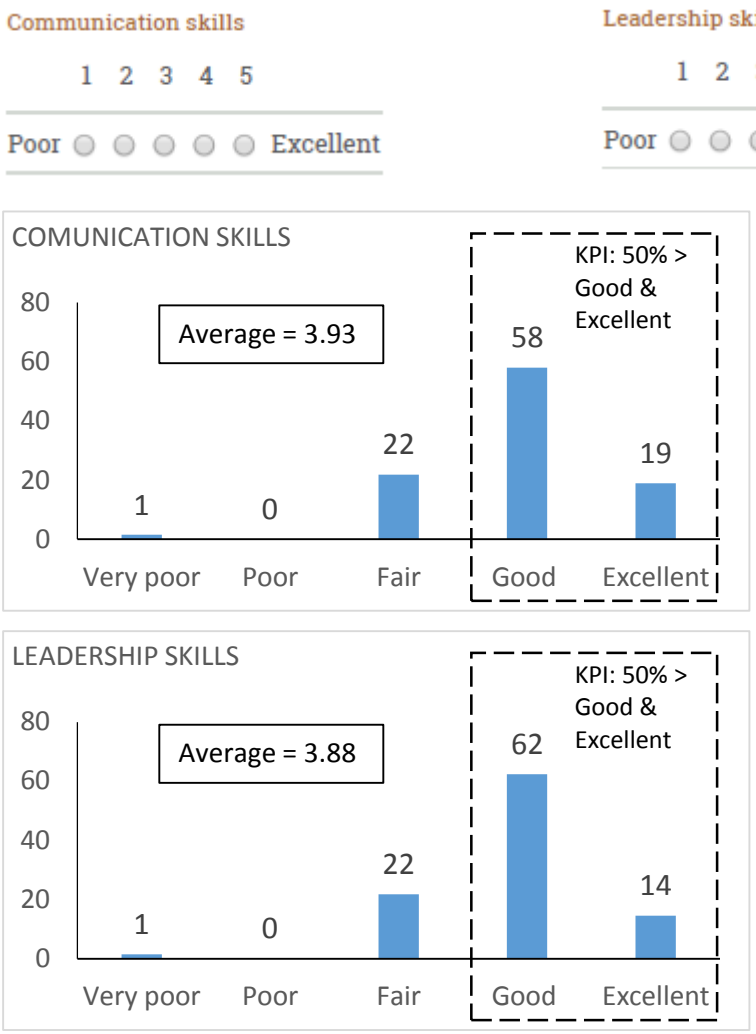


Fig. 4-4. Percentage of respondents expressing their perception on Alumni: Capability in communication skills and leadership skills – supporting strength attributes to PEO 2

4.2.3 PEO 3 – Problem Solving

The feedback on PEO 3 which focuses on the capability of the alumni to solve civil engineering problems innovatively, creatively and ethically through sustainable approach is summarised in Fig. 4-5. Results of the other attributes that supports PEO 3 that was asked to the employers whether the alumni have the ability in problem solving, creative/innovative and critical thinking and have ethics and professional values are shown in Fig. 4-6 and Fig. 4-7

PEO 03 *

Capable to solve civil engineering problems innovatively, creatively and ethically through sustainable approach

1 2 3 4 5

Poor ○ ○ ○ ○ ○ Excellent

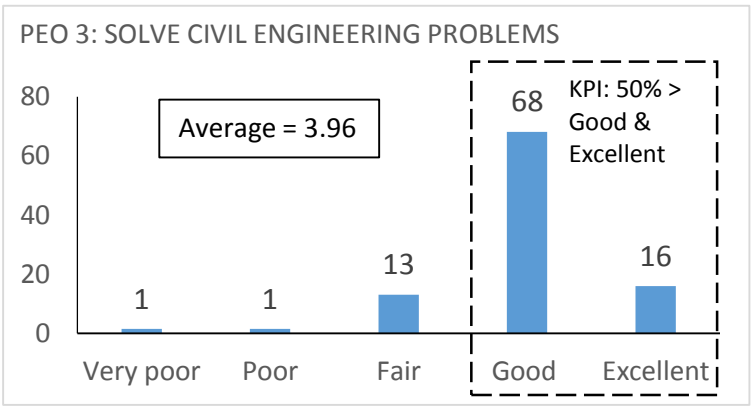


Fig. 4-5. Percentage of respondents expressing their perception on Alumni: Attainment on PEO 3: Capable to solve civil engineering problems innovatively, creatively and ethically through sustainable approach

Problem solving

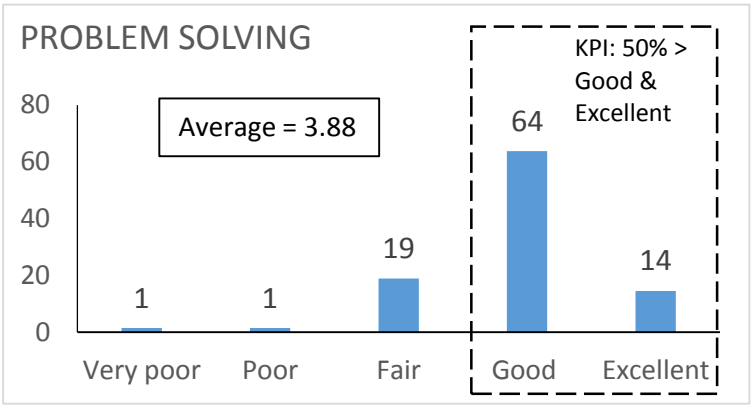
1 2 3 4 5

Poor ○ ○ ○ ○ ○ Excellent

Creative/innovative and critical thinking

1 2 3 4 5

Poor ○ ○ ○ ○ ○ Excellent



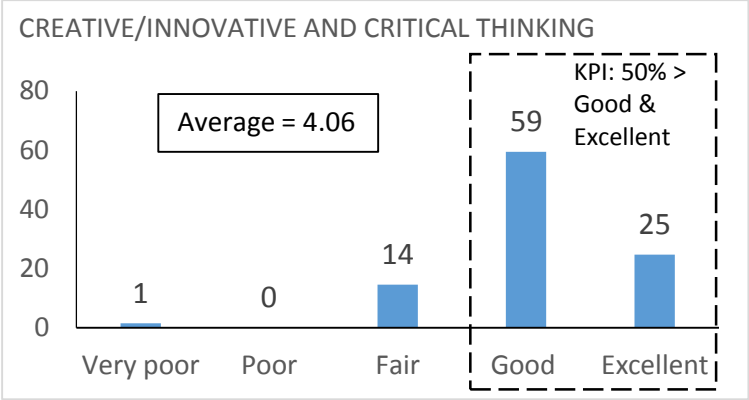


Fig. 4-6. Percentage of respondents expressing their perception on Alumni: Capability in problem solving, in creative/innovative and critical thinking – supporting strength attributes to PEO 3

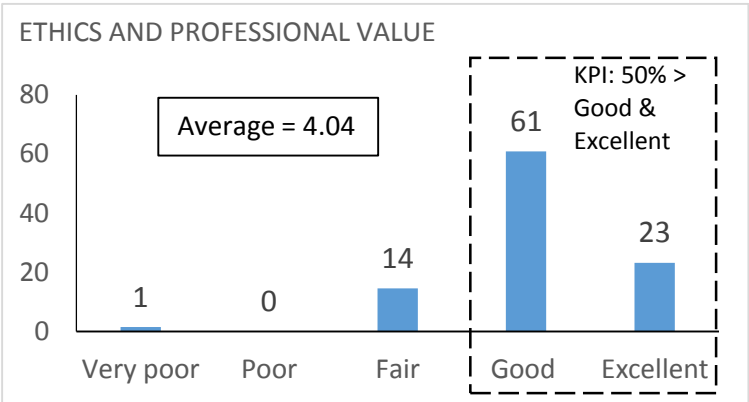


Fig. 4-7. Percentage of respondents expressing their perception on Alumni: exhibits ethics and professional value – supporting strength attributes to PEO 3

84% of the employers surveyed based on their good and excellent scores, agreed that the programme graduates have attained PLO 3. 78%, 85% and 84% of the employers have also agreed that the graduates have either good or excellent ability in problem solving, in creative/innovative and critical thinking and in ethics and professional value respectively which is in line with the industry requirements. All of these attributes have achieved the KPI of 50% which the respondents should give good and excellent feedback.

4.2.4 PEO 4 – Entrepreneurship skills and Lifelong Learning

The summary of the feedback from the respondents on the graduate attainment on PEO 4 and the graduates interest in lifelong learning and are able to work as a team in the company is shown in Fig. 4-8. The feedback shows that 82% of the respondents gave good and excellent scores on the graduates' attainment on PEO 4. The strength attributes that supports PEO 4 which are lifelong learning and teamwork showed good feedback from the respondents where 74% and 86% of them gave good and excellent scores respectively, as presented in Fig. 4-9.

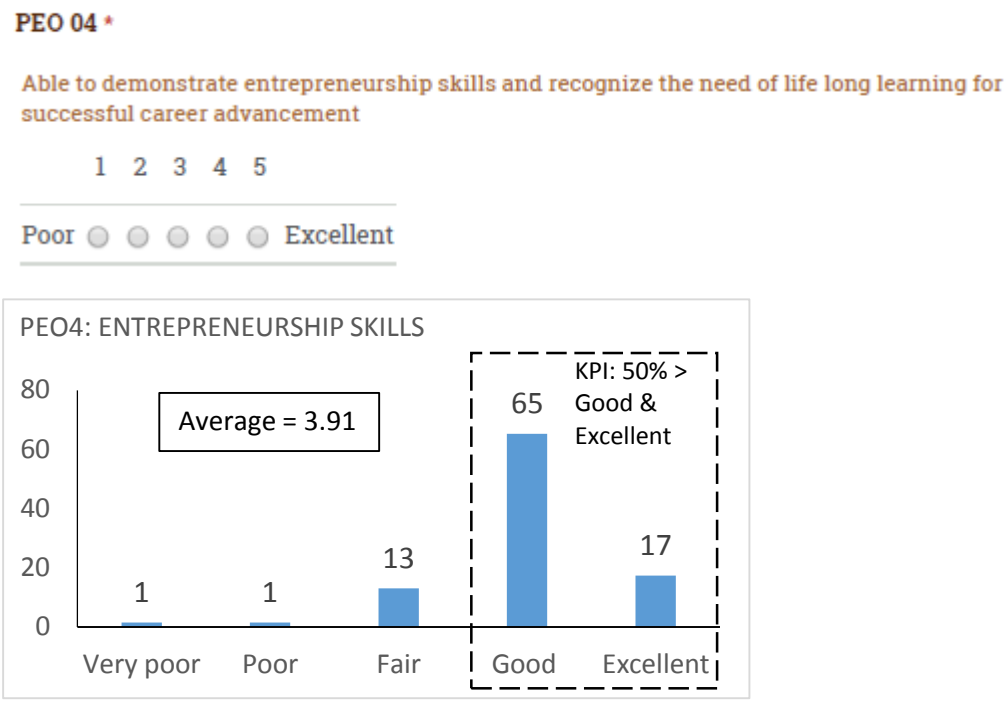


Fig. 4-8. Percentage of respondents expressing their perception on Alumni: Attainment on PEO 4: Able to demonstrate entrepreneurship skills and recognize the need of lifelong learning for successful career advancement

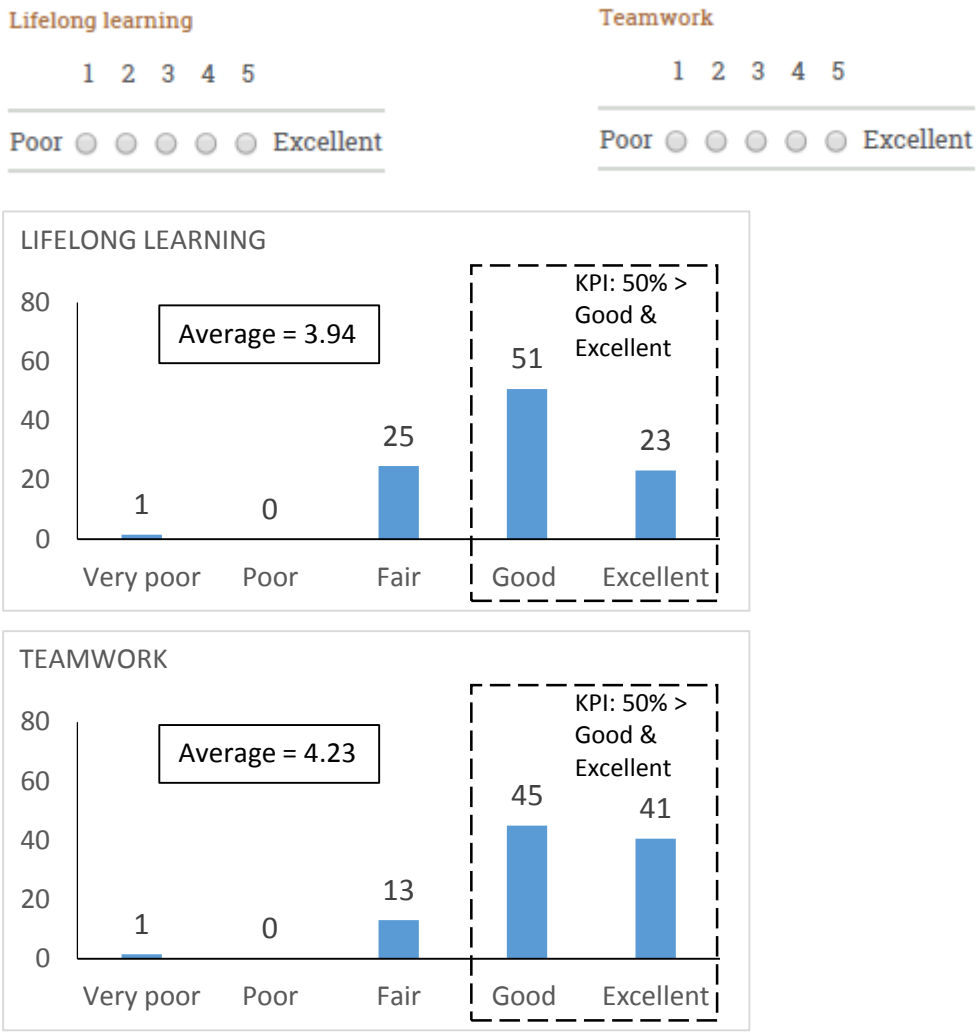


Fig. 4-9. Percentage of respondents expressing their perception on Alumni: Interest in lifelong learning and able to work in teams – supporting strength attributes to PEO 4

4.3 What the Alumni perceive of themselves?

In Alumni Survey, alumni were asked to evaluate themselves on a Likert-scale between 1 (very poor) and 5 (excellent) on the attainment of PEO in oneself. Fig. 4-10 shows the analysis of all the PEO attainment for alumni who have less than 3 years of working experience. It shows that 82% of the respondents perceived that they have good or excellent attainment in PEO 1. However, only 45% of the alumni agreed that they have good or excellent attainment in PEO 2. 76% and 74% of the graduates believed that they have attained PEO3 and PEO4 respectively. This shows that only PEO 1, PEO 3 and PEO

4 have passed the KPI of 50% where the respondents' feedbacks are on the scale of good and excellent scores for alumni with less than 3 years of working experience.

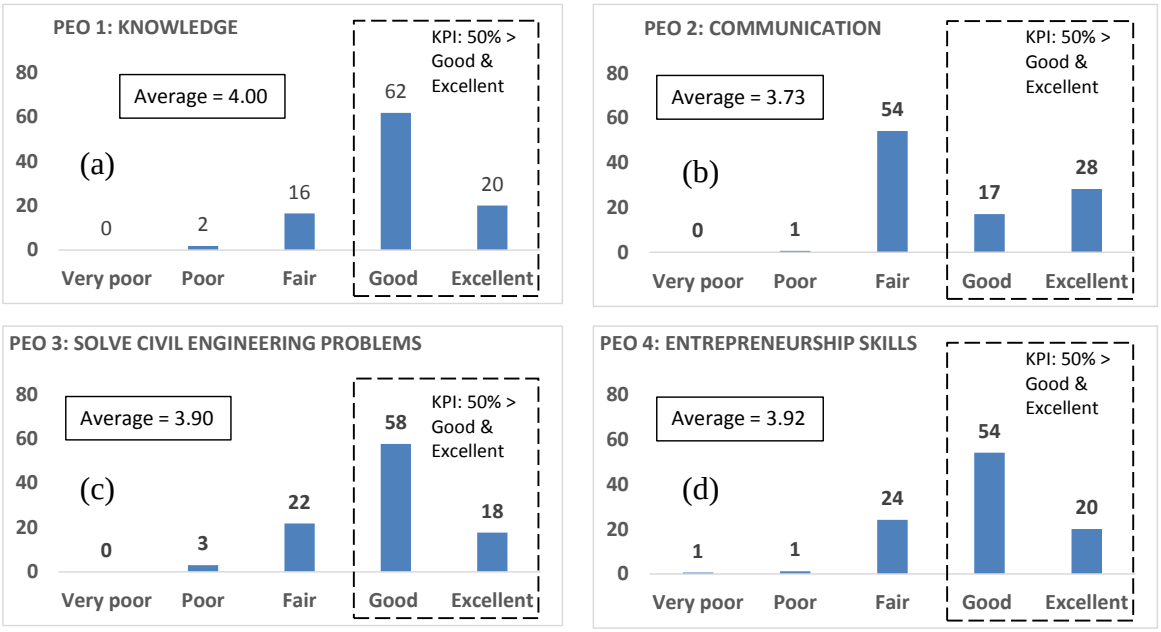


Fig. 4-10. Alumni survey indirect measurement on alumni with less than 3 years of working experience – one's perception on the attainment of (a) PEO 1, (b) PEO 2, (c) PEO 3, (d) PEO 4

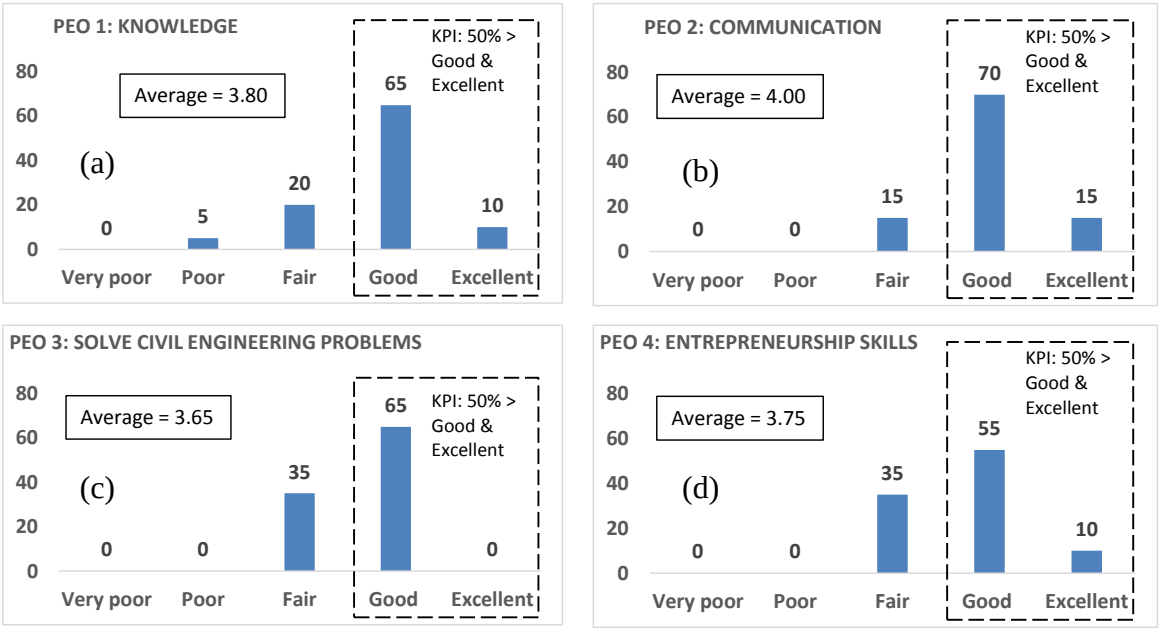


Fig. 4-11. Alumni survey indirect measurement on alumni with 3 to 5 years of working experience – one's perception on the attainment of (a) PEO 1, (b) PEO 2, (c) PEO 3, (d) PEO 4

Fig. 4-11 shows the analysis of all the PEO attainment for alumni who have working experiences of 3 to 5 years. The analysis shows that the attainment for all the PEO are above the KPI criteria. 75% and 85% of the graduates believe that they have good and excellent attainment on PEO 1 and PEO 2 respectively. However, only 65% of the alumni think they have good or excellent attainment for both PEO 3 and PEO 4.

For alumni with more than 5 years working experience as presented in Fig. 4-12, the survey shows that 88% of them believed they have good and excellent attainment in PEO 1. A drastic increase in the alumni's perception in PLO 2 was seen with 95% of them agreed they have attained good and excellent scores. However, only 79% of the graduates gave their perception that they have attained good and excellent scores in both PEO 3 and PEO 4, respectively.

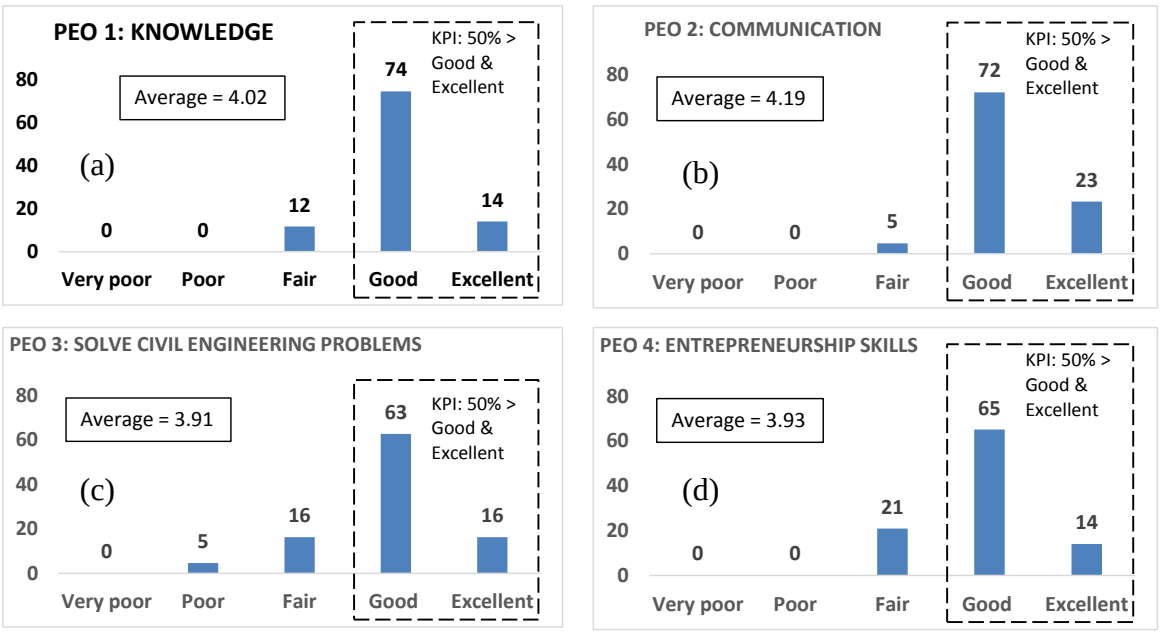
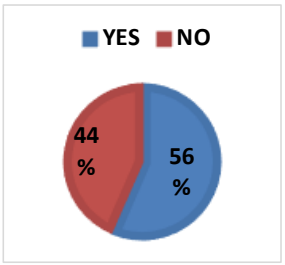
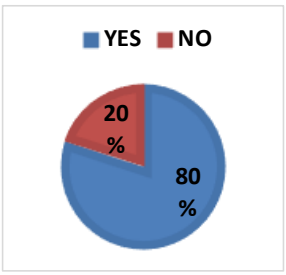
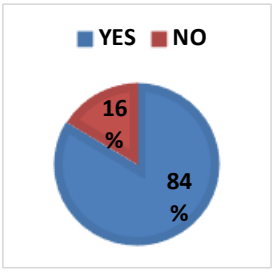
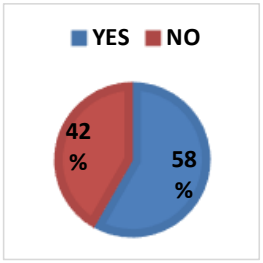
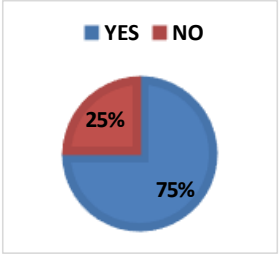
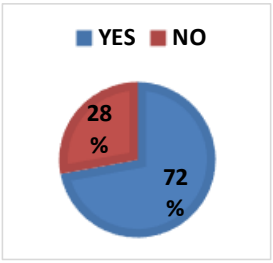
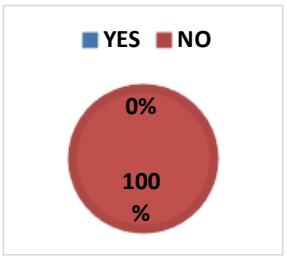
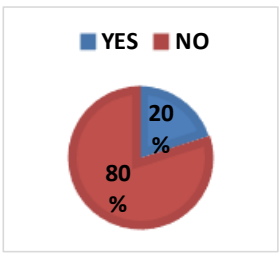
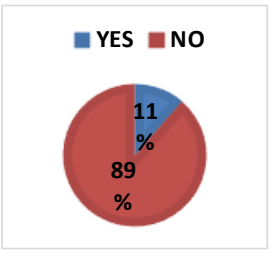


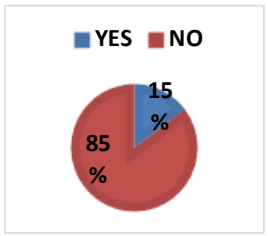
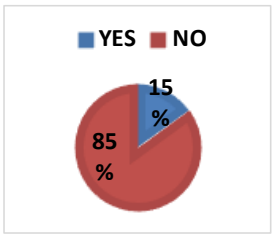
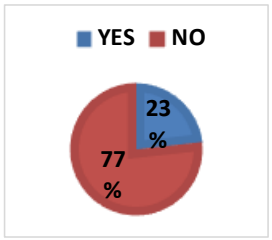
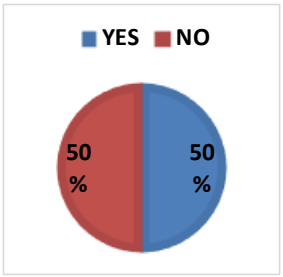
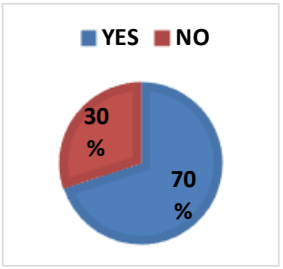
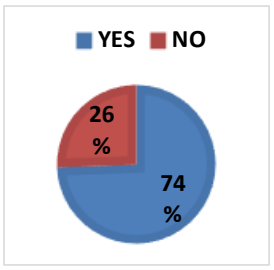
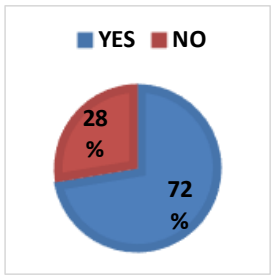
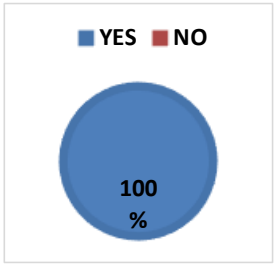
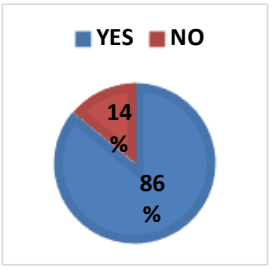
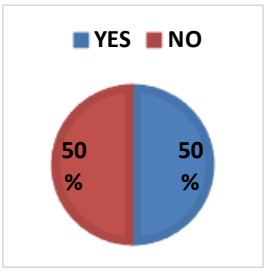
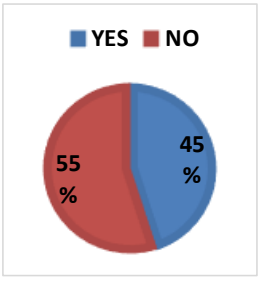
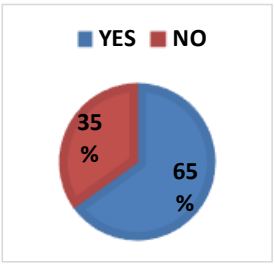
Fig. 4-12. Alumni survey indirect measurement on alumni with more than 5 years of working experience – one's perception on the attainment of (a) PEO 1, (b) PEO 2, (c) PEO 3, (d) PEO 4

4.4 Alumni's real achievements through direct measurement

The direct survey on alumni's attainment on all the PEO was evaluated by measuring their actual involvement in the organization based on their employment history since their graduation, their professional achievement and contribution, and their professional development. Table 4-2 shows a summary analysis of the alumni response with working experience less than 3 years, 3 to 5 years and more than 5 years. Each PEO was measured with a specific question that is in accordance with the KPI success criteria outlined in Table 2-2.

Table 4-2. Alumni Survey direct measurement summary analysis

		< 3 years	3-5 years	5-10 years
1	Have you been promoted or offered to a better position? (**PEO 1**)	YES 96 NO 74 	YES 16 NO 4 	YES 36 NO 7 
2	Have you been involved in research/ construction project proposal either as member or leader? (**PEO 1**)	YES 99 NO 71 	YES 15 NO 5 	YES 31 NO 12 
3	Are you a Professional Engineer (PE)? (**PEO 1**)	YES 0 NO 152 	YES 4 NO 16 	YES 5 NO 39 

		< 3 years	3-5 years	5-10 years
4	Have you published papers in conference journal? (**PEO 2**)	YES 25 NO 145 	YES 3 NO 17 	YES 10 NO 33 
5	Have you held leadership positions for a taskforce or project within an organization? (**PEO 2**)	YES 85 NO 85 	YES 14 NO 6 	YES 32 NO 11 
6	Have been involved in civil engineering design/construction projects? (**PEO 3**)	YES 123 NO 47 	YES 20 NO 0 	YES 37 NO 6 
7	Have been involved in research and/or development projects related to civil engineering? (**PEO 3**)	YES 85 NO 85 	YES 9 NO 11 	YES 28 NO 15 

It is observed that regardless of the years of working experience, PEO 1, 2 and 3 have satisfied the KPI success criteria. The survey has found two important patterns with regards to "written communication skills" and the attainment of "professional engineer" title. These two patterns appeared to be on the lower boundary across the years of

working experience amongst all the respondents. This is reflected in the response towards questions 3 and 4 of Table 4-2**.** PEO 4 however was not measured in the survey.

4.5 Summary

The assessment findings to PEO achievement have been presented in this chapter. The findings include both indirect and direct measurements methods namely Employer Survey and Alumni Surveys. Likert-scale rating of 1(Very Poor) to 5 (Excellent) has been adopted as a standard measure to reflect the achievement of individual attributes within every PEO.

Table 4-3 gives the summary analysis of the Employer Survey coming from a total of 69 respondents. All the PEO attributes are rated not far from each other with a rating range of 3.84 to 4.23 which can be interpreted as bordering to Good and above.

Table 4-3. Employer Survey indirect measurement summary analysis

PEO	Rating	Strength attributes	Rating
1	4.01	Knowledge in Civil Engineering	3.88
		Technically competent	3.84
2	4.01	Communication	3.93
		Leadership	3.88
3	3.96	Problem solving	3.88
		Creative/ innovative and critical thinking	4.06
		Ethics and professional values	4.04
4	3.91	Life-long learning	3.94
		Teamwork	4.23

Table 4-4 shows the summary analysis of Alumni Survey for two groups of alumni. The first has working experience of 3 to 5 years and the second group has working experience of over 5 years. The ratings reported are all bordering to Good. The highest rated attribute is Communication (4.00) while the least rated attribute is Problem Solving (3.65). It is also observed that as the alumni gain more years of working experience, the rated PEO attributes improved by 4 to 7% depending on the number of years of experience.

Table 4-4. Alumni Survey indirect measurement summary analysis for different years of working experience

PEO	Attributes	Rating by Alumni with 3 to 5 years work experience	Rating by Alumni more than 5 years work experience
1	Knowledge in Civil Engineering ; Technically competent	3.80	4.02
2	Communication; Leadership	4.00	4.19
3	Problem solving	3.65	3.91
4	Entrepreneurship; Life-long learning	3.75	3.93

In conclusion, this chapter has shown sufficient evidence that the PEOs of BFF programme have satisfied all the stipulated KPI based on the assessments that have been performed. This is evident where PEO assessment by Employer and Alumni, both exhibited rating of "Good" by more than 50% respondents (range 74% to 86% said "Good" rating and above), and the direct measurement on Alumni's achievement fulfils the stipulated KPI.

5 PLO ASSESSMENT FINDINGS

5.1 The Assessment

For PLO benchmarking, there are 3 types of assessment: (1) CLO-PLO Assessment; (2) Fundamental Civil Engineering Exam; and (3) Exit Survey. These assessments and their KPI are discussed in detail in Chapter 3 and summarised in Fig. 3-5. This chapter reports all the findings to each of the aforementioned assessments.

5.2 CLO-PLO Assessment - Overall

Course Learning Outcome-Programme Learning Outcome (CLO-PLO) assessment refers to a direct continuous measurement of students' attainment of PLO. Appendix 5-1 presents the CLO-PLO matrix for BFF programme providing the relevant PLOs for each course. Every course has 3 CLO which is mapped to 3 PLO of Cognitive, Psychomotor and Affective domains. The CLO achievement of each cohort is tracked and updated every academic semester. At the end of their study, the students achievement of each PLO is then determined.

This section reports the PLO achievement for 2 semesters: (1) Semester I Session 2014/2015, and (2) Semester II Session 2014/2015. The first success criterion / KPI for each PLO attainment is that the marks of the course addressing the PLO is at least 55%. The second success criterion / KPI used to measure the achievement of PLO is at least 50% of students achieve 55% marks. This success criterion focuses on the student numbers while the former success criterion focuses on the PLO marks. The number of courses offered and number of students enrolled for the courses is summarised in Table 5-1.

The achievement of PLO for the semesters is summarised in Table 5-2 and reflected graphically in Fig. 5-1 indicating that the KPI of PLO at 55% marks has been satisfied for all PLO. Appendix 5-2 and Appendix 5-3 give the CLO-PLO data for all courses for Semester 1 and Semester 2 Session 2014/2015, respectively. For Session 2014/2015, the assessments were conducted directly for existing PLO 1 to PLO 9 while the additional

new PLO 10 to PLO 13 were superimposed to other partnering existing PLO that were assumed to have the closest characteristics to the added new PLO 10 to PLO 13. This assumed superimposition is illustrated in Table 5-3. However for the following Session 2015/2016, each PLO including the new additional PLO has been assessed directly and individually without any superimposition assumption.

Table 5-1. Summary of courses offered and number of students in 2015

Semester/Session	Number of courses offered	Number of students registered
Semester I Session 2014/2015	77	1848
Semester II Session 2014/2015	69	1998

Table 5-2. Summary of PLO achievement in percentage for corresponding semester in Session 2014/2015

	PLO								
	1	2	3	4	5	6	7	8	9
Semester I	64.9	70.5	78.9	71.4	81.5	80.0	78.5	83.8	84.1
Semester II	68.1	83.4	93.3	92.0	97.1	94.2	90.4	85.7	93.7

Table 5-3. Summary of PLO achievement in percentage for corresponding semester in Session 2014/2015

PLO	PLO Superimposition			
EXISTING PLO	5	6	5, 6, 7 and 9	8
NEW PLO	10	11	12	13
Attributes of NEW PLO	Design/ Development and Solutions	Problem Analysis	Environmental and Sustainability	Engineer and Society

The superimposition and realignment of the CLO-PLO assessment to cover the additional new PLO 10 to PLO 13 is reflected in Fig. 5-2, Fig. 5-3, and Fig. 5-4 for 3 culminating courses: Integrated Project Design (IDP), Final Year Project (FYP), and Industrial Training, respectively.

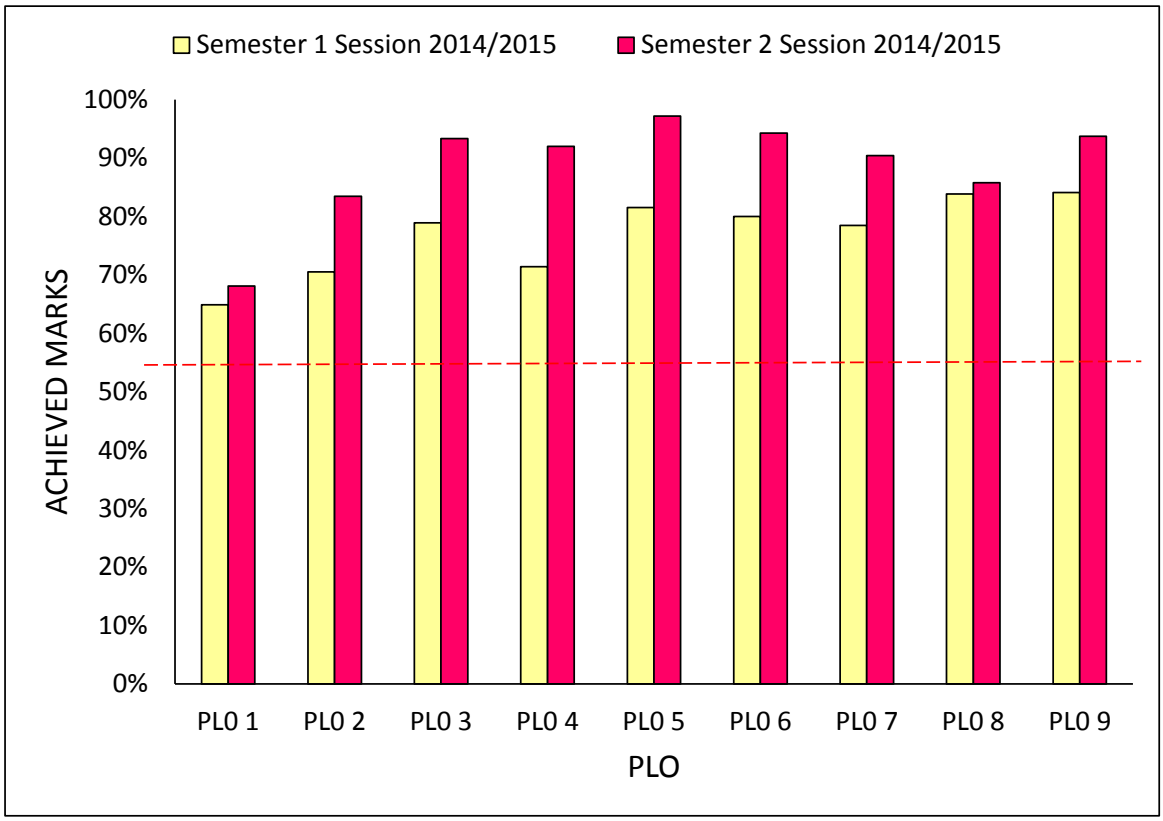


Fig. 5-1. CLO-PLO achievement for BFF programme in Semester 1 and Semester 2 Session 2014/2015

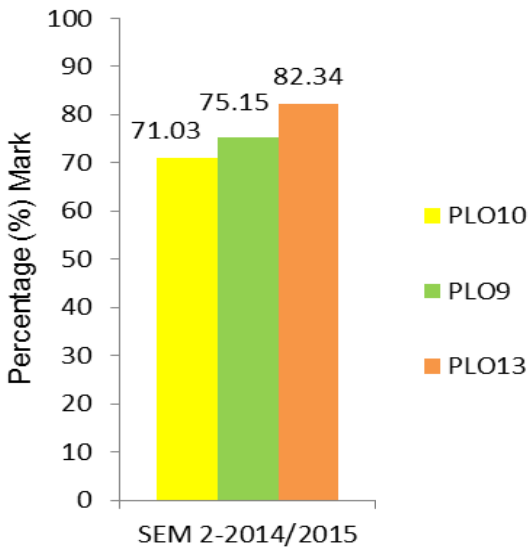


Fig. 5-2. CLO-PLO achievement for IDP

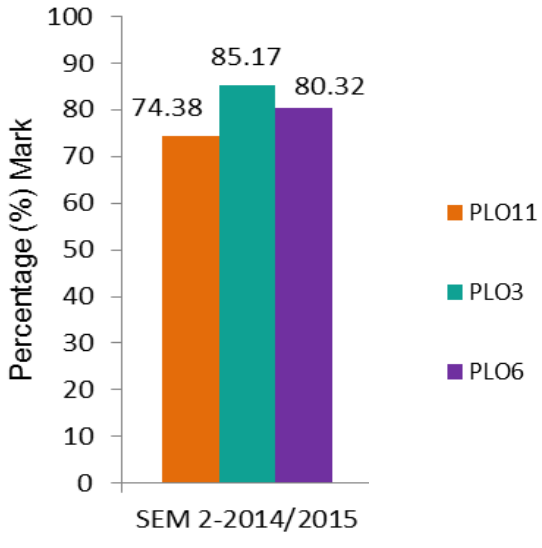


Fig. 5-3. CLO-PLO achievement for FYP2

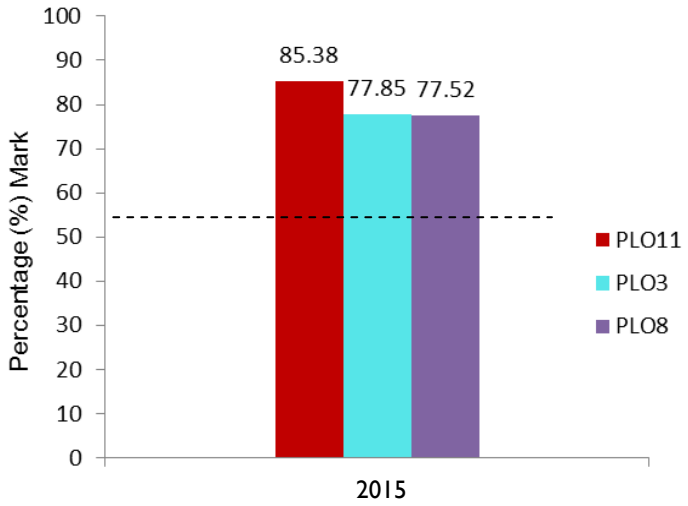


Fig. 5-4. CLO-PLO achievement for Industrial Training

UNIVERSITI TUN HUSSEIN ONN MALAYSIA (UTHM)
Overall CLOs Achievement Report

Course Code : BFC43003 REKABENTUK STRUKTUR KELULI DAN KAYU / STRUCTURAL STEEL AND TIMBER DESIGN
Section : SEMUA
Coordinator : 00266 - PROF. MADYA DR DAVID YEOH ENG CHUAN
Session / Sem : 20152016 / 1

Overall CLOs ACHIEVEMENT REPORT (Previous)

Session: 20142015 / 1
Course Code: BFC43003

OBE Option	CLOs	PLOs	KPI		Achieved KPI		Remarks
			% Students	% Marks	No. Students	% Students	
1	CLO 1	PLO 04 (CTPS	50	55	46 / 335	13.73	Not Achieved
2	CLO 1	PLO 10 (DS)	50	55	14 / 79	17.72	Not Achieved
1	CLO 2	PLO 02 (P)	50	55	307 / 335	91.64	Achieved
2	CLO 2	PLO 09 (LS)	50	55	65 / 79	82.28	Achieved
1	CLO 3	PLO 03 (CS)	50	55	332 / 335	99.10	Achieved
2	CLO 3	PLO 05 (TS)	50	55	79 / 79	100.00	Achieved

Overall CLOs ACHIEVEMENT REPORT (Current)

Session: 20152016 / 1
Course Code: BFC43003

OBE Option	CLOs	PLOs	KPI		Achieved KPI		Remarks
			% Students	% Marks	No. Students	% Students	
1	CLO 1	PLO 04 (CTPS	50	55	2 / 12	16.67	Not Achieved
2	CLO 1	PLO 10 (DS)	50	55	117 / 310	37.74	Not Achieved
1	CLO 2	PLO 02 (P)	50	55	11 / 12	91.67	Achieved
2	CLO 2	PLO 09 (LS)	50	55	287 / 310	92.58	Achieved
1	CLO 3	PLO 03 (CS)	50	55	11 / 12	91.67	Achieved
2	CLO 3	PLO 05 (TS)	50	55	309 / 310	99.68	Achieved

STATISTIK BILANGAN PELAJAR MENDAFTAR KURSUS

Sesi	Sem	Kod Kursus	Seksyen	Program	DT	UK	Jumlah
20142015	1	BFC43003	1	BFF - SARJANA MUDA KEJURUTERAAN AWAM DENGAN KEPUJIAN	63	1	64
			2	BFF - SARJANA MUDA KEJURUTERAAN AWAM DENGAN KEPUJIAN	58	2	60
			3	BFF - SARJANA MUDA KEJURUTERAAN AWAM DENGAN KEPUJIAN	62	1	63
			4	BFF - SARJANA MUDA KEJURUTERAAN AWAM DENGAN KEPUJIAN	51		51
			5	BFF - SARJANA MUDA KEJURUTERAAN AWAM DENGAN KEPUJIAN	48		48
			6	BFF - SARJANA MUDA KEJURUTERAAN AWAM DENGAN KEPUJIAN	62		62
			7	BFF - SARJANA MUDA KEJURUTERAAN AWAM DENGAN KEPUJIAN	65	1	66
Jumlah Besar					409	5	414

Fig. 5-5. Typical example of CLO-PLO assessment with KPI focus on student numbers

Apart from the presentation of CLO-PLO assessment based on PLO marks attainment, the assessment is also presented based on student numbers who attained a minimum of 55% marks for the PLO. This is illustrated in Fig. 5-5 for a single course.

5.3 CLO-PLO Assessment – At Course Level and at Student Level

CLO-PLO assessment at course level is conducted automatically for every course showing the achievement of marks for the related PLO. Fig. 5-6 shows a typical illustration of CLO-PLO assessment at course level. At student level, the CLO-PLO assessment is shown in Fig. 5-7.

KOD KURSUS : BFC43003 REKABENTUK STRUKTUR KELULI DAN KAYU / STRUCTURAL STEEL AND TIMBER DESIGN SESI / SEMESTER : 20142015 / 1
SEKSYEN : SEMUA
PENYELARAS : 60266 - PROF. MADYA DR DAVID YEOH ENG CHUAN

STATISTIK PURATA PENCAPAIAN CLO DAN PLO

				CLO 1	CLO 2	CLO 3
Sesi/Semester	Kursus	Seksyen	Pilihan OBE	PLO 04 (CTPS)	PLO 02 (P)	PLO 03 (CS)
20142015/1	BFC43003	1	1	41.29	84.44	84.26
		2	1	46.02	83.47	75.75
		3	1	41.48	76.63	86.67
		4	1	38.59	76.78	84.63
		5	1	46.62	93.00	93.60
		6	1	44.65	75.45	85.33
		7	1	43.97	82.15	89.78
20142015/1 Total				43.23	80.29	85.72
Grand Total				43.23	80.29	85.72

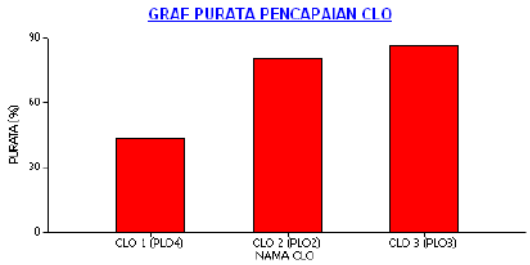


Fig. 5-6. Typical example of CLO-PLO assessment at course level

ANALISA PURATA PENCAPAIAN MENGIKUT CLO DAN PLO

				CLO 1	CLO 2	CLO 3
Kod Kursus	Seksyen	Pilihan OBE	Nama Pelajar	PLO 04 (CTPS)	PLO 02 (P)	PLO 03 (CS)
BFC43003	1	1	(60 , A) YEO YIN YIN [AF110225]	76.76	100.00	92.00
			(67 , B) WONG KOK YAW [AF110226]	61.32	100.00	92.00
			(64 , B-) NUR ASSHEEKIN BINTI ZAINAL KARIM [AF110007]	59.32	92.00	76.00
			(64 , B-) MOHAMAD AZIM BIN MOHD NOR [AF110124]	57.79	100.00	90.33
			(63 , B-) NADIA NATASHA BINTI SALIM [AF110122]	56.62	96.00	92.00

Fig. 5-7. Typical example of CLO-PLO assessment at student level for each course

5.4 Fundamental Civil Engineering Exam (FCEE)

Two FCEEs were conducted in 2015, during Semester I Session 2014/2015 and Semester II Session 2014/2015. The dates of the FCEE and the number of candidates for the exams are shown in Table 5-4**.**

Table 5-4. FCEE performed in Session 2014/2015

Semester, Session	Date of FCEE	Number of students
Semester I, Session 2014/2015	27 Nov 2014	297
Semester II, Session 2014/2015	5 May 2015	254
	Total	551

Fig. 5-8 and Fig. 5-9 show the PLO achievement in Semester I Session 2014/2015 and Semester II Session 2014/2015, respectively. The overall PLO achievement in 2015 is shown in Fig. 5-10. The result is based on the average of achievement in both semesters by considering the number of students in each semester.

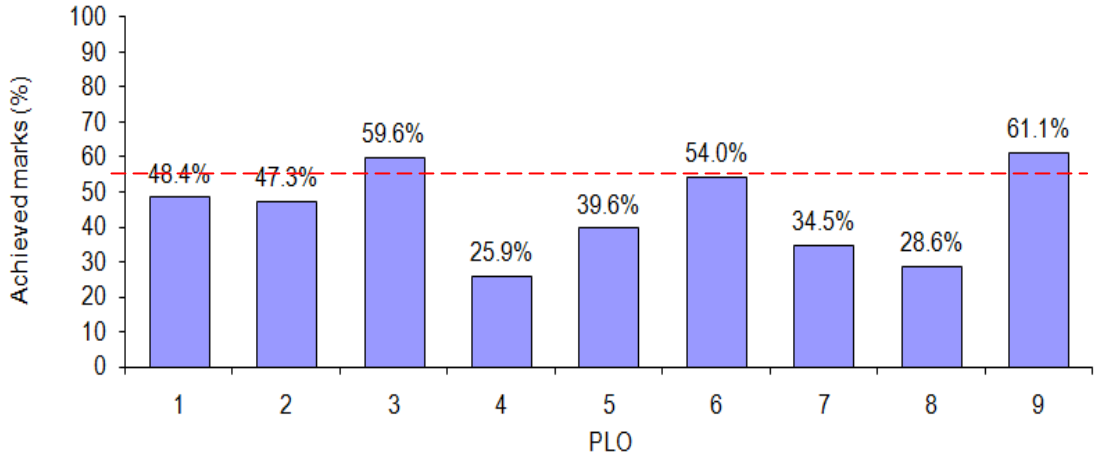


Fig. 5-8. FCEE achievement in Semester I Session 2014/2015 in accordance to PLO

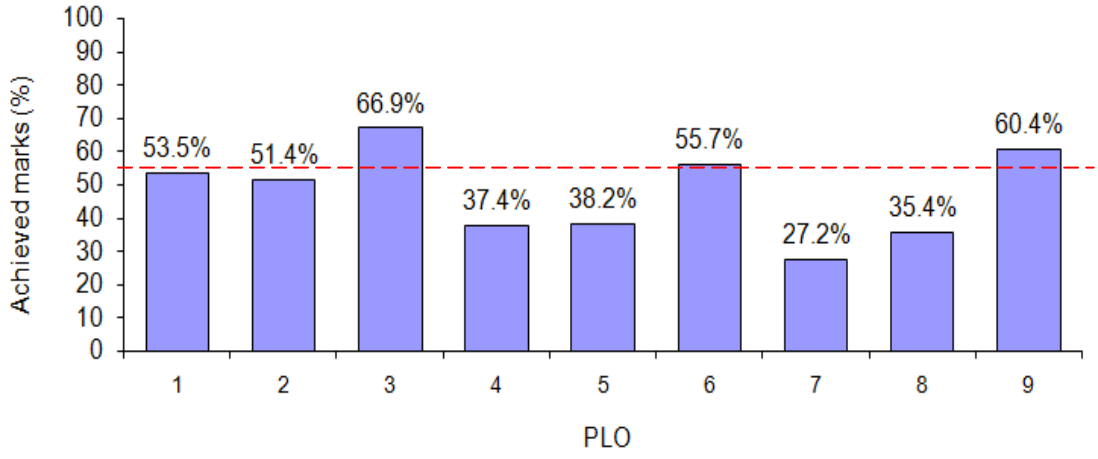


Fig. 5-9. FCEE achievement in Semester II Session 2014/2015 in accordance to PLO

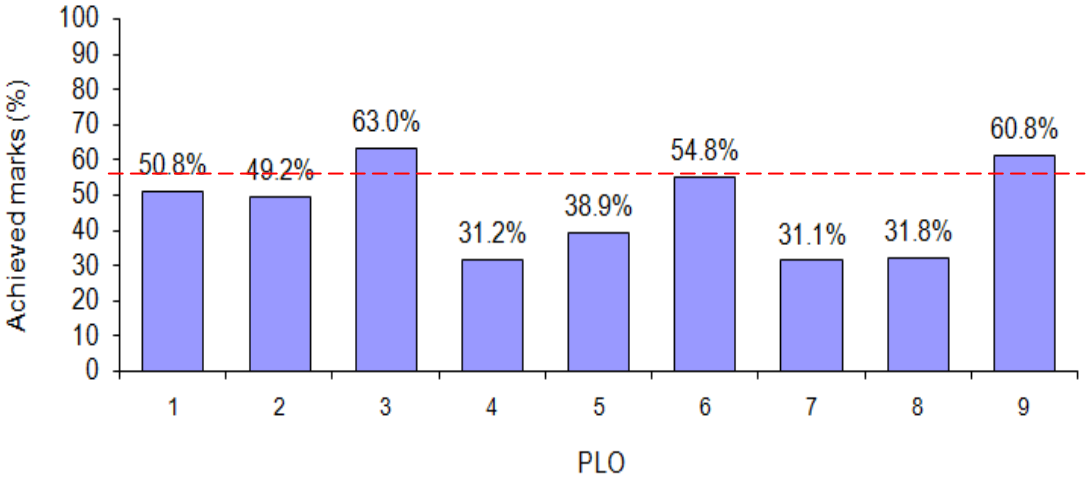


Fig. 5-10. FCEE achievement for year 2015 in accordance to PLO

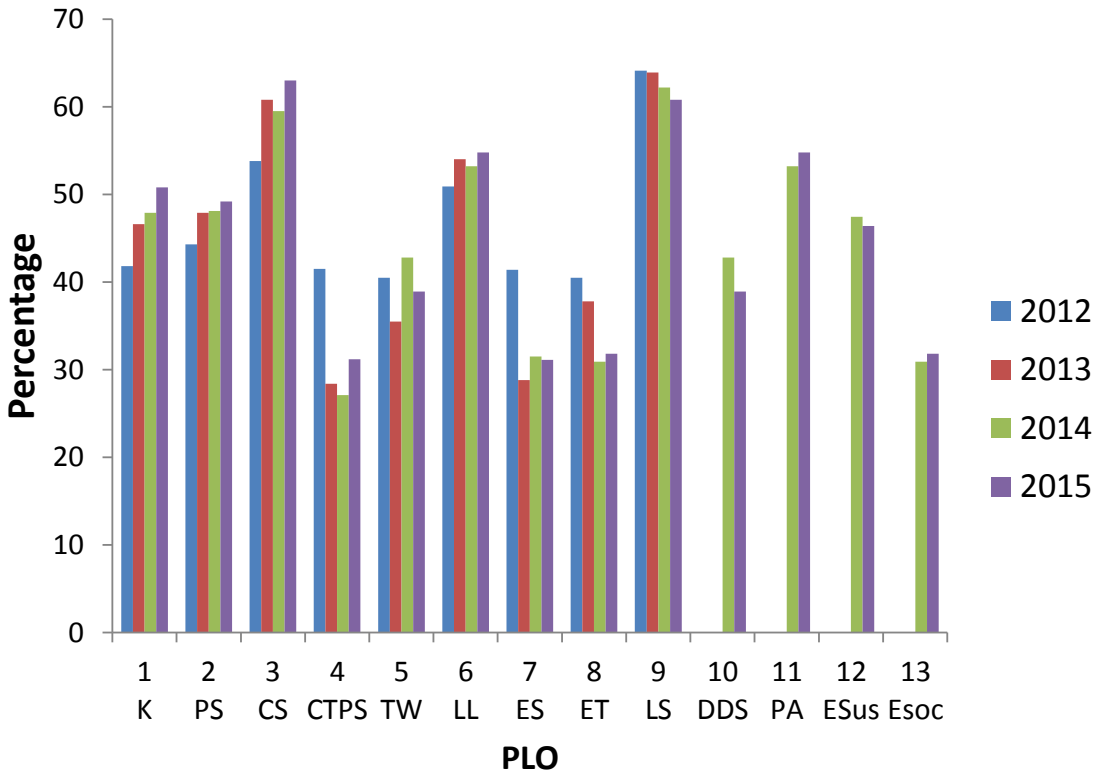


Fig. 5-11. Comparison of FCEE achievement from year 2012 to 2015

The KPI set is 55% marks as marked by the red line in Fig. 5-8, Fig. 5-9 and Fig. 5-10. Overall, it is observed that PLO 3 (Communication), PLO 6 (Life-long Learning), and PLO 9 (Leadership skill) satisfied the KPI while PLO 1 (Knowledge) and PLO 2 (Practical technical skills) are marginally below the KPI. The other PLOs 4 (Critical

thinking and problem solving), 5 (Teamwork), 7 (Entrepreneurship) and 8 (Ethics) are found to be significantly below the KPI. These are indicated in Fig. 5-10.

Fig. 5-11 presents the comparison of FCEE achievement according to PLO for the last 4 years from 2012 to 2015. PLO 4 (CTPS) appeared to be the lowest achieved PLO in all years. The trend of achievement for every PLO was found to be almost similar in all years.

Table 5-5. FCEE results according to overall paper of 40 questions

Section in IDP course	Semester 1		Semester 2	
	Number students get ≥ 55% marks for whole paper	Total students	Number students get ≥ 55% marks for whole paper	Total students
1	1	58	16	58
2	14	61	17	53
3	10	59	20	67
4	3	59	27	57
5	20	60	3	19
Total	48	297	83	254
Percentage	16.2%		32.7%	

The following are CQI activities carried out and recommended to improve students' performance in the upcoming FCEE:

i FCEE is not suitable used to measure students' achievement in the domain of psychomotor and affective. Therefore, the FCEE questions should be reviewed and only used to assess the PLO in cognitive domain.

ii. Student briefing on FCEE should be carried out by the coordinator during the first meeting of Integrated Design Project course to ensure that the students are well prepared for the exam;

iii. The FCEE questions should be reviewed by professional engineer or adjunct professor to increase its quality and suitability; and

iv. More sets of questions should be prepared to increase the reserve of questions, as a different set of FCEE questions is used each semester.

Table 5-5 presents the actual number of students who have achieved more than 55% marks for the overall FCEE paper. The percentages are 16.2% and 32.7% for Semesters 1 and 2, respectively. On a normal scale or normal distribution, this percentage is not expected to be beyond 50% considering that the content of the paper challenges the real fundamental understanding of every student. The effort of FKAAS is to aim for a percentage that is marginally above 50% without lowering the quality of the FCEE paper. With some aforementioned CQI activities, the increase in percentage is observed between Semester 1 and Semester 2, from 16.2% to 32.7%, which is a double increment.

5.5 Exit Survey

Out of the 628 sets of questionnaires analysed, 280 (46%) of the respondents are male students and 348 (54%) are female students (Fig. 5-12).

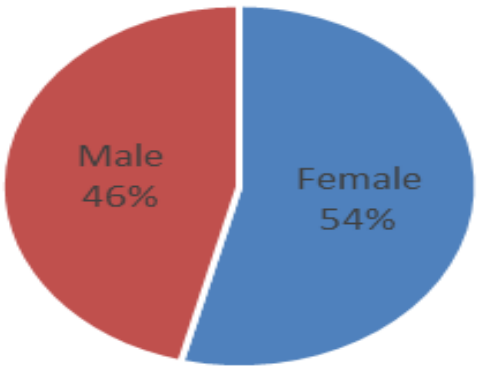


Fig. 5-12. Exit Survey respondent gender distribution

In gauging the PLO attainment, respondents were asked to evaluate themselves on a scale of 1 (very poor) to 5 (excellent) according to level of attainment. The KPI of PLO attainment in Exit Survey is that at least 80% of the respondents have at least good (scale 4) or excellent (scale 5) score.

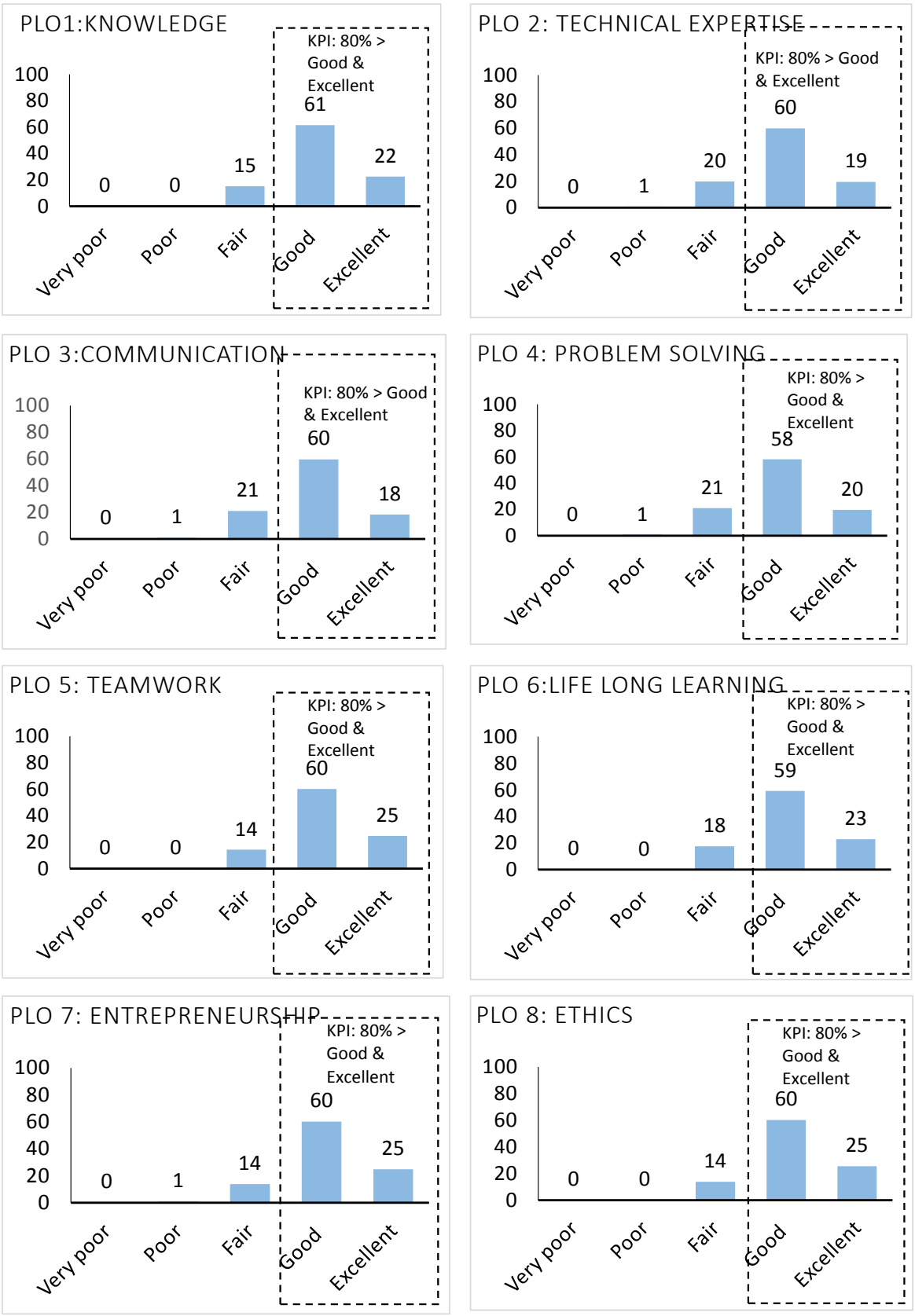


Fig. 5-13. Perception of graduating students concerning the attainment of PLO

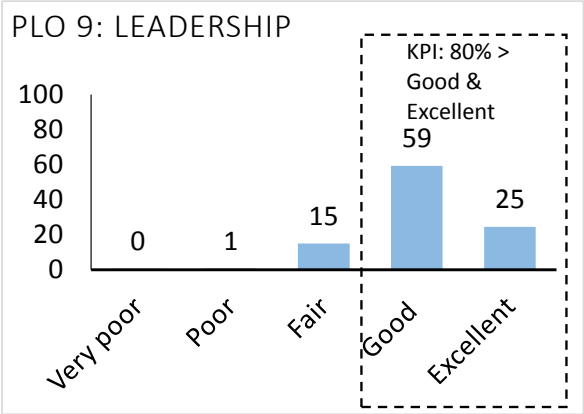


Fig. 5-13. Perception of graduating students concerning the attainment of PLO (continued)

Table 5-6. Exit Survey PLO achievement of KPI

PLO	% of students responded good (scale 4) or excellent (scale 5) score	KPI Achievement (80% of the respondents feedbacks are on the scale of ≥ 4 (good and excellent)
1	83	YES
2	79	NO
3	78	NO
4	78	NO
5	85	YES
6	83	YES
7	85	YES
8	85	YES
9	84	YES

Fig. 5-13 shows the results on the students' perception of themselves in the attainment of each PLO. It can be seen that 83% of the students have agreed they have attained good and excellent perception of themselves in the attainment of PLO 1. 79%, of the students have evaluated themselves to have good and excellent attainment in PLO 2, while 78% of them agreed to have good or excellent scores in the attainment of PLO 3 and PLO 4

respectively. PLO 5 and PLO 6 also achieved good or excellent scores where 85% and 83% respectively among the students agreed on this. 85% of the students also have the perception that they have rated good or excellent scores for PLO 7 and PLO 8 respectively. Finally, PLO 9 have been evaluated that 84% of them agreed to give good or excellent scores.

Table 5-6 shows the perception of the student on the attainment of PLO 1, PLO 5, PLO 6, PLO 7, PLO 8 and PLO 9 achieved the KPI criteria where 80% of the respondents' feedbacks are on the scale of ≥ 4 (good and excellent). The perception of the students on their attainment on PLO 2 (Practical technical skills), PLO 3 (Communication), and PLO 4 (Critical thinking and problem solving), however, showed that the percentage of students only marginally pass on the KPI criteria. This indicates that some form of improvement on the students are required with regards to their ability to demonstrate comprehensive technical expertise in civil engineering, to communicate effectively both in written and spoken form with engineers, other professionals and community and the ability to Identify, formulate and provide creative, innovative and effective solutions in research and complex civil engineering problems through the use of accurate tools.

5.6 Summary of PLO Assessment for 2015

The achievement of PLO for 2015 can be summarised in Table 5-7. Each PLO is considered attained when the overall average percentage is above 55%. Table 5-7 indicates that all PLOs have been attained. Although all PLOs achieved the KPI, attention and improvements are required primarily for PLO 4 (Critical thinking and problem solving) which is less than 65%.

A comparison of PLO achievement between 2014 and 2015 is shown in Fig. 5-14. It is observed that all of the PLO except for PLO 1 and PLO 2 have shown some measure of improvement in year 2015 compared to year 2014. Across all PLO, it is also observed that PLO 4 (CTPS) was found to be the lowest achieved PLO in both years.

Table 5-7. Summary of PLO achievement in percentage for 2015

PLO	CLO-PLO	Exit Survey	FCEE	Ave All	KPI ≥ 55%
1	66.5	83.0	50.8	66.8	PASS
2	77.0	79.0	49.2	68.4	PASS
3	86.1	78.0	63.0	75.7	PASS
4	81.7	78.0	31.2	63.6	PASS
5	89.3	85.0	38.9	71.1	PASS
6	87.1	83.0	54.8	75.0	PASS
7	84.5	85.0	31.1	66.9	PASS
8	84.8	85.0	31.8	67.2	PASS
9	93.9	84.0	60.8	79.6	PASS
10	89.3	85.0	38.9	71.1	PASS
11	87.1	83.0	54.8	75.0	PASS
12	88.7	84.3	46.4	73.1	PASS
13	84.8	85.0	31.8	67.2	PASS

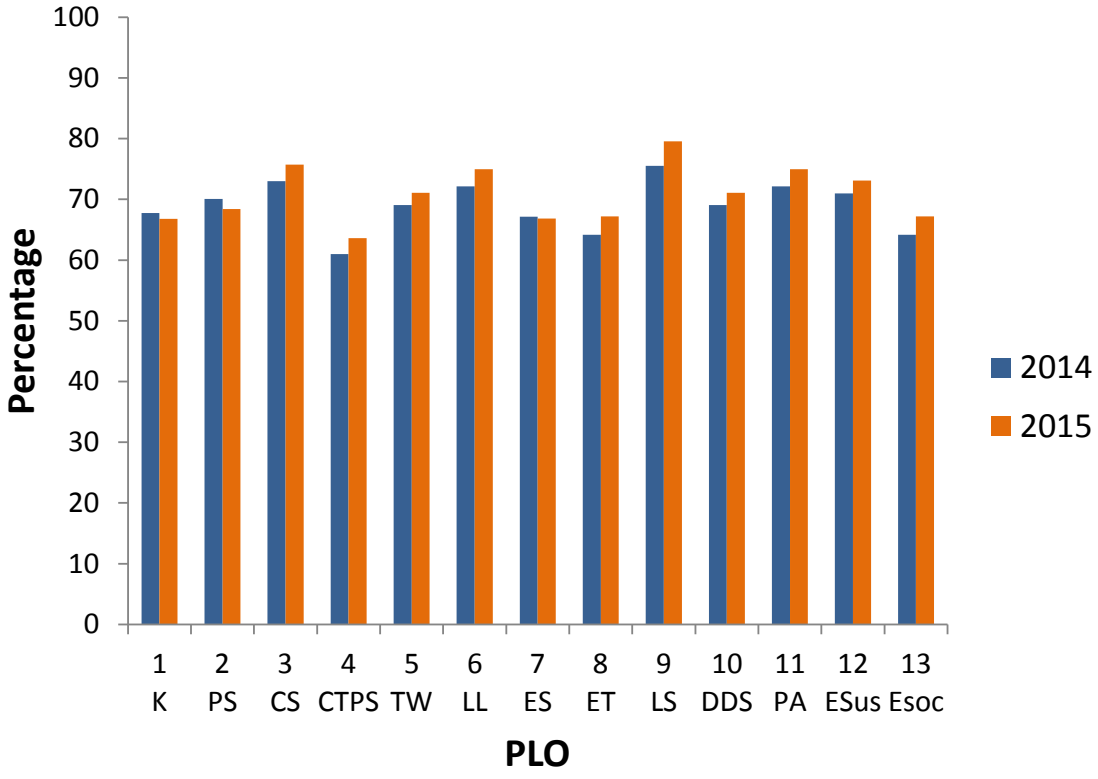
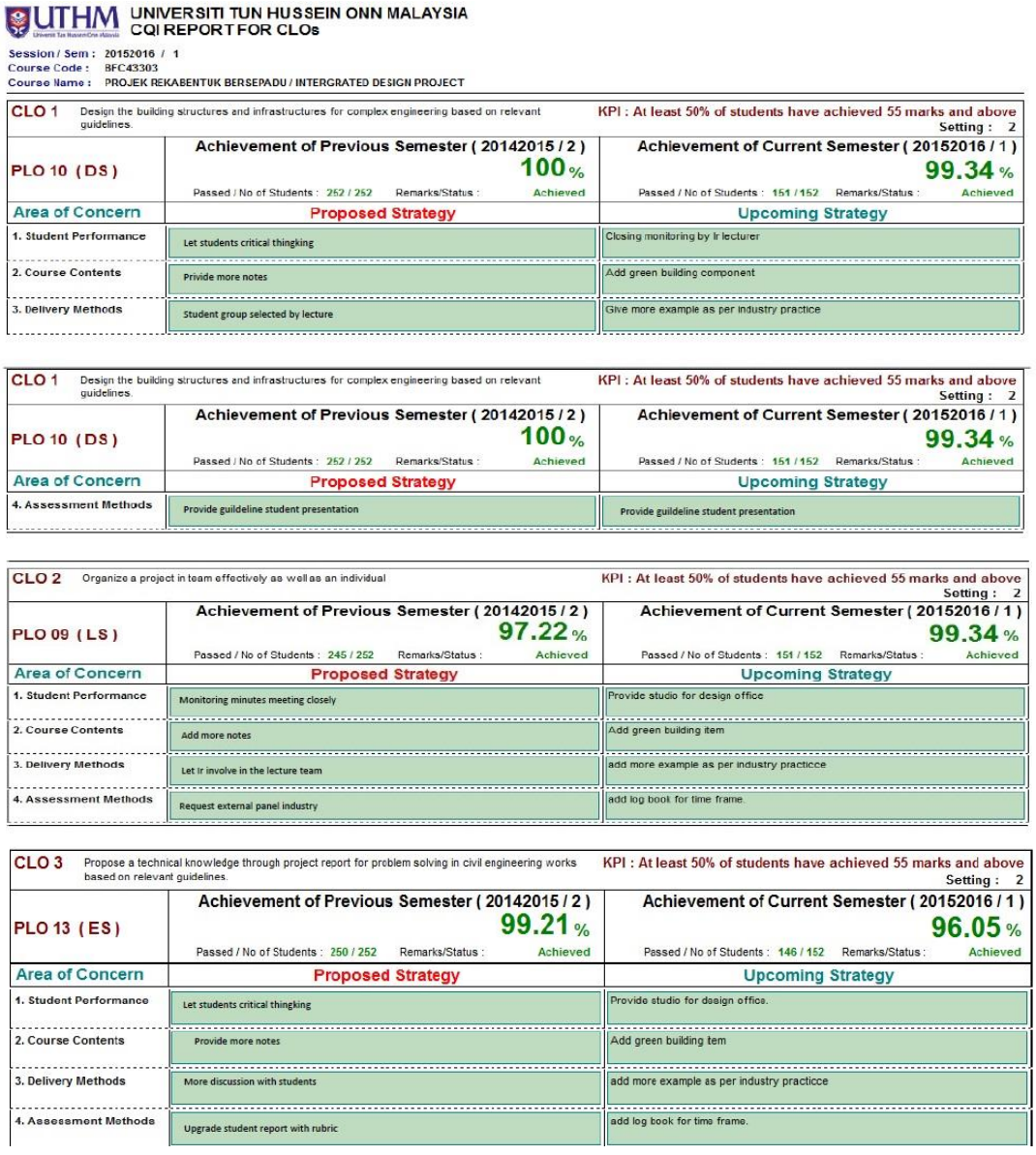


Fig. 5-14. Comparison of PLO achievement 2014 and 2015

5.7 Continuous Quality Improvement (CQI) Efforts

In order to improve CLO within the teaching learning of a particular course, various strategies can be proposed by the lecturer for the different area of concern. This is generated in a format known as CQI Report for CLO as shown in Fig. 5-15. The proposed strategy for improvement is suggested and passed onto the next lecturer automatically via a course management system.



UTHM UNIVERSITI TUN HUSSEIN ONN MALAYSIA
CQI REPORT FOR CLOs

Session / Sem : 20152016 / 1
Course Code : BFC43303
Course Name : PROJEK REKABENTUK BERSEPADU / INTERGRATED DESIGN PROJECT

CLO 1	Design the building structures and infrastructures for complex engineering based on relevant guidelines.	KPI : At least 50% of students have achieved 55 marks and above (Setting : 2)
PLO 10 (DS)	Achievement of Previous Semester (20142015 / 2) 100 % Passed / No of Students : 252 / 252 Remarks/Status : Achieved	Achievement of Current Semester (20152016 / 1) 99.34 % Passed / No of Students : 151 / 152 Remarks/Status : Achieved
Area of Concern	Proposed Strategy	Upcoming Strategy
1. Student Performance	Let students critical thingking	Closing monitoring by lr lecturer
2. Course Contents	Privide more notes	Add green building component
3. Delivery Methods	Student group selected by lecture	Give more example as per industry practice

CLO 1	Design the building structures and infrastructures for complex engineering based on relevant guidelines.	KPI : At least 50% of students have achieved 55 marks and above (Setting : 2)
PLO 10 (DS)	Achievement of Previous Semester (20142015 / 2) 100 % Passed / No of Students : 252 / 252 Remarks/Status : Achieved	Achievement of Current Semester (20152016 / 1) 99.34 % Passed / No of Students : 151 / 152 Remarks/Status : Achieved
Area of Concern	Proposed Strategy	Upcoming Strategy
4. Assessment Methods	Provide guildeline student presentation	Provide guildeline student presentation

CLO 2	Organize a project in team effectively as well as an individual	KPI : At least 50% of students have achieved 55 marks and above (Setting : 2)
PLO 09 (LS)	Achievement of Previous Semester (20142015 / 2) 97.22 % Passed / No of Students : 245 / 252 Remarks/Status : Achieved	Achievement of Current Semester (20152016 / 1) 99.34 % Passed / No of Students : 151 / 152 Remarks/Status : Achieved
Area of Concern	Proposed Strategy	Upcoming Strategy
1. Student Performance	Monitoring minutes meeting closely	Provide studio for design office
2. Course Contents	Add more notes	Add green building item
3. Delivery Methods	Let lr involve in the lecture team	add more example as per industry practicce
4. Assessment Methods	Request external panel industry	add log book for time frame.

CLO 3	Propose a technical knowledge through project report for problem solving in civil engineering works based on relevant guidelines.	KPI : At least 50% of students have achieved 55 marks and above (Setting : 2)
PLO 13 (ES)	Achievement of Previous Semester (20142015 / 2) 99.21 % Passed / No of Students : 250 / 252 Remarks/Status : Achieved	Achievement of Current Semester (20152016 / 1) 96.05 % Passed / No of Students : 146 / 152 Remarks/Status : Achieved
Area of Concern	Proposed Strategy	Upcoming Strategy
1. Student Performance	Let students critical thingking	Provide studio for design office.
2. Course Contents	Provide more notes	Add green building item
3. Delivery Methods	More discussion with students	add more example as per industry practicce
4. Assessment Methods	Upgrade student report with rubric	add log book for time frame.

Fig. 5-15. CQI report for CLO

More comprehensive CQI is also carried out in the class with students for every course. This is normally recorded in a faculty level form called CQI Report as presented in Fig.

5-16 which includes description of CQI activities, CQI topics and recommendations for improvement. An example of CQI effort in Integrated Design Project is given in Fig. 5-17 and Fig. 5-18 where external practicing engineers were invited to examine the students presenting their projects.

5.8 PLO Achievement for Individual Student via MyPLO

The achievement of PLO at student level for every individual has been developed and displayed through MyPLO. The detail achievement of an individual student is presented in Fig. 5-19 while the typical summary is given in Fig. 5-20.

Continual Quality Improvement (CQI) Report
Faculty of Civil and Environmental Engineering

CQI Report (OBE Form)			
Programme :	**Bachelor of Civil Engineering with Honours**	Semester :	**II**
Course Name :	**Hydraulics**	Session :	**2014/2015**
Course Code :	**BFC 21103**	Section :	**1, 2, 3, 5 & 6**
Coordinator :	**Tan Lai Wai**	Cohort :	**BFF0405-8**

KPI	**50% of students achieve 55% marks**			**Achieved**	**~~Not achieved~~**
CLO 1 (Cognitive)	Explain the concept of uniform and non-uniform flows in open channel, hydraulic structure and machinery (C4, PLO1)				
Number of students that require CQI for Test 1 (score less than 55%)	88 (31.2%)	**Attach "Laporan Keseluruhan Kursus" for Test 1 (from TCIS) (Appendix 1)**			
Number of students that require CQI for Test 2 (score less than 55%)	178 (63.1%)	**Attach "Laporan Keseluruhan Kursus" for Test 2 (from TCIS) (Appendix 1)**			
CQI activities	**Additional Class**	**Additional Exercise**	**Additional Notes**	**Different Delivery Approaches**	**Self-assessment**	**Other**
Please tick (x)	–	x	x	x	x	x
Description on CQI activities	Students were given more exercises, additional notes (also in graphic & video formats to create interest), and also trial exams to help students improve their grasps of the learning outcomes.					

Description on topics where CQI has been conducted (Attach examples and pictures as proof)

1) Careless mistakes in calculating open channel flow characteristics (**Appendix 2**). Students were always informed that if mistakes were done earlier in the calculations, the end results of analysis will be affected.
2) Students have problems in derivation and mathematical equations. **Appendix 3** shows how WhatsApp and online learning management system AUTHOR are used in delivering lessons.
3) Video and photos were used in learning and teaching of Hydraulics to relate students to the engineering practices (**Appendix 4**).
4) Additional notes and exercises were conducted throughout the semester for Hydraulics. For every chapter, new exercise questions were discussed during the tutorial sessions (**Appendix 5**).

Suggestion of improvement in the next semester:

Current CQI activities can be maintained as comparison between Test 1, Test 2 and Final Examination results shows that CQI activities conducted have help student in improving their achievement in Final Examination. Variety of delivery approaches can be proposed ahead of next semester as to ensure students realize the importance of the learning outcomes and how they relate to the civil engineering practices. Apart from CQI activies on students, staff also attended variety of learning and teaching courses to enhance the skills (**Appendix 6**).

Prepared by : Tan Lai Wai
Tan Lai Wai

Date :
08 July 2015

Fig. 5-16. CQI report at faculty level

Fig. 5-17. CQI briefing of IDP evaluation to external panels

Fig. 5-18. Evaluation of IDP project – a CQI effort

5.9 Complex Engineering Problem in PLO

Complex Engineering Problem are defined as engineering problems that have some or all of the following characteristics: (1) involve wide ranging or conflicting technical or engineering issues; (2) have no obvious solution and require originality in analysis; (3) involve infrequently encountered issues; (4) are outside problems encompassed by standards and code of practice for professional engineering; (5) involve diverse group of stakeholders with wide varying needs; (6) have significant consequences in a range of contexts; (7) cannot be resolved without an in-depth engineering knowledge .

Complex Engineering Problem (CEP) is mentioned in PLO 1, PLO 4, PLO 10 and PLO 11, all four PLOs being designated with Cognitive Domain as the primary domain type in FKAAS. Under CEP, accompanying attributes related to Complex problem solving (WP) and Complex engineering activities (EA) can be found within other different PLO. Such attributes are found across all courses offered and having different degree of complexity. However, for a start, 11 courses and all elective courses have been specially selected to showcase CEP components. This is given in Table 5-8. Each of these courses has been assigned to various CPS attributes. The CEP activities for every attribute are described in a form as shown in Fig. 5-21. Further description of CEP and the corresponding PLO are tabulated in Appendix 5-4. The course matrixes to components of CEP are given in Appendices 5-5 to 5-7.

UNIVERSITI TUN HUSSEIN ONN MALAYSIA
LAPORAN PENCAPAIAN INDIVIDU MENGIKUT PLO

Nomatrik : AF110220 **Status Daftar :** K - Graduan
Nama : TAN HENG JIN
Tahap : SARJANA MUDA **Kurikulum :** BFF0405-6 **Sesi / Semester Mula :** 20112012 / 1
Program : [4 BFF] SARJANA MUDA KEJURUTERAAN AWAM DENGAN KEPUJIAN
Fakulti : FAKULTI KEJURUTERAAN AWAM DAN ALAM SEKITAR
Penasihat Akademik : [00224] ABD HALID BIN ABDULLAH

Session/sem	Course code , Course Name	PLO 01 (K)	PLO 02 (P)	PLO 03 (CS)	PLO 04 (CTPS)	PLO 05 (TS)	PLO 06 (LLL)	PLO 07 (KK)	PLO 08 (EM)	PLO 09 (LS)
20122013 / 1	BFC10601, MAKMAL BAHAN DAN BENDALIR		78.57	81.33		76.00				
	BFC20703, GEOMATIK KEJURUTERAAN	74.80	76.70		80.00					
	BFC20802, PENGATURCARAAN KOMPUTER		71.25		90.00		90.00			
	BFC20903, MEKANIK BAHAN	71.82			82.67	93.33				
	BFC23702, KREATIVITI DAN INOVASI			74.40	38.00	89.23				
	BPK20802, KEUSAHAWANAN	68.29					80.00	73.33		
	BWM20403, MATEMATIK KEJURUTERAAN III	93.89			100.00		80.00			
Average 20122013 / 1		**77.20**	**75.51**	**77.87**	**78.13**	**86.19**	**83.33**	**73.33**		
20122013 / 2	BFC21002, KEJURUTERAAN PEMBINAAN	79.20		75.00						
	BFC21103, HIDRAULIK	67.42	97.75			100.00				
	BFC21201, MAKMAL HIDRAULIK DAN MEKANIK BAHAN	81.14	66.67			78.67				
	BFC21303, GEOLOGI KEJURUTERAAN		72.35			93.33				73.33
	BFC21403, ANALISIS STRUKTUR	89.53			63.81					97.33
	BWM30603, MATEMATIK KEJURUTERAAN IV	82.06			100.00		100.00			
	UWB20302, PENULISAN TEKNIKAL	63.33		72.50						
Average 20122013 / 2		**77.11**	**78.92**	**73.75**	**81.91**	**90.67**	**100.00**			**85.33**
20122013 / 3	BFC21501, AMALAN GEOMATIK		0.00		0.00	0.00				
Average 20122013 / 3			**0.00**		**0.00**	**0.00**				
20132014 / 1	BFC31602, KONTRAK DAN TAKSIRAN	67.00						76.36	80.00	
	BFC31703, GEOTEKNIK	65.00		88.00			76.00			

Session/sem	Course code , Course Name	PLO 01 (K)	PLO 02 (P)	PLO 03 (CS)	PLO 04 (CTPS)	PLO 05 (TS)	PLO 06 (LLL)	PLO 07 (KK)	PLO 08 (EM)	PLO 09 (LS)
20132014 / 1	BFC31802, KEJURUTERAAN JALAN RAYA	95.00				79.00	66.73			
	BFC31901, MAKMAL GEOTEKNIK DAN STRUKTUR		73.50	60.00		72.00				
	BFC32002, HIDROLOGI	72.88	50.00	80.00						
	BFC32102, REKABENTUK STRUKTUR KONKRIT I		68.86	80.00	88.00					
	BFC32703, PENGURUSAN PEMBINAAN LESTARI	76.65						92.00	100.00	
	BWM20502, STATISTIK KEJURUTERAAN	85.00			100.00		100.00			
Average 20132014 / 1		**76.92**	**64.12**	**77.00**	**94.00**	**75.50**	**80.91**	**84.18**	**90.00**	
20132014 / 2	BFC32202, JURUTERA DAN MASYARAKAT	100.00					100.00		88.32	
	BFC32302, KEJURUTERAAN TRAFIK DAN KESELAMATAN	65.76		89.33					89.33	
	BFC32403, KEJURUTERAAN ALAM SEKITAR	77.14		65.00	93.50					
	BFC32501, MAKMAL KEJURUTERAAN ALAM SEKITAR DAN PENGANGKUTAN		85.00	80.26		83.00				
	BFC32603, SISTEM MEKANIKAL DAN ELEKTRIKAL	72.71		60.00						60.00
	BFC32802, REKABENTUK STRUKTUR KONKRIT II		70.00	87.73	63.09					
	BFC43103, KEJURUTERAAN ASAS		54.24		76.00	76.00				
	BFC43501, KESELAMATAN DAN KESIHATAN PEKERJAAN		58.18	70.00					80.00	
Average 20132014 / 2		**78.90**	**66.86**	**75.39**	**77.53**	**79.50**	**100.00**		**85.88**	**60.00**
20132014 / 3	BFC32904, LATIHAN INDUSTRI		86.00				94.00		90.33	
Average 20132014 / 3			**86.00**				**94.00**		**90.33**	
20142015 / 1	BFC43003, REKABENTUK STRUKTUR KELULI DAN KAYU		100.00	100.00	75.59					
	BFC43201, PERISIAN KEJURUTERAAN AWAM		80.00		92.73	77.78				

Session/sem	Course code , Course Name	PLO 01 (K)	PLO 02 (P)	PLO 03 (CS)	PLO 04 (CTPS)	PLO 05 (TS)	PLO 06 (LLL)	PLO 07 (KK)	PLO 08 (EM)	PLO 09 (LS)
20142015 / 1	BFC43303, PROJEK REKABENTUK BERSEPADU		75.23		80.00					74.00
	BFC43402, PROJEK SARJANA MUDA I		86.67				81.82			
	BFS40903, REKABENTUK STRUKTUR LANJUTAN		60.84		64.00		78.67			
	BPK30902, EKONOMI KEJURUTERAAN	58.00				96.00			69.27	
Average 20142015 / 1		**58.00**	**80.55**	**100.00**	**78.08**	**86.89**	**80.25**		**69.27**	**74.00**
20142015 / 2	BFC43604, PROJEK SARJANA MUDA II		86.67		87.27					
	BFG40203, GEOTEKNIK LANJUTAN		90.00		74.57		100.00			
	BFK40303, REKABENTUK STRUKTUR KAYU LANJUTAN	80.80	100.00			100.00				
	BFS40303, REKABENTUK KONKRIT PRA TEGASAN		73.35		80.00		85.07			
Average 20142015 / 2		**80.80**	**87.51**		**80.61**	**100.00**	**92.54**			

Fig. 5-19. MyPLO detail achievement of individual student

UTHM UNIVERSITI TUN HUSSEIN ONN MALAYSIA
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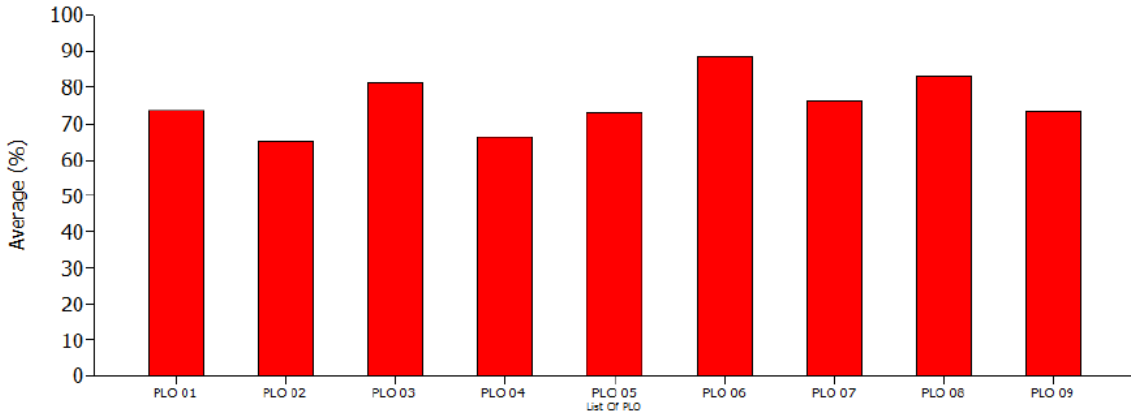
Penasihat Akademik : [00224] ABD HALID BIN ABDULLAH

CUMULATIVE AVERAGE PLO ACHIEVEMENT



PLO 01 : Knowledge
PLO 02 : Practical Skills
PLO 03 : Communication Skills
PLO 04 : Critical Thinking and Problem Solving
PLO 05 : Team Working Skills
PLO 06 : Life-long Learning
PLO 07 : Entrepreneurship Skills
PLO 08 : Ethics and Morale
PLO 09 : Leadership Skil
PLO 10 : Design
PLO 11 : Problem Analysis
PLO 12 : Sustainable Development
PLO 13 : Engineer and Society
Tiada : Tiada

Fig. 5-20. MyPLO summary achievement of individual student

Table 5-8. Selected courses for CEP components

No	Course Code	Courses
1	BFC 23702	Creativity and Innovation
2	BFC 32703	Sustainable Construction Management
3	BFC 32102	Reinforced Concrete Design I
4	BFC 32803	Reinforced Concrete Design II
5	BFC 43003	Structural Steel and Timber Design
6	BFC 21502	Geomatic Practice
7	BFC 43103	Foundation Engineering
8	BFC 32403	Environmental Engineering
9	BFC 32904	Industrial Training
10	BFC 43303	Integrated Design Project
11	BFC 43402	Final Year Project I and II
12	BFX 4xxx3	Elective

CEP Form OBE FKAAS 2015

COMPLEX ENGINEERING PROBLEM (CEP) DESCRIPTIVE FORM FOR FKAAS

COURSE CODE: **BFC43003**

COURSE NAME: **STRUCTURAL STEEL AND TIMBER DESIGN**

		PLO		LEVEL
CLO 1	Design the steel and timber structure elements according to BS EN 1993 and BS EN 1995.	10	C	5
CLO 2	Manipulate structural design processes to complete the assigned project.	9	P	4
CLO 3	Organize the design works report in group affectively which comprise of ideas and problem solving.	5	A	4

COMPLEX PROBLEM SOLVING (CPS) MATRIX

ATTRIBUTE	1	2	3	4	5	6	7	8	9
(tick)	/		/					/	/

CPS ATTRIBUTE	ASSESSMENT METHOD	TOPIC	CEP ACTIVITY DESCRIPTION
(1) Depth of knowledge required	Project	Beam, Column, Truss, Connection	Students are to perform the following activities: Layout planning, load distribution and analysis, design calculations, structural drawing and detailing. The project activities involve proposing a design for either a residential medium-rise, bus station or stadium grandstand. Wide ranging, indepth fundamental engineering knowledge are required.
(3) Depth of analysis required	Project	Beam, Column, Truss, Connection	In order to solve the given project, the students need to demonstrate and perform lengthy and in-depth analysis and calculations. Some analysis do not have obvious solutions for example in the design of long span truss frames. The students need to understand the fundamental concept of statics and mechanics before pursuing the analysis either by hand or using software.
(8) Consequences	Project	Beam, Column, Truss, Connection	A good design will be economical and easy to build. A poor design will be costly and hard to build. Detailing skills are also important.
(9) Judgment	Project	Beam, Column, Truss, Connection	The student will be assessed on their judgment especially in the layout planning activity. Good judgment brings about good decision making also in the load distribution and load combinations for the design works.

Fig. 5-21. Complex Engineering Problem Form

6 CONCLUDING REMARKS

Discovering OBE in FKAAS is only made possible after many years of hard effort of the FKAAS OBE Committee. This book explained the model of OBE in FKAAS and its implementation in teaching and learning with the faculty. It also described how every PEO and PLO were measured and analysed. The compilation of the PEO and PLO assessment findings are useful for further continuous quality improvement to the programme and to teaching and learning within the faculty.

Appendix 2-1 PEO Employer Survey

Version 2016

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

EMPLOYER SURVEY

EMPLOYER DETAILS

1. Name :
2. Email :
3. Contact Number :
4. Company Address :
5. I am a : ☐ Consultant
   ☐ Contractor
   ☐ Developer
   ☐ Manufacturer
   ☐ Government Agency
   ☐ Others : _____
6. Date Of This Survey :

ALUMNI STATISTICS

Total number of UTHM Alumni you are employing

	1 Person	2 Person	3 Person	4 Person	5 Person	6 Person	7 Person	8 Person	9 Person
Graduated 3 to 5 years ago									

If more than 9 persons please state : _____

GRADUATE RATING (graduated 3 to 5 years ago)
Kindly rate UTHM graduates

Please rate the strength of UTHM alumni.

		Fail	Poor	Average	Good	Excellent
1.	Knowledgeable in Engineering, Mathematics & Science	1	2	3	4	5
2.	Technically competent	1	2	3	4	5
3.	Have a sense of number and dimensions	1	2	3	4	5
4.	Proficient in spoken English	1	2	3	4	5
5.	Proficient in written English	1	2	3	4	5
6.	Able to prepare and deliver presentation	1	2	3	4	5
7.	Able to prepare report containing words and drawings	1	2	3	4	5
8.	Able to lead a given task or project	1	2	3	4	5
9.	Able to work with others in a team	1	2	3	4	5
10.	Able to solve problems related to work	1	2	3	4	5
11.	Willing to share ideas	1	2	3	4	5
12.	Willing to do things in the right way	1	2	3	4	5
13	Willing and able to follow instruction	1	2	3	4	5
14	Show concerns for safety, quality and environmental protection	1	2	3	4	5
15	Have basic interpersonal skills	1	2	3	4	5
16	Bold and courageous to explore new ideas	1	2	3	4	5
17	Often ready to initiate ideas	1	2	3	4	5
18	Enthusiastic and productive at work	1	2	3	4	5
19	Willing to learn and improve technical abilities	1	2	3	4	5
20	Able to understand and meet expectations of customers	1	2	3	4	5

THANK YOU

Appendix 2-2 PEO Alumni Survey

Version 2016

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)
ALUMNI SURVEY

PART 1 : PERSONAL DETAILS

1. Name :
2. Email :
3. Contact Number :
4. Year Graduate Degree Programme :
5. Position :
6. Company Address :

PART 2: PROGRAMME EDUCATIONAL OBJECTIVES

Please rate on a scale of 1 (Very Poor) to 5 (Excellent) how well has each of these PEO been achieved in you from the day you graduated until now

		Very Poor	Poor	Average	Good	Excellent
PEO 1	Knowledgeable and technically competent in civil engineering discipline in-line with the industry requirement.	1	2	3	4	5
PEO 2	Effective in communication and demonstrate good leadership quality in an organization	1	2	3	4	5
PEO 3	Capable to solve civil engineering problems innovatively, creatively and ethically through sustainable approach	1	2	3	4	5
PEO 4	Able to demonstrate entrepreneurship skills and recognize the need of life-long learning for successful career advancement	1	2	3	4	5

PART 3: TRACER STUDY FOR ALUMNI

Programme Educational Objectives (PEO) FKAAS

Please tick in the box below.

1.	Have been promoted or offered to a better position	☐ Yes	☐ No
2.	Have been involved in research/construction project proposal either as member or leader	☐ Yes	☐ No
3.	I am a Professional Engineer (PE)	☐ Yes	☐ No
4.	Have published papers in conference/journal	☐ Yes	☐ No
5.	Have held leadership positions for a taskforce or project within an organization	☐ Yes	☐ No
6.	Have been involved in civil engineering design/construction projects	☐ Yes	☐ No
7.	Have been involved in research and/or development projects related to civil engineering	☐ Yes	☐ No
8.	Have been attending Continuous Professional Development courses.	☐ Yes	☐ No
9.	Have furthered studies to a higher degree	☐ Yes	☐ No
10.	Have ventured into business (self-owned or partnership)	☐ Yes	☐ No

THANK YOU

Appendix 3-1 PLO Exit Survey

EXIT SURVEY PROGRAM LEARNING OUTCOME (PLO) FKAAS

Please rate (tick in the box below) on a scale of 1 (POOR) to 5 (EXCELLENT) how well has each of the 13 PLO been achieved in you.

PART 1: PERSONAL DETAILS

1. Name :
2. Matric Number :
3. Gender :
4. Working Status : ☐ Further Study Master or PhD
   ☐ Not Employed
   ☐ Employed (Civil Engineering)
   ☐ Employed (Not Civil Engineering)

PART 2: PROGRAM LEARNING OUTCOME (PLO)

Please rate (tick in the box below) on a scale of 1 (Fail) to 5 (Excellent) how well has UTHM graduates fulfil these PLO

		Fail	Poor	Average	Good	Excellent
1.	Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex civil engineering problems.	1	2	3	4	5
2.	Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex civil engineering activities, with an understanding of the limitations.	1	2	3	4	5
3.	Communicate effectively on complex civil 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.	1	2	3	4	5
4.	Conduct investigation into complex problems using research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.	1	2	3	4	5
5.	Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.	1	2	3	4	5

6.	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.	1	2	3	4	5
7.	Self-motivate and enhance entrepreneurship skills for career development.	1	2	3	4	5
8.	Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.	1	2	3	4	5
9.	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	1	2	3	4	5
10.	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.	1	2	3	4	5
11.	Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.	1	2	3	4	5
12.	Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.	1	2	3	4	5
13.	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.	1	2	3	4	5

PART 3: VERIFICATION

E-mail : _____

THANK YOU

Appendix 5-1 Mapping Matrix of Courses to PLOs

Course to Learning Outcome Matrix				Learning Outcome												
				COGNITIVE				PSYCHOMOTOR				AFFECTIVE				
				Engineering Knowledge	Critical Thinking and Problem Solving / Investigation	Design / Development of Solutions	Problem Analysis	Practical/ Tech. Skills/ Modern Tool Usage	Communication Skills	Entrepreneurship Skills	Leadership Skills / Project Management and Finance	Individual and Team Work	Life Long Learning	Ethics and Professionalism Values	Environment and Sustainability	The Engineer and Society
				K	CTPS	DDS	PA	PS	CS	ES	LS	TW	LLL	ET	Esus	Esoc
	Course Code	Course	Credit	PLO-1	PLO-4	PLO-10	PLO-11	PLO-2	PLO-3	PLO-7	PLO-9	PLO-5	PLO-6	PLO-8	PLO-12	PLO-13
University Compulsory Courses																
1	UWB 10102	Academic English	2	3					3				3			
2	UWB 10202	Effective Communication	2	3					2				3			
3	UWS 10103	Nationhood and Current Development of Malaysia	3	2							3			3		
4	UWS 10202	Ethnics Relationship	2	2								2		3		
5	UWA10302	Islamic and Asian Civilization	2	2					2					3		
6	UWA10102/ UWA10202	Islamic Studies/Moral Studies	2	2				2						3		

Note: Value in table refers to Taxonomy Level.

Course to Learning Outcome Matrix				Learning Outcome												
				COGNITIVE				PSYCHOMOTOR				AFFECTIVE				
				Engineering Knowledge	Critical Thinking and Problem Solving / Investigation	Design / Development of Solutions	Problem Analysis	Practical/ Tech. Skills/ Modern Tool Usage	Communication Skills	Entrepreneurship Skills	Leadership Skills / Project Management and Finance	Individual and Team Work	Life Long Learning	Ethics and Professionalism Values	Environment and Sustainability	The Engineer and Society
	Course Code	Course	Credit	PLO-1	PLO-4	PLO-10	PLO-11	PLO-2	PLO-3	PLO-7	PLO-9	PLO-5	PLO-6	PLO-8	PLO-12	PLO-13
University Compulsory Courses																
7	UQ* 1xxx1	Co-Curriculum I	1					3				4	3			
8	UQ* 1xxx1	Co-Curriculum II	1					3				4	3			
9	UMB 1xxx2	Foreign Language	2	2					3				3			
10	UWB 20302	Technical Writing	2	3					2				3			
11	BFC 23702	Creativity and Innovation	2	3						3	3					
Total			**21**													

Note: Value in table refers to Taxonomy Level.

Course to Learning Outcome Matrix				Learning Outcome												
				COGNITIVE				PSYCHOMOTOR				AFFECTIVE				
				Engineering Knowledge	Critical Thinking and Problem Solving / Investigation	Design / Development of Solutions	Problem Analysis	Practical/ Tech. Skills/ Modern Tool Usage	Communication Skills	Entrepreneurship Skills	Leadership Skills / Project Management and Finance	Individual and Team Work	Life Long Learning	Ethics and Professionalism Values	Environment and Sustainability	The Engineer and Society
	Course Code	Course	Credit	PLO-1	PLO-4	PLO-10	PLO-11	PLO-2	PLO-3	PLO-7	PLO-9	PLO-5	PLO-6	PLO-8	PLO-12	PLO-13
Science and Mathematics																
12	BFC 13903	Civil Engineering Mathematic I	3	3				3					2			
13	BFC 14003	Civil Engineering Mathematic II	3	3				3					2			
14	BFC 24103	Civil Engineering Mathematic III	3	3				3					2			
15	BFC 24203	Civil Engineering Mathematic IV	3	4				4					3			
16	BFC 34303	Civil Engineering Statistic	3	4				4					3			
Total			**15**													

Note: Value in table refers to Taxonomy Level

Course to Learning Outcome Matrix				Learning Outcome												
				COGNITIVE				PSYCHOMOTOR				AFFECTIVE				
				Engineering Knowledge	Critical Thinking and Problem Solving / Investigation	Design / Development of Solutions	Problem Analysis	Practical/ Tech. Skills/ Modern Tool Usage	Communication Skills	Entrepreneurship Skills	Leadership Skills / Project Management and Finance	Individual and Team Work	Life Long Learning	Ethics and Professionalism Values	Environment and Sustainability	The Engineer and Society
	Course Code	Course	Credit	PLO-1	PLO-4	PLO-10	PLO-11	PLO-2	PLO-3	PLO-7	PLO-9	PLO-5	PLO-6	PLO-8	PLO-12	PLO-13
Faculty's Supporting Courses																
17	BFC 20802	Computer Programming	2		4			5					2			
18	BFC 10202	Nature Conservation	2	2					2						2	
19	BPK 20802	Entrepreneurship	2	4						3				3		
20	BPK 30902	Engineering Economics	2	4						2	3					
21	BFC 32202	Engineer and The Society	2	4							6					5
22	BFC 32703	Sustainable Construction Management	3	4							4				4	
Total			**13**													

Note: Value in table refers to Taxonomy Level

Course to Learning Outcome Matrix				COGNITIVE				PSYCHOMOTOR				AFFECTIVE				
				Engineering Knowledge	Critical Thinking and Problem Solving / Investigation	Design / Development of Solutions	Problem Analysis	Practical/ Tech. Skills/ Modern Tool Usage	Communication Skills	Entrepreneurship Skills	Leadership Skills / Project Management and Finance	Individual and Team Work	Life Long Learning	Ethics and Professionalism Values	Environment and Sustainability	The Engineer and Society
	Course Code	Course	Credit	PLO-1	PLO-4	PLO-10	PLO-11	PLO-2	PLO-3	PLO-7	PLO-9	PLO-5	PLO-6	PLO-8	PLO-12	PLO-13
Core Engineering Courses																
Structure and Materials Engineering																
23	BFC 10103	Static and Dynamic	3				3	2				3				
24	BFC 10502	Civil Engineering Materials	2	2							2				2	
25	BFC 20601	Material and Fluid Laboratory	1													
26	BFC 20903	Mechanics of Materials	3		4			4				3				
27	BFC 21403	Structural Analysis	3				4		3			3				
28	BFC 32102	Concrete Structure Design I	2			4					4	4				
29	BFC 32803	Concrete Structure Design II	3			4					4	4				

Note: Value in table refers to Taxonomy Level

Course to Learning Outcome Matrix				Learning Outcome												
				COGNITIVE				PSYCHOMOTOR				AFFECTIVE				
				Engineering Knowledge	Critical Thinking and Problem Solving / Investigation	Design / Development of Solutions	Problem Analysis	Practical/ Tech. Skills/ Modern Tool Usage	Communication Skills	Entrepreneurship Skills	Leadership Skills / Project Management and Finance	Individual and Team Work	Life Long Learning	Ethics and Professionalism Values	Environment and Sustainability	The Engineer and Society
	Course Code	Course	Credit	PLO-1	PLO-4	PLO-10	PLO-11	PLO-2	PLO-3	PLO-7	PLO-9	PLO-5	PLO-6	PLO-8	PLO-12	PLO-13
Core Engineering Courses																
30	BFC 43003	Steel and Timber Structure Design	3			4					4	4				
31	BFC 43201	Civil Engineering Software Applications	1		4			4				4				
Building and Construction Engineering																
32	BFC 10303	Engineering Drawing and CAD	3		3			4				3				
33	BFC 31602	Contract and Estimation	2	3						3				2		
34	BFC 43502	Occupational Safety and Health	2	4							4					4

Note: Value in table refers to Taxonomy Level

Course to Learning Outcome Matrix				Learning Outcome												
				COGNITIVE				PSYCHOMOTOR				AFFECTIVE				
				Engineering Knowledge	Critical Thinking and Problem Solving / Investigation	Design / Development of Solutions	Problem Analysis	Practical/ Tech. Skills/ Modern Tool Usage	Communication Skills	Entrepreneurship Skills	Leadership Skills / Project Management and Finance	Individual and Team Work	Life Long Learning	Ethics and Professionalism Values	Environment and Sustainability	The Engineer and Society
	Course Code	Course	Credit	PLO-1	PLO-4	PLO-10	PLO-11	PLO-2	PLO-3	PLO-7	PLO-9	PLO-5	PLO-6	PLO-8	PLO-12	PLO-13
Infrastructure and Geomatic Engineering																
35	BFC 20703	Geomatic Engineering	3		4			4				4				
36	BFC 21303	Geology Engineering	3	3				4				3				
37	BFC 21502	Geomatic Engineering Practice	2		2			4				2				
38	BFC 21702	Geotechnic I	2	3					3				3			
39	BFC 31802	Highway Engineering	2			4					4				3	
40	BFC 31901	Geotechnics and Structure Laboratory	1		2			4				2				
41	BFC 32302	Traffic Engineering and Safety	2			4					4				3	
42	BFC 34402	Geotechnic II	2	4					4				4			
43	BFC 43103	Foundation Engineering	3			5		4				4				

Course to Learning Outcome Matrix				Learning Outcome												
				COGNITIVE				PSYCHOMOTOR				AFFECTIVE				
				Engineering Knowledge	Critical Thinking and Problem Solving / Investigation	Design / Development of Solutions	Problem Analysis	Practical/ Tech. Skills/ Modern Tool Usage	Communication Skills	Entrepreneurship Skills	Leadership Skills / Project Management and Finance	Individual and Team Work	Life Long Learning	Ethics and Professionalism Values	Environment and Sustainability	The Engineer and Society
	Course Code	Course	Credit	PLO-1	PLO-4	PLO-10	PLO-11	PLO-2	PLO-3	PLO-7	PLO-9	PLO-5	PLO-6	PLO-8	PLO-12	PLO-13
Core Engineering Courses																
Water and Environmental Engineering																
44	BFC 10403	Fluid Mechanics	3	4					3			2				
45	BFC 21103	Hydraulics	3		4			3				3				
46	BFC 21201	Hydraulics and Mechanics of Material Laboratory	1		2			4				2				
47	BFC 32002	Hydrology	2			4		3				3				
48	BFC 32403	Environmental Engineering	3	4				3							4	
49	BFC 32501	Environmental Engineering and Transportation Laboratory	1		2			4				2				

Note: Value in table refers to Taxonomy Level

Course to Learning Outcome Matrix				Learning Outcome												
				COGNITIVE				PSYCHOMOTOR				AFFECTIVE				
				Engineering Knowledge	Critical Thinking and Problem Solving / Investigation	Design / Development of Solutions	Problem Analysis	Practical/ Tech. Skills/ Modern Tool Usage	Communication Skills	Entrepreneurship Skills	Leadership Skills / Project Management and Finance	Individual and Team Work	Life Long Learning	Ethics and Professionalism Values	Environment and Sustainability	The Engineer and Society
	Course Code	Course	Credit	PLO-1	PLO-4	PLO-10	PLO-11	PLO-2	PLO-3	PLO-7	PLO-9	PLO-5	PLO-6	PLO-8	PLO-12	PLO-13
Building and Construction Engineering																
50	BFC 21002	Construction Engineering	2	3							3				2	
51	BFC 32602	Mechanical and Electrical System	2	4				3							3	
52	BFC 32904	Industrial Training	4				6		5					5		
53	BFC 43303	Integrated Design Project	3			5					5					5
54	BFC 43402	Final Year Project I	2			5			5				4			
55	BFC 43604	Final Year Project II	4				6		6				5			
Total			**78**													

Note: Value in table refers to Taxonomy Level

Course to Learning Outcome Matrix				Learning Outcome												
				COGNITIVE				PSYCHOMOTOR				AFFECTIVE				
				Engineering Knowledge	Critical Thinking and Problem Solving / Investigation	Design / Development of Solutions	Problem Analysis	Practical/ Tech. Skills/ Modern Tool Usage	Communication Skills	Entrepreneurship Skills	Leadership Skills / Project Management and Finance	Individual and Team Work	Life Long Learning	Ethics and Professionalism Values	Environment and Sustainability	The Engineer and Society
	Course Code	Course	Credit	PLO-1	PLO-4	PLO-10	PLO-11	PLO-2	PLO-3	PLO-7	PLO-9	PLO-5	PLO-6	PLO-8	PLO-12	PLO-13
Elective Courses																
56	BF* 40**3	Elective 1	3	5				4				5				
57	BF* 40**3	Elective 2	3	5				4				5				
58	BF* 40**3	Elective 3	3	5				4				5				
Total			**9**													
Overall Total			**136**													

Note: Value in table refers to Taxonomy Level

Appendix 5-2 CLO-PLO Data for Semester 1 Session 2014/2015

Faculty/ Centre	FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING		**KPI for CLO**	50% OF STUDENT ACHIEVED ≥ 55% MARKS	
Programme	BACHELOR OF CIVIL ENGINEERING		**KPI for PLO**	55%	
Session/ Semester	2014/ 2015/ 1		**Cohort of Students**	ALL	

				Programme Learning Outcomes (PLOs)												
				PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**
Learning Domains				K	PS	CS	CTPS	TS	LL	ES	ET	LS				
Taxonomy Domains (C, P, or A)																
No.	**Course Code**	**Course Name**	**Credit**	**CLO Achievement (in %)**												
Year 1, Sem 1	UMB 1011	English for Academic Purposes	1													
	UMB 1052	Effective Communication	2													
	UMA 1162	Tamadun Islam dan Tamadun Asia	2													
	UM*1312	Bahasa Asing	2													
	UQ* 1xx1	Ko-Kurikulum I	1													
	BFC 10103	Statik dan Dinamik	3		55.96%			80.68%	85.48%							
	BFC 10202	Pemuliharaan Alam Semulajadi	2	71.40%				85.06%			82.41%					

Faculty/ Centre	FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING	**KPI for CLO**	50% OF STUDENT ACHIEVED ≥ 55% MARKS
Programme	BACHELOR OF CIVIL ENGINEERING	**KPI for PLO**	55%
Session/ Semester	2014/ 2015/ 1	**Cohort of Students**	ALL

				Programme Learning Outcomes (PLOs)												
				PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**
Learning Domains				K	PS	CS	CTPS	TS	LL	ES	ET	LS				
Taxonomy Domains (C, P, or A)																
No.	**Course Code**	**Course Name**	**Credit**	**CLO Achievement (in %)**												
Year 1, Sem 2	UMB 1042	Technical Writing	2													
	* UMS 1113	Kenegaraan dan Pembangunan Mutakhir Malaysia	3													
	BFC 10403	Mekanik Bendalir	3	58.48%		71.68%		71.68%								
	BFC10601	Makmal Bahan dan Bendalir	1		83.15%	79.52%		82.70%								
Year 2, Sem 1	UMA 1182/ UMA 1142	Pengajian Islam / Pengajian Moral	2													
	UQ*1xx1	Ko-Kurikulum II	1													
	BFC 23702	Creativity and Innovation	2													
	BSM 2913	Matematik Kejuruteraan III	3													
	BFC 20703	Geomatik Kejuruteraan	3	60.15%	65.36%		67.76%									
	BFC 20802	Pengaturcaraan Komputer	2													
	BFC 20903	Mekanik Bahan	3	58.44%			81.77%	80.73%								

Faculty/ Centre	FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING			**KPI for CLO**	50% OF STUDENT ACHIEVED ≥ 55% MARKS
Programme	BACHELOR OF CIVIL ENGINEERING			**KPI for PLO**	55%
Session/ Semester	2014/ 2015/ 1			**Cohort of Students**	ALL

				Programme Learning Outcomes (PLOs)												
				PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**
Learning Domains				K	PS	CS	CTPS	TS	LL	ES	ET	LS				
Taxonomy Domains (C, P, or A)																
No.	**Course Code**	**Course Name**	**Credit**	**CLO Achievement (in %)**												
Year 2, Sem 2	** UMS 1122	Hubungan Etnik	2													
	BFC 21002	Kejuruteraan Pembinaan	2	76.97%		67.24%				91.62%						
	BFC 21103	Hidraulik	3	53.44%	85.49%			88.41%								
	BFC 21201	Makmal Hidraulik dan Mekanik Bahan	1	79.89%	86.11%			85.73%								
	BFC 21303	Geologi Kejuruteraan	3		53.92%			88.88%				97.48%				
	BFC 21403	Analisis Struktur	3	90.84%			52.83%					83.97%				
	BFC 21702	Geoteknik I	2	62.53%		91.79%			85.12%							
Year 3, Sem 1	BFC 31703	Geoteknik	3	62.20%		86.67%			89.29%							
	BFC 31802	Kejuruteraan Jalan Raya	2	72.38%				86.37%	53.42%							
	BFC 31901	Makmal Geoteknik dan Struktur	1													
	BFC 32002	Hidrologi	2	62.64%	97.50%	86.78%										
	BFC 32102	Rekabentuk Struktur Konkrit I	2		56.53%	81.93%	83.58%									
	BFC 34402	Geoteknik II	2	55.20%		74.00%			82.97%							

Faculty/ Centre	FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING	**KPI for CLO**	50% OF STUDENT ACHIEVED ≥ 55% MARKS
Programme	BACHELOR OF CIVIL ENGINEERING	**KPI for PLO**	55%
Session/ Semester	2014/ 2015/ 1	**Cohort of Students**	ALL

				Programme Learning Outcomes (PLOs)												
				PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**
Learning Domains				K	PS	CS	CTPS	TS	LL	ES	ET	LS				
Taxonomy Domains (C, P, or A)																
No.	**Course Code**	**Course Name**	**Credit**	**CLO Achievement (in %)**												
Year 3, Sem 2	BFC 32302	Kejuruteraan Trafik dan Keselamatan	2	58.86%		76.50%					92.35%					
	BFC 32403	Kejuruteraan Alam Sekitar	3	53.24%		70.56%	87.52%									
	BFC 32501	Makmal Kej. Alam Sekitar dan Pengangkutan	1		72.72%	88.20%		73.47%								
	BFC 32602	Sistem Mekanikal dan Elektrikal	2	65.25%		78.19%						76.56%				
	BFC 32603		3	61.93%		76.00%						80.00%				
	BFC 32703	Pengurusan Pembinaan Lestari	3	64.20%						65.33%	76.78%					
	BFC 32802	Rekabentuk Struktur Konkrit II	2		76.17%	71.42%	39.75%									
	BFC 32803		3		85.75%	79.73%	50.52%									
Year 4, Sem 1	BFC 43003	Rekabentuk Struktur Keluli dan Kayu	3		80.29%	85.72%	43.23%									
	BFC 43103	Kejuruteraan Asas	3		52.53%		73.25%	73.20%								
	BFC 43201	Aplikasi Perisian Kejuruteraan Awam	1		79.57%	75.09%	75.15%									
	BFC 43303	Projek Rekabentuk Bersepadu	3		71.40%		83.53%					82.51%				
	BPK 30902	Ekonomi Kejuruteraan	2													
	BFB 40603	Perkhidmatan Bangunan 1	3		59.80%		58.76%		73.24%							
	BFP 40103	Perancangan dan Penjadualan Pembinaan	3		60.21%		78.17%		79.67%							
	BFP 40503	Pengurusan Kewangan Projek	3		54.67%		80.61%		80.61%							

Faculty/ Centre	FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING									**KPI for CLO**	50% OF STUDENT ACHIEVED ≥ 55% MARKS								
Programme	BACHELOR OF CIVIL ENGINEERING									**KPI for PLO**	55%								
Session/ Semester	2014/ 2015/ 1									**Cohort of Students**	ALL								
				Programme Learning Outcomes (PLOs)															
				PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**			
Learning Domains				K	PS	CS	CTPS	TS	LL	ES	ET	LS							
Taxonomy Domains (C, P, or A)																			
No.	**Course Code**	**Course Name**	**Credit**	**CLO Achievement (in %)**															
Year 4, Sem 2	BFB 40703	Perkhidmatan Bangunan 2	3		75.97%		80.77%		66.32%										
	BFS 40903	Rekabentuk Struktur Lanjutan	3		51.61%		82.21%		87.29%										
	BFS 40603	Rekabentuk Konkrit Pra-tegasan	3		55.02%		78.67%		72.08%										
	BFW 40103	Kejuruteraan Sumber Air	3		65.17%		78.19%		85.49%										
	BFW 40403	Kejuruteraan Air Bumi	3		67.43%		90.00%		86.35%										
	BFA 40403	Rekabentuk Kejuruteraan Air Sisa	3		73.91%		69.57%		73.19%										
	BFA 40203	Rekabentuk Bekalan Air	3		82.08%		100.00%		90.13%										
	BFG 40303	Geo Persekitaran	3		62.15%		64.80%		86.51%										
	BFT 40303	Kejuruteraan Pengangkutan	3		67.84%		82.30%		78.37%										
	BFG 4033	Geo Persekitaran	3		80.70%		44.80%		94.00%										
	BFT 40203	Kejuruteraan Turapan	3		79.19%		67.15%		79.85%										
	BFG 40203	Geoteknik Lanjutan	3		76.96%		61.70%		70.00%										
		Number of courses		**18**	**30**	**17**	**26**	**11**	**20**	**2**	**3**	**5**	**0**	**0**	**0**	**0**			
		Average PLO Achievement		**64.9%**	**70.5%**	**78.9%**	**71.4%**	**81.5%**	**80.0%**	**78.5%**	**83.8%**	**84.1%**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**			
		KPI Status		**PASSED**	**PASSED**	**PASSED**	**PASSED**	**PASSED**	**PASSED**	**PASSED**	**PASSED**	**PASSED**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**			

Appendix 5-3 CLO-PLO Data for Semester 2 Session 2014/2015

Faculty/ Centre	FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING	**KPI for CLO**	50% OF STUDENT ACHIEVED ≥ 55% MARKS
Programme	BACHELOR OF CIVIL ENGINEERING	**KPI for PLO**	55%
Session/ Semester	2014/ 2015/ 2	**Cohort of Students**	ALL

				Programme Learning Outcomes (PLOs)												
				PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
Learning Domains				K	PS	CS	CTPS	TS	LL	ES	ET	LS				
Taxonomy Domains (C, P, or A)																
No.	**Course Code**	**Course Name**	**Credit**	**CLO Achievement (in %)**												
Year 1, Sem 1	UMB 1011	English for Academic Purposes	1													
	UMB 1052	Effective Communication	2													
	UMA 1162	Tamadun Islam dan Tamadun Asia	2													
	UM*1312	Bahasa Asing	2													
	UQ* 1xx1	Ko-Kurikulum I	1													
	BFC 13903	Matematik Kej. Awam I	3	23.81%			97.62%		92.86%							
	BFC 10102	Statik & Dinamik	2		100.00%			100.00%	100.00%							
	BFC 10103		2		43.48%			100.00%	100.00%							
	BFC 10202	Pemuliharaan Alam Semulajadi	2	40.18%				91.07%			41.96%					
Year 1, Sem 2	UMB 1042	Technical Writing	2													
	* UMS 1113	Kenegaraan dan Pembangunan Mutakhir Malaysia	3													
	BFC 14003	Matematik Kej. Awam II	3	64.22%			99.76%		97.87%							
	BFC 10303	Lukisan Kejuruteraan dan CAD	3		99.53%		96.68%		100.00%							
	BFC 10403	Mekanik Bendalir	3	68.90%		99.52%		100.00%								
	BFC 10502	Bahan Kejuruteraan Awam	2	90.91%	93.94%		100.00%									

Faculty/ Centre	FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING	**KPI for CLO**	50% OF STUDENT ACHIEVED ≥ 55% MARKS
Programme	BACHELOR OF CIVIL ENGINEERING	**KPI for PLO**	55%
Session/ Semester	2014/ 2015/ 2	**Cohort of Students**	ALL

				Programme Learning Outcomes (PLOs)												
				PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**
Learning Domains				K	PS	CS	CTPS	TS	LL	ES	ET	LS				
Taxonomy Domains (C, P, or A)																
No.	**Course Code**	**Course Name**	**Credit**	**CLO Achievement (in %)**												
Year 2, Sem 1	UMA 1182/ UMA 1142	Pengajian Islam / Pengajian Moral	2													
	UQ*1xx1	Ko-Kurikulum II	1													
	BFC 23702	Creativity and Innovation	2			100.00%	95.76%	100.00%								
	BFC 24103	Matematik Kej. Awam III	3	47.55%			99.30%		100.00%							
	BFC 20703	Geomatik Kejuruteraan	3													
	BFC 20802	Pengaturcaraan Komputer	2		74.36%		99.49%		78.46%							
	BFC 20903	Mekanik Bahan	3	50.88%			98.94%	96.11%								
Year 2, Sem 2	** UMS 1122	Hubungan Etnik	2													
	BFC 24203	Matematik Kej. Awam IV	3	68.98%			99.75%		99.26%							
	BFC 21002	Kejuruteraan Pembinaan	2	21.28%						77.13%						
	BFC 21103	Hidraulik	3	75.18%	98.23%			94.68%								
	BFC 21201	Makmal Hidraulik dan Mekanik Bahan	1	100.00%	99.78%			87.99%								
	BFC 21303	Geologi Kejuruteraan	3		46.40%			100.00%				99.09%				
	BFC 21403	Analisis Struktur	3	20.87%			96.96%					92.61%				
	BFC 21702	Geoteknik I	2	18.73%		98.23%			98.94%							

Faculty/ Centre	FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING	**KPI for CLO**	50% OF STUDENT ACHIEVED ≥ 55% MARKS
Programme	BACHELOR OF CIVIL ENGINEERING	**KPI for PLO**	55%
Session/ Semester	2014/ 2015/ 2	**Cohort of Students**	ALL

				Programme Learning Outcomes (PLOs)												
				PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**
Learning Domains				K	PS	CS	CTPS	TS	LL	ES	ET	LS				
Taxonomy Domains (C, P, or A)																
No.	**Course Code**	**Course Name**	**Credit**	**CLO Achievement (in %)**												
Year 3, Sem 1	BFC 34303	Statistik Kejuruteraan Awam	3	33.33%			100.00%		100.00%							
	BFC 31802	Kejuruteraan Jalan Raya	2	90.82%				99.52%	25.60%							
	BFC 31901	Makmal Geoteknik dan Struktur	1		98.12%	94.34%		98.12%								
	BFC 32002	Hidrologi	2	61.11%	94.44%	99.67%										
	BFC 32102	Rekabentuk Struktur Konkrit I	2		72.84%	97.94%	97.94%									
	BPK 20802	Keusahawanan	2	100.00%					100.00%	94.00%						
	BFC 34402	Geoteknik II	2	76.22%		100.00%			100.00%							
Year 3, Sem 2	BFC 32202	Jurutera dan Masyarakat	2	79.01%					88.89%		100.00%					
	BFC 32302	Kejuruteraan Trafik dan Keselamatan	2	51.31%		84.73%					97.14%					
	BFC 32403	Kejuruteraan Alam Sekitar	3	55.02%		93.78%	98.80%									
	BFC 32501	Makmal Kej. Alam Sekitar dan Pengangkutan	1		85.48%	99.52%		99.52%								
	BFC 32602	Sistem Mekanikal dan Elektrikal	2	99.09%		85.11%						83.89%				
	BFC 32703	Pengurusan Pembinaan Lestari	3	85.57%						100.00%	97.59%					
	BFC 32802	Rekabentuk Struktur Konkrit II	2		60.00%	60.00%	0.00%									
	BFC 32803		3		93.09%	91.78%	47.37%									

Faculty/ Centre	FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING	**KPI for CLO**	50% OF STUDENT ACHIEVED ≥ 55% MARKS
Programme	BACHELOR OF CIVIL ENGINEERING	**KPI for PLO**	55%
Session/ Semester	2014/ 2015/ 2	**Cohort of Students**	ALL

				Programme Learning Outcomes (PLOs)												
				PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**
Learning Domains				K	PS	CS	CTPS	TS	LL	ES	ET	LS				
Taxonomy Domains (C, P, or A)																
No.	**Course Code**	**Course Name**	**Credit**	**CLO Achievement (in %)**												
Year 4 Sem 1	BFC 43003	Rekabentuk Struktur Keluli dan Kayu	3		87.54%	98.22%	52.31%									
	BFC 43103	Kejuruteraan Asas	3		63.64%		98.48%	98.48%								
	BFC 43201	Aplikasi Perisian Kejuruteraan Awam	1		89.40%	94.04%	88.74%									
	BFC 43303	Projek Rekabentuk Bersepadu	3		100.00%		96.89%					99.22%				
	BPK 30902	Ekonomi Kejuruteraan	2		86.25%		99.24%									
	BFB 40603	Perkhidmatan Bangunan 1	3		100.00%		98.75%		100.00%							
	BFP 40103	Pengurusan dan Penjadualan Pembinaan	3		100.00%		97.50%		100.00%							
	BFB 40903	Penyelenggaraan Bangunan	3		90.00%		100.00%		100.00%							
	BFP 40503	Pengurusan Kewangan Projek	3		56.25%				93.75%							

Faculty/ Centre	FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING								**KPI for CLO**	50% OF STUDENT ACHIEVED ≥ 55% MARKS								
Programme	BACHELOR OF CIVIL ENGINEERING								**KPI for PLO**	55%								
Session/ Semester	2014/ 2015/ 2								**Cohort of Students**	ALL								
				Programme Learning Outcomes (PLOs)														
				PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**	**PLO 13**		
Learning Domains				K	PS	CS	CTPS	TS	LL	ES	ET	LS						
Taxonomy Domains (C, P, or A)																		
No.	**Course Code**	**Course Name**	**Credit**	**CLO Achievement (in %)**														
Year 4, Sem 2	BFC 43501	Keselamatan dan Kesihatan Pekerjaan	1		98.86%	96.02%					92.05%							
	BFS 40103	Analisis Struktur Lanjutan	3		75.86%		93.10%		93.10%									
	BFB 40703	Perkhidmatan Bangunan 2	3		100.00%		100.00%		84.42%									
	BFK 40403	Rekabentuk Struktur Kayu Lanjutan	3	75.00%	91.67%			91.67%										
	BFS 40303	Rekabentuk Konkrit Pra-tegasan	3		80.00%		97.14%		97.14%									
	BFW 40503	Pengurusan Air Ribut	3	84.27%			96.63%		97.75%									
	BFW 40403	Kejuruteraan Air Bumi	3	85.19%			93.83%		100.00%									
	BFA 40403	Rekabentuk Kejuruteraan Air Sisa	3	100.00%			95.24%		95.24%									
	BFW 40303	Kejuruteraan Pantai dan Pelabuhan	3		97.73%		98.86%											
	BFA 40203	Rekabentuk Bekalan Air	3	86.08%			97.47%		97.47%									
	BFG 40303	Geo Persekitaran	3		54.20%		95.80%		95.80%									
	BFT 40303	Kejuruteraan Pengangkutan	3	82.05%			100.00%		98.72%									
	BFS 40603	Teknologi Konkrit	3		100.00%		98.78%		100.00%									
	BFT 40203	Kejuruteraan Turapan	3		78.19%		84.52%		97.82%									
	BFP 40203	Pengurusan Loji Pembinaan	3	74.68%			100.00%	100.00%										
	BFT 40503	Kejuruteraan Trafik Lanjutan	3		28.57%		97.40%		87.01%									
	BFG 40203	Geoteknik Lanjutan	3		98.63%		80.14%		95.89%									
	BFA 40303	Pengurusan Sisa Pepejal dan Sisa Berbahaya	3	100.00%			97.62%		100.00%									
		Number of courses		**31**	**34**	**16**	**39**	**15**	**32**	**3**	**5**	**4**	**0**	**0**	**0**	**0**		
		Average PLO Achievement		**68.1%**	**83.4%**	**93.3%**	**92.0%**	**97.1%**	**94.2%**	**90.4%**	**85.7%**	**93.7%**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**		
		KPI Status		**PASSED**	**PASSED**	**PASSED**	**PASSED**	**PASSED**	**PASSED**	**PASSED**	**PASSED**	**PASSED**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**		

Appendix 5-4 Complex Engineering Problem Graduate Attributes (referenced from http://www.ieagreements.org)

IEA Graduate Attributes and Professional Competencies						
No.	**EAC Key Word**	**PLO BEJ**	**Graduate Attribute Profiles for Washington Accord Graduate (IEA 2013, pg 10-11)**	**Knowledge Profile (Initial WK)**	**Complex Problem Solving (Initial WP)**	**Complex Engineering Activities**
				(WK)	**(WP)**	**(EA)**
1	Engineering Knowledge	*Pengetahuan* Knowledge	WA1: Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to the solution of complex engineering problems. (Note: WK ranges in Knowledge Profile)	(WK1 - WK4)	Must have WP1 AND some or ALL WP2 to WP7 (AND must resolve with one or more of WK3, WK4, WK5, WK6 or WK8)	Nil
2	Modern Tool Usage	*Kemahiran Praktikal* Practical Skills	WA5: 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) (Note: WK ranges in Knowledge Profile)	(WK6)	Must have WP1 AND some or ALL WP2 to WP7 (AND must resolve with one or more of WK3, WK4, WK5, WK6 or WK8)	Nil
3	Communication	*Kemahiran Komunikasi* Communication Skills	WA10: 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.	(WK1 - WK4)	Nil	some or all of EA1 to EA5

IEA Graduate Attributes and Professional Competencies

No.	EAC Key Word	PLO BEJ	Graduate Attribute Profiles for Washington Accord Graduate (IEA 2013, pg 10-11)	Knowledge Profile (Initial WK)	Complex Problem Solving (Initial WP)	Complex Engineering Activities
				(WK)	(WP)	(EA)
4	Investigation	*Pemikiran Kritikal & Penyelesaian Masalah* Critical Thinking & Problem Solving	WA4: Conduct investigations of complex 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. (Note: WK ranges in Knowledge Profile)	(WK8)	Must have WP1 AND some or ALL WP2 to WP7 (AND must resolve with one or more of WK3, WK4, WK5, WK6 or WK8)	some or all of EA1 to EA5
5	Individual and Team Work	*Kemahiran Kerja Kumpulan* Team Work Skills	WA9: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.	(WK1 - WK4)	Nil	Nil
6	Life Long Learning	Pembelajaran Sepanjang Hayat Life Long Learning	WA12: 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.	(WK1 - WK4)	Nil	Nil
7	Entrepreneurship Skills	*Kemahiran Keusahawanan* Entrepreneurship Skills		Not related	Nil	NIl

IEA Graduate Attributes and Professional Competencies						
No.	**EAC Key Word**	**PLO BEJ**	**Graduate Attribute Profiles for Washington Accord Graduate (IEA 2013, pg 10-11)**	**Knowledge Profile (Initial WK)**	**Complex Problem Solving (Initial WP)**	**Complex Engineering Activities**
				(WK)	**(WP)**	**(EA)**
8	Ethics	*Nilai Etika dan Profesionalisma* Ethics and Professionalisme Values	WA8: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. (WK7) (Note: WK ranges in Knowledge Profile)	(WK7)	Must have WP1 AND some or ALL WP2 to WP7 (AND must resolve with one or more of WK3, WK4, WK5, WK6 or WK8)	some or all of EA1 to EA5
9	Project Management and Finance	*Kemahiran Kepimpinan* Leadership Skills	WA11: 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 and in multidisciplinary environments.	(WK1 - WK4)	Nil	Nil
10	Design/ Development of Solutions	*Rekabentuk* Design	WA3: 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) (Note: WK ranges in Knowledge Profile)	(WK5)	Must have WP1 AND some or ALL WP2 to WP7 (AND must resolve with one or more of WK3, WK4, WK5, WK6 or WK8)	some or all of EA1 to EA5

IEA Graduate Attributes and Professional Competencies

No.	EAC Key Word	PLO BEJ	Graduate Attribute Profiles for Washington Accord Graduate (IEA 2013, pg 10-11)	Knowledge Profile (Initial WK)	Complex Problem Solving (Initial WP)	Complex Engineering Activities
				(WK)	(WP)	(EA)
11	Environment and Sustainability	*Persekitaran & Kelestarian* Environment & Sustainabilily	WA7: Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts. (WK7) (Note: WK ranges in Knowledge Profile)	(WK7)	Must have WP1 AND some or ALL WP2 to WP7 (AND must resolve with one or more of WK3, WK4, WK5, WK6 or WK8)	Nil
12	Problem Analysis	*Analisa Masalah* Problem Analysis	WA2: Identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. (WK1 to WK4) (Note: WK ranges in Knowledge Profile)	(WK1 - WK4)	Must have WP1 AND some or ALL WP2 to WP7 (AND must resolve with one or more of WK3, WK4, WK5, WK6 or WK8)	some or all of EA1 to EA5
13	Engineer and Society	*Jurutera & Masyarakat* Engineer & Society	WA6: 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) (Note: WK ranges in Knowledge Profile)	(WK7)	Must have WP1 AND some or ALL WP2 to WP7 (AND must resolve with one or more of WK3, WK4, WK5, WK6 or WK8)	Nil

Appendix 5-5 Knowledge Profile (WK)

MATRIK KURSUS DAN KNOWLEDGE PROFILE												
					Emphasis to Knowledge Profile							
	Bil	Kod Kursus	Kursus	Kredit	KP 1	KP 2	KP 3	KP 4	KP 5	KP 6	KP 7	KP 8
Kursus Wajib Universiti	1	UWB 10102	Academic English	2								x
	2	UWB 10202	Effective Communication	2							x	x
	3	UWS 10303	Kenegaraan dan Pembangunan Mutakhir Malaysia	3							x	
	4	UWS 10202	Hubungan Etnik	2							x	
	5	UWA 10302	Tamadun Islam dan Tamadun Asia	2							x	
	6	UWA 10102 / UWA 10202	Pengajian Islam / Pengajian Moral	2							x	
	7	UQ* 1xxx1	Ko-Kurikulum I	1							x	
	8	UQ* 1xxx1	Ko-Kurikulum II	1							x	
	9	UQ* 1xxx2	Bahasa Asing	2								x
	10	UWB 20302	Technical Writing	2								x
Kursus Matematik	11	BFC 13903	Matematik Kejuruteraan Awam I	3		x						
	12	BFC 14003	Matematik Kejuruteraan Awam II	3		x						
	13	BFC 24103	Matematik Kejuruteraan Awam III	3		x						
	14	BFC 24203	Matematik Kejuruteraan Awam IV	3		x						
	15	BFC 34303	Statistik Kejuruteraan Awam	3		x						
Kursus Teras Fakulti	16	BFC 20802	Pengaturcaraan Komputer	2		x						
	17	BFC 10202	Pemuliharaan Alam Semulajadi	2	x						x	
	18	BFC 23702	Creativity and Innovation	2					x			
	19	BPK 20802	Keusahawanan	2							x	
	20	BPK 30902	Ekonomi Kejuruteraan	2							x	
	21	BFC 32202	Jurutera dan Masyarakat	2							x	
	22	BFC 32703	Pengurusan Pembinaan Lestari	3							x	
Kursus Teras Program Pengajian	23	BFC 10103	Statik dan Dinamik	3			x	x				
	24	BFC 10502	Bahan Kejuruteraan Awam	2			x		x	x		
	25	BFC 20601	Makmal Bahan dan Bendalir	1			x		x	x		
	26	BFC 20903	Mekanik Bahan	3			x	x				
	27	BFC 21403	Analisis Struktur	3			x	x	x			
	28	BFC 32102	Rekabentuk Struktur Konkrit I	2			x	x	x	x		
	29	BFC 32803	Rekabentuk Struktur Konkrit II	3			x	x	x	x		
	30	BFC 43003	Rekabentuk Struktur Keluli dan Kayu	3			x	x	x	x		
	31	BFC 43201	Perisian Kejuruteraan Awam	1		x		x	x			
	32	BFC 10303	Lukisan Kejuruteraan dan CAD	3					x			
	33	BFC 31602	Kontrak dan Taksiran	2							x	
	34	BFC 43502	Kesihatan dan Keselamatan Pekerjaan	2							x	
	35	BFC 20703	Geomatik Kejuruteraan	3			x	x				
	36	BFC 21303	Geologi Kejuruteraan	3	x		x	x				
	37	BFC 21502	Amalan Geomatik	2			x	x		x		
	38	BFC 21702	Geoteknik I	2			x	x	x			
	39	BFC 31802	Kejuruteraan Jalan Raya	2			x	x	x			
	40	BFC 31901	Makmal Geoteknik dan Struktur	1			x		x	x		
	41	BFC 32302	Kejuruteraan Trafik dan Keselamatan	2			x	x	x			
	42	BFC 33802	Geoteknik II	2			x	x	x			
	43	BFC 43103	Kejuruteraan Asas	3			x	x	x			
	44	BFC 10403	Mekanik Bendalir	3			x	x	x			
	45	BFC 21103	Hidraulik	3			x	x	x			
	46	BFC 21201	Makmal Hidraulik dan Mekanik Bahan	1			x		x	x		
	47	BFC 32002	Hidrologi	2			x	x	x			
	48	BFC 32403	Kejuruteraan Alam Sekitar	3	x		x	x	x			
	49	BFC 32501	Makmal Kej. Alam Sekitar dan Pengangkutan	1			x		x	x		
	50	BFC 21002	Kejuruteraan Pembinaan	2			x	x	x			
	51	BFC 32602	Sistem Mekanikal dan Elektrikal	2			x	x	x			
	52	BFC 32904	Latihan Industri	4						x	x	
	53	BFC 43303	Projek Rekabentuk Bersepadu	3				x	x	x		
	54	BFC 43402	Projek Sarjana Muda I	2				x				x
	55	BFC 43604	Projek Sarjana Muda II	4				x				x
Elektif	56	BF* 40**3	Elektif 1	3				x				
	57	BF* 40**3	Elektif 2	3				x				
	58	BF* 40**3	Elektif 3	3				x				

Appendix 5-6 Complex Engineering Activities (EA)

MATRIK KURSUS DAN COMPLEX ENGINEERING ACTIVITIES (CEA)									
					Emphasis to the CEA				
	Bil	Kod Kursus	Kursus	Kredit	CEA 1	CEA 2	CEA 3	CEA 4	CEA 5
Kursus Wajib Universiti	1	UWB 10102	Academic English	2					
	2	UWB 10202	Effective Communication	2					
	3	UWS 10303	Kenegaraan dan Pembangunan Mutakhir Malaysia	3					
	4	UWS 10202	Hubungan Etnik	2					
	5	UWA 10302	Tamadun Islam dan Tamadun Asia	2					
	6	UWA 10102 / UWA 10202	Pengajian Islam / Pengajian Moral	2					
	7	UQ* 1xxx1	Ko-Kurikulum I	1					
	8	UQ* 1xxx1	Ko-Kurikulum II	1					
	9	UQ* 1xxx2	Bahasa Asing	2					
	10	UWB 20302	Technical Writing	2					
Kursus Matematik	11	BFC 13903	Matematik Kejuruteraan Awam I	3					
	12	BFC 14003	Matematik Kejuruteraan Awam II	3					
	13	BFC 24103	Matematik Kejuruteraan Awam III	3					
	14	BFC 24203	Matematik Kejuruteraan Awam IV	3					
	15	BFC 34303	Statistik Kejuruteraan Awam	3					
Kursus Teras Fakulti	16	BFC 20802	Pengaturcaraan Komputer	2					
	17	BFC 10202	Pemuliharaan Alam Semulajadi	2		x		x	
	18	BFC 23702	Creativity and Innovation	2	x		x		
	19	BPK 20802	Keusahawanan	2	x				
	20	BPK 30902	Ekonomi Kejuruteraan	2	x			x	
	21	BFC 32202	Jurutera dan Masyarakat	2		x		x	
	22	BFC 32703	Pengurusan Pembinaan Lestari	3				x	
Kursus Teras Program Pengajian	23	BFC 10103	Statik dan Dinamik	3					
	24	BFC 10502	Bahan Kejuruteraan Awam	2					
	25	BFC 20601	Makmal Bahan dan Bendalir	1	x				
	26	BFC 20903	Mekanik Bahan	3					
	27	BFC 21403	Analisis Struktur	3					
	28	BFC 32102	Rekabentuk Struktur Konkrit I	2		x	x		
	29	BFC 32803	Rekabentuk Struktur Konkrit II	3		x	x		
	30	BFC 43003	Rekabentuk Struktur Keluli dan Kayu	3		x	x		
	31	BFC 43201	Perisian Kejuruteraan Awam	1					
	32	BFC 10303	Lukisan Kejuruteraan dan CAD	3					
	33	BFC 31602	Kontrak dan Taksiran	2	x				
	34	BFC 43502	Kesihatan dan Keselamatan Pekerjaan	2				x	
	35	BFC 20703	Geomatik Kejuruteraan	3	x			x	
	36	BFC 21303	Geologi Kejuruteraan	3	x			x	
	37	BFC 21502	Amalan Geomatik	2	x	x			
	38	BFC 21702	Geoteknik I	2	x			x	
	39	BFC 31802	Kejuruteraan Jalan Raya	2	x			x	
	40	BFC 31901	Makmal Geoteknik dan Struktur	1	x				
	41	BFC 32302	Kejuruteraan Trafik dan Keselamatan	2	x			x	
	42	BFC 33802	Geoteknik II	2	x			x	
	43	BFC 43103	Kejuruteraan Asas	3	x				
	44	BFC 10403	Mekanik Bendalir	3	x				
	45	BFC 21103	Hidraulik	3	x			x	
	46	BFC 21201	Makmal Hidraulik dan Mekanik Bahan	1	x				
	47	BFC 32002	Hidrologi	2	x			x	
	48	BFC 32403	Kejuruteraan Alam Sekitar	3		x		x	
	49	BFC 32501	Makmal Kej. Alam Sekitar dan Pengangkutan	1	x				
	50	BFC 21002	Kejuruteraan Pembinaan	2	x			x	
	51	BFC 32602	Sistem Mekanikal dan Elektrikal	2	x				
	52	BFC 32904	Latihan Industri	4		x			x
	53	BFC 43303	Projek Rekabentuk Bersepadu	3	x	x	x	x	x
	54	BFC 43402	Projek Sarjana Muda I	2	x	x	x	x	
	55	BFC 43604	Projek Sarjana Muda II	4	x	x	x	x	
Elektif	56	BF* 40**3	Elektif 1	3	x	x	x		
	57	BF* 40**3	Elektif 2	3	x	x	x		
	58	BF* 40**3	Elektif 3	3	x	x	x		

Appendix 5-7 Complex Problem Solving (WP)

MATRIK KURSUS DAN COMPLEX PROBLEM SOLVING (CPS)

					Emphasis to the CPS								
	Bil	Kod Kursus	Kursus	Kredit	CPS 1	CPS 2	CPS 3	CPS 4	CPS 5	CPS 6	CPS 7	CPS 8	CPS 9
Kursus Wajib Universiti	1	UWB 10102	Academic English	2									
	2	UWB 10202	Effective Communication	2									
	3	UWS 10303	Kenegaraan dan Pembangunan Mutakhir Malaysia	3									
	4	UWS 10202	Hubungan Etnik	2									
	5	UWA 10302	Tamadun Islam dan Tamadun Asia	2									
	6	UWA 10102 / UWA 10202	Pengajian Islam / Pengajian Moral	2									
	7	UQ* 1xxx1	Ko-Kurikulum I	1									
	8	UQ* 1xxx1	Ko-Kurikulum II	1									
	9	UQ* 1xxx2	Bahasa Asing	2									
	10	UWB 20302	Technical Writing	2									
Kursus Matematik	11	BFC 13903	Matematik Kejuruteraan Awam I	3									
	12	BFC 14003	Matematik Kejuruteraan Awam II	3									
	13	BFC 24103	Matematik Kejuruteraan Awam III	3									
	14	BFC 24203	Matematik Kejuruteraan Awam IV	3									
	15	BFC 34303	Statistik Kejuruteraan Awam	3									
Kursus Teras Fakulti	16	BFC 20802	Pengaturcaraan Komputer	2									
	17	BFC 10202	Pemuliharaan Alam Semulajadi	2									
	18	BFC 23702	Creativity and Innovation	2	x								
	19	BPK 20802	Keusahawanan	2									
	20	BPK 30902	Ekonomi Kejuruteraan	2									
	21	BFC 32202	Jurutera dan Masyarakat	2									
	22	BFC 32703	Pengurusan Pembinaan Lestari	3			x			x			
Kursus Teras Program Pengajian	23	BFC 10103	Statik dan Dinamik	3									
	24	BFC 10502	Bahan Kejuruteraan Awam	2									
	25	BFC 20601	Makmal Bahan dan Bendalir	1									
	26	BFC 20903	Mekanik Bahan	3									
	27	BFC 21403	Analisis Struktur	3									
	28	BFC 32102	Rekabentuk Struktur Konkrit I	2	x		x					x	x
	29	BFC 32803	Rekabentuk Struktur Konkrit II	3	x		x					x	x
	30	BFC 43003	Rekabentuk Struktur Keluli dan Kayu	3	x		x					x	x
	31	BFC 43201	Perisian Kejuruteraan Awam	1									
	32	BFC 10303	Lukisan Kejuruteraan dan CAD	3									
	33	BFC 31602	Kontrak dan Taksiran	2									
	34	BFC 43502	Kesihatan dan Keselamatan Pekerjaan	2									
	35	BFC 20703	Geomatik Kejuruteraan	3									
	36	BFC 21303	Geologi Kejuruteraan	3									
	37	BFC 21502	Amalan Geomatik	2	x								x
	38	BFC 21702	Geoteknik I	2									
	39	BFC 31802	Kejuruteraan Jalan Raya	2									
	40	BFC 31901	Makmal Geoteknik dan Struktur	1									
	41	BFC 32302	Kejuruteraan Trafik dan Keselamatan	2									
	42	BFC 33802	Geoteknik II	2									
	43	BFC 43103	Kejuruteraan Asas	3	x					x		x	x
	44	BFC 10403	Mekanik Bendalir	3									
	45	BFC 21103	Hidraulik	3									
	46	BFC 21201	Makmal Hidraulik dan Mekanik Bahan	1									
	47	BFC 32002	Hidrologi	2									
	48	BFC 32403	Kejuruteraan Alam Sekitar	3	x					x		x	x
	49	BFC 32501	Makmal Kej. Alam Sekitar dan Pengangkutan	1									
	50	BFC 21002	Kejuruteraan Pembinaan	2									
	51	BFC 32602	Sistem Mekanikal dan Elektrikal	2									
	52	BFC 32904	Latihan Industri	4	x	x				x			
	53	BFC 43303	Projek Rekabentuk Bersepadu	3	x	x	x	x	x	x	x	x	x
	54	BFC 43402	Projek Sarjana Muda I	2	x	x	x					x	x
	55	BFC 43604	Projek Sarjana Muda II	4	x	x	x					x	x
Elektif	56	BF* 40**3	Elektif 1	3	x								
	57	BF* 40**3	Elektif 2	3	x								
	58	BF* 40**3	Elektif 3	3	x								