ENGINEERING ACCREDITATION COUNCIL (EAC)

DOCUMENTS FOR APPROVAL OF NEW PROGRAMME

BACHELOR OF MECHANICAL ENGINEERING WITH HONOURS

Appendix C

ENGINEERING ACCREDITATION COUNCIL

Checklist of Documents for Approval of New Programme and Relevant Information

Please tick:

Accreditation	✓
Approval of New Programme	

For accreditation of programme only, please fill out the table below for qualifying requirements:

	Qualifying Requirements for Application of Accreditation for Programme	**Yes/No**
1	Minimum 135 credit hours of which 80 credit hours must be engineering subjects	Yes
2	Final year project	Yes
3	Industrial training	Yes
4	Minimum of 8 full – time academic staff	Yes
5	Staff: student ratio of 1:20 or better (ideally it should be 1 : 15 or better)	Yes
6	External examiner's report	Yes
7	Programme Objectives	Yes
8	Programme Outcomes	Yes

Failure to meet any one of the qualifying requirements will mean that the programme shall not be assessed for accreditation, and the process shall stop here and no submission to the EAC can be made by the IHL. IHLs are advised to ensure all requirements are fulfilled by the programme before re-applying for accreditation.

For Approval of a New Programme, please fill respond to this Appendix wherever applicable.

INTRODUCTION

A. GENERAL INFORMATION

No.	Item.	To be filled out by the IHL where applicable.	Checked by EAD.
1	Name of IHL.	First City University College	
2	Address of IHL.	No.1, Persiaran Bukit Utama, Bandar Utama, 47800, Petaling Jaya, Selangor.	
3	Name of Faculty/School/Department.	Faculty of Engineering and Computing	
4	Name and phone number of staff to be contacted.	Wan Sumayyah Syahidah binti Wan Mohamad Tel: 03 – 77273200 Ext.387	
5	Programme for Accreditation.	Bachelor of Mechanical Engineering with Honours	
6	EAC Reference Number.	N/521/6/0176	
7	Degree to be Awarded and Abbreviation.	Bachelor of Mechanical Engineering with Honours	
8	IHL Awarding the Degree: (if different from A1).	-	
9	Mode of Study [Full-Time/Twinning/Part-Time/Others (please specify)].	Full-time	
10	Duration of Programme (in years).	4 Years	
11	Medium of Instruction of Programme Evaluated.	English	
12	Language Available for Reference Materials.	English	
13	IHL Academic Session.	Intake date: Feb / Jun /Sep	
14	URL Address; IHL website.	www.firstcity.edu.my	

B. PROGRAMME ACCREDITATION HISTORY

No.	Item.	To be filled in by the IHL where applicable.	Checked by EAD.
1	Introduction Year of Programme.	2018	
2	Year of Last Accreditation for this Programme.	N/A	
3	Conditions (if any) from Previous Accreditation.	N/A	
4	Action Taken on the Conditions Above	N/A	
5	Major Changes (Self-Initiated), Reasons and Year of Changes.	N/A	

C. PROGRAMME OBJECTIVES

No.	Evidence cited should be made available as per requirement in Section J or K.	Indicate the location of these items in the documents submitted to be made available during the visit.	Checked by Evaluation Panel.
1	State the vision and mission of the IHL and/or faculty.	Section 2.1.	
2	Describe the PEOs and state where they are published.	Sections 2.2 – 2.3. Refer to Appendix C2.	
3	Describe how the PEOs are consistent with the vision and mission of the IHL and/or faculty and stakeholder requirements.	Sections 2.1 – 2.3.	
4	Describe the processes used to establish/formulate/define and review the PEOs, and the extent to which the programme's various stakeholders are involved in these processes.	Section 2.4.	
5	Describe how the IHL ensures achievement of the PEOs.	Section 2.5.	
6	Describe the ongoing evaluation of the level of achievement of these objectives, and the extent to which the programme's various stakeholders are involved in these processes.	Section 2.6.	
7	Describe how the results obtained from the evaluation are being used to improve the effectiveness of the programme.	Section 2.7.	

D. PROGRAMME OUTCOMES

No.	Evidence cited should be made available as per requirement in Section J or K.	Indicate the location of these items in the documents submitted and/or in the documents to be made available during the visit.	Checked by Evaluation Panel.
1	List down the Programme Outcomes and state where they are published.	Refer to Section 3.1.	
2	Describe how the Programme Outcomes relate to the Programmes Objectives.	Section 3.2.	
3	Describe how the Programme Outcomes encompass the outcome requirements of Section 4.0 of this manual.	Section 3.3.	
4	Describe the processes used to establish and review the Programme Outcomes, and the extent to which the programme's various stakeholders are involved in these processes.	Section 3.4, Section 3.8.	
5	Describe the data gathered and explain the results of the assessment.	Section 3.5, Sections 3.9 – 3.10.	
6	Explain how the assessment results are applied to further develop and improve the programme.	Section 3.6.	
7	Describe the materials, including student work and other tangible materials that demonstrate achievement of the Programme Outcomes.	Section 3.7, Sections 3.11 – 3.14.	

E. CRITERION 1: ACADEMIC CURRICULUM

No.	**Evidence cited should be made available as per requirement in Section J or K.** **For item 1 & 2, refer to 8.2.4 (iii) for further information / presentation format to be included.**	**Indicate the location of these items in the documents submitted and/or in the documents to be made available during the visit.**	**Checked by Evaluation Panel.**
1	Discuss the programme structure and course contents to show how they are appropriate to, consistent with, and support the development of the range of intellectual and practical skills and attainment or achievement of the Programme Outcomes.	Section 4.1.	
2	Discuss the programme delivery and assessment methods and how these are appropriate to, consistent with, and support the development of the range of intellectual and practical skills and attainment or achievement of the Programme Outcomes.	Section 4.2 – 4.11.	

F. CRITERION 2: STUDENTS

No.	**Evidence cited should be made available as per requirement in Section J or K.** **For item 1 to 5, refer to 8.2.5 (vi) for further information / presentation format to be included.**	**Indicate the location of these items in the documents submitted and/or in the documents to be made available during the visit.**	**Checked by Evaluation Panel.**
1	Discuss students' performance in relation to Programme Outcomes.	Section 5.1.	
2	Discuss the requirement and process for admission of students to the programme.	Sections 5.2 – 5.3.	
3	Discuss the policies and processes for credit transfer / exemption.	Section 5.4.	
4	Discuss student workload.	Section 5.5.	
5	Discuss students' activities and involvement in student organisations that provide experience in management and governance,	Sections 5.6 – 5.10.	

	representation in education and related matters and social activities.		

G. Criterion 3: ACADEMIC AND SUPPORT STAFF

No.	**Evidence cited should be made available as per requirement in Section J or K.** **For item 1 to 3, refer to 8.2.6 (iv) for further information / presentation format to be included.**	**Indicate the location of these items in the documents submitted and/or in the documents to be made available during the visit.**	**Checked by Evaluation Panel.**
1	Discuss strength and competencies of the academic staff in covering all areas of the programme, and in implementing the outcome – based approach to education.	Section 6.1.	
2	Discuss how overall staff workload enables effective teaching, student – staff interaction, student advising and counselling, IHL service and research activities, professional development and interaction with industries.	Section 6.2.	
3	Discuss sufficiency and competency of technical and administrative staff in providing adequate support to the educational programme.	Sections 6.3 – 6.6.	

H. CRITERION 4: FACILITIES

No.	**Evidence cited should be made available as per requirement in Section J or K.** **For item 1 to 3, refer to 8.2.7 (iv) for further information / presentation format to be included.**	**Indicate the location of these items in the documents submitted and/or in the documents to be made available during the visit.**	**Checked by Evaluation Panel.**
1	Discuss the adequacy of teaching and learning facilities such as classrooms, learning – support facilities, study areas, information resources (library), computing and information – technology systems, laboratories and workshops, and associated	Section 7.1.	

	equipment to cater for multi – delivery modes.		
2	For programmes offered wholly or partly in distance mode, or at multiple remote locations, describe how the facilities provided are equivalent to those provided for on – campus students.	N/A.	
3	Describe the adequacy of support facilities such as hostels, sport and recreational centres, health centres, student centres, and transport in facilitating students' life on campus and enhancing character building.	Sections 7.3 – 7.6.	

I. CRITERION 5: QUALITY MANAGEMENT SYSTEMS

No.	**Evidence cited should be made available as per requirement in Section J or K.**	**Indicate the location of these items in the documents submitted and/or in the documents to be made available during the visit.**	**Checked by Evaluation Panel.**
1	Outline the organisational structure of the IHL as well as the structure within the faculty / department / programme. Discuss the level and adequacy of institutional support, operating environment, financial resources, constructive leadership, policies and mechanisms for attracting	Sections 8.1 – 8.2.	
2	Discuss the mechanism for programme planning; curriculum development; curriculum and content review; responding to feedback and inputs from stakeholders including industry advisors, students, and alumni; tracking the contributions of individual courses to the Programme Outcomes; tracking performance through assessment; responding to External Examiners comments; reviewing of Programme Objectives and Programme Outcomes; and continual quality improvement. Where these are discussed	Sections 8.3.	

	elsewhere in the report, specify their locations. For a new programme, the IHL also needs to discuss the processes surrounding the decision to introduce the programme.		
3	Summarise responses to the external examiner's report.	Section 8.4.	
4	Discuss how the IHLs' quality management system provides quality assurance and benchmarking.	Section 8.5.	

J. SUPPORT DOCUMENTS

No.		To be provided in digital format.	Checked by Evaluation Panel.
1	Evidence of stakeholders' involvement in all the processes above.	These will be provided during the full accreditation exercise.	
2	Other relevant evidence available to support claims made (e.g. minutes of meetings of relevant committees, survey forms).		
3	Relevant evidence available to support claims made for programme outcomes (e.g. learning and assessment tolls such as student portfolios, survey forms).		
4	List of final – year project titles for the past five years.	Refer to Section 4.6.	
5	Summary of the industrial training schemes and list of companies involved.	Sections 5.7 – 5.8.	
6	Evidence on the participation of academic staff and students in the continual quality improvement process.		
7	Evidence on the development of academic staff through opportunities in further education, industrial exposure, as well as research and development.		
8	Policies, internal processes and practices that are in place at all levels within the IHL		

	relating to the criteria as stated in Section 7 of this Manual.		
9	Evidence of the on – going participation of industry advisors in discussion and forums, professional practice exposure, and collaborative projects.		

K. INSTITUTIONAL DOCUMENTS AND ADDITIONAL DOCUMENTATION

No.		To be made available during the visit.	Checked by Evaluation Panel.
1	Handbook, Calendar Supplement, or other Official Publication relating to the Engineering Faculty, and containing the statement of programme details.		
2	IHL Prospectus.		
3	Additional Information on the IHL, Faculty of Engineering, and programme not provided in the Hard Copy Document or CD.		
4	Any other official documents that relates to the Engineering Faculty in other forms.		
5	Course files – detailed description of the content (syllabus), targeted learning outcomes, course information distributed to students, learning activities, assessment methods, learning modes, text used, pre – requisites, graded examination papers with low, medium and high grades, tutorial assignments, class projects, a copy of the text book, and any other materials used for the course. For laboratory courses, provide a copy of the syllabus, experiment instruction sheets, graded student laboratory work with low, medium and high grades, as well as supporting information.		
6	Copy of the final – year project report, instruction sheets, and grade sheets or other		

	evaluations for the project for a sample of students for the past five years.		
7	Evidence on the use of tutorials and non – conventional delivery methods such as Problem Based Learning (PBL) techniques alongside traditional lectures		
8	Copy of the training report, guidelines for the training, reviews by industry sponsors as well as the faculty mentors for a sample of students for the past years.		
9	List of activities and evidence relevant to industry exposure.		
10	Any supporting documentation for objectives and outcomes assessment including sample questionnaire, portfolios, survey forms, video recordings, etc.		
11	All evidences related to CQI of the programme.		
12	Description of procedures used for credit transfer / credit exemption and evidence of implementation of such procedures.		
13	Acceptance of transfer students and provide evidence that the processes and procedures are working.		
14	Relevant policies on Institutional Support, Operating Environment and Financial Resources.		
15	Any other relevant documents.		

Glossary

BEM	Board of Engineers Malaysia
CCM	Course Committee Meeting
CEng	Chartered Engineer
COs	Course Outcomes
CPEng	Chatered Professional Engineer
CQI	Continuous Quality Improvement
DIMC	Diploma in Mechatronics
EA	Engineering Activities
EAC	Engineering Accreditation Council
EE	External Examiner
EED	Electronic Engineering Department
FCUC	First City University College
FEC	Faculty of Engineering and Computing
FEST	Foundation in Engineering, Computing and Technology
FYP	Final Year Project
HTMi	Hotel and Tourism Management Institute Switzerland
IDP	Integrated Design Project
IEM	Institute of Engineers Malaysia
ICAP	Industry Committee Advisory Panel
IEAP	Industry Expert Advisory Panel
IEAust	Institution of Engineers Australia
IHL	Institute of Higher Learning
IMechE	Institution of Mechanical Engineer
IMM	Instituke of Materials Malaysia
IPTA	Institut Pengajian Tinggi Awam
IPTS	Institut Pengajian Tinggi Swasta
KBU	Kolej Bandar Utama
LAN	Lembaga Akreditasi Negara
MED	Mechanical Engineering Department
MEP	Mechanical Engineering Programme
MOHE	Ministry of Higher Education
MPU	Mata Pelajaran Umum
MQA	Malaysian Qualification Agency
MSC	Multimedia Super Corridor
MSA	Malaysian Scientific Association
MyQuest	Malaysian Quality Evaluation System
NCC	National Computing Centre
OBE	Outcome Based Education
OSHA	Occupational Safety and Health Act
PC	Programme Coordinator
PEng	Professional Engineer
PEOs	Programme Educational Objectives

PEPC	Professional Engineer with Practicing Certificate
POs	Programme Outcomes
PLOs	Programme Learning Outcomes
PRDC	Programme Review and Development Committee
PSQR	Programme Standards and Quality Report
QA/QC	Quality Assurance and Quality Control
QAD	Quality Assurance Department
SFM	Student Feedbak Form
SSG	Subject Specialists Group
USM	Universiti Sains Malaysia
WK	Knowledge Profile
WP	Complex Problem Solving

TABLE OF CONTENT

SECTION 1: GENERAL INFORMATION

This section provides the general information of the newly establish degree in Mechanical Engineering with Honours at First City University College (FCUC). The aim of this report is to allow Engineering Accreditation Council (EAC) to view and assess the content of this newly establish degree whether it fulfil all criteria and requirements setup by EAC. Upon meeting all criteria and requirements, it is expected the degree is fully recognised and endorsed by EAC after reviewing all necessary documents provided by FCUC.

1.1 Provide general information on the IHL and the specific programme.

Since its inception in 1990, Kolej Bandar Utama (KBU) International College has an excellent track record in producing employable graduates and entrepreneurs. In recognition of our excellence in providing tertiary education, the Ministry of Higher Education elevated KBU to FIRST CITY UNIVERSITY COLLEGE (FCUC). FCUC will continue KBU's proud tradition of providing the best learning experience for its students. The courses offered will continue to be industry relevant. These will be the springboard for our graduates to be successful in their chosen careers.

Quality education at FCUC is further enhanced by its compliance with the requirements of the Agensi Kelayakan Malaysia or Malaysian Qualifications Agency (MQA). Constant monitoring is also carried out by FCUC's very own Quality Assurance Department and its international university partners.

Important development milestones accomplished by FCUC includes:

- 1990 Kolej Swasta Bandar Utama was founded by the late Tan Sri Dato' Dr. Teo Soo Cheng at Damansara Utama; International partners include Nottingham Trent Polytechnic, UK and Anglia Polytechnic, UK.

- 1992 Signed Agreement with The London Institute to conduct its Higher National Diploma course in Art and Design.

- 1993 New campus construction commenced in Bandar Utama; The Ministry of Education approved of Kolej Swasta Bandar Utama's change of name to Kolej Bandar Utama (KBU).

- 1994 KBU's partner, Nottingham Trent University, held its first graduation ceremony in Malaysia. A student was awarded the Vice Chancellor's Scholarship.

- 1995 The College was relocated to Bandar Utama; Graduation Ceremony of KBU and the London Institute on 8 August 1995 was graced by YB Datuk Dr Fong Chan Onn, Deputy Minister of Education.

- 1998 KBU Chief Executive Dato (Dr) Teo Chiang Liang was awarded the letter of approval to conduct franchised honours degree programmes under the '3+0' mode, from YB Dato Sri Najib Tun Razak, the Minister of Education; A signing ceremony to authorise KBU as a training centre for Mentor Graphics Software. The ceremony was witnessed by YB Datuk Dr Fong Chan Onn.

- 2000 Awarded the Multimedia Super Corridor (MSC) status.

- 2001 The Board of Engineers Malaysia (BEM) granted accreditation to two engineering degree courses, conducted in collaboration with Nottingham Trent University, under the '3+0' mode; KBU is the first and only private college to receive the BEM accreditation.

- 2002 The Ministry of Education approved of KBU's change of name to KBU International College.

- 2003 Awarded "Anugerah Khas" by the Ministry of Education for our students' outstanding academic performance; A new crest was officially launched.

- 2004 Awarded ISO 9001:2000 for the Provision of Library Services; Commenced collaboration with Sheffield Hallam University, UK; KBU Chief Executive Dato' (Dr) Teo Chiang Liang and Mr Hugh Algurie at the MoU signing ceremony between KBU and the Curriculum Council, Government of Western Australia.

- 2005 Awarded the 'Excellence in Student Internationalisation Award' from the Ministry of Education.

- 2007 NCC Education presented a plaque to KBU, in recognition of being the first private higher educational institution to be accredited by Lembaga Akreditasi Negara (LAN) for the programme, National Computing Centre (NCC) International Diploma in Computer Studies.

- 2008 Signed MoU with IBM Malaysia to train students on IBM z Systems Academic Initiative Programme.

- 2010 Signed agreement with Anglia Ruskin University, UK to conduct MBA programme.

- 2011 Rated a 5-star education provider by Malaysian Quality Evaluation System (MyQuest) setup by the Ministry of Higher Education, Malaysia.

- 2012 Signed agreement with Hotel & Tourism Management Institute Switzerland (HTMi) for the award of their Diploma to KBU's graduates in Hospitality & Tourism Management.

- 2013 Received invitation letter from the Ministry of Education to be elevated to a University College; Signed agreement with Politeknik Port Dickson to enhance teaching and learning experience; Phase II of the campus construction commenced.

- 2014 Received approval for the establishment of FCUC from the Ministry of Education.

- 2015 KBU International College became FCUC in 2015.

- 2016 The new phase of FCUC campus slated to be completed in 2016.

Engineering Education at FCUC

FCUC has been involved in and has achieved great successes in offering Engineering Programmes since 1992.

The Faculty of Engineering and Computing (FEC) is led by the Dean and is supported by the Head, Deputy Head, and Programme Coordinators. Currently, FCUC offers the following Engineering Programmes accredited / provisional accredited by MQA:

- Foundation in Engineering, Science and Technology.
- Diploma in Electronic Engineering.
- Diploma in Mechanical Engineering.
- Diploma in Mechatronics.
- Bachelor of Electronic Engineering with Honours.
- Bachelor of Mechanical Engineering with Honours (pending for accreditation by EAC).

There are plans to introduce higher degree by course work in the future (Master of Engineering Management) and higher degree by research in the future (Master of Engineering (Research), Doctor of Philosophy (Engineering)).

Basic Programme Structure

At each year of the programme, the students undertake two semesters of study, two long (14 weeks duration) semesters. The students would normally enrol on average for 15 credit hours in each long semester.

Typically, each module in the programme corresponds to a structure with 3 credit hours allocated to it which corresponds to 3 contact hours of lectures or 2 contact hours of lectures, and 1 credit hour equivalent of tutorial/project work comprising of design and laboratory work (if relevant). It does not include those extra hours which the students are expected to spend on private study in order to complete practice problems, assignments, and to obtain reasonable comprehension of the course. The details, as appropriate, will vary from course to course, and the method of teaching and learning.

The students are required to achieve a total of 137 credit hours to complete the degree. The programme structure and the course structure are available in Table 4.2 and Table 4.5.

Appointment of External Examiner

As far as the FEC is concerned, the External Examiners' reports are always treated seriously and taken to be constructive and developmental for the FEC, its staff members and the programme.

The External Examiner (EE) is appointed and will be invited to evaluate the programme at least once a year. The EE will then, in writing, present his / her findings to the FEC. All findings and suggestion for improvement reported by the EE will be considered in programme review and development committee meetings for continual quality improvement.

For Mechanical Engineering, the appointed EE is:

Professor Ir. Dr. Ramesh Singh, CEng. (UK), CPEng. (Australia), P.Eng. (Ma'sia)
Deputy Dean
Faculty of Engineering
University of Malaya (UM)

The duration of this appointment is 3 years (2017 - 2019). This appointment is extended for two years from 23rd Dec 2019 to 22nd Dec 2021. This again is extended from 23rd Dec 2012 to 31st Dec 2023.

The External Examiner's CV is attached at the end of this chapter.

1.2 History of Programme Accreditation.

Not applicable; this is a new programme being developed at FCUC and seeking the approval from the EAC.

1.3 Self-initiated changes to the Programme.

The programme in its current structure represents the original submission and no changes have been carried out as this submission is for the approval to run the programme.

This section summarizes some of the self-initiated changes done to improve and enhance MEP which includes:

1. A new course to PO mapping has been restructured to ensure crucial POs are delivered and assessed.
2. A new initiation to plan delivery and assessment of courses has been structured.
3. All modules with mixed assessment of final examination and coursework (includes phase tests, quizzes, projects and assignments) have been changed from 70% final exam and 30% coursework to 60% final exam and 40% coursework. All modules with no final exams will be assess solely on phase tests, quizzes, projects and assignments.

External Examiner's CV

CURRICULUM VITAE

PERSONAL DETAIL

PROFESSOR IR. DR. RAMESH SINGH A/L KULDIP SINGH

Department of Mechanical Engineering
Faculty of Engineering

79677671
79675330
ramesh79@um.edu.my
Department of Mechanical Engineering, Faculty of Engineering, University of Malaya, 50603 Kuala Lumpur, W.Persekutuan Kuala Lumpur, Malaysia

ResearcherID Link http://www.researcherid.com/rid/E-9947-2011 (http://www.researcherid.com/rid/E-9947-2011)

BIOGRAPHY

Professor Ramesh Singh has contributed immensely to the development and enhancement in science & technology in Malaysia, particularly in the field of ceramics engineering. Amongst his significant achievements include the development of an ageing resistant zirconia for steam environment, production of a novel nanostructured hydroxyapatite bioceramic derived from eggshells and bovine bones for orthopedic applications, and more recently is the tailoring of a novel electrical-conducive ceramic that is able to conduct electric current at room temperature without compromising on the mechanical properties.

His work has attracted great interest from the industres locally and internationaly. He has provided solutions to industrial problems and have developed new materials/products that exhibits enhance performace and reliability. He has published more than 300 research articles in various ISI/WoS- and Scopus-listed publications and his research group has secured more than RM15 million of research funding for numerous projects relating to materials development, advanced manufacturing and machining. Prof. Ramesh has filed numerous patents for his inventions and received many accolades as a distinguished scholar. He was the recipient of the prestigious IEM Young Engineer Award, MTBF Science & Technology Award 2014 and won more than 55 awards at international/national exhibitions pertaining to his research and inventions. He was recognized as the top 12 "Malaysia Engineer Stars" by the Institution of Engineers Malaysia for his notable contribution in the field of engineering education and advancement in ceramics engineering in the country.

Prof Ramesh is a Chartered Engineer with the Engineering Council, UK, a Chartered Professional Engineer with Engineers Australia, a Professional Engineer with the Board of Engineers Malaysia and Fellow of five prominent professional societies. I.e. The Institution of Mechanical Engineers UK, Institution of Engineers Australia, Institution of Engineers Malaysia, Institute of Materials Malaysia and Malaysia Scientific Association. He is on the International Editorial Board of Ceramics International (a Web of Science, Tier 1, Elsevier Publication), the Editor in Chief of the International Journal of Mechanical and Materials Engineering (a Scopus-listed publication), Editorial Board Member of the Journal of Institute of Materials Malaysia and Journal of Industrial Technology.

Besides research excellence, Prof. Ramesh is also a distinguished professor in mechanical and materials engineering in the country. He is serving in numerous capacities as external assessor, professional mentor, resource person, external examiner, advisor and engineering accrediation panel. He holds a joint appointment as an Associate Director with the Engineering Accreditation Departmment, Board of Engineers Malaysia for his notable contribution in upholding the standards and quality of engineering education in Malaysia.

ACADEMIC QUALIFICATION
(Qualification), (Institution).

Ph.D. , UNIVERISTY OF SUNDERLAND

SECTION 2: PROGRAM EDUCATIONAL OBJECTIVES

The Program Educational Objectives (PEOs) of Mechanical Engineering Programme (MEP) describes what graduates are expected to attain within a few years of graduation. PEOs are particularly formulated to ensure that the graduates are recognized for their accomplishments nationally or internationally. This section details the implementation, assessment and evaluation of PEOs for MEP.

2.1 State the vision and mission of the Institute of Higher Learning (IHL) and/or faculty.

The visions and missions of FCUC and FEC are very important for the MEP. Hence, the PEOs of MEP need to be aligned with the visions and missions set by FCUC and FEC.

2.1.1 The vision and mission of the FCUC.

Vision:
Empowering Students to be Globally Competitive.

Mission:
To Provide Affordable Quality Higher Education for an Enriching Future.

Objective:
To offer quality holistic education and training that produce graduates with the following qualities and capabilities:

- Academic excellence
- Professionalism
- Confident with high self-esteem
- Responsible and caring members of society
- Global citizens

2.1.2 The vision and mission of Faculty of Engineering and Computing.

Vision:
The Faculty of Engineering and Computing (FEC) shall be recognized as leading, innovative, dynamic and diverse centre for academic excellence that empowers the next generation of world-class engineering and computing professionals in a global society.

Mission:
The FEC is dedicated to excellence in teaching and knowledge creation through national and international collaboration to produce competent, employable, and ethical graduates in the field of engineering and computing.

2.2 Description of Programme Educational Objectives (PEOs).

The FEC expect its alumni, who, after being involved in the industry or academia for at least 4 years,

PEO1 – To practice their knowledge and skills in mechanical engineering and related fields.

PEO2 – To remain committed to professional development.

These are the two PEO established for the MEP. The PEOs are published in the Programme Handbook, FCUC website, mechanical engineering laboratories and teaching staff office. This is to constantly remind staff and students about the PEOs that are to be committed and followed.

2.3 Describe how the PEOs are consistent with the vision and mission of the IHL and / or faculty and stakeholder requirements.

The PEOs are designed in such that they are in line with the vision, mission and objectives of the FCUC. The PEOs state that graduates are expected to possess the necessary technical competencies and committed to professional development during their career. Feedbacks are obtained from perspective of students, demand of the job market, industry players and employers to ensure the curriculum is relevant and acceptable to the market needs. The teaching-learning assessment is able to gauge knowledge gained, competencies and dispositions for the human capital required by the mechanical engineering field.

The established PEOs are coherent with the vision and mission of FCUC and MEP as illustrated through a mapping of PEOs with the vision and mission of both organizations in Table 2.1. The establishment of these PEOs have also taken into consideration, suggestions and feedbacks from stakeholders which includes industries/employers, alumnus and parents. This ensures that the established PEOs are also in line with the stakeholders needs.

Table 2.1: The Mapping of PEOs with relation to FCUC and FEC's vision and mission.

Vision and Mission	Programme Objectives	
	PEO1	PEO2
FCUC Vision Empowering Students to be Globally Competitive.	✓	✓
FCUC Mission To Provide Affordable Quality Higher Education for an Enriching Future.	✓	✓
FEC Vision To be recognized as leading, innovative, dynamic and diverse centre for academic excellence that empowers the next generation of world-class engineering and computing professionals in a global society.	✓	✓
FEC Mission Dedicated to excellence in teaching and knowledge creation through national and international collaboration to produce competent, employable, and ethical graduates in the field of engineering and computing.	✓	✓

2.4 Establishment and Review the PEOs.

The FEC offers a full-time 4-year undergraduate programme leading to the award of Bachelor of Mechanical Engineering with Honours. The curriculum has been developed with the following aspirations:

i) To enhance the quality of learning and teaching in the academic environment.
ii) To disseminate engineering sciences which focused on quantitative, problem solving, design and engineering practice.
iii) To incorporate the generic skills which include communication skill, leadership, social and environmental responsibilities awareness.
iv) To embed research attributes in courses.

With the above-mentioned aspirations, the PEOs was initially developed by internal team of experts from FEC who is programme owner and academic consultant. Review of the PEOs is carried out once every four years so as to ensure that the PEOs stay relevant to the needs of the industry.

The stakeholders of the mechanical engineering programme include the following:

- Students (and their families) - the students expect to become a technically competent, marketable and productive engineer upon the completion of the programme.
- Academic staff members - the staff lead the students in the learning process and assume the responsibility for the programme outcomes relative to the programme educational objectives.
- Alumni - the alumni expect a continued high quality educational programme at FCUC as their reputation is reflected in the quality of their own education.
- Industry Expert Advisory Panel (IEAP) - these individuals have been highly successful and being insight from a variety of industries and academia.
- External Examiner - this candidate is appointed based on his / her academic background and experience in engineering accreditation.
- Industry / Employers - this group expects graduates who are technically competent, productive, effective team members, are "computer capable", have social and environment awareness and have good communication skills.

The assessment methods for the PEOs comprise the following:

(i) Feedback from the alumni that measure the level of readiness provided by the programme which helped them to achieve the PEOs. The feedback will be collected via survey four years after graduation. A survey form will be developed for this purpose. The obtained results will be used by Programme Review and Development Committee (PRDC) for Continuous Quality Improvement (CQI).

(ii) Academic staff members to conduct benchmarking against other national and international universities.

(iii) PRDC meeting is conducted to discuss the outcomes of the surveys and the reports and recommendations.

A detail flow process used at MEP to review the PEOs has been summarized in Figure 2.1. This figure clearly shows the extent of stakeholder's involvement throughout the process where inputs from them are attained through survey and meeting. The process begins with inputs from accreditation recommendation, assessment and evaluation findings as well as inputs from various stakeholders (i.e., Industries / Employers, Parents, Alumnus, External Examiner, Government Policy, FCUC and MEP Vision & Mission). Upon concern raised for improvisation of PEOs, MEP Board reviews the new PEOs proposed by OBE committee. Upon agreement, these PEOs will then be presented to stakeholders (i.e., during IEAP meeting). Once a mutual agreement between the stakeholders and MEP has been achieved, MEP Board proceeds to endorse the new PEOs. Soon after, the new PEOs will be updated and published in various locations mentioned earlier.

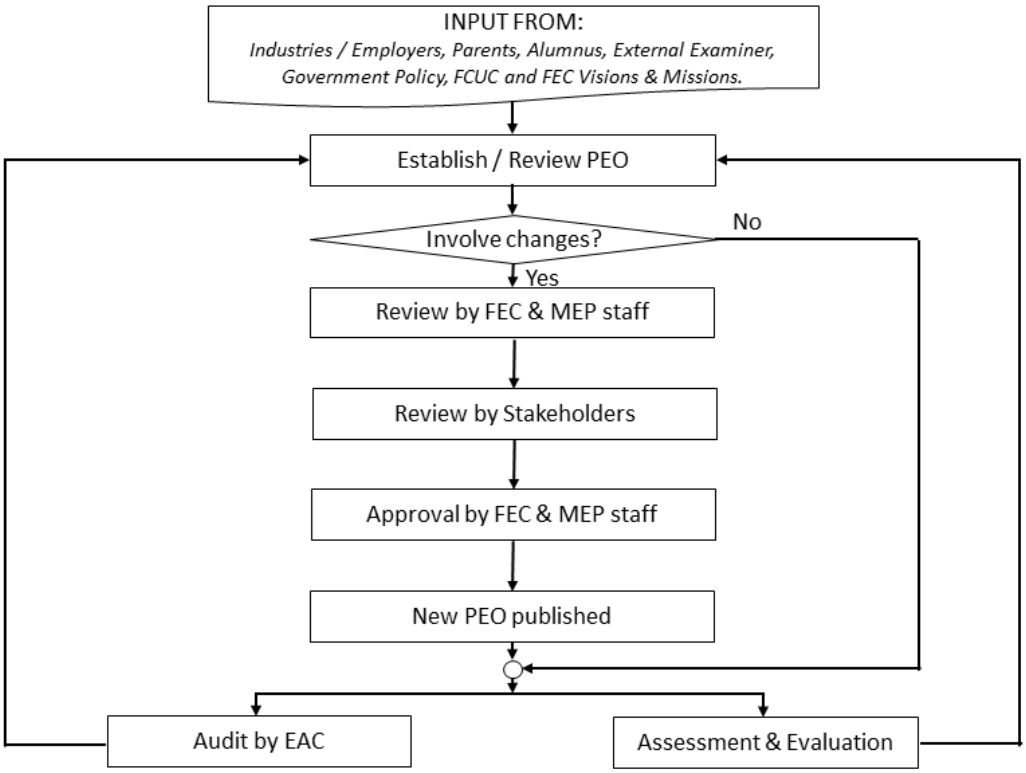


Figure 2.1: General Establishment and Review Process for PEOs.

2.5 Describe how the IHL ensures achievement of the Programme Objectives (POs).

The course structures are designed in accordance with the PEOs and Programme Outcomes (POs). Over the 4-year programme, students would have completed the group Integrated Design Project (IDP), internship, individual Final Year Project (FYP) and others, providing them the necessary knowledge, skills and qualities to undertake a rewarding job in the area of his / her specialty. Generally, the curriculum for MEP has the following features:

(a) Most major courses in Year 1 and Year 2 have laboratory components to enforce the theory taught in class by practical investigation.
(b) The curriculum offers a number of mathematics courses to develop the students' analytical skills and to provide the theoretical background when forming or designing engineering problems.
(c) Project based courses that aim to sharpen students' soft skills such as report writing and presentation skills.
(d) Programming / software – based courses that illustrate the contribution of computer software packages in saving time and money when solving engineering problems.
(e) Modules that emphasise on the ethical values and the role of engineers in the society.

(f) One session of internship for 10 weeks during intersession between Year 3 to Year 4. Students are being supervised by both internal supervisor and external supervisor at the site and they are required to keep their working record in a logbook and submit a report upon the completion of the placement.

Furthermore, the FEC encourages and supports students to participate and take roles in competitions, guest lectures / employer lectures, and industrial visits. By doing so the FEC aims to help the students develop better interpersonal skills and keep their knowledge up to date which in turn will enforce the lifelong learning.

The Figure 2.2 shows the OBE framework implemented at MEP which consists of three interrelated processes for formulating and evaluating the PEOs, POs and COs. The outer loop describes the steps in the process of formulating and evaluating the PEOs. Each PEOs attainment are assessed using indirect alumni survey. Apart from indirect survey, inputs from stakeholders are conducted every 4 years to ensure the CQI intended is relevant and effective. At this instance, these CQI are also ensured to be coherent with the FCUC and FEC vision and mission.

Upon a new PEO has been defined or revised, the available POs are reviewed to ensure it is consistent and relevant with the new PEOs. Furthermore, input from stakeholders and also from FCUC and MEP vision and mission are also taken into consideration for POs review if necessary. Besides, POs are also reviewed on yearly basis for each academic calendar. The CQI raised to improve POs generally originates from the findings based on the direct and indirect assessments. Similar action will be taken for formulating and evaluating COs activities but on a semester basis. Therefore, a well-structured academic curriculum of MEP is the primary mechanism for ensuring the achievement of PEOs.

2.6 Ongoing Evaluation on the Level of Achievement of PEOs.

It is very essential for continuously evaluating the achievements of the PEOs. Therefore, the MEP is examined internally and externally.

As discussed in Section 2.5, the cycle for PEOs assessment and evaluation are 4 years. In general, the MEP PEOs assessment and evaluation cycle involves stakeholders, MED and alumnus. The detail steps of the process together with its timeline is illustrated in Table 2.2. The process begins with identifying PEOs relevance by stakeholders. Then, both MED and stakeholders will initiate to define and review for a new PEO if deemed necessary. These stated activities are executed during the first year of the cycle. Upon defining new PEO, MED will outline the performance indicators and the relevant assessment methods to assess the PEOs in the second year.

In the third year of the cycle, MED will distribute in a form of survey the relevant assessment details to alumnus for their feedback. This feedback from alumnus will be gathered till the last year of the cycle. Towards the end of the four years of PEOs assessment and evaluation cycle, MED will evaluate and present the findings to the stakeholders to identify the CQI deemed necessary. At the end of the meeting, MED will report and document the process and findings for further action.

2.6.1 Internal Expertise

The FEC academic staff members who are specialized in the area of mechanical engineering will be involved in evaluating the level of achievement of the PEOs through PRDC. The PRDC is held whenever there are issues concerning some modules.

2.6.2 External Expertise

External Examiners

As according to FCUC academic rules and regulations, all programmes conducted at the FCUC are required to have external examiner(s) to evaluate the level achievement of PEOs and POs. The EE is appointed with due consideration given to the examiner's academic / professional standing, experience and expertise. The comments and suggestions on improvement of programme structure, content, assessment process and administration of the programme as well as advice on staff development, training, research and the development of teaching and learning resources would be discussed in PRDC as part of the CQI process.

Industry Expert Advisory Panel

FCUC has Industry Expert Advisory Panel (IEAP) for the programme to provide expert advice on the relevancy of the curriculum contents to the requirement of the current and future needs of the industry.

The IEAP is to provide input on the following:

- Current and future development of technology / methodology available to the industry and the potential impacts to the FEC in terms of resources needed; PEOs and POs of the programme.
- Knowledge and reference of relevant trade and industrial associations.

FCUC has collaborated and will continue to collaborate with industries and professional bodies to conduct talks, seminars and joint research to assist staff with the latest development in the subject matter and the profession.

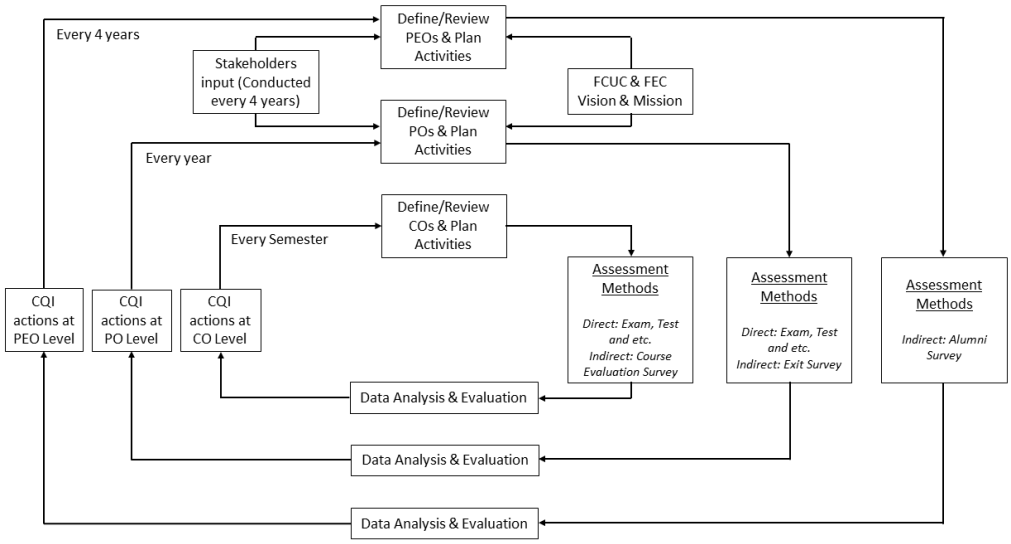


Figure 2.2: Objective Based Educational (OBE) framework.

Table 2.2: The PEOs 4-year Cycle of Assessment and Evaluation Process of MEP.

No.	Contributor	Process	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)
1	Stakeholders	Identify/suggest PEO relevance.	✓			
2	Stakeholders and MED	Define/Review of PEO.	✓			
3	MED	Define/Review of performance indicators for PEO.		✓		
4	MED	Develop/review assessment methods for PEO.		✓		
5	Alumnus	Provides survey data for PEO evaluation.				
6	MED	Collect PEO survey data.			✓	✓
7	MED	Evaluate PEO attainment.				✓
8	Stakeholders and MED	Presents findings and identify CQI if necessary.				✓
9	MED	Prepare report.				✓

2.7 Results of PEOs Achievement.

As part of the FCUC regulations, all PEOs will require to undergo regular review, i.e., once every four years to monitor the quality and review the relevance to industry requirements through the feedback obtained from the stakeholders, including the alumni.

The inputs will then be discussed in the PRDC. The revised PEOs (if any) will then be forwarded to the Senate for approval and adoption.

Currently, MEP PEOs assessment and evaluation process are at the end stage of the cycle. Exit surveys have been distributed to first graduating cohort of MEP to measure the PEOs achievement.

In this section, the summary of PEOs results based on the feedbacks received thus far is shown in Table 2.3. A total of 2 feedbacks have been received from graduates of batch 2022. Data shows that 100% of our total graduates have responded within the first six months of survey circulation initiation. Based on the responded survey data from alumnus, a pre-finding of PEOs attainments is presented in Table 2.4.

2.8 CQI of PEOs.

There are 3 and 2 performance indicators defined for PEO1 and PEO2 and respectively as shown in Table 2.4. The MEP's PEO1 and PEO2 is deemed achieved when 50% and 50% of the respondent have met either one of the performance indicators in respective order. In overall, the complete findings of PEOs attainment will be available at the end of 2022 for appropriate CQI action. Since the MEP currently has not completed the PEO assessment and evaluation cycle, a detail planned CQI action plan is not available. Only at the end of the four years of PEOs assessment and evaluation cycle, MED will evaluate and present the findings to the stakeholders to identify the CQI deemed necessary.

Table 2.3: Respondent statistics.

Cohort	Total Graduated	Respondent
2022	2	2

Table 2.4: Results of PEOs Survey.

Programme Outcomes		Performance Indicator	Result	Performance Target
PEO1	PI1/1	Competent in the design of engineering solutions.	50%	50% of respondent achieved either one of the performance indicators.
	PI1/2	Competent in practical application of engineering principles.	50%	
	PI1/3	Communicate effectively in cross-functional teams.	50%	
PEO2	PI2/3	Continue professional certified courses, trainings, workshops or seminars.	50%	50% of respondent achieved either one of the performance indicators.
	PI2/4	Independent learning for continuous professional development.	0%	

2.9 Strength related to PEOs.

A summary of PEOs related strengths is listed below:

1. The PEOs defined are in line with the FCUC and FEC vision and mission.

2. Industry representatives via Industrial Expert Advisory Panel (IEAP) meeting have direct involvement in formulation and evaluation on PEOs.

3. The revised PEOs have enabled an objective assessment and evaluation to produce eloquent CQI results.

4. A short PEOs assessment and evaluation cycle of 4 years ensure the strength of MEP.

2.10 CQI relating to PEOs.

As stated earlier, the MEP currently has not completed the PEO assessment and evaluation cycle. Thus, a detail planned CQI action plan is not available. However, preliminary data findings based on available feedbacks have indicated that all PEOs achieved, since 50% responded have achieved PEO1. Similarly, PEO2 also achieved, since more than 50% stated achieved either one of the performance indicators. Nevertheless, the preliminary findings indicate the lack in alumnus seeking to gain the status of Professional Engineer. This is due to the graduates has not accumulate enough of design and site experiences as required by BEM since the first batch of graduated students started work as an engineer not long ago.

2.11 Self-Assessment related to PEOs.

Aspect	Poor	Satisfactory	Good	Comments
Performance indicators expected for Programme Outcomes.				
Defined, measurable and achievable.			✓	
Linked to Programme Outcomes.			✓	
Detailed out and documented.			✓	
Published.			✓	
Consistent and linked to mission & vision of FCUC and stakeholder needs.			✓	
Linked to curriculum design.			✓	
Reviewed and updated.			✓	
Performance indicators expected for process & results.				
Established process for formulating Programme Outcomes.			✓	
Established process for assessing achievement of Programme Outcomes.			✓	
Established process for evaluating achievement of Programme Outcomes.			✓	
Performance target of the Programme Outcomes is achieved.			✓	
Evaluation results are used in the CQI of the programme.				
Performance indicators expected for Stakeholder involvement.				
High degree of involvement in defining Programme Outcome statements.			✓	
High degree of involvement in assessing the achievement of Programme Outcomes.			✓	
High degree of involvement in assessing improvement cycles (CQI).			✓	
Involved in strategic partnership.			✓	MOU/MOA with UbiTech.

SECTION 3: PROGRAM OUTCOMES

The Program Outcomes (POs) of MEP describes what students are expected to know and be able to do by the time of their graduation. They are formulated to be in line with the PO guidelines given by EAC. This section details the implementation, assessment and evaluation of POs for MEP.

3.1 Programme Outcomes Statement.

The FEC adopted the POs from Engineering Accreditation Council (EAC) Manual 2020, and the Programme Learning Outcomes (PLO) describe the expected achievements of the MEP graduates at the time of graduation. Upon completion of Bachelor of Mechanical Engineering programme, graduates of MEP will be able to:

PO1. Engineering knowledge.

Apply knowledge of mathematics, science, and engineering fundamentals to the solution of complex engineering problems.

PO2. Problem analysis.

Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3. Design / Development of solutions.

Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO4. Investigation.

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.

PO5. Modern tool usage.

Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations.

PO6. The Engineer and society.

Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO7. Environment and sustainability.

Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PO8. Ethics.

Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9. Communication.

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 10. Individual and teamwork.

Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

PO 11. Lifelong learning.

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.

PO 12. Project management and finance.

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.

The Programmes Outcomes are published in the Programme Handbook, FCUC website, and mechanical engineering laboratories and workshop.

3.2 Relationship between PEOs and POs.

The POs are formulated to support the achievement of MEP PEOs. The attainment of POs by our students upon graduation should lead to the achievement of the PEOs. The Table 3.1 depicts the relationship between the POs and the PEOs. Currently, each PEOs are mapped to all POs. This is mainly attributed by the Performance Indicator (PI) defined for PEOs are relevant to each POs. The FEC expect its alumni, who, after being involved in the industry or academia for at least 4 years, to possess the Programme Educational Outcomes (PEOs):

PE01: To practice their knowledge and skiffs in mechanical engineering and related fields.

PE02: To remain committed to professional development.

Table 3.1: Mapping of POs to PEOs.

PEO \ Programme Outcomes (POs)	Engineering Knowledge	Problem Analysis	Design / Development of Solutions	Investigation	Modern Tool Usage	Engineer and Society	Environment and Sustainability	Ethics	Communication	Individual and Teamwork	Lifelong Learning	Project Management and Finance
	1	2	3	4	5	6	7	8	9	10	11	12
PEO1	✓	✓	✓	✓	✓			✓	✓	✓		
PEO2	✓	✓		✓		✓	✓	✓			✓	✓

3.3 Programme Outcomes encompass the outcome requirements of Section 4.0 of EAC Manual.

The FEC adopted the POs from EAC Manual 2020, which consists of outcomes from different areas such as engineering knowledge, problem analysis, design / development of solutions, investigation, modern tool usage, engineer and society, environment and sustainability, ethics, communication, individual and teamwork, lifelong learning, and project management & finance. Their relationship is shown in Table 3.2. It is worth mentioning that POs of MEP are in similar order and principles when compared to EAC outcomes.

For each PO, a detail description which indicates its attributes, sub-attributes, PI and the relevant Bloom Taxonomy are explicitly tabulated in Table 3.3. Thus, this

information clearly indicates the AEP expectation of measurable student's ability to be achieved in each PO.

Table 3.2: Relationship between the POs of MEP and the Outcomes Requirement listed in the EPAM2012.

Programme Outcomes for MEP		**Refer to Section 4.0 of EPAM2012**											
		i	**ii**	**ii**	**iv**	**v**	**vi**	**vii**	**viii**	**ix**	**x**	**xii**	**xii**
PO1	Apply knowledge of mathematics, science, and engineering fundamentals to the solution of complex engineering problems.	✓											
PO2	Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.		✓										
PO3	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.			✓									
PO4	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.				✓								
PO5	Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations.					✓							
PO6	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.						✓						
PO7	Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.							✓					
PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.								✓				
PO9	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.									✓			
PO10	Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.										✓		
PO11	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.											✓	
PO12	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.												✓

Table 3.3: Program Outcomes Description.

Programme Outcomes for MEP		Attribute	Sub-attribute	Performance Indicator		Bloom		
						C	A	P
PO1	**Engineering Knowledge** Apply knowledge of mathematics, science, and engineering fundamentals to the solution of complex engineering problems.	Mathematics Principles	Proficiency in application of mathematics principles	PI1/1	Apply fundamental concepts of mathematics to solve problems.	C3		
		Sciences Principles	Proficiency in application of sciences principles	PI1/2	Apply fundamental concepts of sciences to solve problems.	C3		
		Engineering Principles	Proficiency in application of engineering principles	PI1/3	Apply fundamental concepts of engineering to solve problems.	C3		
PO2	**Problem Analysis** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	Problem Solving	Problem Identification	PI2/1	The process of recognising and identifying an issue that may cause a problem or conflict.	C1		
			Analysis	PI2/2	The process of separating or detailed examination of gathered, measured or collected data, into smaller elements for decision-making or interpretation.	C4		
			Create	PI2/3	The action of putting ideas or solutions into operation to solve problems.	C6		
PO3	**Design / Development of Solutions** Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.	Scientific Skills	Conceptualisation	PI3/1	Formation of new ideas or solutions.	C6		
			Generation of Solutions	PI3/2	The process of producing alternative or new solutions.	C6		
			Integration	PI3/3	The act or process of bringing together elements, ideas, solutions, people, systems etc. to function as one.	C5		
			Development	PI3/4	The process of growth, addition, improvement or a significant consequence or event.	C6		
			Creation	PI3/5	The act of making, produce or invent something into existence.	C6		
PO4	**Investigation** Conduct investigation into complex problems using research-based knowledge and research methods	Problem Solving	Synthesis and Evaluation	PI4/1	The combination or composition of small parts to form a whole idea, new solution or system.	C5		P6
			Decision Making	PI4/2	The thought process of selecting a solution from several alternatives.	C6		P7

	including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.	Scientific Skills	Evaluation / Selection	PI4/3	The process of weighing the significance, worth or value of a decision made and to choose a solution or alternative solution.	C6		P6
			Implementation	PI4/4	The process of putting or executing a solution or idea into effect.	C5		P6
PO5	**Modern Tool Usage** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations.	Use of Modern tools, skills and techniques	Knowledge of Modern tools, skills and techniques	PI5/1	Selection of appropriate tools, skills and techniques in solving the problem.	C1		P1
			Mechanism of Modern tools, skills and techniques	PI5/2	Application of tools, techniques and skills to develop a solution.	C3		P4
		Fundamental Engineering Laboratories	Preparation prior laboratory and field work	PI5/3	Student's preparation prior to laboratory and field data.	C1		P2
			Data collection	PI5/4	Collect, analyse, and synthesize data related to engineering surveying and field measurements.	C3		P3
			Experimental procedure & Safety	PI5/5	Use of right experimental and laboratory with safety procedures.	C3		P4
PO6	**The Engineer and Society** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.	Social Responsibility	Rational attitude towards a multicultural society	PI6/1	Sensitive to the problems of society and the environment. Able to recognize and adopt a rational attitude towards a multi-cultural society.	C5	A4	
			Contribution to the society	PI6/2	The ability to be responsible and take the initiative/volunteer to be engaged and able to act as an agent of change in the society.	C5	A5	
PO7	**Environment and Sustainability** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.	Environmental awareness	Environmental Elements	PI7/1	Recognize understanding and appreciation of the potential issues, activities and elements of engineered systems on the environment.	C1	A2	
			Environmental impact	PI7/2	Develop an understanding and appreciation of the potential impacts of engineered systems on the environment.	C4	A3	
			Solutions of Environmental impact	PI7/3	Predict solutions of the potential impacts of engineered systems on the environment.	C2	A2	
		Sustainability	Understanding of unsustainable practices	PI7/4	Multi-dimensional and multi-generational understanding of unsustainable practices.	C3	A4	

			Systems thinking	PI7/5	Recognize understanding and appreciation of the potential issues, activities and elements of engineered systems on the sustainability.	C3	A5	
			Solutions of Sustainability	PI7/6	Predict solutions of the potential impacts of engineered systems on the sustainability.	C2	A2	
PO8	**Ethics** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.	Self-Awareness	Etiquette	PI8/1	The ability to be ethical in carrying out responsibilities to society.	C3	A3	
		Ethics and Professionalism	Work Responsibility	PI8/2	Duties to be carried out as prescribed in the scope and terms of reference of the position held.	C6	A5	
			Work Relation	PI8/3	Relationships with co-workers or within institution, work groups and community in a work setting.	C5	A4	
			Work Ethics	PI8/4	System of moral rules or principles of behaviour, which are practiced in a workplace or a working environment.	C6	A5	
			Integrity	PI8/5	Level of honesty and being upright in keeping or defending his/her stand, principles and accountability in carrying out a task.	C3	A3	
PO9	**Communication** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	Values and Attitudes	Moral	PI9/1	Personality, manners and politeness according to universal good and positive values that are generally acceptable and considered good by the community.	C3	A1	
			Identity	PI9/2	Characteristics of an individual's origin such as customs, language, culture and religion which make up the pillar and portrayal of his personality and bring out the spirit of patriotism and love for the nation-state.	C3	A3	
			Proactive	PI9/3	A positive attitude to prepare and control actions to be performed ahead of expectations before the occurrence of an event or incident.	C3	A3	
			Appearance	PI9/4	Character, behaviour as well as tidiness and suitability of the attire based on situations in	C3	A3	

					interacting with other persons and in managing or performing a task.			
		Verbal Communication	Clear delivery of ideas	PI9/5	Delivery of clear and defined ideas which can be well.	C2	A2	
			Confident delivery of ideas	PI9/6	Confident and convincing in delivery of ideas.	C2	A2	
			Effective and articulate delivery of ideas	PI9/7	Ideas are delivered effectively and can be used to solve problems.	C2	A2	
			Understand and respond to questions	PI9/8	Able to understand and respond to questions.	C2	A2	
			Adapt delivery to audience level	PI9/9	Ability to adapt delivery to a variety of audiences.	C3	A2	
		Written Communication	Clearly written academic discourse	PI9/10	Writing an academic discourse that fulfils the grammar rules and can deliver the correct meaning.	C2	A2	
			Coherently written academic discourse	PI9/11	Writing an academic discourse that is coherent or shows the link between sentences so that it can be easily comprehended.	C3	A4	
			Systematically written academic discourse	PI9/12	Writing an academic discourse which has an approach or flow or systematic arrangement that is clear and easy to comprehend.	C4	A4	
		Information Retrieval and Management	List of References	PI9/13	Required number of references related to a given task.	C1	A1	
			Relevance	PI9/14	Appropriateness and relevance of references to a task.	C3	A2	
			Optimisation	PI9/15	Optimising variety of references (to make useful as possible).	C4	A4	
			Curation	PI9/16	Curate is to select, organize and look for required information according to a list of references.	C4	A4	
			Articulation	PI9/17	Able to express ideas clearly and effectively in writing and easily understood by the reader.	C3	A2	
			References	PI9/18	The materials or sources of information used to elicit further information regarding a subject matter.	C3	A4	

		Entrepreneurial Mind	Networking	PI9/19	Awareness to become an entrepreneur requires the following characteristics: Entrepreneurial relationship through the formation of a business circle, personal integrity, communication, and good offers.	C1	A2	
PO10	**Individual and Teamwork** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.	Self Confidence	Relationship building	PI10/1	The ability to build good relationship, interact with others and work effectively with them.		A4	P6
			Self-expression	PI10/2	The ability to express, explain the perception of others towards self, and receive or give praise and constructive feedback.		A4	P1
		Respect	Active Listening	PI10/3	The ability to practice active listening skills, provide feedback and communicate with others from different cultures.		A5	P4
			Respect for others	PI10/4	The ability to recognize and respect the attitude, behaviour, belief and the rights of other people.		A5	P7
		Social Communication	Interaction with others	PI10/5	The ability to converse and maintain interactions with others.		A2	P2
			Nurturing relationships	PI10/6	The ability to understand and interchange roles between team leader and team members.		A5	P7
		Self-Awareness	Emotion management	PI10/7	The ability to control emotions while socializing.		A3	P4
		Values and Attitudes	Independence	PI10/8	An attitude not to rely on others' help in order to perform a certain task.		A3	P4
			Volunteerism	PI10/9	An attitude of helping others and caring for the community wellbeing for the common good.		A3	P5
		Teamwork	Foster good relationship	PI10/10	Cooperate with others.		A4	P6
			Alternate roles	PI10/11	Able to play different roles for different situations.		A4	P6
			Respect and accept opinions	PI10/12	Able to honour and accept opinions of others.		A5	P5
PO11	**Lifelong Learning.** Recognise the need for and have the preparation and ability to engage in independent and life-long learning in	Autonomous Learning	Engagement	PI11/1	The degree of attention, curiosity, interest, optimism, and passion to heighten the learning process.	C2	A1	
			New Idea	PI11/2	To express ideas as a result of self-exploration.	C2	A1	

	the broadest context of technological change.	Autonomous Learning	Self-Learning	PI11/3	Self-directed learning that involves learners relate to new information, concepts, process.	C6	A5	
		Inquisitive Mind	Interest	PI11/4	Interest to heighten knowledge.	C3	A5	
			Initiative	PI11/5	Demonstrate the level of willingness to start and complete a task.	C3	A5	
			Effort	PI11/6	To show effort to investigate or search for information.	C4	A3	
		Entrepreneurial Mind	Vision	PI11/7	Innovative vision for solving real world problems.	C1	A2	
			Passionate	PI11/8	Excitement or liking when performing entrepreneurial activities.	C3	A3	
		Entrepreneurial Skills	Entrepreneurial Opportunity	PI11/9	A process to find opportunities following a planned strategy as a result of creative consolidating process, generation of new ideas and innovation in the application of ideas into practice.	C3	A2	
			Entrepreneurial Experience	PI11/10	Learning through engagement in entrepreneurial activities.	C6	A4	
			Risk Tolerant	PI11/11	Attitude and readiness of an entrepreneur in the identification and confrontation of the risk.	C6	A4	
			Internal Locus of Control	PI11/12	Belief in the fundamental of success lies in self-employment and ability to manage one's life.	C6	A5	
			Achievement and Perseverance	PI11/13	Ability to put a higher target and has high endurance in facing challenges.	C2	A2	
PO12	**<u>Project Management and Finance.</u>** 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.	Leadership	Knowledge and skills in leadership	PI12/1	The knowledge and understanding of the fundamental concepts of leadership.	C1	A3	P1
			Effective leadership	PI12/2	The ability to lead self and/or others.	C3	A5	P5
		Managerial	Time Management	PI12/3	The process of planning and exercising conscious control over the amount of time spent on specific activities, especially to increase effectiveness, efficiency or productivity.	C3	A2	P1
			Decision making	PI12/4	The process resulting in the selection of a belief or a course of action among several alternative possibilities.	C6	A4	P5

			Organization of ideas	PI12/5	Present an idea completely in clear, cohesive and organized manner.	C3	A2	P5
			Delegation of work	PI12/6	Assignment of responsibility or authority to a group to carry out activities.	C4	A4	P6
			Motivation	PI12/7	Being self-motivated and encourage group members to complete every task and activity.	C6	A5	P7
		Entrepreneurial Skills	Financial Management	PI12/8	Ability to handle financial components and sources.	C5	A4	P1

Referring to EPAM2012, an engineering programme is expected to have a minimum of 120 credit hours of which 80 credit hours must be core engineering courses offered over a period of four years. As for MEP, it is expected to cover the broad areas of Mechanical Discipline at an appropriate level. In addition, Graduates Attributes and Professional Competencies document by International Engineering Alliance (IEA) outlined 12 Knowledge Profiles (WK) to be implemented to build an engineering programme. IEA also states that the engineering programme should also be developed towards building 12 attributes known as Graduate Attribute Profiles (WA).

Based on these requirements, the curriculum of MEP offered at MED is designed. Then, WK for each module are defined which indirectly specifies the WA attributes. This enables us to identify the POs for each course with relation to WA as shown in Table 3.4. Based on the new guidelines from IEA Graduates Attributes and Professional Competencies (21st June 2021), majority of POs are mapped accordingly to the WKs (Knowledge Profiles) and WAs (Graduate Attributes).

Table 3.4: Mapping of POs to WAs and WKs based on the latest IEA framework for Graduate Engineer (June 2021).

Program Outcomes (PO)	***Graduate Attribute Profiles***	***Knowledge Profiles (WK)***
PO1	WA1	WK1 to WK4
PO2	WA2	WK1 to WK4
PO3	WA3	WK5
PO4	WA4	WK8
PO5	WA5	WK2, WK6
PO6	WA6	WK1, WK5, WK7
PO7	-	-
PO8	WA7	WK9
PO9	WA9	-
PO10	WA8	WK9
PO11	WA11	WK8
PO12	WA10	-

The mapping of POs to other attributes based on Knowledge Profile (WK), Complex Problems Solving (WP) and Engineering Activities (EA) are also performed (Table 3.6). Each of these attributes are presented in Table 3.5a, Table 3.5b and Table 3.5c respectively.

Table 3.5a: Different attributes of Knowledge Profile (WKs).

No.	Knowledge Profile (WK)
1	A systematic, theory-based understanding of the **natural sciences** applicable to the discipline.
2	Conceptually based **mathematics**, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to the discipline.
3	A systematic, theory-based formulation of **engineering fundamentals** required in the engineering discipline.
4	Engineering **specialist knowledge** that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
5	Knowledge that supports **engineering design** in a practice area.
6	Knowledge of **engineering practice** (technology) in the practice areas in the engineering discipline.
7	**Comprehension** of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the professional responsibility of an engineer to public safety; the impacts of engineering activity: economic, social, cultural, environmental and sustainability.
8	Engagement with selected knowledge in the **research literature** of the discipline.
9	**Ethics, inclusive behaviour and conduct.** Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes

Table 3.5b: Different attributes of Complex Problem Solving (WPs).

No.	Attribute	**Complex problems** have characteristic WP1 and some or all of WP2 to WP7:
WP1	Depth of Knowledge Required	Cannot be resolved without in-depth engineering knowledge at the level of one or more of WK3, WK4, WK5, WK6 or WK8 which allows a fundamental-based, first principles analytical approach.
WP2	Range of conflicting requirements	Involve wide-ranging or conflicting technical, engineering and other issues.
WP3	Depth of analysis required	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models.
WP4	Familiarity of issues	Involve infrequently encountered issues.
WP5	Extent of applicable codes	Are outside problems encompassed by standards and codes of practice for professional engineering.
WP6	Extent of stakeholder involvement and level of conflicting requirements	Involve diverse groups of stakeholders with widely varying needs.
WP7	Interdependence	Are high level problems including many component parts or sub problems.

Table 3.5c: Engineering Activities (EA) and its attributions.

No.	Attribute	**Complex activities** mean engineering activities or projects that have some or all of the following characteristics:
EA1	Range of resources	Involve the use of diverse resources (and for this purpose resources includes people, money, equipment, materials, information and technologies).
EA2	Level of interactions	Require resolution of significant problems arising from interactions between wide ranging or conflicting technical, engineering or other issues.
EA3	Innovation	Involve creative use of engineering principles and research-based knowledge in novel.
EA4	Consequences to society and the environment	Have significant consequences in a range of contexts, characterised by difficulty of prediction and mitigation.
EA5	Familiarity	Can extend beyond previous experiences by applying principles-based approaches.

Table 3.6: The mapping between POs to WKs, WPs and EAs.

PO	WK									WP							EA				
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	1	2	3	4	5
1	✓	✓	✓	✓						✓							✓				
2	✓	✓	✓	✓						✓							✓				
3					✓						✓								✓		
4								✓				✓							✓		
5		✓				✓							✓						✓		
6	✓				✓		✓						✓				✓				✓
7																				✓	
8									✓					✓						✓	
9																✓		✓			
10									✓						✓					✓	
11								✓					✓								✓
12																✓	✓				

Based on these strategies, the courses mapping to POs matrix has been established as shown in Table 3.7. In this table, it clearly elucidates on how the POs mapped to all courses are either only for delivery or also accessed for PO attainment. The values shown is the weightage contribution of each module specifically for Academic Year 2021/2022. Eventually from this mapping, the courses relevant to each POs can be clearly established as shown in Table 3.8. Moreover, these courses relation to each POs are defined with specific indication to either if it is a core or an elective course. In summary, all 12 POs are assessed by at least three core courses for MEP. It is noteworthy that the PO assessment plan is established only for courses offered by MED.

Table 3.7: Modules to POs Matrix for MEP.

Course Code	Course Name	Owner	Year and Semester (Y_S_)	Programme Outcomes (POs)											
				PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BGS1001	Engineering Mathematics I	MED	Y1S1	1.00											
BME1001	Engineering Statics	MED	Y1S1	0.33	0.33		0.33								
BME1002	Introduction to Electrical and Electronic Engineering	MED	Y1S1	0.50	0.50										
BME1003	Engineering Drawing	MED	Y1S1			0.50		0.50							
BGS1002	Engineering Mathematics II	MED	Y1S2	0.50	0.50										
BME1004	Engineering Materials I	MED	Y1S2	0.50			0.50								
BME1005	Engineering Dynamics	MED	Y1S2		0.25	0.25						0.25	0.25		
BME1006	Machine Drawing	MED	Y1S2			0.33		0.33					0.33		
BGS1003	Engineering Practice and Communication Skills	MED	Y1S2				0.25		0.25			0.25	0.25		
BGS2001	Engineering Mathematics III	MED	Y2S1		1.00										
BGS2002	Programming for Engineers	MED	Y2S1	0.33		0.33		0.33							
BME2001	Fluid Mechanics I	MED	Y2S1	0.33		0.33	0.33								
BME2002	Thermodynamics I	MED	Y2S1	0.50	0.50										
BME2003	Solid Mechanics I	MED	Y2S1	0.25	0.25		0.25	0.25							
BME2004	Solid Mechanics II	MED	Y2S2	0.33	0.33	0.33									
BME2005	Thermodynamics II	MED	Y2S2	0.25	0.25		0.25			0.25					
BME2006	Fluid Mechanics II	MED	Y2S2	0.33	0.33			0.33							
BME2007	Introduction to Microprocessor	MED	Y2S2	0.33		0.33	0.33								
BME2008	Engineering Materials II	MED	Y2S2	0.33	0.33		0.33								
BME3001	Machine Component Design I	MED	Y3S1	0.20	0.20	0.20	0.20					0.20			
BME3002	Heat Transfer	MED	Y3S1		0.25	0.25		0.25		0.25					
BME3003	Instrumentation and Measurement	MED	Y3S1	0.25	0.25	0.25	0.25								
BME3004	Manufacturing Processes	MED	Y3S1	0.33				0.33					0.33		
BGS3001	Engineering Economics	MED	Y3S1												1.00
BME3101	Integrated Design Project	MED	Y3S1S2			0.20						0.20	0.20	0.20	0.20

BME3005	Machine Component Design II	MED	Y3S2			0.25	0.25					0.25		0.25	
BME3006	Control Systems	EED	Y3S2	0.14	0.14	0.14		0.14				0.14	0.14	0.14	
BGS3002	Numerical Analysis and Statistics	MED	Y3S2	0.50	0.50										
BME3007	Electrical Power and Machines	MED	Y3S2	0.50			0.50								
BME3102	Industrial Training	MED							0.25		0.25	0.25		0.25	
BME4101	Final Year Project	MED	Y4S1S2			0.20	0.20	0.20				0.20		0.20	
BME4001	Operations and Quality Management	MED	Y4S1						0.33		0.33				0.33
BME4002	Sustainable Energy Systems	MED	Y4S1		0.33					0.33		0.33			
BME4003	Mechanical Vibration	MED	Y4S1		0.33		0.33	0.33							
BGS4001	Professional Practice	MED	Y4S2						0.33		0.33			0.33	
BGS4002	Project Management and Product Development	MED	Y4S2						0.33		0.33				0.33
BGS4003	Entrepreneurship	MED	Y4S2									0.33		0.33	0.33
	Elective														
BME4004	*Finite Element Method*	MED	Y4S1S2		0.25	0.25	0.25	0.25							
BME4005	*Hydraulics and Pneumatics*	MED	Y4S1S2		0.25	0.25	0.25	0.25							
BME4006	*Ergonomics*	MED	Y4S1S2		0.25	0.25	0.25	0.25							
BME4007	*Air Conditioning and Refrigeration*	MED	Y4S1S2		0.25	0.25	0.25	0.25							
BME4008	*Manufacturing Systems*	MED	Y4S1S2		0.25	0.25	0.25	0.25							
BME4009	*Engineering Tribology*	MED	Y4S1S2		0.25	0.25	0.25	0.25							

Table 3.8: POs assessment plan.

Programme Outcomes		Strategies (where students learn, practice and demonstrate)		Target performance
		Core	Elective	
PO1	**Engineering Knowledge** Apply knowledge of mathematics, science, and engineering fundamentals to the solution of complex engineering problems.	BGS1001, BME1001, BME1002, BGS1002, BME1004, BGS2002, BME2001, BME2002, BME2003, BME2004, BME2005, BME2006, BME2007, BME2008, BME3001, BME3003, BME3004, BME3006, BGS3002, BME3007		60% of student in the class achieving 50% marks or better.
PO2	**Problem Analysis** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.	BME1001, BME1002, BGS1002, BME1005, BGS2001, BME2002, BME2003, BME2004, BME2005, BME2006, BME2007, BME2008, BME3001, BME3002, BME3003, BME3006, BGS3002, BME4002, BME4003	BME4004, BME4005, BME4006, BME4007, BME4008, BME4009	
PO3	**Design / Development of Solutions** Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.	BME1003, BME1005, BME1006, BGS2002, BME2001, BME2004, BME3001, BME3002, BME3003, BME3101, BME3005, BME3006, BME4101	BME4004, BME4005, BME4006, BME4007, BME4008, BME4009	
PO4	**Investigation** 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.	BME1001, BME1004, BGS1003, BME2001, BME2003, BME2005, BME2007, BME2008, BME3001, BME3003, BME3005, BME3007, BME4101, BME4003	BME4004, BME4005, BME4006, BME4007, BME4008, BME4009	
PO5	**Modern Tool Usage** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations.	BME1003, BME1006, BGS2002, BME2003, BME2006, BME3002, BME3004, BME3006, BME4101, BME4003	BME4004, BME4005, BME4006, BME4007, BME4008, BME4009	

PO6	**The Engineer and Society** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.	BGS1003, BME3102, BME4001, BGS4001, BGS4002		
PO7	**Environment and Sustainability** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.	BME2005, BME3002, BME4002		
PO8	**Ethics** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.	BME3102, BME4001, BGS4001, BGS4002		
PO9	**Communication** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	BME1005, BGS1003, BME3001, BME3101, BME3005, BME3006, BME3102, BME4101, BME4002, BGS4003		
PO10	**Individual and Teamwork** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.	BME1005, BME1006, BGS1003, BME3004, BME3101, BME3006		
PO11	**Lifelong Learning** 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.	BME3101, BME3005, BME3006, BME3102, BME4101, BGS4001, BGS4003		

PO12	**Project Management and Finance** 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.	BGS3001, BME3101, BME4001, BGS4002, BGS4003		

3.4 Process of Establishing and Reviewing POs.

Current POs established for MEP are the result of a review process made based on the revised POs outlined by EPAM2012. It has been endorsed in the Senate Meeting on the 7th November 2017. A detail flow process used at MED to review the POs has been summarized in Figure 3.1. This figure clearly shows the extent of stakeholder's involvement throughout the process where inputs from them are attained through survey and meeting.

The process begins with inputs from accreditation recommendation, assessment and evaluation findings as well as inputs from various stakeholders (i.e., Industries / Employers, Parents and Government Policy) and documentation (i.e., EAC Manual, IEA Manual, FCUC and FEC Vision & Mission and PEO Statement). Upon concern raised for improvisation of POs, MED Board reviews the new POs proposed by Outcome Based Education (OBE) committee. Upon agreement, these POs will then be presented to stakeholders (i.e., during ICAP meeting). Once a mutual agreement between the stakeholders and MED has been achieved, MED Board proceeds to endorse the new POs. Soon after, the new POs will be updated and published in various locations mentioned earlier.

The measurement of POs attainment comprises direct and indirect methods. The Course Outcomes (COs) is used as direct assessment to measure the POs because there is a direct relationship between the POs and the COs through the mapping matrix. Therefore, the achievement of the COs for the selected modules in the MEP is collectively used to measure the attainment of POs.

It should be noted that the POs is essentially the expected outcome of the students "upon graduation" rather than "throughout their study". Therefore, it would be more reliable to evaluate the POs attainment at the higher level of their study, i.e., Year 3 and Year 4. For the evaluation of POs attainment, a number of core modules were selected in Year 3 and Year 4, whereby the selected modules are focused on the particular POs.

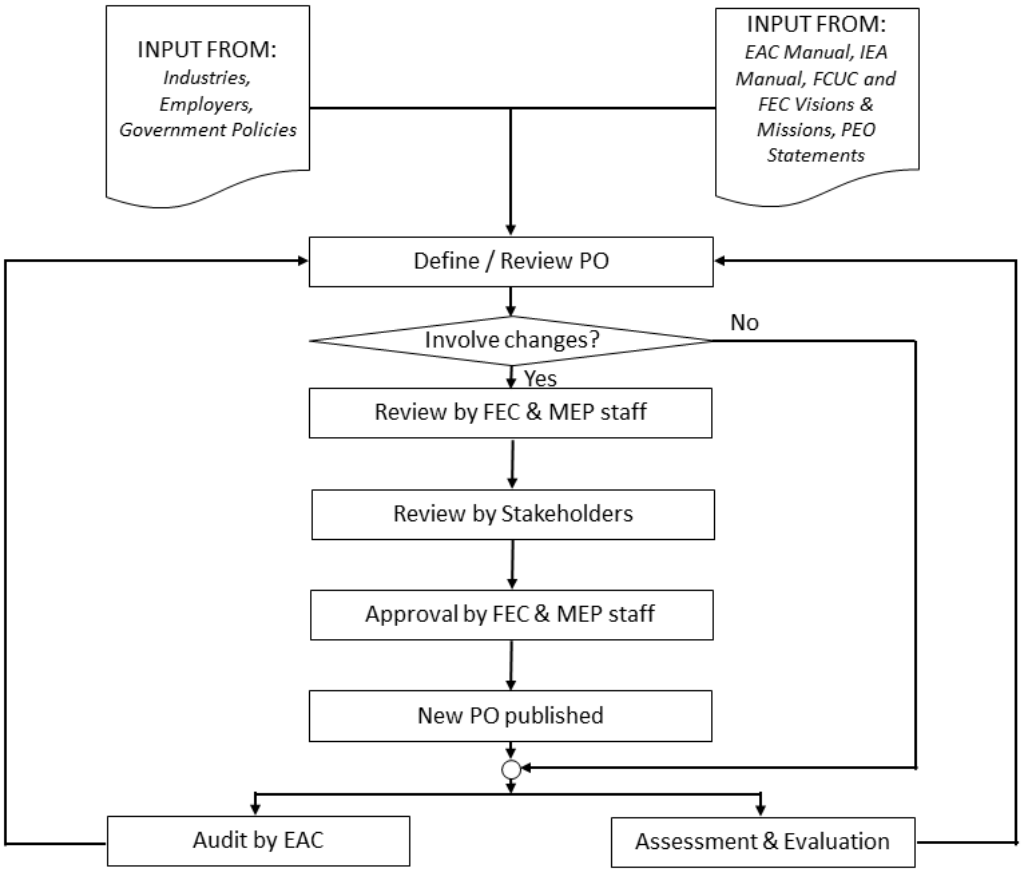


Figure 3.1: General Establishment and Review Process for POs.

Besides, the indirect assessment method can also be used to measure the achievement of POs:

(i) Feedback from students upon the completion of the programme via survey through the Exit Survey.
(ii) Feedback from industry to evaluate the students' performance through the internship companies via survey.
(iii) Feedback from external examiner and IAP based on the results obtained from (i) and (ii).

The results collected from the above will be analysed and evaluated during the PRDC meeting.

The review of the POs is tied to the achievements of PEOs. The POs will be reviewed only after the measurement of PEOs is conducted, or it is found that the POs are unable to prepare the students to achieve the PEOs.

The Figures 3.2 below represent the total number of each PO from all modules in MEP. The count for first four POs (PO1, PO2, PO3 and PO4) are 20 and above. This represents 20 or more modules covered the first four POs. The remaining POs shares the same

analogy of the results. As for Figure 3.3, the pie chart presents the same information of Figure 3.2 but in terms of percentage. The Table 3.8 presents a detailed information about each modules' POs.

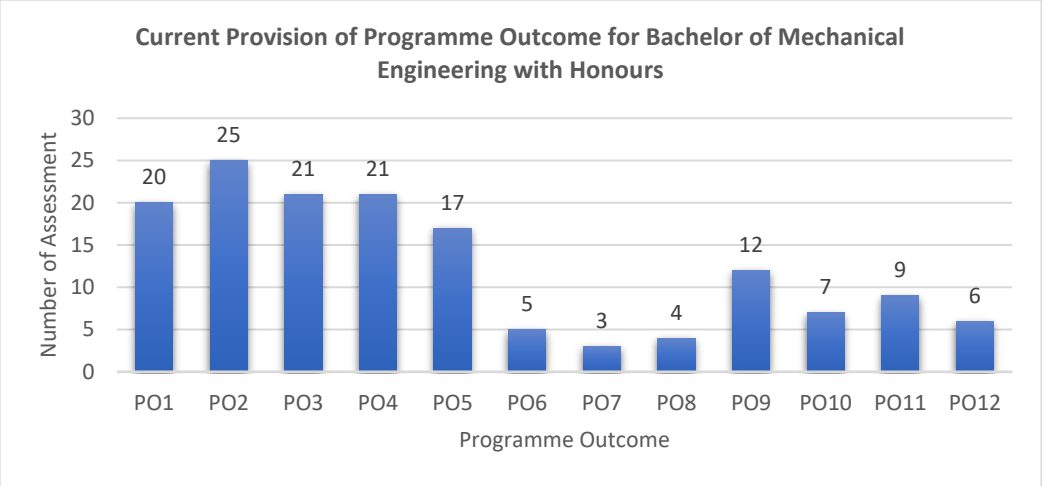


Figure 3.2: The total number of each PO from all modules.

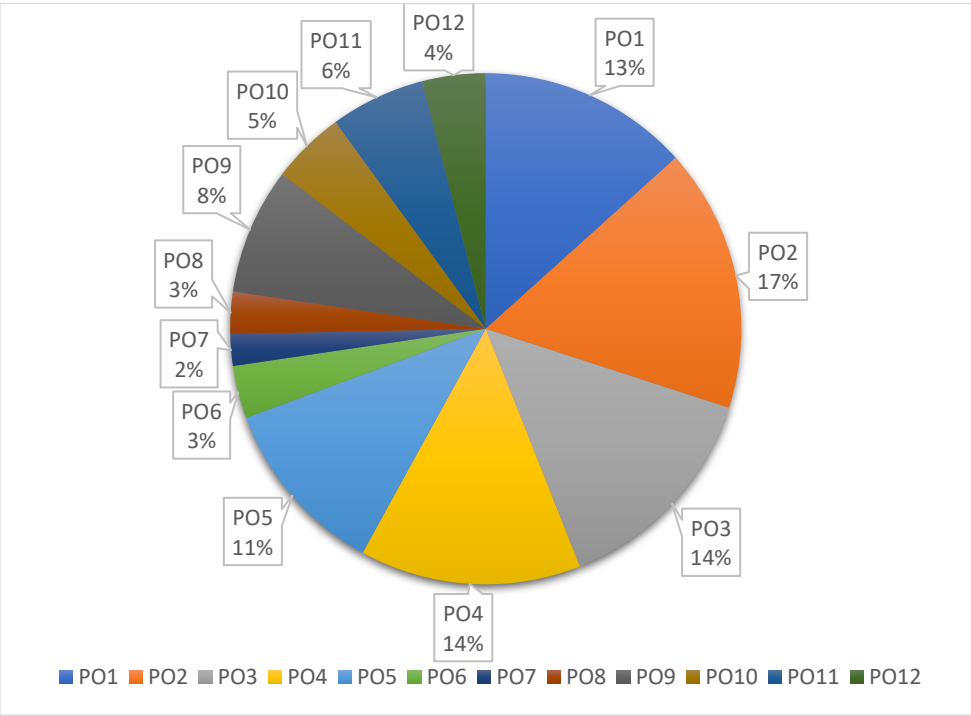


Figure 3.3: The PO percentage distribution of all modules.

3.5 Describe the data gathered and explain the results of the assessment.

All existing curriculums will be required to undergo regular review to monitor the health of the programme, standard and quality of the programme and review the relevance to industry requirements through the feedback obtained from the stakeholders. All evidence materials will be available during the full accreditation exercise as these data will only be available after the programme has completed its first cycle (upon completion of first cohort of students).

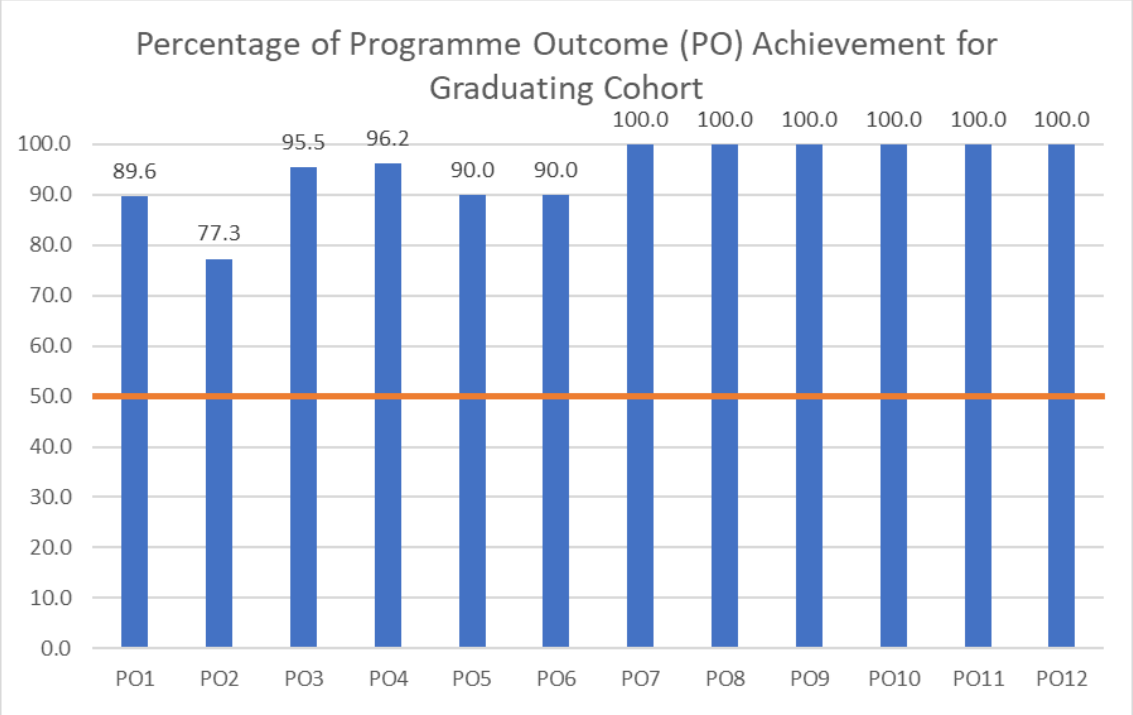


Figure 3.4: The POs achievement for graduating cohort.

The Figure 3.4 represents the POs achievement of the MEP for current graduating cohort. The modules ranged from Semester 1 and 2 of Year 1 to Year 4. The POs achievement is satisfactory as all POs passed the 50% threshold. The modules included in this sample are Engineering Mathematics I (BGS1001), Engineering Statics (BME1001), Introduction to Electrical and Electronic Engineering (BME1002), Engineering Drawing (BME1003), Engineering Mathematics II (BGS1002), Engineering Practice and Communication Skills (BGS1003), Engineering Materials I (BME1004), Engineering Dynamics (BME1005), Machine Drawing (BME1006), Engineering Mathematics III (BGS2001), Programming for Engineers (BEE2009), Fluid Mechanics I (BME2001), Thermodynamics I (BME2002), Solid Mechanics I (BME2003), Solid Mechanics II (BME2004), Thermodynamics II (BME2005), Fluid Mechanics II (BME2006), Introduction to Microprocessor (BME2007), Instrumentation and Measurement (BEE2005), Mechanical Engineering Design I (BME3001), Heat Transfer (BME3002), Engineering Materials II (BME3008), Manufacturing Processes (BME3004), Engineering Economics (BGS3001), Integrated Design Project (Part I & II) (BME3101), Mechanical Engineering Design II (BME3005), Control Systems (BEE3005), Numerical

Analysis and Statistics (BGS3002), Electrical Power and Machines (BME3007), Industrial Training (BME3102), Operations and Quality Management (BME4001), Sustainable Energy System (BME4002), Mechanical Vibration (BME4003), Professional Practice (BGS4001), Project Management and Product Development (BGS4002), Entrepreneurship (BGS4003), Finite Element Method (BME4004), Hydraulics and Pneumatics (BME4005), Air Conditioning and Refrigeration (BME4007) and Final Year Project (BME4101).

The subsequent Figure 3.5 is the PO achievement for current cohort students in Year 2.

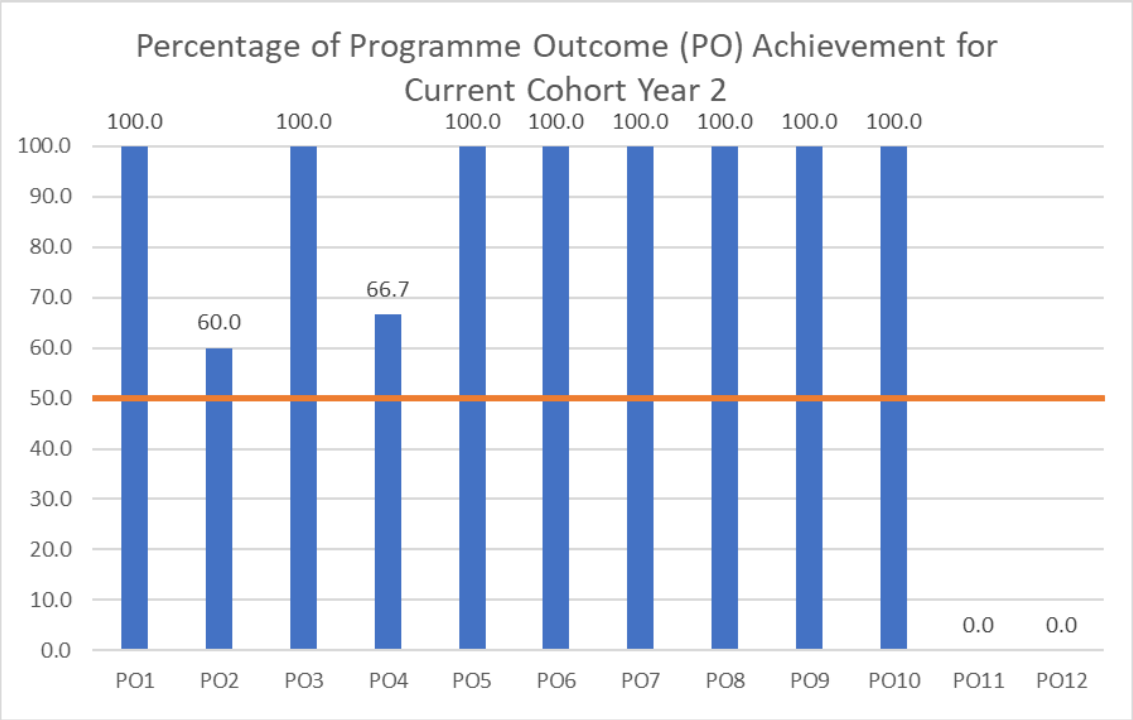


Figure 3.5: The POs achievement for current cohort in Year 2.

The modules covered in this sample coincidentally do not have PO11 and PO12. The modules assessed are Engineering Mathematics I (BGS1001), Engineering Statics (BME1001), Introduction to Electrical and Electronic (BME1002), Engineering Drawing (BME1003), Engineering Mathematics II (BGS1002), Engineering Practice and Communication Skills (BGS1003), Engineering Materials (BME1004),Engineering Dynamics (BME1005), Machine Drawing (BME1006), Engineering Mathematics III (BGS2001), Solid mechanics II (BME2004), and Fluid Mechanics II (BME2006) Nevertheless, the POs achievement still passed the 50% threshold.

3.6 Explain how the assessment results are applied to further develop and improve the programme.

The review process takes place in the PRDC. Feedback from various stakeholders such as students, staff, evaluation of students' performance in assessment, external examiner and IEAP will be taken into consideration by the PRDC to put forward recommendation that are appropriate for the programme. Proposed changes by the PRDC will then be forwarded to the Senate for approval and adoption.

3.7 Describe the materials, including student work and other tangible materials that demonstrate achievement of the POs.

The mapping of subjects to programme outcomes is carried out based on the collective ideas of academic staff in the FEC. This is to ensure that the entire MEP cover the POs in an appropriate manner. Detailed mapping for each course is available in Table 3.9.

The curriculum in the MEP has been structured to support the POs. The method to measure the extent of this achievement is through COs achievement. The detail measurement and all evidence materials will be shown during EAC accreditation visit.

Table 3.9: Course mapping of PO with Knowledge Profile (WK), Complex Problems Solving (WP) and Engineering Activities (EA).

Course Code	Course Name	Programme Outcomes (POs)												Knowledge Profile (WK)									Complex Problems Solving (WP)							Engineering Activities (EA)				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WP1	WP2	WP3	WP4	WP5	WP6	WP7	EA1	EA2	EA3	EA4	EA5
BGS1001	Engineering Mathematics I	✓												✓	✓	✓	✓						✓											
BME1001	Engineering Statics	✓	✓		✓									✓	✓	✓	✓				✓		✓	✓						✓		✓		
BME1002	Introduction to Electrical and Electronic Engineering	✓	✓											✓	✓	✓	✓						✓							✓				
BME1003	Engineering Drawing			✓		✓												✓	✓					✓		✓						✓		
BGS1002	Engineering Mathematics II	✓	✓											✓	✓	✓	✓						✓											
BME1004	Engineering Materials I	✓			✓									✓	✓	✓	✓				✓		✓		✓					✓		✓		
BME1005	Engineering Dynamics		✓	✓						✓	✓			✓	✓	✓	✓	✓				✓	✓	✓				✓	✓	✓	✓	✓	✓	
BME1006	Machine Drawing			✓		✓					✓							✓	✓			✓		✓		✓		✓				✓	✓	
BGS1003	Engineering Practice and Communication Skills				✓		✓			✓	✓									✓	✓	✓			✓	✓		✓	✓	✓		✓	✓	✓
BGS2001	Engineering Mathematics III		✓											✓	✓	✓	✓						✓											
BGS2002	Programming for Engineers	✓		✓		✓								✓	✓	✓	✓	✓	✓				✓	✓		✓				✓		✓		
BME2001	Fluid Mechanics I	✓	✓		✓									✓	✓		✓				✓		✓		✓					✓		✓		
BME2002	Thermodynamics I	✓	✓											✓	✓	✓	✓						✓							✓				
BME2003	Solid Mechanics I	✓	✓		✓	✓								✓	✓	✓	✓		✓		✓		✓		✓	✓				✓		✓		
BME2004	Solid Mechanics II	✓	✓	✓										✓	✓	✓	✓	✓					✓	✓						✓		✓		
BME2005	Thermodynamics II	✓	✓		✓			✓						✓	✓		✓		✓				✓		✓					✓		✓	✓	
BME2006	Fluid Mechanics II	✓	✓			✓								✓	✓	✓	✓		✓				✓			✓				✓		✓		
BME2007	Introduction to Microprocessor	✓		✓	✓									✓	✓	✓	✓	✓			✓		✓	✓	✓					✓		✓		
BME2008	Engineering Materials II	✓	✓		✓									✓	✓	✓	✓				✓		✓		✓					✓		✓		
BME3001	Machine Component Design I	✓	✓	✓	✓					✓				✓	✓	✓	✓	✓			✓		✓	✓	✓				✓	✓		✓	✓	
BME3002	Heat Transfer		✓	✓		✓		✓							✓	✓		✓	✓				✓	✓		✓				✓		✓	✓	
BME3003	Instrumentation and Measurement	✓	✓	✓	✓									✓	✓	✓	✓	✓			✓		✓	✓	✓					✓		✓		
BME3004	Manufacturing Processes	✓				✓					✓			✓	✓	✓	✓		✓			✓	✓			✓		✓		✓		✓	✓	

BGS3001	**Engineering Economics**											✓																	✓				
BME3101	**Integrated Design Project**			✓						✓	✓	✓	✓					✓				✓		✓		✓		✓	✓	✓	✓	✓	✓	✓
BME3005	**Machine Component Design II**			✓	✓					✓		✓						✓				✓	✓	✓				✓		✓	✓		✓
BME3006	**Control Systems**	✓	✓	✓		✓				✓	✓	✓		✓	✓	✓	✓	✓	✓			✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓
BGS3002	**Numerical Analysis and Statistics**	✓	✓											✓	✓	✓	✓						✓											
BME3007	**Electrical Power and Machines**	✓			✓									✓	✓	✓	✓				✓		✓		✓					✓		✓		
BME3102	**Industrial Training**						✓		✓	✓		✓								✓		✓				✓	✓			✓	✓		✓	✓
BME4101	**Final Year Project**			✓	✓	✓				✓		✓						✓	✓		✓			✓	✓	✓			✓		✓	✓		✓
BME4001	**Operations and Quality Management**						✓		✓				✓							✓		✓				✓	✓		✓	✓			✓	✓
BME4002	**Sustainable Energy Systems**		✓					✓		✓				✓	✓	✓	✓			✓			✓						✓	✓	✓		✓	
BME4003	**Mechanical Vibration**		✓		✓	✓								✓	✓	✓	✓		✓		✓		✓		✓	✓				✓		✓		
BGS4001	**Professional Practice**						✓		✓			✓								✓		✓				✓	✓			✓			✓	✓
BGS4002	**Project Management and Product Development**						✓		✓				✓							✓		✓				✓	✓		✓	✓			✓	✓
BGS4003	**Entrepreneurship**									✓		✓	✓													✓			✓	✓	✓			✓
	Elective																																	
BME4004	***Finite Element Method***		✓	✓	✓	✓								✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓				✓		✓		
BME4005	***Hydraulics and Pneumatics***		✓	✓	✓	✓								✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓				✓		✓		
BME4006	***Ergonomics***		✓	✓	✓	✓								✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓				✓		✓		
BME4007	***Air Conditioning and Refrigeration***		✓	✓	✓	✓								✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓				✓		✓		
BME4008	***Manufacturing Systems***		✓	✓	✓	✓								✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓				✓		✓		
BME4009	***Engineering Tribology***		✓	✓	✓	✓								✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓				✓		✓		

3.8 POs Delivery and Assessment Process.

In order to ensure successful execution of the POs Delivery and Assessment Plan outlined in Table 3.8, both course and programme level delivery and assessment plan is crucial. The process begins with Programme Level Delivery and Assessment done; 2 weeks before each academic calendar year as shown in Table 3.10 below. This process of planning the curriculum mainly done by the Programme Coordinator. This Programme Level Delivery and Assessment Process includes reviewing the plan, evaluating PO's attainment, and finally presenting and verifying POs attainment at Programme CQI Meeting for further CQI action if necessary.

Table 3.10: Programme Level Delivery and Assessment Process of MEP (Academic Year Cycle).

No.	Delivery and Assessment Process	Timeline	Person In Charged
1	Identify previous CQI plan if available.	2 weeks before new academic session.	Programme Coordinator.
2	Review Programme Assessment Plan (Refer Table 3.8).	2 weeks before new academic session.	Programme Coordinator.
3	Evaluate PO attainment using data obtained at Course Level.	2 weeks before new academic session.	Programme Coordinator.
4	Prepare Programme Analysis Document.	Before CQI Meeting.	Programme Coordinator.
5	Present PO attainment in CQI meeting.	During CQI Meeting.	Module Coordinator.
6	Identify CQI if required.	During CQI Meeting.	Module Coordinator.
7	Prepare Programme Analysis Document.	Immediately After CQI Meeting.	Programme Coordinator.
8	Verify Programme Analysis Document.	Immediately After CQI Meeting.	Dean.
9	Update documentation in Programme File and Relevant Course File.	Immediately After CQI Meeting.	Administrative Staff.

As for the course level delivery and assessment, the process will be repeated each time the course is offered. The detail steps of the process together with its schedule for Course Level Delivery and Assessment is illustrated in Table 3.11. Instead of Programme Coordinator, this process of planning the course structure is mainly done by the Course Coordinator. This Course Level Delivery and Assessment Process includes reviewing the plan, collecting data for CO and PO attainment, evaluating CO's attainment, and finally preparing, presenting and verifying COs attainment at Course CQI Meeting.

3.9 Individual Students' POs Attainment.

In this section, the steps taken to determine the individual students' POs attainment upon completing their studies are illustrated. The Figure 3.6 illustrate the framework on how data from each assessment of each module are used to determine the POs attainment. There can be a variety of assessment method, and each assessment is explicitly mapped to POs. An example of the assessments to POs mapping for Heat Transfer (BME3002) module is given in Table 3.12.

Table 3.11: Module Level Delivery and Assessment Process of AEP (Semester Cycle).

No.	Delivery and Assessment Process	Timeline	Person In Charged
1	Identify previous CQI plan if available.	End of Semester.	Module Coordinator.
2	Develop/review the Course Structure.	End of Semester.	Module Coordinator.
3	Develop/review the Delivery & Assessment Plan.	End of Semester.	Module Coordinator.
4	Collect data for CO/PO attainment.	During semester.	Module Coordinator.
5	Evaluate CO attainment.	End of semester.	Programme Coordinator.
6	Prepare Course Analysis Document.	End of semester.	Programme Coordinator.
7	Identify CQI if required.	End of semester.	Module Coordinator.
8	Complete Course Analysis.	End of semester.	Module Coordinator.
9	Present CO attainment in CQI meeting.	End of semester.	Module Coordinator.
10	Endorse Course Analysis.	End of semester.	Programme Coordinator.
11	Approve Course Analysis.	End of semester.	Dean.
12	Update documentation in Course File.	End of semester.	Administrative Staff.

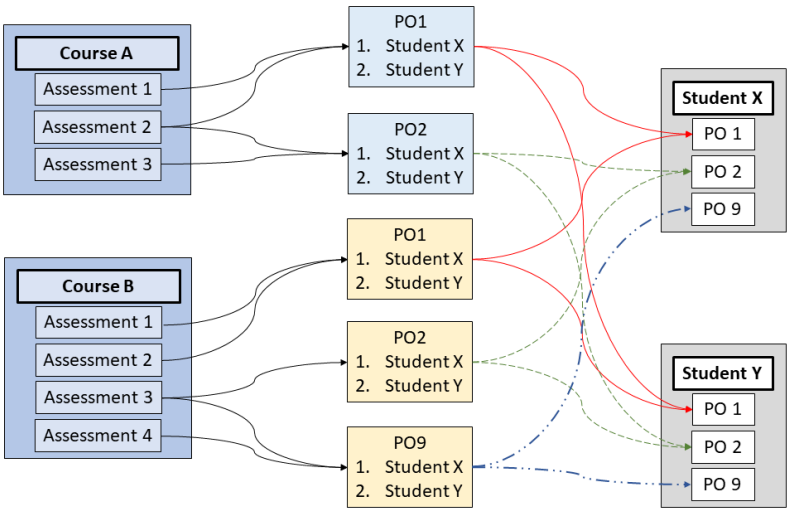


Figure 3.6: Framework for Individual Students' POs Attainment.

Table 3.12: Delivery and Assessment Plan for Heat Transfer (BME3002).

Assessment Method		Question	Weightage (%)	PO#	PI#
CW (Coursework, total of 30 % of the module)	Quiz	1	0.5	PO1	PI 1/3
		2	0.5	PO1	PI 1/3
		3	0.5	PO1	PI 1/3
		4	0.5	PO1	PI 1/3
		5	0.5	PO1	PI 1/3
		6	0.5	PO1	PI 1/3
		7	0.5	PO1	PI 1/3
		8	0.5	PO1	PI 1/3
		9	0.5	PO3	PI 3/3
		10	0.5	PO7	PI 7/5
	Test 1	1	2.5	PO1	PI 1/3
		2	2.5	PO1	PI 1/3
	Test 2	1	2.5	PO1	PI 1/3
		2	2.5	PO1	PI 1/3
	Assignment	1	0.65	PO1	PI 1/3
		2	0.65	PO1	PI 1/3
		3	1.04	PO1	PI 1/3
		4	1.04	PO1	PI 1/3
		5	1.62	PO3	PI 3/3
	Project	1	0.5	PO1	PI 1/3
		2	0.5	PO1	PI 1/3
		3	2	PO3	PI 3/2
		4	3	PO3	PI 3/3
		5	3	PO3	PI 3/3
		6	1	PO7	PI 7/6
EW (Final Exam, total of 70% of the module)	Question 1	(a)	2.1	PO1	PI 1/3
		(b)	15.4		PI 1/3
	Question 2	(a)	7.7	PO1	PI 1/3
		(b)	9.8		PI 1/3
	Question 3	(a)	11.9	PO1	PI 1/3
		(b)	5.6		PI 1/3
	Question 4	(a)	2.1	PO3	PI 3/3
		(b)	8.4		PI 3/3
		(c)	7		PI 3/3
	Question 5	(a)	2.1	PO3	PI 3/3
		(b)	15.4		PI 3/3

Once the course plan executed, results data will be collected and analysed in respective to POs. The Table 3.13 shows the example of tabulated marks for each assessment that are mapped to the respective POs for Heat Transfer (BME3002) module for a single student. The PO Weightage stated in this table are equivalent to 1 to denote 100% and each PO attainment is calculated using Eq. (3.1). This calculation proses is applied to each student who enrolled for module BME3002. Note that the CO attainment is also calculated using the same procedure.

$$PO_i = \frac{\sum_{j=1}^{n} w_{A_j}\left(\frac{m_j}{f_j}\right)}{\sum_{j=1}^{n} w_{A_j}} \times 100 \qquad (3.1)$$

Then, the calculation of POs attainment will continue to include for all the courses taken. The Table 3.14 shows the example of tabulated POs attainment of few courses taken by a particular student. Here, to determine the cumulative POs attainment for an individual student, a similar process of student's cumulative grade point average (CGPA) has been adopted. Hence, the attainment for individual student's cumulative POs attainment will take into account each course credit value as weightage (i.e., the values shown in bracket within Table 3.14). In summary, the formulation to determine the cumulative PO attainment is given in Eq. (3.2).

$$PO_{Total} = \frac{\sum_{j=1}^{n} w_{PO_j} POi_j}{\sum_{j=1}^{n} w_{PO_j}} \times 100 \qquad (3.2)$$

Table 3.13: PO Attainment Calculation of a student for Heat Transfer (BME3002).

PO_i	j	Assessment Method [Question]	Assessment Weightage (%), w_{Aj}	Full Marks, f_j	Marks, m_j	m_j/f_j	$w_{Aj}*(m_j/f_j)$	PO Weightage	PO Marks (%)
PO1	1	Quiz [1]	0.5	0.5	0.5	1.00	0.50	0.7088	92.68
	2	Quiz [2]	0.5	0.5	0.5	1.00	0.50		
	3	Quiz [3]	0.5	0.5	0.5	1.00	0.50		
	4	Quiz [4]	0.5	0.5	0.5	1.00	0.50		
	5	Quiz [5]	0.5	0.5	0.5	1.00	0.50		
	6	Quiz [6]	0.5	0.5	0.5	1.00	0.50		
	7	Quiz [7]	0.5	0.5	0.5	1.00	0.50		
	8	Quiz [8]	0.5	0.5	0.5	1.00	0.50		
	9	Test 1(a)	2.5	10	10	1.00	2.50		
	10	Test 1(b)	2.5	10	9	0.90	2.25		
	11	Test 2(a)	2.5	10	10	1.00	2.50		
	12	Test 2(b)	2.5	10	9.5	0.95	2.38		
	13	Assignment (1)	0.65	10	7.5	0.75	0.49		
	14	Assignment (2)	0.65	10	10	1.00	0.65		
	15	Assignment (3)	1.04	16	16	1.00	1.04		
	16	Assignment (4)	1.04	16	16	1.00	1.04		
	17	Project (1)	0.5	5	4	0.80	0.40		
	18	Project (2)	0.5	5	5	1.00	0.50		
	19	Exam (1(a))	2.1	3	3	1.00	2.10		
	20	Exam (1(b))	15.4	22	22	1.00	15.40		
	21	Exam (2(a))	7.7	11	11	1.00	7.70		
	22	Exam (2(b))	9.8	14	10.5	0.75	7.35		
	23	Exam (3(a))	11.9	17	16	0.94	11.20		
	24	Exam (3(b))	5.6	8	6	0.75	4.20		
PO3	1	Quiz [9]	0.5	0.5	0.5	1.00	0.50	0.2762	89.76
	2	Assignment (5)	1.62	25	23	0.92	1.49		
	3	Project (3)	2	20	15	0.75	1.50		
	4	Project (4)	3	30	20	0.67	2.00		
	5	Project (5)	3	30	18	0.60	1.80		
	6	Exam (4(a))	2.1	3	3	1.00	2.10		
	7	Exam (4(b))	8.4	12	12	1.00	8.40		
	8	Exam (4(c))	7	10	10	1.00	7.00		
	9	Exam (5(a))	2.1	3	0	0.00	0.00		
	10	Exam (5(b))	15.4	22	0	0.00	0.00		
PO7	1	Quiz [10]	0.5	0.5	0.5	1.00	0.50	0.015	73.33
	2	Project (6)	1	10	6	0.60	0.60		

Table 3.14: Cumulative POs attainment of a few courses taken by a graduating student.

Course Code	Course	j	Credit	Marks for POs (%) (W_{PO} x c)											
				PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BNE1005	Engineering Dynamics	1	3.0	69.7 (1.5)			64.0 (1.5)								
BME2005	Thermodynamics II	2	3.0	92.3 (1.5)			96.5 (1.5)								
BME2006	Fluid Mechanics II	3	3.0	72.1 (1.5)				70.0 (1.5)							
BME3002	Heat Transfer	4	3.0	90.3 (1.0)		55.5 (1.0)				73.3 (1.0)					
BME3005	Mechanical Engineering Design II	5	3.0			87.2 (1.5)	91.1 (1.5)								
BME4002	Sustainable Energy System	6	3.0							81.6 (3.0)					
BME4007	Air Conditioning and Refrigeration	7	3.0		51.0 (1.0)	61.0 (1.0)		90.0 (1.0)							
PO Attainment (%)				81.1	51.0	67.9	83.9	80.0		77.4					

3.10 PO Achievement for Individual Graduating Student.

The cumulative PO attainment calculation mentioned in Section 3.9 is applied on every student of each cohort. Their cumulative PO attainment is progressively monitored for every academic year to ensure that upon graduation all POs have been achieved. A passing mark for PO has been defined as 40 which is equivalent to the FCUC passing mark.

3.11 Programme Performance.

The performance target for all POs have been set to 60% of student population attains 40 marks and above. Referring to Table 3.8, courses that assessing each PO has been established. Each PO are considered achieved if either one of the courses assessing it has achieved the performance target. Nevertheless, the achievement of all courses for each PO are monitored for CQI purpose. In terms of cohort achievement, each PO is considered achieved if 60% of students' population passed the respective cumulative PO attainment.

3.12 PO Results for First Graduating Cohort.

MEP has completed one PO assessment and evaluation cycle. The detail results of 2022 cohort is tabulated in Table 3.15. The performance of the first cohort is shown in Figure 3.7 (a & b). In summary, cohort 2022 have achieved their performance target for PO attainment. The findings shows that 100% students of graduating cohort 2022 passed all the cumulative POs attainment.

Table: 3.15: Individual PO Attainment for Cohort 2022.

No.	Name (Student ID)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	Goh Kee Shan (B0581)	83.9	70.9	78.0	90.1	80.6	81.5	85.0	94.7	89.5	92.7	76.7	91.2
2	Kamalaprashant Ramasamy (B1109)	71.0	51.8	68.2	77.7	69.9	81.2	79.5	86.0	74.6	94.6	79.2	71.2
Cohort Attainment		100	100	100	100	100	100	100	100	100	100	100	100

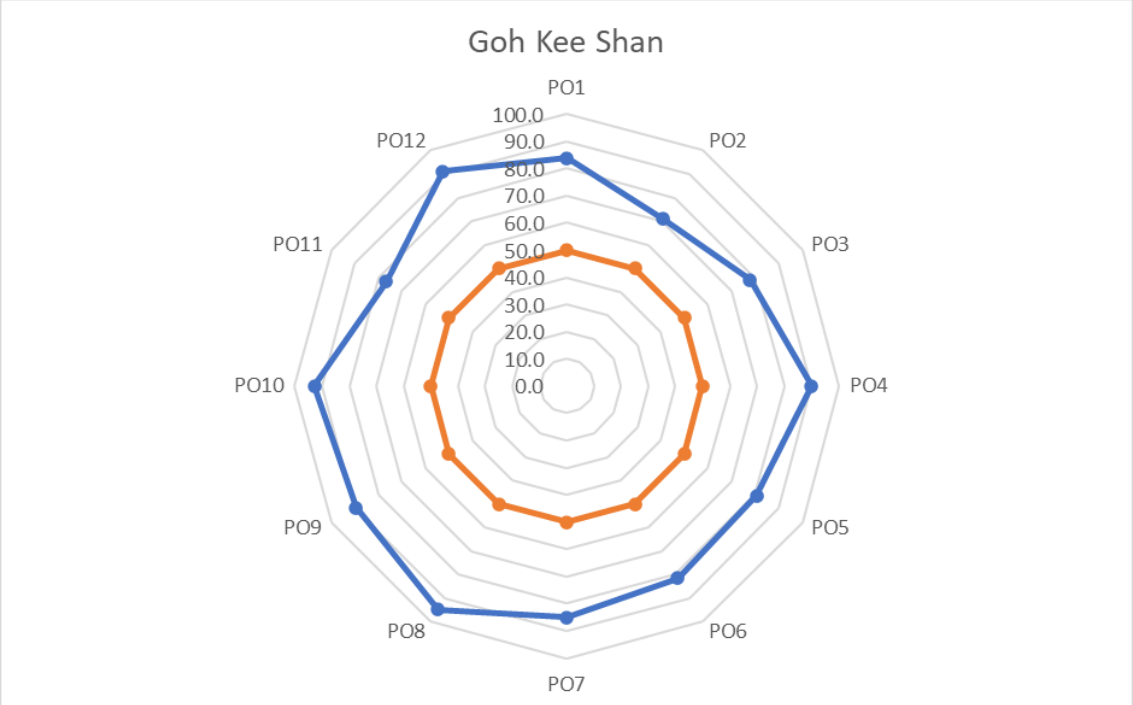


Figure 3.7a: Programme outcome attainment for graduating cohort Goh Kee Shan (B0581) upon completion of internship on Oct 2022.

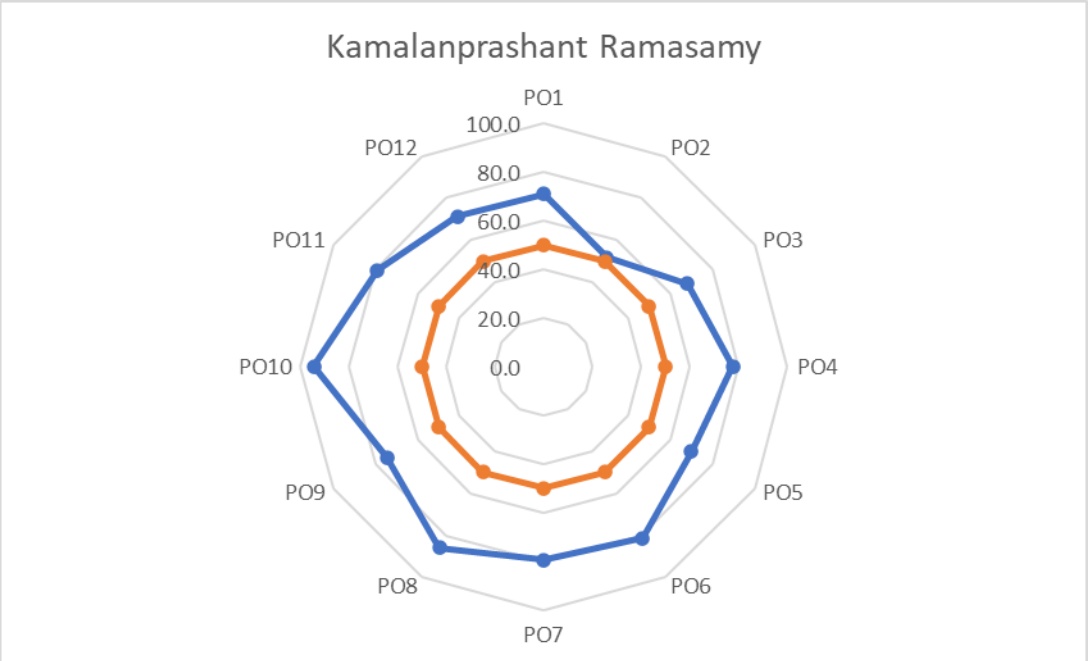


Figure 3.7b: Programme outcome attainment for graduating cohort Kamalaprashant Ramasamy (B1109) upon completion of internship on Oct 2022.

3.13 CQI on POs for First Cohort.

There will not be any further CQI planned for graduating cohort of 2022/2023 since every individual student has passed all POs.

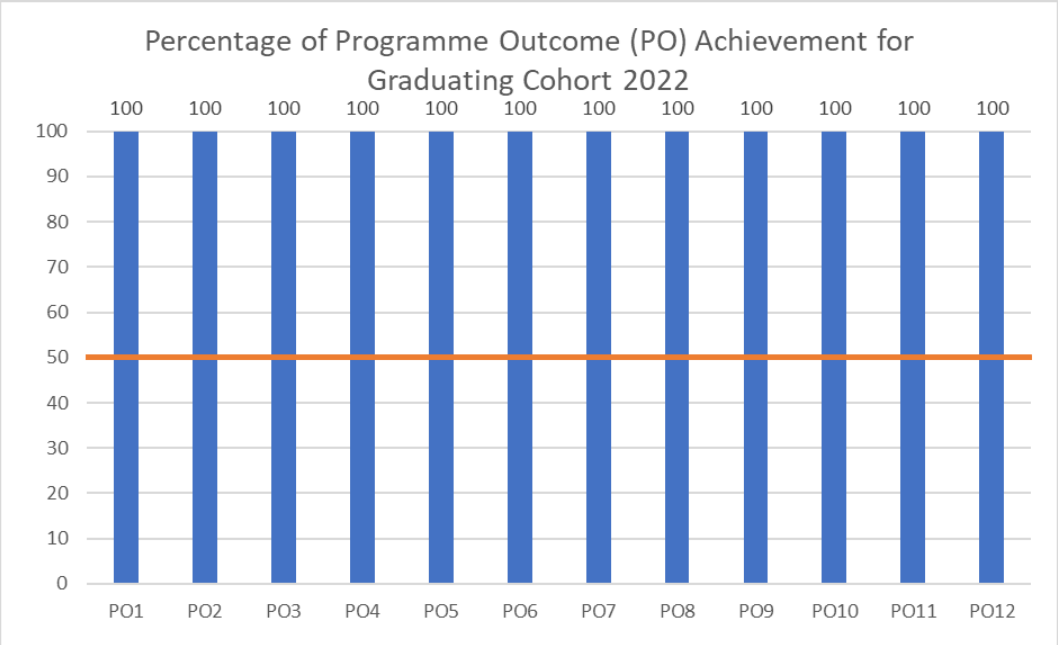


Figure 3.8: PO attainment Performance of Cohort 2022.

3.14 Stakeholders Involvement in Assessment, Evaluation and CQI for POs.

As stated earlier, the input from stakeholders (i.e., industry, alumnus and external reviewer) and also from FCUC and FEC vision and mission are also taken into consideration for POs review if necessary. POs are reviewed on yearly basis for each academic calendar. The CQI raised to improve POs generally originates from the findings based on the direct and indirect assessments. The proposed CQI plan will be presented and discussed in alternate years to industry and external reviewers. Their opinions and suggestion will be taken into consideration in determining the CQI action plan.

3.15 Strength related to POs.

A summary of POs related strengths are listed below:

I. The POs defined are in line with the FCUC and MED vision and mission.
II. Industry representatives (via ICAP) have direct involvement in formulation and evaluation on POs.
III. Each assessment component has been explicitly mapped to POs
IV. The revised POs have specific PI defined with rubrics

V. A short POs assessment and evaluation cycle of yearly to ensure the strength of MEP.

3.16 CQI relating to POs.

In order to further improve programme performance, a rubric scale (Table 3.16) has been developed to relate the PO achievement with programme performance as described in Section 3.11. There are 5 scales defined where the performance of the programme is considered excellent when 10 to 12 POs have been achieved.

Table 3.16: Rubric Scale for PO Achieved at Programme Level.

Scale	Number of POs Achieved at Programme Level
Very Concern	1 – 3
Concern	4 – 5
Good	6 – 7
Very Good	8 – 9
Excellent	10 – 12

3.17 Self – Assessment related to POs

Aspect	Poor	Satisfactory	Good	Comments
Programme Outcomes				
Covers (i) to (xii)			✓	
Linked to Programme Objectives			✓	
Have own wordings			✓	
Have own niche			✓	
Defined, measurable and achievable			✓	
Detailed out and documented			✓	
Published			✓	
Consistent and tied to Programme Objectives			✓	
Outcomes in line with national needs			✓	
Reviewed and updated			✓	
Processes and Results				
Processes for all elements of criteria area quantitatively/qualitatively understood and controlled			✓	
Processes are clearly linked to mission, Programme Objectives, and stakeholder needs			✓	
Systematic evaluation and process improvement in place			✓	
CQI involved support areas			✓	
Processes are deployed throughout the programme, faculty, and IHLs			✓	
Sound and highly integrated system			✓	

Common sources of problems understood and eliminated			✓	
Sustained results			✓	
Results clearly caused by systematic approach			✓	
Stakeholder Involvement				
High degree of involvement in defining Programme Outcomes statements			✓	
High degree of involvement in assessing the achievement of Programme Outcomes			✓	
High degree of involvement in assessing improvement cycles (CQI)			✓	
Involved in strategic partnership			✓	

SECTION 4: ACADEMIC CURRICULUM

A curriculum in general consists of a series of modules to facilitate student learning and practice. A well-structured curriculum is essential to educate students and to develop their intellectual abilities for professional practice. This section details the curriculum structure of MEP.

4.1 Programme Structure and Course Content.

The Bachelor of Mechanical Engineering with Honours is a four-year programme consists of eight long semesters which is taken by a student in a full-time basis. The degree is awarded upon the completion of 137 credit hours with at least CGPA of 2.0 of specified engineering and general education units. The distribution of the units for graduation is shown in Table 4.1. The MEP curriculum structure currently offers 87 core units, 6 units for elective and 44 units for general courses. This requirement is in line with EAC requirements which is to have a minimum 120 credit hours of which 80 credit hours must be core engineering courses offered over a period of four years.

Table 4.1: Graduation Requirement for MEP.

Course	**Credit**
Core	87
Elective	6
General	44
Total	**137**

A long semester consists of 14 teaching weeks, together with one week of mid-semester break and two exam weeks, which makes the total semester weeks as 17 weeks for a long semester.

Typically, a student will enrol in 14-16 credit hours (maximum load allowed is 18 credit hours) in a long semester, and those subjects will be examined at the end of that semester. In addition to the subject requirements, the completion of the Internship and the Mata Pelajaran Umum (MPU) are the requirements that must be completed before the engineering degree can be awarded. The relevant Act from Ministry of Higher Education (MOHE) requires that students complete all of these subjects before they receive their degrees.

The distribution of the individual subjects in the programme to the broad areas appropriate for the Mechanical Engineering is provided in Table 4.2. The total credit hours for the MEP are 137, which including the 6 credit hours assigned to the compulsory 12-week industrial training. The total credit hours for the Engineering-related modules are 93 (all core courses plus two elective courses). In addition, students are required to choose 2 from 6 modules as elective in Year 4, and the list of modules is shown in Table 4.3.

This subsection detailed out on how the programme structure and its course contents are:

- Appropriate to, consistent with, and support the development of the range of intellectual and practical skills and attainment or achievement of the POs.
- To meet the EAC requirements in terms of minimum total credits, minimum credits for engineering courses, covering the broad areas of Engineering sciences, principles, and applications of the respective disciplines, knowledge profile (WK), Complex Problem Solving (WP) and Complex Engineering Activities (EA).

4.1.1 Courses Contribution towards POs.

The curriculum of MEP has been structured by considering its relevance to the student development in both intellectual and practical skills in order to support the attainment of 12 POs elaborated in Section 3. The relationship between the courses of this curriculum in relation to the 12 POs is shown in Table 3.7. As stated earlier in Section 3.5, the values in this table outlined the weightage of each course for Academic Year 2022.

Table 4.2: Curriculum Structure of MEP.

Year	Semester 1			Semester 2		
	Code	**Course**	**Type/Credit**	**Code**	**Course**	**Type/Credit**
1	BGS1001	Engineering Mathematics I	C/3	BGS1002	Engineering Mathematics II	C/3
	BME1001	Engineering Statics	C/3	BME1004	Engineering Materials I	C/3
	BME1002	Introduction to Electrical and Electronic Engineering	C/3	BME1005	Engineering Dynamics	C/3
	BME1003	Engineering Drawing	C/3	BME1006	Machine Drawing	C/3
	MPU3113 MPU3143	MPU 1 (Paper 1) • Hubungan Etnik (Local Student) • Bahasa Melayu Komunikasi 2 (Foreign Student)	M/3	BGS1003	Engineering Practice and Communication Skills	C/3
				MPU3143 MPU3173	MPU 1 (Paper 2) • Tamadun Islam dan Tamadun Asia (Local Student) • Pengajian Malaysia 3 (Foreign Student)	M/3
			15			18
2	BGS2001	Engineering Mathematics III	C/3	BME2004	Solid Mechanics II	C/3
	BGS2002	Programming for Engineers	C/3	BME2005	Thermodynamics II	C/3
	BME2001	Fluid Mechanics I	C/3	BME2006	Fluid Mechanics II	C/3
	BME2002	Thermodynamics I	C/3	BME2007	Introduction to Microprocessor	C/3
	BME2003	Solid Mechanics I	C/3	BME2008	Engineering Materials II	C/3
	MPU3212 MPU3262 MPU3242	*MPU 2 • Bahasa Kebangsaan A • Stress Management • Social Networking for Higher Education	M/2	MPU3332	MPU 3 • Scientific Thinking Skills	C/2
			17			17
3	BME3001	Mechanical Component Design I	C/3	BME3005	Mechanical Component Design II	C/3
	BME3002	Heat Transfer	C/3	BME3006	Control Systems	C/3

	BME3003	Instrumentation and Measurement	C/3	BGS3002	Numerical Analysis and Statistics	C/3
	BME3004	Manufacturing Processes	C/3	BME3007	Electrical Power and Machines	C/3
	BGS3001	Engineering Economics	C/3	BME3101	Integrated Design Project	C/3
	BME3101	Integrated Design Project	C/3			
	MPU3422	MPU 4 • Team Building	M/2			
			20			15
4	BME3102	Industrial Training	C/6	BME4101	Final Year Project	C/3
	BME4101	Final Year Project	C/3	BGS4001	Professional Practice	C/2
	BME4001	Operations and Quality Management	C/3	BGS4002	Project Management and Product Development	C/3
	BME4002	Sustainable Energy Systems	C/3	BGS4003	Entrepreneurship	C/3
	BME4003	Mechanical Vibration	C/3		Second Elective	E/3
		First Elective	E/3			
			21			14
Total Unit = 137, Total Engineering Courses = 93, Total General Education Courses = 44						
Elective Courses refer to Table 4.4.						
C – Core, E – Elective, M – MPU modules.						

Table 4.3: List of Elective Courses.

Code	Course	Unit
BME4004	Finite Element Method	3
BME4005	Hydraulics and Pneumatics	3
BME4006	Ergonomics	3
BME4007	Air Conditioning and Refrigeration	3
BME4008	Manufacturing System	3
BME4009	Engineering Tribology	3

The POs weightage for each course has been summarized in percentage as given in Table 4.4 with detailed percentage among courses offered by MED in comparison to the complete courses required for graduation. The percentage stated in this Table 4.4 is based on the number of courses assessing the respective PO.

Table 4.4: Contribution of Courses for Each PO.

MEP	Programme Outcomes (%)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
All courses for MEP	15.87	15.08	11.90	11.90	8.73	3.97	2.38	3.17	9.52	5.56	7.14	4.76

4.1.2 Distribution of Engineering Courses.

The list of engineering courses distribution with respect to core and elective courses that covered the EAC broad area for mechanical discipline is shown in Table 4.5 and Table 4.6, respectively. The table clearly depicts that the total core courses offered upon graduation sums to 93 units which are more than 80 units required by EAC. The total Student Learning Time (SLT) for each courses fulfils the guidelines stated by Malaysian Qualifications Agency (MQA).

4.1.3 Distribution of General Education Courses.

In MEP, non-engineering courses are also offered to students to support the knowledge enhancement of our graduates. Besides, there are seven university courses that are made mandatory by MOHE. They are languages, Islamic and Asean civilization, ethnic relation and entrepreneurship. These courses are offered to all programmes in FCUC. The list of non-engineering courses offered to support the programme is provided in Table 4.7.

Table 4.5: Distribution of Engineering Courses for MEP.

Groupings	Course Code	Course	Course Type	Hours					EAC Equivalent Total Credits
				Lecture	Lab / Workshop	Project	PBL* / Design	Tutorial	
Materials	BME1004	Engineering Materials I	Core	25.5	4.0	-	-	12.0	3.0
	BME3008	Engineering Materials II	Core	24.0	2.0	-	-	16.5	3.0
Statics and Dynamics	BME1001	Engineering Statics	Core	22.0	2.5	-	-	14.0	3.0
	BME1005	Engineering Dynamics	Core	20.0	2.0	-	-	18.0	3.0
Fluid Mechanics	BME2001	Fluid Mechanics I	Core	24.0	2.5	-	-	12.0	3.0
	BME2006	Fluid Mechanics II	Core	20.5	8.0	-	-	11.5	3.0
Thermodynamics and Heat Transfer	BME2002	Thermodynamics I	Core	22.5	-	2.0	-	17.0	3.0
	BME2005	Thermodynamics II	Core	28.0	2.5	-		14.0	3.0
	BME3002	Heat Transfer	Core	27.0	-	-	-	16.0	3.0
	BME4002	Sustainable Energy System	Core	39.0	-	-	-	-	3.0
Mechanical Design	BME3001	Machine Component Design I	Core	21.0	-	-	-	15.0	3.0
	BME3005	Machine Component Design II	Core	15.0	-	8.0	-	10.0	3.0
Instrumentation and Control	BME3003	Instrumentation and Measurement	Core	28.0	14.0	-	-	14.0	3.0
	BME3006	Control Systems	Core	28.0	14.0	-	-	14.0	3.0
Vibrations	BME4003	Mechanical Vibration	Core	24.0	-	-	-	17.0	3.0
Solid Mechanics	BME2003	Solid Mechanics I	Core	19.5	8.0	-	-	14.0	3.0
	BME2004	Solid Mechanics II	Core	27.5	-	-	-	14.0	3.0
Manufacturing / Production	BME3004	Manufacturing Process	Core	32.0	-	3.0	-	-	3.0
Electrical Power and Machines	BME3007	Electrical Power and Machines	Core	35.0	14.0	-	-	-	3.0
Electronics and Microprocessors	BME1002	Introduction to Electrical and Electronic Engineering	Core	24.0	9.5	-	-	11.0	3.0
	BME2007	Introduction to Microprocessor	Core	28.0	14.0	-	-	14.0	3.0
Computer Aided Engineering	BME1003	Engineering Drawing	Core	19.0	-	-	-	20.0	3.0
	BME1006	Machine Drawing	Core	14.0	-	-	-	22.0	3.0
		Elective Courses (x2)	Elective	-	-	-	-	-	6.0
Total Equivalent Credit Hours									**75.0**
*Industrial Training	BME3102	Industrial Training	Core	-	-	-	-	-	6.0

Mechanical Design	BME3101	Integrated Design Project	Core	14.0	-	-	-	210.0	6.0
Final Year Project	BME4101	Final Year Project	Core	14.0	-	-	-	210.0	6.0
Total Credit Hours for MEP									**93.0**

*Industrial training for minimum of 12 weeks.

Table 4.6: List of Elective Courses for MEP.

Groupings	Course Code	Course	Course Type	Hours					EAC Equivalent Total Credits
				Lecture	Lab / Workshop	Project	PBL* / Design	Tutorial	
	BME4004	Finite Element Method	Elective	18.0	24.0	-	-	-	3.0
	BME4005	Hydraulics and Pneumatics	Elective	24.0	-	-	-	13.0	3.0
	BME4006	Ergonomics	Elective	27.0	-	-	-	13.0	3.0
	BME4007	Air Conditioning and Refrigeration	Elective	21.0	-	-	3.0	16.0	3.0
	BME4008	Manufacturing System	Elective	26.0	-	-	-	17.0	3.0
	BME4009	Engineering Tribology	Elective	28.0	-	-	-	15.0	3.0

Table 4.7: Distribution of General Education Courses for MEP.

Area (EAC)	Course Code	Course	Course Type	Hours			EAC Equivalent Total
				Lecture	Lab / Workshop / Project	Tutorial	
Applied Science / Mathematics / Computer	BGS1001	Engineering Mathematics I	Core	35.0	-	14.0	3.0
	BGS1002	Engineering Mathematics II	Core	35.0	-	14.0	3.0
	BGS2001	Engineering Mathematics III	Core	35.0	-	14.0	3.0
	BGS3002	Numerical Analysis and Statistics	Core	35.0	-	14.0	3.0
	BGS4003	Entrepreneurship	Core	21.5	9.0	11.0	3.0
	BEE2009	Programming for Engineers	Core	28.0	28.0	-	3.0
Total Credit Hours							**18.0**
Management / Law / Accountancy	MPU 3212 MPU 3262 MPU 3242	*MPU 2 • Bahasa Kebangsaan A • Stress Management • Social Networking for Higher Education	Compulsory	28.0 30.0 14.0	- - 28.0	- - -	2.0
	BGS3001	Engineering Economics	Core	42.0	-	-	3.0
	BME4001	Operations and Quality Management	Core	44.5	-	-	3.0

	BGS4002	Project Management and Product Development	Core	18.0	9.0	-	3.0
Total Credit Hours							**11.0**
Communication Skills / Humanities / Ethics	BGS1003	Engineering Practice and Communication Skills	Core	28.0	-	28.0	3.0
	MPU3113 MPU3143	MPU 1 (Paper 1) • Hubungan Etnik (Local Student) • Bahasa Melayu Komunikasi 2 (Foreign Student)	Compulsory	42.0	-	-	3.0
	MPU3143 MPU3173	MPU 1 (Paper 2) • Tamadun Islam dan Tamadun Asia (Local Student) • Pengajian Malaysia 3 (Foreign Student)	Compulsory	42.0	-	-	3.0
	BGS4001	Professional Practice	Core	28.0	-	-	2.0
	MPU3332	MPU 3 • Scientific Thinking Skills	Core	28.0	-	-	2.0
	MPU3422	MPU 4 • Team Building	Core	28.0	-	28.0	
	Total Credit Hours						**15.0**
	Total Credit Hours for General Education Courses						**44.0**

Note: * Choose ONE subject only for MPU 2. Bahasa Kebangsaan A is for student who does not have credit in SPM Bahasa Me/ayu and is taken once in any level of study.

Table 4.8: Courses Offered (Programme Structure) According to Semester and Total Credit Hours.

Semester	Code	Courses	Course Type	IHL Credits		EAC Equivalent Credits	
				Engineering Courses	Related Courses	Engineering Courses	Related Courses
Semester 1 Year1	BGS1001	Engineering Mathematics I	Core	-	3.0	-	3.0
	BME1001	Engineering Statics	Core	3.0	-	3.0	-
	BME1002	Introduction to Electrical and Electronic Engineering	Core	3.0	-	3.0	-
	BME1003	Engineering Drawing	Core	3.0	-	3.0	-
	MPU3113 MPU3143	MPU 1 (Paper 1) • Hubungan Etnik (Local Student) • Bahasa Melayu Komunikasi 2 (Foreign Student)	Compulsory	-	3.0	-	3.0
Semester 2 Year1	BGS1002	Engineering Mathematics II	Core	-	3.0	-	3.0
	BME1004	Engineering Materials I	Core	3.0	-	3.0	-
	BME1005	Engineering Dynamics	Core	3.0	-	3.0	-
	BME1006	Machine Drawing	Core	3.0	-	3.0	-
	BGS1003	Engineering Practice and Communication Skills	Core	-	3.0	-	3.0
	MPU3143 MPU3173	MPU 1 (Paper 2) • Tamadun Islam dan Tamadun Asia (Local Student) • Pengajian Malaysia 3 (Foreign Student)	Compulsory	-	3.0	-	3.0
Semester 1 Year2	BGS2001	Engineering Mathematics Ill	Core	-	3.0	-	3.0
	BGS2002	Programming for Engineers	Core	-	3.0	-	3.0
	BME2001	Fluid Mechanics I	Core	3.0	-	3.0	-
	BME2002	Thermodynamics I	Core	3.0	-	3.0	-
	BME2003	Solid Mechanics I	Core	3.0	-	3.0	-
	MPU3212 MPU3262 MPU3242	*MPU 2 Bahasa Kebangsaan A Stress Management Social Networking for Higher Education	Compulsory	-	2.0	-	2.0
Semester 2 Year2	BME2004	Solid Mechanics II	Core	3.0	-	3.0	-
	BME2005	Thermodynamics II	Core	3.0	-	3.0	-
	BME2006	Fluid Mechanics II	Core	3.0	-	3.0	-

	BME2007	Introduction to Microprocessor	Core	3.0	-	3.0	-
	BME2008	Engineering Materials II	Core	3.0	-	3.0	-
	MPU3332	MPU 3 • Scientific Thinking Skills					
Semester 1 Year3	BME3001	Mechanical Component Design I	Core	3.0	-	3.0	-
	BME3002	Heat Transfer	Core	3.0	-	3.0	-
	BME3003	Instrumentation and Measurement	Core	3.0	-	3.0	-
	BME3004	Manufacturing Processes	Core	3.0	-	3.0	-
	BGS3001	Engineering Economics	Core	-	3.0	-	3.0
	BME3101	Integrated Design Project	Core	3.0	-	3.0	-
	MPU3422	MPU 4 • Team Building	Core	-	2.0		2.0
Semester 2 Year3	BME3005	Mechanical Component Design II	Core	3.0	-	3.0	-
	BME3006	Control Systems	Core	3.0	-	3.0	-
	BGS3002	Numerical Analysis and Statistics	Core	-	3.0	-	3.0
	BME3007	Electrical Power and Machines	Core	3.0	-	3.0	-
	BME3101	Integrated Design Project	Core	3.0	-	3.0	-
Intersession	BME3102	**Industrial Training					
Semester 1 Year4	BME4101	Final Year Project	Core	3.0	-	3.0	-
	BME4001	Operations and Quality Management	Core	-	3.0	-	3.0
	BME4002	Sustainable Energy Systems	Core	3.0	-	3.0	-
	BME4003	Mechanical Vibration	Core	3.0	-	3.0	-
		Elective	Elective 1	3.0	-	3.0	-
Semester 2 Year4	BME4101	Final Year Project	Core	3.0	-	3.0	-
	BGS4001	Professional Practice	Core	-	2.0	-	2.0
	BGS4002	Project Management and Product Development	Core	-	3.0	-	3.0
	BGS4003	Entrepreneurship	Core	-	3.0	-	3.0
		Elective	Elective 2	3.0	-	3.0	-
Total Credit Hours for Engineering and General Courses				**93.0**	**44.0**	**93.0**	**44.0**
Total Credit Hours				**137.0**		**137.0**	

* Choose ONE subject only for MPU 2. Bahasa Kebangsaan A is for student who does not have credit in SPM Bahasa Melayu and is taken once in any level of study.

** Industrial training for minimum of 12 week.

The pie chart below (Figure 4.1) represents the total credit hours occupied by different group type of modules, which is: core, non – core, MPU and electives. It is shown that the core, non – core, MPU and electives modules represented 61%, 26%, 9% and 4 % respectively of the total credit hour of 137.

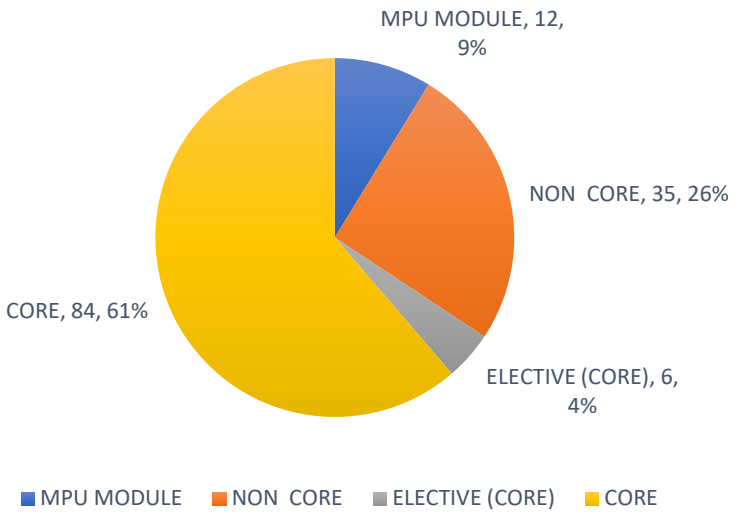


Figure 4.1: Different group type modules credit hours distribution.

4.1.4 Distribution of courses according to semester.

The distribution of courses according to semester and their credit hours is shown in Table 4.8. This table clearly depicts that the total credit hours for the programme are equivalent with EAC requirement. Students are required to register core courses ranging from 9 to 15 units in a semester. The students can add university or elective courses depending on their capability to the maximum of 21 units. In addition, the total 21 credit hours in semester 7 has included the 6 units of Industrial Training (BME3102) which practiced during their third year long semester break (12 weeks). Thus, in the final year of their studies, students will actually undergo only 15 and 14 units in Semester 1 and Semester 2, respectively.

4.1.5 Distribution of courses according to WKs, WPs and EAs.

The mapping of courses according to their WKs, WPs and EAs is shown in Table 3.8. In this table, the mapping includes all the core and elective courses offered for MEP undergraduate studies. The details on the course code and ownership with respect to the semester offered have been elucidated. Generally, courses WKs are mapped accordingly to their course level.

4.2 Programme Delivery and Assessment Methods.

Our curriculum delivery has been extensively following the OBE framework since the introduction of the MEP in 2019, into a comprehensive and systematic delivery and assessment system. This is to ensure our students receive the highest standards of learning and also to achieve POs through various assessment methods.

4.2.1 Programme Delivery

The MEP delivery are defined and categories into 6 elements, which includes formal lectures, tutorial and laboratory. Detail description of these delivery method are given below.

1. Formal Lectures

Formal lectures are conducted to develop knowledge and understanding on fundamental and technical aspect of engineering. Sometimes field trips and engaging guest speakers from industry are organised to enhanced student learning experiences. Facilities used are typically LCD projector, OHP projector, printed notes, and computers. Students are encouraged to do as much independent study as possible as in research, group discussion (if applicable), presentation of case studies, and assignments.

2. Tutorials

Tutorial sessions are conducted to assist student to further understand on how to solve problems of the respective subjects.

3. Laboratory

Laboratory sessions are conducted to expose student with hands-on activities which related to the engineering topics that they have learned during lectures. The laboratory sessions are conducted in conventional lab. In the lab session, students are given complete lab manual to follow and is guided by lab technician to perform the experiment.

4. Integrated Design Project (IDP)

The course involves the application of appropriate knowledge and skills learned, to evaluate and develop a solution to a complex engineering problem. This is a two-semester course. The IDP or capstone project is offered in a way that students will be grouping into minimum 2 to maximum 5 students per group to perform multi-disciplinary type of project. Analytical thinking skills are developed through structured walkthroughs, presentations and reports, where student will be

expected to explain the reasons for choices made, design considerations and decisions taken.

5. Final Year Project (FYP)

The FYP is a 6 credit hours course and carried out in two consecutive semesters in the final year of study in semesters 7 and 8. The FYP introduces an investigative research-oriented approach to engineering studies. The final year project topics selection should preferably be industry related and relevant to the Bachelor of Mechanical Engineering programme so that students can apply the knowledge gained in several subject areas of the degree programme to address a research problem individually.

The supervisor will provide titles of FYP which related to either design, hardware construction, as well as simulation or analysis project that suitable for undergraduate degree level. The supervisor also has to ensure the proposed FYP projects can be conducted with existing resources and facilities. The supervisor is also responsible to monitor their students work and guide them in conducting the project on a regular interval. The student will be evaluated through a systematic rubric evaluation which are designed based on their project progress, written thesis and presentation skills.

Activities such as self-assessment, development, and monitoring of project plans, presenting findings and recommendations, working towards deadlines and on projects encourages students to be responsible for their learning and prepares them for lifelong learning.

6. Industrial Training

Industrial Training is a key component of learning in which the students will be exposed to a real-life experience working in a local industry. The industrial training is compulsory for all students in which they have to complete a minimum of 10 weeks during their long semester break at related industries approved by the school. The industrial training is carried out after the completion of semester 6. This training contributes 5 credit hours, and the students are awarded with a Pass/Fail grade upon completion. The latest CQI implemented the 10 weeks industrial training. The graduating cohort still run on 12 weeks industrial training before the implementation tookplace.

4.2.2 Assessment Methods

The assessment methods can measure the students' achievement of the learning outcomes base on the formative and summative assessment which includes assignment (coursework) and examinations. Intellectual and practical skills are assessed through assignment and seminar questions. Assessment on problems solving performing procedures and demonstrating techniques are based on lab sessions. Students' performance will be monitored progressively through constructive feedback. A formal final assessment in the form of written examination will be held at the end of each semester. The final examination paper will be set according to Bloom's Taxonomy cognitive levels. The guidelines for setting examination papers are available to all academic staff.

There are two measuring tools used to evaluate students' performance: Direct and Indirect measurement. In direct measurement, this method is performed to demonstrate the students' knowledge and skills with respect to the course outcomes. While for indirect measurement, the assessments are performed using course survey and exit survey to measure students' reflection on their learning and judge their own ability to achieve the COs and POs.

The following details the direct measurement method of assessments which includes both examination and coursework:

1. **Examination**

   Courses with examination will have summative assessment which will be performed during Final Examination at the end of every semester. Students have to sit for the examination of the courses they have enrolled. In addition, students have to fulfil the standing requirements for lectures/tutorials/practical and other requirements before being allowed to sit for the examinations. Students are required to complete their coursework **and** final examination with minimum passing marks/grade of 40% in order to obtain a passing grade.

   Commonly, courses offered in MEP adopts 60% final exam and 40% continuous assessments (coursework) such as tests, quizzes, laboratory report, group project report or assignments. The final exam is usually scheduled for 3 final weeks during the semester by FCUC's registry. Exam questions which fulfil the Bloom Taxonomy level defined in the course delivery and assessment plan are prepared by lecturers by the mid-semester and vetted during Exam Vetting Meeting within the school. During the process, the questions are vetted together with the answer scheme to ensure the appropriate complexity and difficulty levels of the questions are satisfactory.

2. Coursework

Students also are assessed from continuous assessments performed during the semester. Students will be evaluated from tests, assignments, quizzes, laboratory reports, group projects, industrial visit reports and presentations, as well as from their final year thesis and presentation. Breakdown percentage of the assessments depends on the individual courses. The assessments of the coursework portion in courses are evaluated using the prepared and established rubrics (Table 3.3).

i. Test

Test is conducted during the class which will be taken and assessed individually. There may be one or more tests performed during the semester graded by the lecturer.

ii. Assignment

Assignment is given to student to enhance their understanding on the respective topics. Assignment is usually performed individually and will be graded by the lecturer.

iii. Group Work

In the future when there is a favourable student intake, this Group Work assessment type will be considered. This is helpful on the development of student's interpersonal skills through group work evaluation.

iv. Presentation

Communication and soft skills of the students is assessed during class presentation. The presentation evaluation is conducted as part of evaluation in mini/group project and capstone project.

v. Thesis/report

Students' depth of knowledge in the related topics together with their writing skills are evaluated through thesis in Final Year Project, laboratory report, capstone project and group work.

As for indirect measurement, various method of assessments is performed: Course Survey and Exit Survey. Course Survey is conducted to measure student's achievement on COs for each course registered during their respective semesters. The survey is given to students just before the end of the course. As for the Exit Survey, it is conducted to measure their PO attainments. This survey is performed before the students leave the university.

4.3 Curriculum Breath and Depth of Professional Engineering Education

In this section, some of the steps taken to ensure the curriculum breadth and depth are in-par to a professional engineering education are discussed. The steps include curriculum review, curriculum benchmarking and exposure done relating to engineering practice.

4.3.1 Curriculum Review

Review and improvement in the curriculum have been done in the programme to ensure the programme is in line with professional engineering education. The Table 4.9 shows the summary of curriculum review activities related to MEP. Mainly there has been four activities performed which includes an introduction to a new course, open ended laboratory and harmonizing course to POs mapping besides syllabus revision.

Table 4.9: Curriculum Review Activities performed before the submission of the SAR.

No.	Description of Curriculum Activities
1	Converts mark distribution for all modules from 70 (Exam)/30 (Coursework) to 60 (Exam)/40 (Coursework).
2	Review all modules contents.
3	Redesign of the elective modules' contents to ensure all elective modules covered the same POs (PO2, PO3, PO4 and PO5).
4	Converts module with assignment assessment to Project Based Learning (PBL) assessment.

4.3.2 Curriculum Benchmarking

The MED has conducted one curriculum benchmarking with Universiti Sains Malaysia (USM). The perspective is taken into consideration to ensure MEP on par with professional engineering education. A full report is produced for the curriculum benchmarking done with USM on 30th Sep 2021. Overall, the core courses offered in mechanical engineering discipline between the FCUC and USM are highly comparable.

Table 4.10: Comparison of courses offered in mechanical engineering programme with UM, USM and UTM.

FCUC		UM	Remarks	USM	Remarks	UTM	Remarks
CORE COURSES							
BME1001	Engineering Statics	✓		✓		✓	
BME1002	Introduction to Electrical and Electronic Engineering	✓		✓		✓	
BME1003	Engineering Drawing	✓		✓		✓	
BME1004	Engineering Materials I	✓		✓		✓	
BME1005	Engineering Dynamics	✓		✓		✓	
BME1006	Machine Drawing			✓			
BGS1003	Engineering Practice and Communication Skills	✓		✓		✓	

BGS2002	Programming for Engineers	✓		✓		✓	
BME2001	Fluid Mechanics I	✓		✓		✓	
BME2002	Thermodynamics I	✓		✓		✓	
BME2003	Solid Mechanics I	✓		✓		✓	
BME2004	Solid Mechanics II	✓		✓		✓	
BME2005	Thermodynamics II	✓		✓		✓	
BME2006	Fluid Mechanics II	✓		✓		✓	
BME2007	Introduction to Microprocessor						
BME2008	Engineering Materials II	✓					
BME-3001	Mechanical Component Design I	✓		✓		✓	
BME3002	Heat Transfer	✓		✓		✓	
BME3003	Instrumentation and Measurement	✓		✓		✓	
BME3004	Manufacturing Processes	✓		✓		✓	
BGS3001	Engineering Economics	✓		✓		✓	
BME3101	Integrated Design Project	✓		✓		✓	
BME3005	Mechanical Component Design II			✓			
BME3006	Control Systems	✓		✓		✓	
BME3007	Electrical Power and Machines			✓			
BME3102	Industrial Training	✓		✓		✓	
BME4101	Final Year Project	✓		✓		✓	
BME4001	Operations and Quality Management			✓			
BME4002	Sustainable Energy Systems	✓					
BME4003	Mechanical Vibration	✓		✓			
BGS4001	Professional Practice	✓		✓		✓	
BGS4002	Project Management and Product Development	✓					
BGS4003	Entrepreneurship	✓				✓	
	6 Electives		6 Electives		4 Electives		4 Electives
Total credit	137	143	29/34=85%	135	28/34=82%	137	26/34=76%

Benchmarking is necessary to ensure this programme is of good standard with other universities locally or internationally. Comparison of programme educational goals, learning outcomes, curriculum contents and facilities visitations and meetings with other collaborative universities will review good practices that can be incorporated into existing programme. The Table 4.10 shows the benchmarking of programme structure that the FEC has done with respect three local universities namely University Malaya (UM), Universiti Sains Malaysia (USM), and Universiti Teknologi Malaysia (UTM). There seems to be high similarity in terms of programme structure with 85%, 82%, and 76% for UM, USM, and UTM, respectively.

Benchmarking is part of a programme quality management effort in accordance to Engineering Accreditation Council (EAC) requirement for programme accreditation. We requested permission to online visit USM for benchmarking of our Bachelor of Mechanical Engineering with Honours degree programme with UM's Bachelor of Mechanical Engineering degree programme.

We chose USM for benchmarking because USM is one of the oldest public universities in Malaysia and is the highest-ranking Malaysian institution of higher education in 2020 and 2021.

4.4 Description of Industrial Training Scheme

Industrial training gives opportunity to students to work with companies and organisations in the field of their profession. The process of getting industrial placement will be initiated by students who will be sending their applications to various mechanical engineering related industries. Once response and acceptance letter from the industry has been obtained, Programme Coordinator will provide placement letter, logbook and registration card to the student. The coordinator will also conduct a brief session on the training procedures to the students before placed at the designated companies.

During the industrial training period, the Programme Coordinator will monitor for any problem or issues from the students or industries. Several lecturers will be appointed to visit the students in ensuring right exposure is given to the students. Upon completion of the training, the students have to submit a comprehensive report containing their work experience obtained during attachment and suggest suitability of the trainings and companies.

In addition, the respective industries will be requested to provide confidential report about the training program and attributes of the students containing their knowledge on the subject matter, quantity and quality of the work, initiative and interest in work, relationship with work colleagues, discipline and punctuality.

The students are placed in industries that best suit their area of studies. It is an experimental learning that requires the students to learn the process and able to apply their knowledge acquired in the real world. The knowledge acquired during practical training may be used later in the final year as well as to equip them with sufficient knowledge for their job. This Industrial Training module covered a few POs such as PO6 (The Engineer and Society), PO8 (Ethics), PO9 (Communication) and PO11 (Lifelong Learning). The students will be graded Pass or Fail on the basis of a supportive feedback from the industry together with a completion of 10 weeks training.

This industrial training scheme also provides an opportunity for student to secure a permanent job with their internship employer after graduation provided that the student worked satisfactorily, responsibly, diligently and professionally during the internship period and is favour (or offered) by the internship employer to continue to work with them in permanent basis. The favourable location of FCUC within the Klang Valley offers many opportunities (engineering companies and manufacturing plants)

for students to look for internship during study or permanent job after graduation. This is also convenient for collaboration between FCUC and the industries.

4.5 Description of Exposure to Professional Practices

There are five core courses in the MEP that provides the enrolled students to the fundamental principles on project and financial management, Quality Assurance and Quality Control (QA/QC), ethics and principles related to environment and Occupational Safety and Health Act (OSHA) and professional practice. These five courses are:

I. Engineering Economics (BGS3001)
II. Operations and Quality Management (BME4001)
III. Project Management and Product Development (BGS4002)
IV. Engineering Practice and Communication Skills (BGS1003)
V. Professional Practice (BGS4001)

The main objective of these courses is to provide a basic understanding and knowledge regarding to principles of safety & health at workplace, engineering management practice and also the ethics and regulations. Therefore, students are required to directly involve in solving real project through critical thinking and group work. Hence, PO4, PO6, PO8, PO9, PO10, PO11 and PO12 are delivered and assessed.

4.6 Description of Final Year Project (FYP)

As stipulated in the EPAM2012, the MEP students will perform FYP over a period of 2 semesters with total credit hours of 6 units. The total units will be divided into two semesters. The FYP introduces the students an investigative research-oriented approach to engineering studies that enhances the individual ability to seek, analyse and judge independently. A summary flowchart is given in Figure 4.2 to illustrate the step and process in accomplishing the FYP. The POs covered and assessed in the FYP are PO3 (Design/Development of Solutions), PO4 (Investigation), PO5 (Modern Tool Usage), PO9 (Communication) and PO11 (Lifelong Learning). The Table 4.11 represents the graduating cohort with their respective FYP titles and the nature of the FYP. These FYPs are mechanical engineering related. Thus, students are assessed using report, presentation, and project notebook, where detail proportion for each assessment in shown in Table 4.12.

Table 4.11: List of FYP titles for graduating cohort.

Name (Student ID)	FYP Title	Nature of the FYP
Goh Kee Shan (B0581)	Development of Drone for Industrial Inspection	Simulation based
Kamalaprashant Ramasamy (B1109)	Thermal Analysis on a micro heat pipe	Simulation based

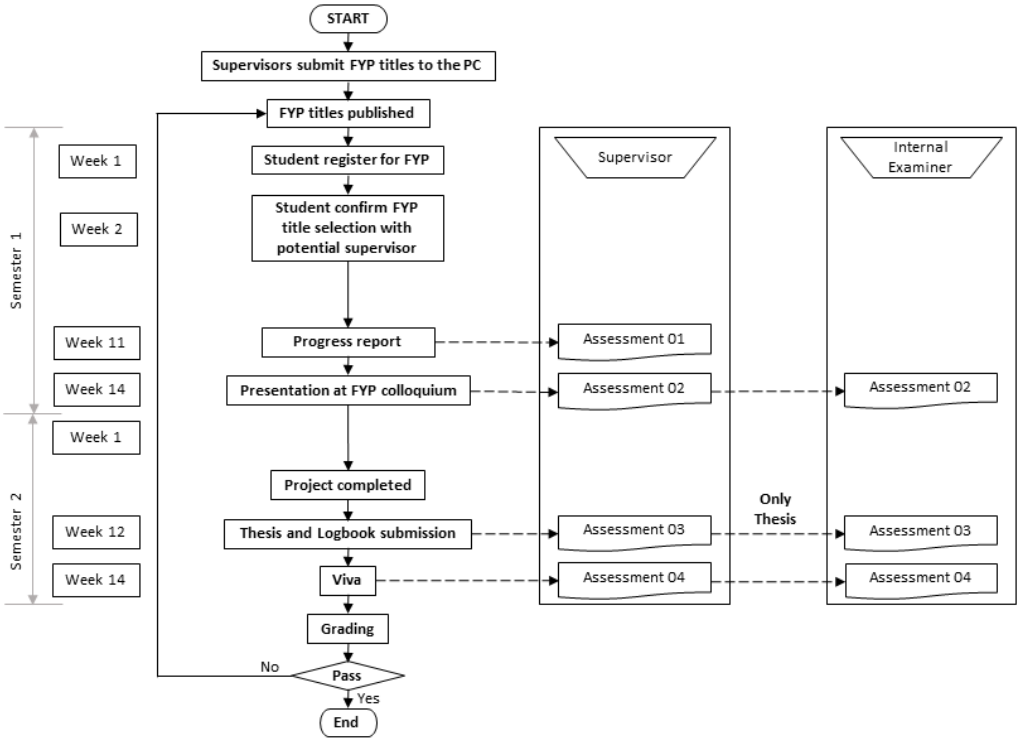


Figure 4.2: The process of the FYP in stages throughout the final year (4th year).

Table 4.12: Grading Distribution of FYP.

Semester	Assessment Methods	Percentage (%)
7	Progress Report (Evaluate by supervisor)	20.0
	Progress Presentation (Evaluation by supervisor)	5.0
	Progress Presentation (Evaluation by examiner)	5.0
8	Thesis (Evaluation by supervisor)	25.0
	Final Presentation (Evaluation by supervisor)	5.0
	Logbook (Evaluation by supervisor)	10.0
	Thesis (Evaluation by examiner)	25.0
	Final Presentation (Evaluation by examiner)	5.0

4.7 Description of Integrated Design Project (IDP)

Due to low number of student intake, the IDP project is completed by one group and consist of 2 students. The two students work in collaboration manner to complete the assigned design project.

The project involved for the first batch graduating cohort is the analysis of bicycle parts. One student looked into the Finite Element Analysis (FEA) of bicycle parts and the other student experimentally studied (material tensile strength etc) the bicycle parts. Each student is to present their findings through individual oral presentation and submit a group report.

In general, the major focus of this module will involve students working in teams to design product with real and practical purposes. Assessment tools to evaluate student performance are designed to constructively align student activities to achieve those programme outcomes. This IDP covered a few POs such as PO3 (Design/Development of Solutions), PO9 (Communication), PO10 (Individual and Teamwork), PO11 (Lifelong Learning) and PO12 (Project Management and Finance).

4.8 Condition for Passing Modules

A continuous assessment approach has been adopted to demonstrate the depth of knowledge attained by students as shown in Figure 4.3. In general, there are two ways of grading an assessment, either using rubrics or answer scheme. As mentioned earlier, the defined PI for each POs has dedicated rubrics with predefined bloom taxonomy level. Therefore, all lecturers are required to use these dedicated rubrics accordingly to ensure the depth of knowledge attained by students are standardized in delivery and assessment.

Similarly, for non-rubric assessments (i.e., exam questions, tests, quizzes and etc.), lecturers are required to prepare questions with an answer scheme and undergo a reviewing process with a peer reviewer to ensure they are complied with their dedicated CO, PO, PI, bloom taxonomy level as planned.

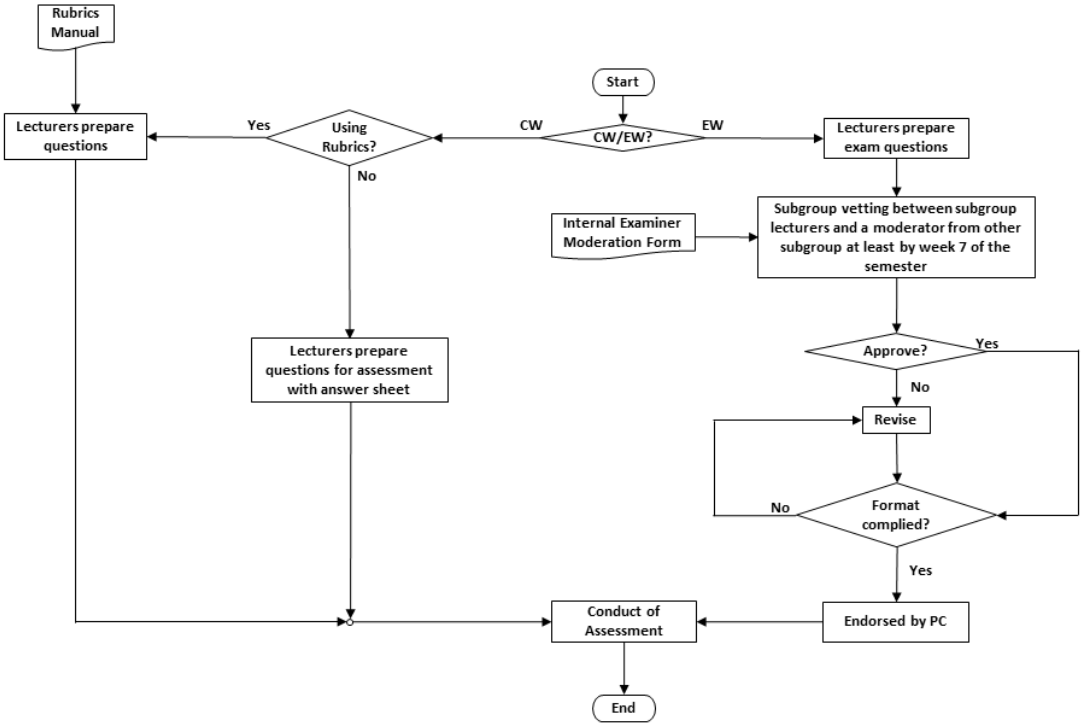


Figure 4.3: Course Assessment and Evaluation Process.

The grading system as defined in FCUC Standard Academic Regulations is described in Table 4.13. The marks and grade are classified to high distinction, distinction, merit, pass or fail.

Table 4.13: The Grading System of Bachelor of Mechanical Engineering

Marks	Grade	Grade Points	Definition
90-100	A+	4.00	High Distinction
80-89	A	4.00	Distinction
75-79	A-	3.67	Distinction
70-74	B+	3.33	Merit
65-69	B	3.00	Merit
60-64	B-	2.67	Merit
55-59	C+	2.33	Pass
50-54	C	2.00	Pass
45-49	C-	1.67	Fail
40-44	D+	1.33	Fail
35-39	D	1.00	Fail
30-34	D-	0.67	Fail
00-29	F	0.00	Fail
	N	-	Incomplete
	W	-	Withdrawal
	K	-	Credit Exemption

The passing requirement for a module that consists of coursework and final examination is described in Table 4.14. Students are required to score at least 40% coursework, 40% final examination and 50% overall marks, in order to pass a course or module.

Table 4.14: Passing requirement for coursework, final examination and module.

Type of assessment	Minimum passing mark
Coursework	40%
Final Examination	40%
Module	50%

The details and example scenarios are explained below:

Main examination

1. Coursework must be at least 40% for students to pass. A student can fail some coursework components, but as long as the total coursework mark is at least 40%, the student is considered to have pass coursework.
2. Final exam must be at least 40% for student to pass.
3. Total final exam and coursework must be at least 50% for students to

pass the module. There is a possibility that student can pass coursework (40%) and final examination (40%), and still fail the module, because the passing mark of the module is 50%.

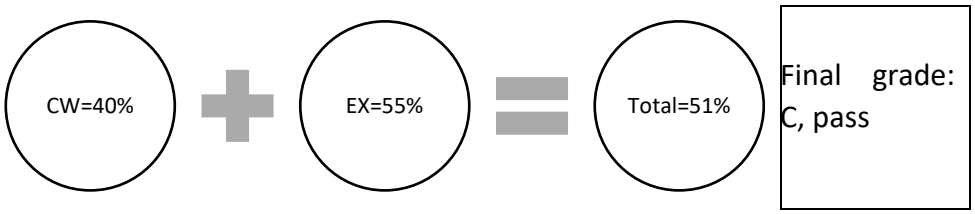
4. If student fails either coursework or final examination, and achieve an overall mark of 50% or more, then, the student will be awarded maximum mark of 49 or Grade C− (fail).

<u>Referred examination</u>

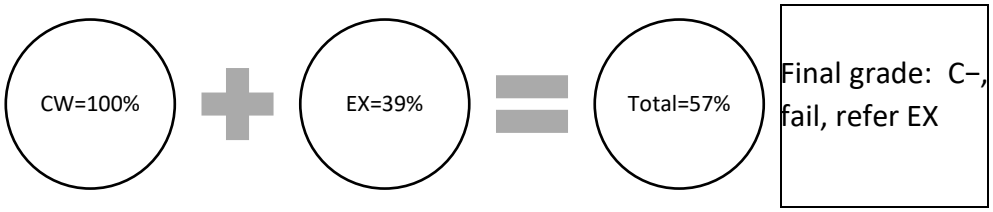
1. The maximum mark that a student can score for referred examination is 50%.
2. If the referred exam mark is more than previously scored mark, referred exam mark overwrites previously scored mark. The mark is then added to the students' mark to determine the final grade.
3. If the referred exam mark is less than or equal to the previously scored mark, the previously scored mark is retained.

Example cases for coursework (CW) weight 30% and final examination (EX) weight 70% are as follow:

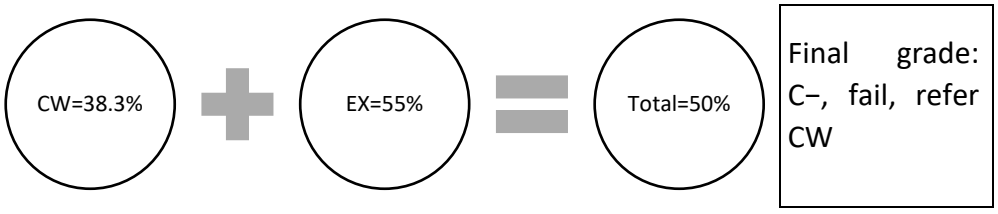
Pass coursework, pass final examination, and pass overall module



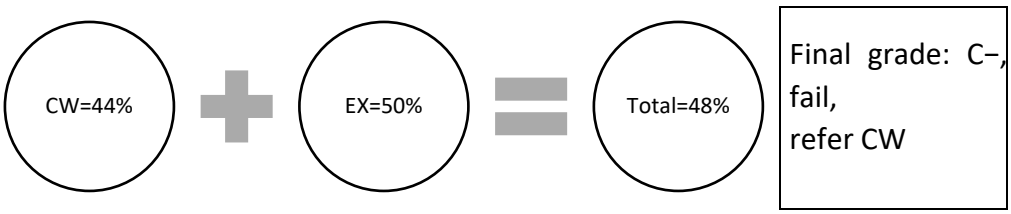
Pass coursework, fail final examination, and fail overall module



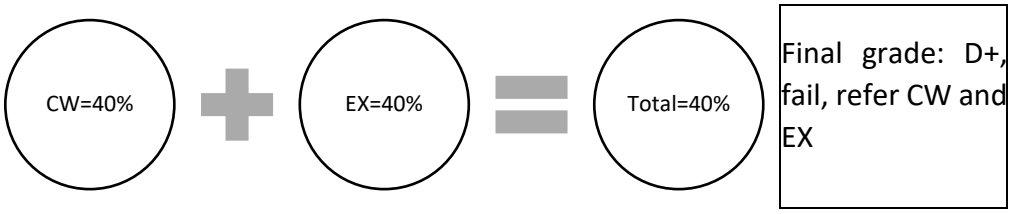
Fail coursework, pass final examination, and fail overall module



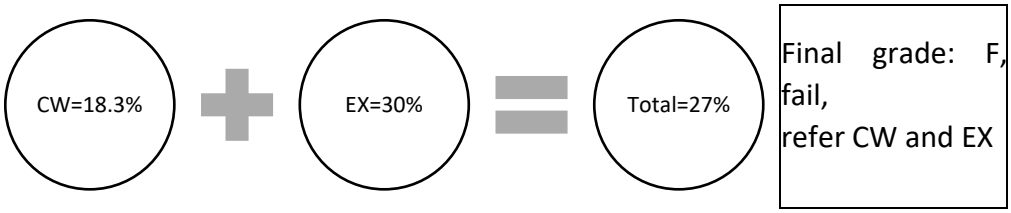
Pass coursework, pass final examination, and fail overall module



Pass coursework, pass final examination, and fail overall module



Fail coursework, fail final examination, and fail overall module



4.9 Strength Related to Academic Curriculum

The strength of MEP academic curriculum is elaborated in this section as follows:

1) The MEP also cater significantly on design courses to distinguish our graduated engineers from technologist.
2) The curriculum contents are developed to ensure all students progressively acquire the essential cognitive skills like analytical, critical, constructive, and creative thinking as they proceed though the semesters.
3) Apart from lectures, increasing elements of cooperative learning are introduced in the course delivery for the past four years including in-class team discussions, group projects and others.
4) Apart of conventional assessment methods like tests, quizzes and examinations, there are also more widespread uses of rubrics for non-cognitive skills like teamwork and communication skills. A number of courses also promote life-long learning via self-reflections.
5) The diverse FYP topics offered to students are closely related to either up-to-date scientific or industrial research projects. A systematic FYP process has been in place (Figure 4.2) to ease monitoring, implementation and execution.
6) The MEP curriculum has also established a process for industrial training practice to ensure students obtain relevant training and experience.
7) The MEP curriculum also emphasizes on professional development via the five courses discussed in Section 4.5 regarding the Exposure to Professional

Practices. Here, students are encouraged to practice their engineering work as a registered member with Board of Engineers.

8) The MEP encourages invited guest speakers from industry relevant to mechanical engineering for a sharing session on the current practice and technologies within the industry.

9) The MEP has undergone local curriculum benchmarking to ensure the suitability and relevance of the delivered curriculum structure.

4.10 Stakeholders Involvement in Curriculum Development and Review Processes

Various industries played their role as stakeholders in developing and reviewing the curriculum. Meeting with IAP is conducted every year to discuss the relevance of curriculum offered in the MED, POs, PEOs, and Industrial Training scheme from their perspective. In addition, External Examiner (EE) visit feedbacks and comments are also taken into consideration to strengthen our curriculum.

4.11 The CQI Relating to Academic Curriculum

The MEP aims to conduct a curriculum review based on the findings obtained from EE visitation report, benchmarking exercise, PEO CQI, PO CQI and CO CQI meetings.

4.12 Self-Assessment on Programme Performance Related to Academic Curriculum

Aspect	Poor	Satisfactory	Good	Comments
Programme Structure and Course Contents, and Balanced Curriculum:				
Programme Structure is appropriate, consistent and support the attainment of Programme Outcomes.			✓	
Curriculum emphasis on basic principles and skill of Mechanical Engineering discipline.			✓	
Curriculum has sufficient element for analytical, critical thinking and evidence-based decision making.			✓	
Curriculum has sufficient element for training student in rational thinking and research method.			✓	
Programme Delivery and Assessment Methods				
Programme delivery and assessment methods is appropriate, consistent, and support the attainment of Programme Outcomes.			✓	
Alongside traditional methods, other varieties of teaching-learning (delivery) modes,			✓	

assessment and evaluation methods shall be designed, planned and incorporated within the curriculum to enable students to effectively develop the range of intellectual and practical skills as well as positive attitudes as required in the Programme Outcomes.				
The assessment to evaluate the degree of the achievement of the Programme Outcomes by the students shall be done both at the programme as well as at course levels.			✓	
Laboratory				
The assessment of laboratory reports shall have been done through a systematic manner.			✓	
Proper laboratory supervision by academic staff members.			✓	
Students shall receive sufficient laboratory work to complement engineering theory that is learnt through lectures.			✓	
The laboratory should help students develop competence in executing experimental work.			✓	
Students need to work in groups, preferably not more than five in a group.			✓	
Laboratory exercises shall be relevant and adequate, illustrative, and promote development of instrumentation skills.			✓	
Inspection of reports needs to show that the required outcomes have been achieved.			✓	
Final Year Project				
The assessment shall have been done through a systematic manner.			✓	
The appropriateness of the project topics in relation to the degree programme is to be monitored.			✓	
The supervisors of the projects must be academic staff members or qualified Engineers from the Industry.			✓	
The place where the projects are conducted should have the facilities to support the projects.			✓	
The final year project is compulsory for all students and			✓	

demands individual analysis and judgement and shall be assessed independently.				
The student is shown to have developed techniques in literature review and information prospecting. It provides opportunities to utilise appropriate modern technology in some aspect of the work, emphasising the need for engineers to make use of computers and multimedia technology in everyday practice.			✓	
Industrial Training				
Exposure to professional engineering practice in the form of an industrial training scheme is compulsory.			✓	
The industrial training is shown to have exposed students and to have made them familiar with all common engineering processes at a practical level.			✓	
Effort needs to be made to assist all students gain placements of suitable quality.			✓	
Exposure to Professional Practice				
Exposure to engineering practice is integrated throughout the curriculum through combination of lectures/talks by guest lecturers from industry, academic staff with industrial experience, courses on professional ethics and conduct, industry visits, and industry-based final year project, and regular use of a logbook in which industrial experiences are recorded.			✓	

SECTION 5: STUDENTS

The performance and quality of the graduates completing MEP very much depends not only on the academic elements of the programme but also on other supporting elements such as their extra-curricular and co-curricular activities, counselling and etc. This section details the students' enrolment record, entry qualification record, requirement and admission process, credit transfer policies, counselling service, student workload, student activities, and their performance in relation to the POs.

Student enrolment to MEP for the past four academic years starting from 2019 until 2022 are listed in Table 5.1. The number of students' enrolment generally falls around 1 student to 2 students. Yet, the ratios of academic staff to students were maintained better than the ideal limit of 1:15. In addition, FEC has opened students' enrolment to foreigners beginning academic year 2018/2019.

Table 5.1: Distribution of Student Enrolment of the Four Cohorts for all Academic Years.

Year	***Academic Year***			
	2019	**2020**	**2021**	**2022**
1	2		1	2
2		2		1
3			2	
4				2
Total Students/Year	2	2	3	5

5.1 Discuss students' performance in relation to Programme Outcomes.

The student enrolment is very low through the years (Table 5.1). The low number enrolment is partly due to the outbreak of pandemics that forced the government to imposed Movement Control Orders (MCO) where all outgoings, schooling etc are not allow. Nevertheless, students' performances will be shown during EAC accreditation visit.

5.2 Entry Qualifications for MEP

The entry qualifications for MEP includes STPM, matriculation, diploma, ASASI programmes, pre-university colleges and A-Level. The Table 5.2 shows the entry qualifications of MEP intakes since 2019, which includes our current final year students. Students from the STPM and Foundation made up the final year cohort.

Table 5.2: Distribution of Entry Qualifications of First Year Students for the Past Four Academic Years.

Entry Qualifications	***Academic Year***			
	2019	**2020**	**2021**	**2022**
STPM	1			
A – Level				
UEC				
IB				
AUSMAT				
SAM				
CPU				
FEST				
Foundation	1		1	1
Matriculation				
Diploma				
Institutions of Higher Learning				1
Others				
Total	2		1	2

5.3 Requirement and Process for Admission of Students

There are different entry requirements for local and international students that needs to be considered when assessing applications as shown in Table 5.3 and Table 5.4, respectively. The Table 5.5 shows the details admission process.

Table 5.3: Entry requirements for the Programme for local students.

General requirements from FEC
▪ Pass SPM/Equivalent with at least a credit pass in SPM English Language and Mathematics;
Qualification: STPM or A - Level
▪ Pass the STPM / A – Level with at least Grade C in 2 subjects including Mathematics and Physics;
Qualification: Unified Examination Certificate (UEC)
▪ Pass the UEC with minimum grade B in 5 subjects including Mathematics and Physics;

Qualification: International Baccalaureate (IB)
▪ Pass the IB with at least 24 points;
Qualification: Australia Matriculation Programme (AUSMAT)
▪ Pass the AUSMAT with an average of 65% including Mathematics;
Qualification: South Australian Matriculation (SAM)
▪ Pass the SAM with a Tertiary Entrance Rank (TER) 70 and at least Grade B in 2 relevant subjects;
Qualification: Canadian Pre-University (CPU)
▪ Pass the CPU with an average of 70% in 6 relevant subjects;
Qualification: FCUC Foundation in Engineering, Science & Technology (FEST)
▪ Pass the FCUC's FEST with at least CGPA 2.00;
Qualification: Relevant Foundation from other Institutions of Higher Learning
▪ Pass the Foundation with at least CGPA 2.00 including Mathematics and Physics;
Qualification: Relevant Matriculation Certificate, Ministry of Education
▪ Pass the Matriculation with at least CGPA 2.00 including Mathematics and Physics;
Qualification: Relevant Diploma from other Institutions of Higher Learning (IHL)
▪ Diploma in Electrical/ Electro-mechanical/ Mechanical/ Electronics/ Telecommunication/ Computer Engineering/ Mechatronics/ other relevant field with at least CGPA 2.00;

Thus, a student with adequate proficiency level of English Language and Mathematics and fundamental knowledge in relevant disciplines will be able to achieve the intended learning outcomes of the programme and to graduate from the programme of study.

Table 5.4: Minimum Entry Requirements for the Programme for International students.

Academic Requirement
▪ Completed 12 years of primary and high school education; AND ▪ Obtained High School Certificate (eg. A-Level, HSC, SMU, & UAN (Indonesia), Matayom Suksa 6 (Thailand), International Baccalaureate etc.); OR ▪ Diploma in the related field
English Requirement
▪ TOEFL score of 500; OR ▪ IELTS Band 5.5; OR ▪ MUET Band 4; OR ▪ Obtain minimum Grade B (Level 4) in the Intensive English Programme conducted by the School of Languages, Literacies and Translation USM; AND ▪ Passed with Credit in Intensive Preparatory Bahasa Malaysia Programme (for candidates pursuing programmes conducted in the National Language).

Table 5.5: Students Admission Process.

No.	Admission Process
1	**Intake Projection**

	Existing projection is given to the MED for review. If amendment required, the revised amendments will be presented at the FCUC Admissions and the Senate for approval. If no amendment being revised, the existing projection will be used for the intake selection.
2	**Reviewing requirements** Existing entry requirements and rules are given to the MED for review. The MED would provide feedback if any amendments required. All amendments are required to be approved by the FCUC Admissions and the Senate. The revised entry requirements will be posted for reference and guidance for application and selection process.
3	**Advertisement and Announcement** Advertising and publishing the categories and programs offered in newspapers and the FCUC website. The advertisement will be uploaded by Marketing department.
4	**Selection process** The selection process is based on merit system (academic and co-curriculum)
5	**Notification and Announcement** Acceptance result will be notified to candidate through website, SMS and offer letter. The candidate will respond to the offer through online system.
6	**Selection process for the appeal candidates** Candidates who do not get any offers will only be considered for appeal. The appeal system is opened online when an offer is made. Shortlisted candidates will be provided based on merit. Appeals candidates will be elected and certified by the Dean and approved by Registrar.
7	**Registration** During the registration, all the related process for the new students will be implemented.

5.4 Discuss the policies and processes for credit transfer/exemption.

FCUC has established a policy to allow credit transfer or exemption, with clear guidelines, for students who either has completed a diploma or transferring from a similar degree programme from other institutions.

Applicants are welcome with non-standard route, either certificated or experiential where the level, content and achievement of previous learning and the congruence of previous learning outcomes of this programme can be exempted.

5.4.1 Conditions for Credit Transfer

5.4.1.1 The conditions for exemption of credit

The conditions and general guidelines listed below to be fulfilled for the transfer or exemption of credit:

I. The module applied for exemption of credit shall not be less than 80% syllabus overlap with the module that is offered at FEC.
II. The Cumulative Grade Point Average (CGPA) obtained for the module concerned must not be lower than 2.0.
III. The completed programme must be equivalent to FEC programme (at least 80% coverage).

IV. Diploma holders are eligible for credit exemption or transfer not exceeding 30% of the total credit for the programme (This is in compliance with EAC's allowable maximum credit transfer of 30%).
V. Students must apply for exemption before the commencement of his or her programme of study.
VI. The total number of semesters exempted should not exceed two semesters.
VII. Courses taken during employment (in service) for diploma holders cannot be considered for unit exemption.
VIII. Unit exemption for university and option courses can only be given for courses such as Bahasa Malaysia (LKM400), English Language, Islamic and Asian Civilisations and as well as co-curriculum.

5.4.1.2 Application process for transfer and exemption of credit within FCUC

From January 2017 to August 2019, for credit exemption of MEP's module, the diploma module must be at least grade D (40 marks or above) and 80% similarity.

Starting September 2019 intake, for credit exemption of MEP's module, the diploma module must be at least grade C (50 marks or above) and 80% similarity. This is proposed in the Programme Team Meeting on 18 July 2019 and approved in Faculty meeting on 21 August 2019.

These exemption policies work for internal transfer from Foundation in Engineering, Computing and Technology (FEST) to MEP or from other IHL to get into FCUC's MEP.

A process was setup to deal with credit transfer and exemption to ensure systematic consistency. The process runs from (a) to (d):

(a) An application for Transfer or Exemption of Credit shall be submitted to the Registrar after completing the programme evaluation using the official form obtainable from the Registry Office.

(b) Transfer or Exemption of Credit shall be evaluated and approved by the Dean of the Faculty concerned. The Registrar shall then verify the evaluation before the issuance of the offer letter, and subsequently reported to the Senate.

(c) The maximum number of credits that may be transferred or exempted shall not exceed one-third of the total credits of the programme of study concerned.

(d) A student shall be informed in writing by the Registrar of the result of his or her application for the transfer or exemption of credit".

5.4.2 Unit Exemption

In addition to the above stated guidelines, students are entitled for semester exemption based on the total units exempted as shown Table 5.6. Any student who would like to apply for unit exemption is required to complete the Unit Exemption Application Form which can be obtained from the Examination and Graduation Section or the FEC. Similar to credit transfer procedure, the form must be approved by the Dean of the School prior to submission to the Examination and Graduation Section for consideration and approval.

The Table 5.7 summarises the credit exemption for FCUC's Diploma in Mechatronics (DIMC) to the MEP. The Diploma in Mechanical Engineering (DME) is a new programme in FCUC and students who completed the DME are given advanced standing to enrol into the MEP and some credits (or modules) will be exempted. The Table 5.8 summarises the credit exemption for FCUC's Diploma in Mechanical Engineering (DME) to the MEP.

Table 5.6: Guidelines for Total Unit Exempted.

Total Units Exempted	Total Semesters Exempted
8 and below	None
9 – 32	1
33 to 1/3 of the total units for graduation	2

Table 5.7: Credit Exemptible Modules for DIMC to MEP.

< May 2018	> May 2018	Year	Sem	Module Code	Module Name (BME)	Credit	Credit Transferable Modules (DIMC)	Remarks
✓	✓	1	1	BGS 1001	Engineering Mathematics I	3.0	Algebra	80% transferable
	✓	1	1	BME 1001	Engineering Statics	3.0	Applied Mechanics 1	Remark 1
✓	✓	1	1	BME 1002	Introduction to Electrical and Electronic Engineering	3.0	Basic Circuit Theory & Basic Electronics & Analogue Electronics 1	80-90% transferable
	✓	1	1	BME 1003	Engineering Drawing	3.0	Engineering Design & CAD and CAE*	Remark 2
✓	✓	1	2	BGS 1002	Engineering Mathematics II	3.0	Calculus	90% transferable
		1	2	BGS 1003	Engineering Practice and Communication Skills	3.0		
	✓	1	2	BME 1004	Engineering Materials I	3.0	Materials Science	Remark 3
	✓	1	2	BME 1005	Engineering Dynamics	3.0	Applied Mechanics 2	Remark 4
		1	2	BME 1006	Machine Drawing	3.0		
		2	3	BGS 2001	Engineering Mathematics III	3.0		
✓	✓	2	3	BGS 2002	C Programming Techniques	3.0	Programming Language	100% transferable
		2	3	BME 2001	Fluid Mechanics I	3.0		
✓	✓	2	3	BME 2002	Thermodynamics I	3.0	Thermofluid Dynamics	80% transferable
		2	3	BME 2003	Solid Mechanics I	3.0		
		2	4	BEE 2005	Instrumentation and Measurement	3.0		
		2	4	BME 2004	Solid Mechanics II	3.0		
		2	4	BME 2005	Thermodynamics II	3.0		
		2	4	BME 2006	Fluid Mechanics II	3.0		
		2	4	BME 2007	Introduction to Microprocessor	3.0		

Remark 1: Applied Mechanics 1 is reviewed such that it contains more on Engineering Statics.

Remark 2: The two modules are reviewed to match Engineering Drawing.

Remark 3: Materials Science is reviewed such that it contains 80% of Engineering Materials I and 20% of content as intro to Engineering Materials II.

Remark 4: Applied Mechanics 2 is reviewed such that it contains 80% of Engineering Dynamics and 20% or less of Solid Mechanics.

Table 5.8: Credit Exemptible Modules for DME to MEP.

> October 2022	Year	Sem	Module Code	Module Name (BME)	Credit	Credit Transferable Modules (DIMC)	Remarks
	1	1	BGS1001	Engineering Mathematics I	3.0	Algebra	80% Transferable
	1	1	BME1001	Engineering Statics	3.0	Static Engineering	90% Transferable
	1	1	BME1002	Introduction to Electrical and Electronic Engineering	3.0	Basic Electrical and Electronics	90% Transferable
	1	1	BME1003	Engineering Drawing	3.0	Engineering Design, CNC and CAD/CAM Technology	Remark 1
	1	2	BGS1002	Engineering Mathematics II	3.0	Calculus	90% Transferable
	1	2	BGS1003	Engineering Practice and Communication Skills	3.0		
	1	2	BME1004	Engineering Materials I	3.0	Materials Science	90% Transferable
	1	2	BME1005	Engineering Dynamics	3.0	Engineering Dynamics	90% Transferable
	1	2	BME1006	Machine Drawing	3.0		
	2	3	BGS2001	Engineering Mathematics III	3.0		
	2	3	BEE2009	Programming for Engineers	3.0		
	2	3	BME2001	Fluid Mechanics I	3.0	Fluid Mechanics 1, Fluid Mechanics 2	Remark 2
	2	3	BME2002	Thermodynamics I	3.0	Thermodynamics1, Thermodynamics 2	Remark 3
	2	3	BME2003	Solid Mechanics I	3.0	Mechanics of Materials	90% Transferable
	2	4	BEE2005 / BME3003	Instrumentation and Measurement	3.0		
	2	4	BME2004	Solid Mechanics II	3.0		
	2	4	BME2005	Thermodynamics II	3.0		
	2	4	BME2006	Fluid Mechanics II	3.0		
	2	4	BME2007	Machine Component Design I	3.0		

Remark 1 : The two modules are reviewed to match Engineering Drawing

Remark 2: The two modules are reviewed to match Fluid Mechanics I

Remark 3: The two modules are reviewed to match Thermodynamics I

5.5 Student Workload.

The total unit distribution for MEP throughout their four-year studies for each semester is given in Table 4.2. As shown in this table, semester 7 has taken into account the 6 units for industrial training which will be carried out during the semester break of the 3rd academic year. Thus, the actual workload for the 7th semester is only 15 units. Generally, student workload is calculated in terms of Student Learning Time (SLT). The SLT is a student effort in learning in order to achieve the specified learning outcomes. This effort includes lecture, tutorial, seminar, self-study, retrieval of information, research, fieldwork, as well as preparing for and sitting examination.

The Student Learning Time (SLT) for each course is calculated based on the recommendations outlined by the Malaysian Qualification Framework (MQF) where, each credit unit is equivalent to 40 hours of notional SLT established as per the least diligent category. Thus, irrespective of the total credit unit of each course, course coordinators are required to prepare the course delivery and assessment plan to oblige the SLT of their course to avoid violation of student total SLT. The Table 5.9 gives an overall guideline adopted for MEP on the SLT for various types of delivery and assessment methods.

Table 5.9: The SLT Guideline for Various Delivery and Assessment Method.

Item	Duration (hours) or requirements	Independent Self Learning (Hours)
Lecture	1	1
Tutorial	1	1
Laboratory	1	2
Coursework (i.e., Quiz, Test, Assignment, Project and etc)	1	2
Final Exam	1	5

5.6 Student Activities and Involvement in Students' Organisations.

The Student Affairs and Services Department (SASD) will provide the necessary supports on the running of student activities, societies and functions. These supports include the provision of funds, a wide range of facilities and experienced human resources to provide the necessary advice and guidance.

Students' placement in industry have played wide role in providing experience in management and governance. The Table 5.10 lists our first graduating cohort the company where they perform their internship and the roles they played during the internship in the company. The Table 5.11 are activities that are organised by FEC to allow

student to get more exposed to outside academic environment that are complementing to their studies. Note that the last activity is in October 2019 and there are no more organised visitation activities due to pandemic outbreak.

Table 5.10: List of companies attended by MEP's first graduating cohort for industrial training recently and their achievement.

No.	Student	Company	Company Field	Student Achievement
1	Goh Kee Shan	JF Technology Sdn. Bhd.	Electronic contact product manufacturer	Managing time wisely on assigned task to meet group goal.
2	Kamalaprashant Ramasamy	Halton Manufacturing Sdn. Bhd.	Kitchen exhaust system manufacturing	Proposed and successfully implemented the safety procedures for above ground works.

Table 5.11: List of organized activities for students.

No.	Program	Date
1	Introduction of Occupational Safety and Health by Ms. Khairussyazwani binti Md Sani, DOSH	25th Apr 2019
2	Metaltech & Automex Expo 2019	15th May 2019
3	Prof. Ir. Dr. Ramesh Singh, External Examiner Visit 2019	8th to 9th Jul 2019
4	Overview of Engineering Accreditation, Washington Accord and OBE by Prof. Ir. Dr. Ramesh Singh	8th Jul 2019
5	Visit to King Koil Factory	14th Oct 2019
6	Research Day 2021	25th Nov 2021
7	Jan 2022 Orientation	4th Jan 2022
8	Feb 2022 Orientation	11th Feb 2022
9	Club Recruitment Day	11th Feb 2022
10	Resume Day	2nd Mar 2022
11	Career Day	25th Mar 2022
12	Virtual Classroom Session with Dr. Christine Lee	22nd Apr 2020
13	Mechanical engineers and project management in the development of MRT coaches	13th Apr 2022
14	Innovation Day	26th May 2022
15	Future Tech Labs launching and MoU Signing	22nd Sep 2022
16	Research Seminar 2022	25th Nov 2022

5.7 Students' Performance in relation to POs

Since the students' performance on curriculum has been discussed in Section 3, this section elaborates on the performance of our students in relation to POs from overall holistic perspective involving various co-curriculum activities which includes completion and awards. These activities address aspects such as communication, societal engagement, team-working, leadership, project management, ethics, environment, and

sustainability. The Table 5.12 highlights qualitative attainment of POs based on various co-curriculum activities. These co-curriculum activities were not measured in POs attainment but believed to qualitatively contribute to the attainment of respective POs.

Table 5.12: Addressing the POs through the Extra-Curricular Activities.

No.	Type of Activities	Description	PO Attainment
1	Industrial Training	The trainings immerse the students into real engineering work experience and environment, allow them to practice their knowledge and skills learned at FCUC, and develops critical engineering skills relevant to their trainings.	Most of these POs are addressed at their training companies: PO1, PO2, PO3, PO5, PO8, PO9, PO10, PO12
2	Industrial Visits and Talks	The industrial visits and talks provide the exposure to the students the working experience and environment for an engineer, the professional expectation towards an engineer, and specific details regarding their engineering projects.	These POs are briefly addressed at the surface level because of the short encounter of these activities: PO1, PO5, PO6, PO8, PO9, PO10

5.8 Students' Counselling Services

For academic related matters, student will refer to the MEP PC for advice and for non – academic related matters, the student can visit the Student Affairs and Services Department (SASD) to raise their concerns or issue. The SSD managed by Head of Department, and it is supported by several officers to provide services to students. The Head and the officers have the relevant qualification in handling student services.

The PC here in the MEP is also equivalent to Academic Advisor in other IHL. The Academic Advisors will advise their students under their responsibility on academic-related matters. Important advice for the students includes the registration planning for certain courses in each semester during the study period. Before registering the course, students are advised to consult and discuss with their Academic Advisors to determine the courses to be registered in a semester.

5.9 Strength Related to Students

A number of elements in the curricular and extra-curricular components that build up the strengths of our students.

1) The FEC's wide range of entry qualification and requirement enabled MED to obtain vast number of both local and international students with significant quality.

2) The FCUC also accommodate good policies and process to cater students for credit transfer/exemption.

5.10 CQI Relating to Students

Heavy workload on students in their 7th semester (i.e., 20 credit hours) have been identified based on guideline recommendations outlined (i.e., < 18 credit hours) by EAC on students' formal credit hour in a semester. The current resolving plan is to move some subjects into short semester (Engineering Economics and MPU 4: Team Building) to satisfy the requirement of less than 18 credit hours per semester.

5.11 Self – assessment on Programme Performance Related to Students

Aspect	Poor	Satisfactory	Good	Comments
Entry requirements (Academic)			✓	
Transfer Policy / Selection Procedure			✓	
Student Counselling		✓		
Workload			✓	
Enthusiasm and Motivation		✓		
Co – curricular activities				
Observed attainment of POs			✓	

SECTION 6: ACADEMIC AND SUPPORT STAFF

The MEP's academic staff comprise experts from various backgrounds, academic and professional qualifications as well as diverse experiences in teaching, research, publications and administration. In this section, the overall competence of academic and support staff of MED in implementing the Outcome-Based Education (OBE) for MEP is elaborated.

6.1 Academic Staff.

The Institution recruits academic staff of high calibre, whose qualifications and work experience are relevant to the academic position. Staff recruited and selected will be based on merit through fair and open processes set out in the Recruitment, Selection and Appointment Procedure and subject to approved budget and manpower plan.

Generally, all academic staff that have been recruited to teach degree programmes must possess at least a Master's Degree or equivalent qualification. Similarly, academic staff recruited to teach Master programmes must possess a Doctorate qualification or at least a Master's Degree with at least five (5) years teaching experience at tertiary level and substantial industrial experiences with professional qualifications.

To support the conduct of programmes at diploma, degree and postgraduate levels, the Institution will continuously recruit well qualified staff and will strive to achieve the criteria of the Ministry of 15% of the academic fraternity with Doctorate/PhD qualification and 60% with Master's qualification or equivalent qualification. At FCUC, Associate Professors and Professors will be recruited in near future to focus more on research and scholarly activities. Besides teaching, the professors would be involved in research and scholarly activities with the aim of publishing and disseminating new knowledge or expanding knowledge within their area of specialization. Besides, the Faculty is fully aware of the need of a minimum of eight full time staff upon the full running of the programme. The management at FCUC always encourage all academic staff to upgrade their qualification (e.g.: PhD).

This programme is taught by three group of academic staffs; core academic staff, support academic staff and academic staff who taught for Mata Pelajaran Umum (MPU). The number of academic staff who taught for Mata Pelajaran Umum (MPU) are excluded in staff number calculation in Table 6.1. The Table 6.1 shows the detail breakdown in terms of numbers of academic staff throughout this entire of the programme from 2018 onwards to 2022. A summary of academic and professional qualifications for all academic staff involved in the MEP is shown in Table 6.2.

The MED academic staff comprise experts from various backgrounds, academic and professional qualifications as well as diverse experiences in teaching, research, publications and administration. The Table 6.1 details the academic staff in MED for current and past years. An overall competency of MED core academic and MPU staff are all summarized in Table 6.2 (Table 6.2a for core academic staff and Table 6.2b for MPU teaching staff). The diverse background and competencies in many areas of mechanical engineering translates the capability of the academicians to deliver a high-quality teaching and research supervision.

Table 6.1: Total numbers of Academic Staff by Academic Year.

Academic Staff	**Programme Academic Year**				
	Year 0 2018	**Year 1 2019**	**Year 2 2020**	**Year 3 2021**	**Year 4 2022**
a) Total number of full-time staff (including those servicing other programmes, staff on study or sabbatical leave & tutors).	2	2	8	8	8
b) Full-time equivalent of academic staff servicing other programmes.	0	1	3	2	2
c) Academic staff (on study or sabbatical leave).	0	0	0	0	0
d) Tutors.	0	0	0	0	0
e) Effective full-time academic staff = (a)-(b)-(c)-(d).	2	1	5	6	6
f) Full-time equivalent of academic staff from other programmes servicing this programme.	2	2	0	3	4
g) Full-time equivalent of part time academic staff.	0	1	0	0	0
Full-Time Equivalent Academic Staff (FTES) Contributing to Staff: Student Ratio = (e)+(f)+(g).	4	4	5	9	10

Notes:

If an academic staff member is involved in teaching more than one-degree programme (including off-campus and distance learning), then the full-time equivalent of that particular staff has to be calculated.

6.1.1 Academic Staff Qualifications and Position

The employment of the academic staff in MED is based on the department's requirement to cater number of students' enrolment and the diverse disciplinary of Mechanical Engineering teaching and research demand. Nevertheless, current number of academic staff fulfils the EAC requirement as specified by the EPAM2012. The Table 6.3 summarizes the MED academic staff highest qualification. Currently there are 60% of MED academic staff have PhD qualifications which is building up the strength of MED capacity to perform good teaching, research and consultancy work. The Table 6.4 summaries based on the academic staff position are also given.

Table 6.2a: Analysis of all academic staff.

Name	Post held	Date of first Appointment at the Fac / Sch / Dept	Part of Full Time or from other programmes	Academic Qualifications/ Field of specialization/ Institution and Year of award	Professional qualification	Membership in professional bodies/Learned	Years of Experience		Level of Activity (High, Medium, Low, None)				
							Govt. / Industry	This Fac / Sch / Dept	Professional society	Research	Consulting Work in industry	Publications	Administration
Dr. Mohammad Hazim Mohamad Hamdan	Programme Coordinator, Lecturer	2-May-19	Full time	PhD (Mechanical), UMP (2021)	None	Graduate member BEM and MBOT	1.5	3.5	Low	High	Low	High	High
Ir. Ts. Dr. Parvathy Rajendran	Associate Professor	1-Oct-20	Full time	PhD (Aerospace), Cranfield University (2012)	None	PE BEM, Ts MBOT, CEng, MIET	13	2.25	High	High	High	High	Low
Asst. Prof. Dr. Lay Kok Keong	Programme Coordinator, Assistant Professor	2-Jan-19	Full time	PhD (Mechanical), Monash University (2018)	None	GE BEM, Associate Member IMechE	1	4	Low	Medium	Low	Medium	High
Dr. Tio Kek Kiong	Senior Lecturer	1-Sep-21	Full time	PhD (Mechanical) USC	None	GE BEM	1	0.5	Low	Medium	Low	Medium	Medium
Ir. Ts. Sukhairul Nizam bin Abdul Razak	Lecturer	1-Sep-20	Full time	MBA, Charles Stuart University (2007)	ACPE (Asean Chartered Professional Engineer)	PEPC BEM, Ts MBOT. M.I.E.M, ACPE	25	2.25	High	Low	High	Low	Low
Ir. Muammar Quadaffi bin Mohd Ariffin	Lecturer	1-Oct-20	Full time	M.Eng (Mechanical), Cornell (1996)	None	PEPC BEM, Member SAE Int'l, Member IEM	26	2.25	Low	Low	Medium	Low	Low

Dr. Mohd Firdaus Bin Abas	Lecturer	1-Sep-20	Full time	PhD (Mechanical), UPM (2021)	None	Graduate member BEM	1	1.5	Low	High	Low	Medium	Low
Dr. Wong Kai Chung	Senior Lecturer	4-Jul-22	Full time	PhD (Mechanical), University of Sydney (2019)	None	Graduate member BEM	21	0.5	Low	Low	Medium	Low	Medium
Mr. Mohamad Fauzi Rahim	Lecturer	1-Sep-22	Full time	MEng (Mechanical), Technische Hochschule Brandenburg (2021)	None	Graduate member BEM	1	0.25	Low	Low	Low	Low	Low
Mr. Darshan Namasivayam	Lecturer	1-Sep-22	Full time	MEngSc (Mechanical), UM (2022)	None	Graduate member BEM	1	0.25	Low	Low	Low	Low	Low

Table 6.2b: Mata Pelajaran Umum (MPU) lecturers

Name	Post held	Date of first Appointment at the Fac/Sch/ Dept	Part of Full Time or from other programmes	Academic Qualifications/ Field of specialization/ Institution and Year of award	Professional qualification	Membership in professional bodies/Learned	**Years of Experience**		**Level of Activity (High, Medium, Low, None)**				
							Govt. / Industry Practice	This Fac/ Sch/ Dept	Professional society	Research	Consulting? Work in industry	Publications	Administration
Asst Prof Siti Maria Mohamad	Head / Programme Coordinator / Lecturer	01 June 2016	Full time	Degree of Master of Malay Studies (Socio-Culture) University Malaya Year 2008 Bachelor of Malay Studies (Major - Malay Language & Minor – Malay Linguistic)	None	None	0 year	6 years	None	Medium	None	Medium	None

				University Malaya Year: 2006									
Siti Hajar Ariffin	Lecturer	2013	Full time	Master of Education Year:2016 Bachelor of Malay Language and Linguistic Year: 2004	n/a	n/a	2 years	12 Years	Low	Medium	Low	Medium	Low
Ahmad Faris Naqiyuddin Mohd Ghazi	Lecturer	22/6/22	Full time	Master in History and Civilization / East Asian History and Minority Muslims / International Islamic University Malaysia (2016) Bachelor in History and Civilization / International Islamic University Malaysia (2013)	None	None	0 year	2 years	None	Low	None	Low	None

Table 6.3: Summary of the academic qualifications of core academic teaching staff involved in the MEP for Academic Year 2022.

Academic qualifications	**Number of fulltime staff**
Total number of academic staff with Doctorate qualification.	6
Total number of academic staff with Master qualification.	4
Total number of academic staff with Bachelor qualification.	0
Total number of academic staff teaching the programme.	10

Note: The headcount in the table EXCLUDED MPU lecturers.

Table 6.4: Post held by core academic staff in 2022 academic year.

Post	**Number of fulltime staff**	**Number of part-time staff**
Professor	0	0
Associate Professor	1	0
Assistant Professor	1	0
Senior Lecturer	2	0
Lecturer	6	0
Total	10	0
Total	**10**	

6.1.2 Academic Staff Professional Qualifications and Membership

Currently, 3 out of 10 MED academic staff have obtained Professional Engineer (PE) qualifications from Board of Engineers Malaysia (BEM). Summary of MED academic staff professional qualifications and membership in professional bodies/societies is tabulated in Table 6.5 together with 3 years forecast. The minimum requirement by the EAC to ensure number of PE status academic staff has been fulfilled by the MED.

Table 6.5: Professional Qualifications and Membership

Qualifications	2019	2020	2021	2022	2 years Forecast	
					2023	2024
Professional Engineer	0	3	3	3	4	5
Chartered Engineer	0	1	1	1	2	2
ASEAN Chartered Professional Engineer	0	1	2	2	2	2
Member of IEM	0	2	2	2	2	2
Member of SAE International	0	1	1	1	1	1
Member of MBOT	0	2	2	2	2	2
Member of IET	0	1	1	1	1	1
Associate Member of IMechE	1	1	1	1	1	1
Graduate Member of IEM/BEM	2	3	3	6	7	7
Graduate Member of MBOT	1	1	1	1	2	2

6.1.3 Academic Staff Research and Publications

In summary, MED has shown adequacy of academic staff with 60% having a PhD qualification. As the MEP is still new and academic staff are currently focusing on teaching and setting up the MEP. In the future when the MEP is accredited, academic staff will focus into research. The Table 6.6 represents the research, publications and innovation spanning from 2019 to 2021. The indexed journal publication output improved from 2019 to 2021. With the MEP accredited in the future, there should be another round of improvement for the research outputs.

6.1.4 Academic Staff Industry Collaborations

MED academic staff works actively with industry via securing grants, MOA/MOU, consultation job as well as classroom session to deliver seminars/lectures/talks to students. Few consultation jobs listed in Table 6.7 and MOA/MOU as shown in Table 6.8 clearly established MED academic staff collaboration with the industry.

Table 6.6: Academic Staff Research and Publications Output.

No.	Descriptions	2019	2020	2021
1	Number of Grants Secured (Active)	0	0	0
2	Total of Postgraduate Students (Local & International)	0	0	0
3	a) Indexed Journal	1	3	19
	b) Conference Refereed Proceeding	0	0	0
	c) Other Journal	0	0	0
	d) Chapters in Research Book	0	0	0
	e) Other Publication	0	0	0
	Number of Total Publications	1	3	19

Table 6.7: MED – Industry Consultancy Work.

Team Leader	Collaborating Industry	Duration	Amount (RM)
Ir. Ts. Dr. Pavarthy Rajendran	USM	07/10/2021 to 30/10/2021	200.00
Ir. Ts. Dr. Pavarthy Rajendran	USM	12/10/2021 to present	800.00
Ir. Ts. Dr. Pavarthy Rajendran	BEM	07/04/2021 to 07/04/2021	1000.00
Ir. Ts. Dr. Pavarthy Rajendran	UPM	11/10/2021 to 11/10/2021	400.00
Ir. Ts. Dr. Pavarthy Rajendran	University of Southern Queensland	28/09/2021 to 28/09/2021	1477.96
Ir. Ts. Dr. Pavarthy Rajendran	University of Southern Queensland	21/04/2021 to 21/04/2021	1533.42
Ir. Ts. Dr. Pavarthy Rajendran	Cranfield University		812.86
Ir. Ts. Dr. Pavarthy Rajendran	ICAMMM 2021	26/03/2021 to 27/03/2021	854.70

Table 6.8: MED – Industry MOA / MOU.

Officer Responsible	Collaborating Industry	Duration
Mr. Koong Kok Leong	UBTech Robotics Corp Limited.	07/10/2020 to 06/10/2021
Mr. Koong Kok Leong	TMAS Technologies Sdn. Bhd.	07/10/2020 to 06/10/2021

6.1.5 Implementation of OBE.

This is the first OBE accreditation exercise in MED. Since, all academic staff are required to adopt and thoroughly comprehend the MED OBE system to ensure to be well-versed in the OBE implementation. Hence, the FEC has rigorously organised knowledge sharing, workshops and training sessions.

6.2 Academic Staff Workload.

This section describes the overall staff workload which enables effective teaching, student- staff interaction, student advising and counselling, IHL service and research activities, professional development and interaction with industries. The workload regularly prepared and presented by the PC in MED board meeting. The distribution of teaching load ensures the effectiveness of research activities, professional development as well as interaction with the industries. Both Table 6.9 and Table 6.10 show the course teaching distribution and summary of workload respectively for MED academic staff for Semester 1 of academic year 2022 & Semester 2 of academic year 2022. The workload of each staff is on average 7-8 hours per week, and this enables effective teaching session with students.

In order to provide high level of interaction between staff and students, the MED has put a continuous effort to ensure a low staff-student ratio is maintained as given in Table 6.11. The ratio has been maintained between 1:0.33 and 1:0.50 for the past four academic years in MED which complies with the requirement stipulated in the EPAM2012. Hence, current MED academic staff workload enables them to participate in various committees at the department and university levels (e.g., EC Promotional Coordination Committee, Alumni Committee, MED OBE Committee, MED KPI & KIP Committee, MED Laboratory Management and etc.).

Table 6.9: Academic Staff Course Teaching Distribution staff for Semester 1 & Semester 2 of academic year 2022.

No.	Code	Credit	Semester	Course	Staff
1	BME1001	3	2	Engineering Statics	Mr. Darshan a/l Namasivayam
2	BME2003	3	2	Solid Mechanics I	Mr. Mohammad Fauzi Bin Rahim
3	BGS1001	3	2	Engineering Mathematic I	Mr. Cham Kah Loon
4	BME1002	3	2	Introduction to Electrical and Electronic Engineering	Ir. Dr. Lim Cheong Seng
5	BME1003	3	2	Engineering Drawing	Ir. Muammar Quaddafi Bin Mohd Ariffin
6	BME2001	3	2	Fluid Mechanics I	Dr. Wong Kai Chung
7	BGS3001	3	2	Engineering Economics	Ir. Sukhairul Nizam

8	BME3003	3	2	Instrumentation and Measurement	
9	BGS1003	3	2	Engineering Practice and Communication Skill	
10	BME2002	3	2	Thermodynamics I	Dr. Lay Kok Keong
11	BME1006	3	2	Machine Drawing	
12	BME2005	3	2	Thermodynamics II	
13	BEE2009	3	2	Programming for Engineer	Mr. Hafizuddin Bin Ameruddin
14	BGS2001	3	2	Engineering Mathematic III	Ms. Nurul Shafiqah Binti Mohd Nor
15	BME4004	3	1	Finite Element Method	Dr. Mohammad Hazim Bin Mohamad Hamdan
16	BME1004	3	1	Engineering Materials I	
17	BME2003	3	1	Solid Mechanics I	
18	BME2006	3	1	Fluid Mechanics II	Dr. Mohd Firdaus Bin Abas
19	BGS4002	3	1	Product Management and Product Development	Ir. Ts. Dr. Parvathy A/P Rajendran
20	BGS4001	2	1	Professional Practice	
21	BME4101	3	1	Final Year Project	
22	BGS1003	3	1	Engineering Practice and Communication Skill	Ir. Sukhairul Nizam Bin Abdul Razak
23	BGS4003	3	1	Entrepreneurship	
24	BME4007	3	1	Air conditional and Refrigeration	Dr. Lay Kok Keong
25	BME1006	3	1	Machine Drawing	
26	BME1005	3	1	Engineering Dynamics	
27	BME4101	3	1	Final Year Project	
28	BGS2001	3	1	Engineering Mathematic III	Ms. Nurul Shafiqah Binti Mohd Nor
29	BGS1001	3	1	Engineering Mathematic I	Mr. Cham Kah Loon

Table 6.10: Summary of Academic Staff Workload Summary.

Lecturer	Total	Teaching		Tutorial		FYP		Lab		Coordinator		Evaluator	
		S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Mr. Darshan a/l Namasivayam	5	0	2	0	1	0	0	0	1	0	0	0	1
Mr. Mohammad Fauzi Bin Rahim	5	0	2	0	1	0	0	0	1	0	0	0	1
Mr. Cham Kah Loon	9	2.5	2.5	1	1	0	0	0	0	0	0	1	1
Ir. Dr. Lim Cheong Seng	5	0	2	0	1	0	0	0	1	0	0	0	1
Ir. Muammar Quaddafi Bin Mohd Ariffin	5	0	2	0	0	0	0	0	2	0	0	0	1
Dr. Wong Kai Chung	5	0	2	0	1.3	0	0	0	0.7	0	0	0	1
Ir. Sukhairul Nizam Bin Abdul Razak	17	4	4	3	2	0	0	1	2	0	0	0	1
Dr. Lay Kok Keong	26	7	4	1	2	1	0	3	2	0	3	1	1
Mr. Hafizuddin Bin Ameruddin	5	0	2	0	0	0	0	0	2	0	0	0	1
Ms. Nurul Shafiqah Binti Mohd Nor	9	2.5	2.0	1	1.5	0	0	0	0	0	0	1	1
Dr. Mohammad Hazim Bin Mohamad Hamdan	16	7	0	2	0	0	0	2	0	3	0	1	0
Dr. Mohd Firdaus Bin Abas	5	2	0	1.3	0	0	0	0.7	0	0	0	1	0
Assoc. Prof. Ir. Ts. Dr. Parvathy A/P Rajendran	7	5	0	0	0	1	0	0	0	0	0	1	0

Table 6.11: Average Staff-Student Ratio.

	Session			
	2019	2020	2021	2022
Students by Cohort	2	0	1	2
Total Students	2	2	3	5
SAE Academic Staff	10	10	10	10
Overall Staff – Student Ratio	1:0.2	1:0.2	1:0.3	1:0.4

6.3 Support Staff.

The MED supporting staff comprise administrative and technical staff from various backgrounds, academic and qualifications as illustrated in Table 6.12. The MED briefs the administrative and technical support staff about their role in helping the academic staff in fulfilling the requirement for OBE. In addition, FCUC requires all staff to update and enhance their knowledge and skills, which requires each support staff a minimum 25 hours of training yearly.

Table 6.12: Support Staff Competency Details.

Staff	Post	Academic Qualification	Number	Total
Technical	Electronics Lab Technician	BEng (Hons)	1	2
	MEP Lab Technician	BEng (Hons)	1	
Administrative	Administration	BTEC-HND	1	1

Currently MED has s total of 2 technical support staff from technical education background where most of them having engineering qualification from college and university. In, additions, many of our technical staff have industry experiences prior FCUC. Their experiences are asset for MEP in supporting the delivery of our courses, especially those courses that involve laboratory and fabrication activities. Details on the competency of these technical support staff are shown in Table 6.13.

As for administrative staff, MED is headed by the Dean and supported by one deputy deans and a PC, a corporate coordinator, an executive registrar. All administrative support staff have sufficient education qualifications to perform their job scope. Similarly, supporting administrative staff are also regularly sent to in-house training programme for enhancing their knowledge and skills. Details on the competency of these administrative support staff are shown in Table 6.14.

6.4 Other External Support Staff.

The MED is active in providing external exposure to MEP students by inviting various lecturers or invited speakers from industry and also public bodies to enrich and support the MEP. The Table 6.15 list the lecturers and invited speakers from various industries and public bodies with their respective topics held during those sharing session.

Table 6.13: Details on Technical Staff.

Name	Post Held	Date of first appointment at MED	Academic Qualifications/Field of Specialization/Institution and Year of Award	Years of Experience	
				Govt./ Industry Practice	MED
Mr. Foo Chun How	Electronics Lab Technician	15.4.2010	BEng (Hons.) / Electrical and Electronics Engineering / KBU College / 2009	-	12
Mr. Mohammad Nazrul Azar Bin Jamaluddin	MEP Lab Technician		BEng (Hons.) / Mechanical Engineering / Universiti Malaya (UM).	2	5

Table 6.14: Details on Administrative Staff.

Name	Post Held	Date of first appointment at MED	Academic Qualifications/Field of Specialization/Institution and Year of Award	Years of Experience	
				Govt./ Industry Practice	MED
Ms. Haslinda Binti Hamzah	Administration	01/12/2005	BTEC-HND / Business Information Technology / Twintech College / 2015	-	17

Table 6.15: List of Lecturers / Invited Speakers from Industry / Public Bodies.

No.	Title	Event Date	Lecturers / Invited Speakers	Industry / Public Bodies
1	Introduction of Occupational Safety and Health	25 April 2019	Ms. Khairussyazwani binti Md Sani	DOSH
2	Overview of Engineering Accreditation, Washington Accord and OBE	8 July 2019	Prof. Ir. Dr. Ramesh Singh	UM

6.5 Strength Related to Academic and Support Staff.

In this sub-section, the strength related to academic and support staff are explained in detail. The strength includes:

1. Most MED academic staff have PhD qualifications to perform good teaching, research and consultancy work.
2. Diversity of expertise in MED further strengthens the MEP.
3. MED has a total 3 PE out of 10 academic staff, i.e., 30% of academic staff.
4. MED has a total 10 out of 10 academic staff registered with BEM, i.e., 100% of academic staff.
5. MED has reputable academic-industry collaborations.
6. A low academic staff workload of an average 5 hours per week.
7. MED maintains excellent staff to student's ratio between 1:0.33 and 1:0.50 for the past four academic years in MED, which if well within the requirement of 1:15 stipulated in EPAM2012.
8. All technical support staff holds relevant and qualified certificate, diploma and degree.
9. MED has good support from external lecturers/speakers from industry/public bodies.
10. Overall, FCUC has good incentives and financial support for professional and career development.

6.6 CQI relating Academic and Support Staff.

MED supports more academic staff to attain PE status.

6.7 Self – assessment Related to Academic and Support Staff.

Aspect	Poor	Satisfactory	Good	Comments
Academic Staff				
1) The staff shall be sufficient in number and competencies to cover all curricular areas.		✓		
2) There must be at least 8 full time staff members for a particular degree programme.		✓		
3) Staff members are encouraged to attain the Professional Engineer status and be active in engineering learned societies such as IEM, IMechE, IEEE etc.		✓		
4) Academic Staff members should be given opportunities to conduct research. The IHL should have provision for research grants for the staff members. Research Output includes recent publication in conference/refereed journals and patents.		✓		
5) Involvement of staff members in appropriate consultancy and industrial jobs.		✓		
6) Average teaching load (teaching hours per week): <12 hours (good), 12 – 15 (satisfactory), >15 (poor).		✓		
7) Staff members motivation and enthusiasm.		✓		
8) The Faculty is encouraged to invite engineers from industry and professional bodies to deliver seminars/lectures/talks to students. However, this is not meant as a replacement of full-time staff members for teaching purposes.		✓		
9) Staff awareness of the Outcome-Based approach to education.		✓		
Support Staff				
1) Qualifications (Certificates, diplomas and degrees in the relevant areas).		✓		
2) Adequacy of support staff (laboratory staff member).		✓		
Staff Development				
1) The IHL shall systematically plan and provide appropriate training, sponsorship for postgraduate studies/sponsorship for conferences, sabbatical leave etc. for academic staff.		✓		
2) IHL shall provide the opportunities for the support staff to upgrade their competencies through training and practical exposure.		✓		
Staff Assessment				
1) The IHL shall incorporate annual assessment of staff performance which		✓		

takes into account participation in professional, academic and other relevant bodies as well as community involvement.				
2) The IHL shall also establish a working system for evaluation/feedback by students on matters relevant to their academic environment.		✓		
Staff : Student Ratio				
1) The ratio of academic staff: student for the programme for the last four academic sessions.		✓		

SECTION 7: FACILITIES

The facilities provided at FCUC covers a wide range of facilities to accommodate teaching and learning, which also includes support facilities such as student hostel, sport and recreation centre, healthcare, student development and guidance, transportation and shuttle service. Our facilities are a critical element that enables effective delivery of quality engineering education and enhancing the learning experience of the engineering students at FCUC.

7.1 Teaching and Learning Facilities.

Learning resources have been effectively developed to underpin teaching and learning and support the aims and objectives of the programme. Orientation handbook, student handbook, computer centre facility usage handbook, library usage handbook provided a comprehensive description of library and IT support, as well as teaching and social accommodation for students. FCUC reviews the learning resource plans to ensure their appropriateness and accessibility. In view of the university college status upgrade, FCUC will expand its physical resources to support its teaching and learning.

7.1.1 Physical Facilities

Currently, the facilities for conducting this programme in terms of physical facilities, equipment and human resources (supporting staff) are adequate. All rooms are air- conditioned and majority are equipped with basic teaching aids, such as LCDs, overhead projectors, screens and whiteboards to create conducive learning environment with multi-delivery modes. The Table 7.1a and Table 7.1b lists the facilities that support the teaching and learning of the proposed programme.

Table 7.1a: FCUC Existing Physical Facilities (Old Building).

No.	Facilities	Unit	Capacity
1	Lecture Rooms	35	985
2	Science Laboratory: Biology / Chemistry / Physics	3	138
3	Engineering Workshop	7	274
4	Mechatronics Laboratory	1	25
5	Recording Studio	1	20
6	Design Development Laboratory	1	25
7	Library	1	329
8	Others:		
	Lecturers' Office	2	60
	Quality Assurance Department	1	4
	Multipurpose Hall	1	350
	Lecture Hall	5	870
	A/V Room	1	50
	Placement Test Room	1	10
	Meeting Room	2	30
	Centre for Excellence in Learning and Teaching	1	30
	Centre for Excellence for Research and Innovation	1	30
	Covered Carpark	1	115 Bays
	Surau	1	40
	Student Hostel Rooms	198 rooms	350
	Badminton Court	4	-
	Football Field	1	-
	Music Room	1	-
	Practical Restaurant	1	26
	Practical Kitchen	3	60
	Practical House Keeping Room	1	15
	Practical Front Desk Office & Tour Office	1	25

Table 7.1b: FCUC New Building Facilities.

No.	Level	Facilities	Unit	Capacity
1	Ground Floor	Marketing & Counselling Office	1	18
		Administration & Management Office	1	20
		Meeting Room	4	25
		File Room	2	-
		Storage Room	1	-
		Printing Room	1	-
		Mother Room	1	-
		Student Services & Affairs Department	1	10
		Student Council Room	1	15
		Counselling Room	1	2
		Student Lounge	1	130
		Dance Studio	1	30
		Book Shop	1	-
		Cafeteria	1	200
		Security Office	1	-
		Sick Bay	1	2
		Male Surau	1	20
		Female Surau	1	20
		Office Utility Room	1	-
		Covered Car Parks	-	-
2	Level 1	Library	1	390
		Chancellery Office	1	4
		Meeting Room	1	15
		Utility Room	2	-
		Covered Car Parks	-	-
3	Level 2	IT Centre	1	376
		MBA Centre	1	100
		MBA Utility	1	-
		Utility Room	1	-
		Covered Car Parks	-	-
4	Level 3	Faculty of Design & Built Environment	1	30
		Lecturer's Office	1	
		Meeting Room	1	6
		White Canvas Gallery	1	-
		Design Studios	8	240
		Tutorial Rooms	3	45
		Covered Car Parks	-	-
5	Level 3A	Drafting Studio	1	30
		Design Studios	17	480
		Tutorial Rooms	4	45
		Covered Car Parks	-	-

6	Level 5	Seminar Rooms (a & b)	3	240
		Seminar Rooms	4	260
		Drawing Studio	1	70
		3D Print Studio	1	20
		Photography Studio	1	25
		Fashion Studio	1	25
		Material Library	1	-
		Covered Car Parks	-	-

7.1.2 Engineering Laboratory and Workshop Facilities.

The Engineering Laboratories for the FEC have been continuously improved from strength to strength since 2018.

The Table 7.2 shows the laboratories / workshop with their list of laboratory equipment / software to support the teaching and learning of the modules and the relevant fields of projects to be carried out in MEP. The Table 7.3 summarises the technical staff supporting laboratories and workshop as shown in Table 7.2.

Table 7.2: The laboratory / workshop with their list of equipment / software, and types of course(s) / project(s) concluded.

Main Equipment / Software	Course(s) / Project(s)
1. Fluid Mechanics Laboratory (Figure 7.1)	
• Basic Hydraulic Benches (6 units) • Bernoulli's Apparatus • Flow Meter Apparatus • Francis Turbine • Hydrostatic Pressure • Impact of Jet Apparatus • Energy Losses in Bends Apparatus • Osbourne Reynolds Apparatus • Orifice and Jet Apparatus • Mini Centrifugal Pump Apparatus • Multi Turbine Apparatus • Vortex Mixer Apparatus • Water Hammer Apparatus • Flow Over Weir Apparatus	• Fluid Mechanics 1 • Fluid Mechanics 2 • Integrated Design Project • Final Year Project
2. Thermodynamics and Heat Transfer Laboratory (Figure 7.2)	
• Concentric Tube Heat Exchanger • Air – Conditioning Controller Unit • Vapour compression cycle unit	• Heat Transfer • Thermodynamics 1 • Thermodynamics 2

• Steam Power Plant • Thermal Conductivity of Building Material Apparatus • Free and Forced Heat Convection • Shell and Tube Heat Exchanger	• Integrated Design Project • Final Year Project
3. Mechanics Laboratory (Figure 7.3)	
• Basic Roof Truss Apparatus • Simple Pendulum, Bifilar Suspension, Trifilar Suspension and Compound Pendulum Apparatus Centre of Gravity Apparatus • Equilibrium of Beam Apparatus • Inclined Plane Apparatus • Work Done by a Variable Force Apparatus • Centrifugal Force Apparatus • Crank and Connecting Rod Apparatus • Linear and Angular Velocity Apparatus	• Engineering Statics • Engineering Dynamics • Solid Mechanics 1
4. Materials and Advanced Manufacturing Laboratory (Figure 7.4)	
• Rockwell and Tensile Test Machine • Rolling Disc Apparatus (in Physics Lab) • Impact Tester Machine • Fatigue Machine • Torsion, Bending and Beam Deflection Test Machine c/w set weight Bending Moment Apparatus • CNC Milling • CNC Lathe Rapid Prototyping Machine – 3D Printer (shared with Architecture Department)	• Engineering Materials 1 • Engineering Materials 2 • Solid Mechanics 1 • Manufacturing Processes • Integrated Design Project • Final Year Project
5. Mechanical Workshop (Figure 7.5)	
• Milling Machine • Lathe Machine • Bench Grinder • Metal Horizontal Band Saw • Bench Vice • MIG Welding (from furniture design workshop) • Workshop tools (hammer, saw etc) • Milling Vice • Cut Off Machine	• Manufacturing Processes • Integrated Design Project • Final Year Project

• Angle Grinder • Toolboxes (x4)	
6. CAD Laboratory	
• 30 computers with Autodesk Mechanical Desktop software (including AutoCAD) • Solidedge • Ansys – Mechanical (license expired)	• Engineering Drawing • Machine Design • Final Year Project • Mechanical Engineering Design • Finite Element Analysis • Heat Transfer • Integrated Design Project • Final Year Project
7. Electronics Engineering Laboratory	
• DC Power Supply • Dual – trace oscilloscope • Function Generator • Powered Project Board	• Introduction to Electrical and Electronic Engineering
8. Hydraulics and Pneumatics Laboratory (under Electronics Engineering Lab)	
• OMRON Programmable Logic Controller set • Pneumatics Plug Board • Equipment Tray Board, Didactic	• Hydraulics and Pneumatics
9. Control And Instrumentation Laboratory (under Electronics Engineering Lab)	
• DC Power Supply • Digital Oscilloscope • Function Generator • Digital Multimeter • Multisim Software • Matlab Software	• Instrumentation & Measurement • Control Systems

Maintenance and calibration

The engineering laboratory does have safety inspections for environment in laboratories, and the instruments also do have maintain check for equipment in schedule.

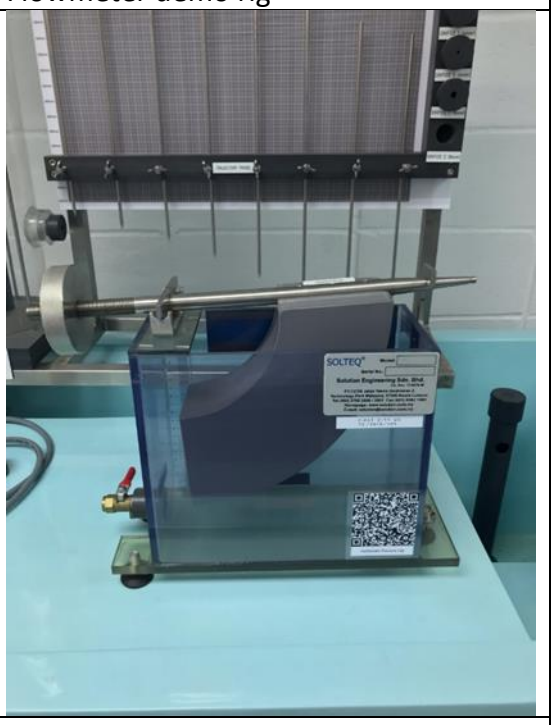
The newly enrolled students will be brief by MEP Laboratory Technician about the safety guidelines in the laboratory and the emergency response flow plan.

The apparatus for each lab is placed in neat and orderly manner. No tables, chairs, benches and apparatus are placed near to the door / exit area to make way for safe evacuations in the event of fire.

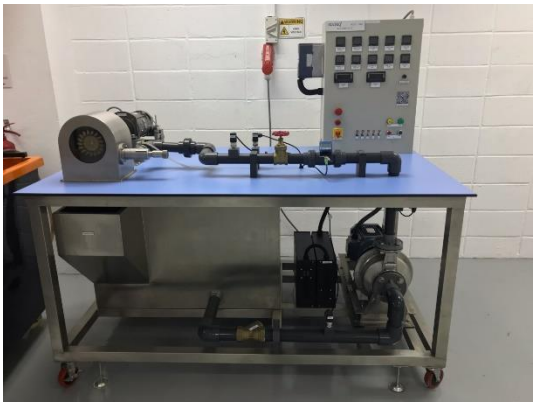
All the laboratories do have evacuation route maps and exit signs. Fire extinguishers have been installed in all laboratories.

FCUC has provided first aid and emergency response training for staff to join.

Figure 7.1: Fluid Mechanics laboratory experimental facility and equipment.

	
Bernoulli theorem demo unit	Flowmeter demo rig
	
Francis Turbine Unit	Hydrostatic Rig

	
Impact Jet Apparatus	Losses in bends and Osborne Reynolds
	
Trajectory Rig	Mini Centrifugal pump test unit



Multi Turbine test set

Vortex Mixer unit

Water Hammer test unit

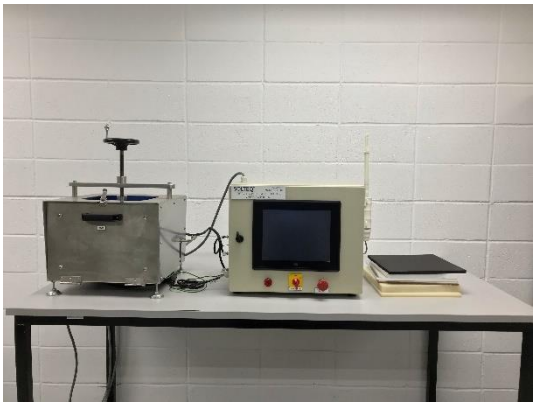
Figure 7.2: Thermodynamics laboratory experimental facility and equipment.

Concentric Tube Heat Exchangers

Air – Conditioning Controller Unit

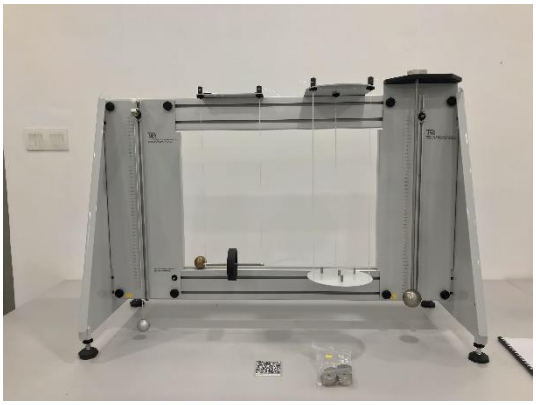
Vapour Compression Cycle Unit

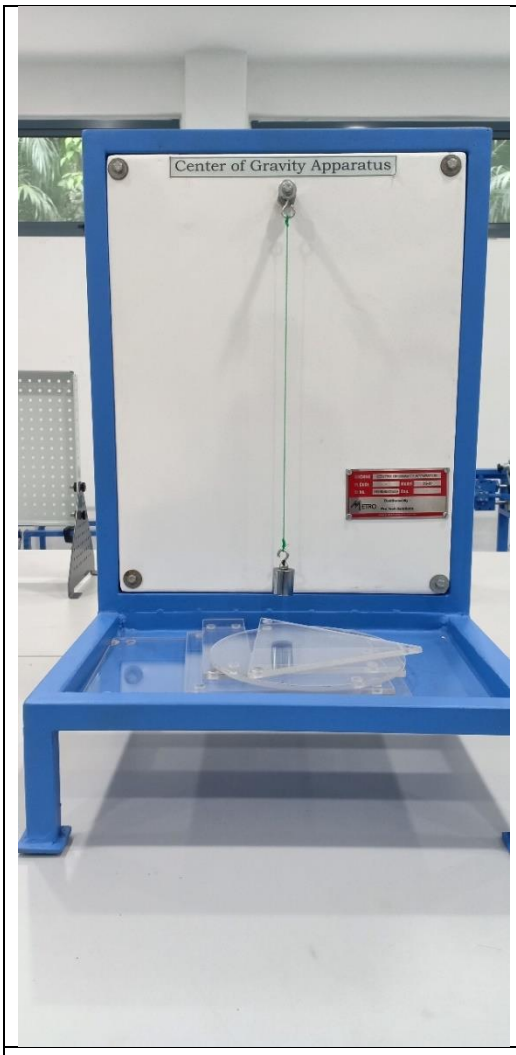
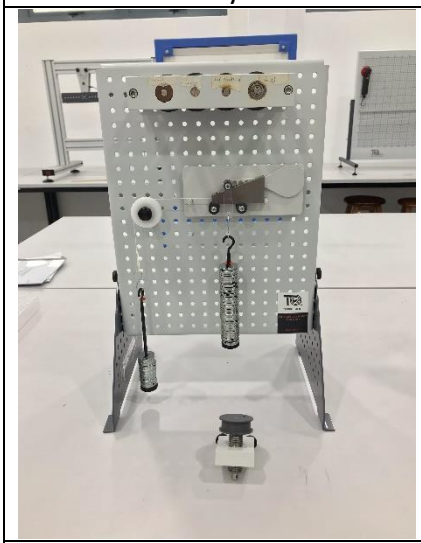
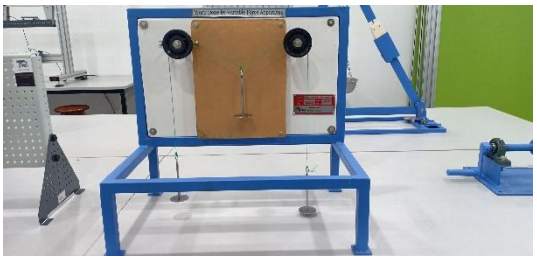
Steam Power Plant

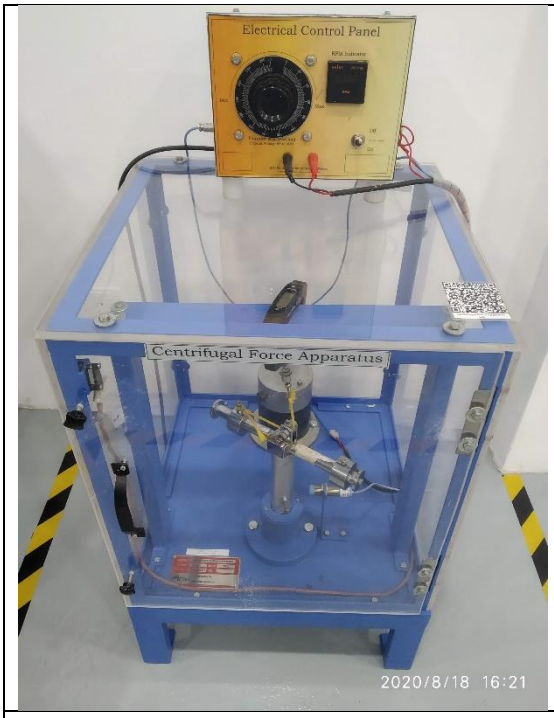


Thermal Conductivity of Building Material Apparatus	Free and Forced Heat Convection
	
Shell and Tube Heat Exchangers	

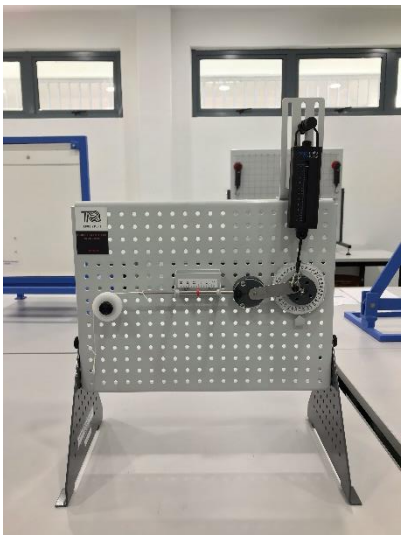
Figure 7.3: Mechanics laboratory experimental facility and equipment.

	
Basic Roof Truss Apparatus	Simple Pendulum, Bifilar Suspension, Trifilar Suspension and Compound Pendulum Apparatus

	
Centre of Gravity	Equilibrium of Beam Apparatus
	
Rotational Friction for Ball Bearings, Wedge and Jack Screw Apparatus.	Work done by a Variable Force Apparats



Centrifugal Force Apparatus



Crank and Connecting Rod Apparatus

Linear and Angular Velocity Apparatus

Figure 7.4: Materials and Advanced Manufacturing laboratory experimental facility and equipment.

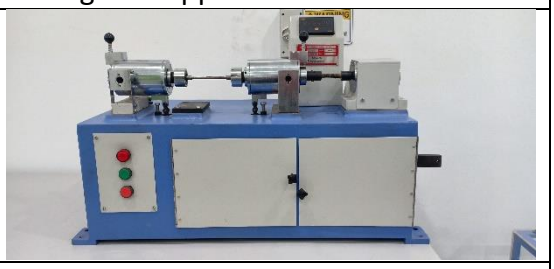
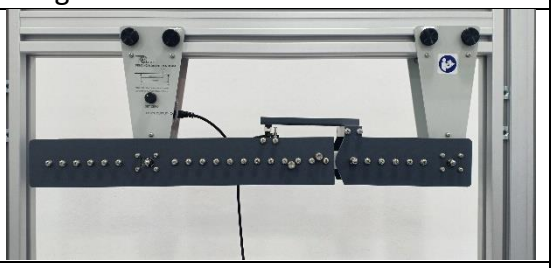
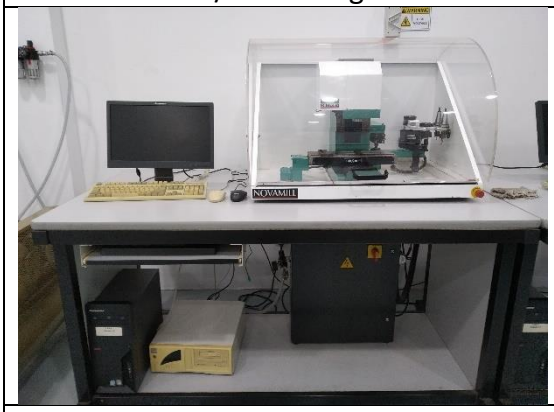
	
Rockwell and Tensile Test Machine	Rolling Disc Apparatus
	
Impact Tester Machine	Fatigue Machine
	
Torsion, Bending and Beam Deflection Test Machine c/w set weight	Bending Moment Apparatus
	
CNC Milling	CNC Lathe

Figure 7.5: Mechanical Workshop laboratory experimental facility and equipment.

	
Milling Machine	Lathe Machine
	
Bench Grinder	Metal Horizontal Band Saw

Bench Vice

Workshop Tools

Cut Off Machine

Angle Grinder

Toolboxes (x4)

Table 7.3: Number of Laboratories and Technician for MEP.

No.	Laboratory	Technician
1	Lab 1: Power and Control Lab	1) Mr. Foo Choon How
2	Lab 5: Digital Electronics Lab	
3	Lab 7: E – CAD / Microprocessor Lab	
4	Fluid Mechanics Lab	1) Mr. Mohammad Nazrul Azar Bin Jamaluddin
5	Thermodynamics Lab	
6	Mechanical Workshop	
7	Mechanics Lab	
8	Materials Lab	
Total	**8 Laboratories**	**2 Technicians**

7.1.3 Library.

The Library at First City University College offers a cosy ambience with well-stocked library materials of more than 25,000 volumes of monographs. It is equipped with reading areas, individual study spaces, discussion rooms and an audio-visual room for the storage of audio library materials.

The library can comfortably cater to 365 visitors at a time.

The FCUC Library has been bestowed with three ISO awards; ISO 9001:2000 in the year 2004, ISO 9001:2008 in the year 2008 and latest, ISO 9001:2015 in the year 2018 for its provision of extensive services. First City UC Library is consistent in providing good services to meet the users' needs.

The library is an integral part of FCUC. It shares the quest for excellence in academics and fully supports the educational needs of all members including students, academicians and staff. The FCUC Library is managed by qualified librarians and staff who have been trained in library. The Table 7.4 represents the work force running the library department.

FCUC Library is using VITUA Integrated Library Management System to manage its operations. It contains catalogue which is accessible from FCUC Library Portal catalog (firstcity.edu.my) and also other modules such as circulation, acquisitions and infostation.

Table 7.4: Details of library staff in FCUC.

No.	Name	Designation	Academic Qualification
1.	Nurul Iylia Sabeela Binti Johari	Chief Librarian	Master of Science in Information Management, UiTM
2.	Nurhidayati Adila Binti Muhamat	Assistant Librarian	Master of Library and Information Science, UM
3.	Irasathi Kaliyammal	Library Assistant	Sijil Pelajaran Malaysia

The library provided many resources for academicians, staff and students to refer onto material that is useful for their (research) works. These resources are:

a. Printed Resources

The First City University College Library provides printed books and journals relevant to the courses offered at First City University College.

b. Media Collections

Includes of CD-ROM, DVD-ROM, Sound disk and video cassettes.

c. Electronic Resources

The First City University College Library is subscribing to ProQuest Database, EBSCOhost Academic eBooks Database and perpetual titles of Emerald Database.

ProQuest Database

It consists of 11,791 titles of international publications. The e-Journals packages are:

1. Social Science Database
2. Art, Design and Architecture Collection
3. ABI/INFORM Global
4. Materials Science & Engineering Collection

EBSCOhost Academic eBooks Database

It consists of 226,014 multidisciplinary eBook titles.

Emerald Database

The library has perpetual titles of Emerald Database collection. It consists of 125 publication titles in management and 26 publication titles in engineering field.

d. Open Access Collection

The First City University College Library encourages users to use Open Access materials as additional references to their courses and reading pleasure activities. These materials include e-Books (Table 7.5), e-Journals (Table 7.6), e-Thesis (Table 7.7), e-Repository (Table 7.8), and physical references (Table 7.9).

Table 7.5: The list of e-Books that are available in the library.

No	Platforms & Links	Quantity
1.	National Library of Malaysia (PNM Overdrive)	18,868 books
2.	SpringerOpen books	1963 books
3.	Directory of Open Access Book (DOAB)	58,413 books
4.	KUPDF	>10,000 books
5.	OAPEN Library	>20,000 books
6.	Oxford Academic Books	6000 titles
7.	JSTOR	7,800 books
8.	De Gruyter	110,000 books
9.	Cambridge – Open Access Books	187 books
10.	Palgrave Macmillan open access books & journals	1,963 books
11.	Edward Elgar Publishing	67 books
12.	Open Textbook Library	1,048 Books

Table 7.6: The list of e-Journals that are available in the library.

No	Platforms & Links	Quantity
1.	Sage Journals	>1,000 journals
2.	Elsevier – Open Access Journals	>600 journals
3.	Wiley-Blackwell listed on Sherpa Romeo Website.	3,227 journals
4.	IEEEAccess	>4 million documents.
5.	Oxford Academic Journals	>450 journals
6.	Directory of Open Access Journal (DOAJ)	17,964 journals
7.	KUPDF	6,178 journals
8.	SpringerOpen	>200 journals
9.	Open Access Academy	>10,000 journals
10.	JSTOR Open Access Journals on Jstor	2,000 journals
11.	Cambridge – Open Access Journal	10,000 journals
12.	Wiley Open Access	136 journals
13.	Edward Elgar Publishing	12 journals
14.	Research in Learning Technology	66 volumes journal
15.	Journal of Entrepreneurship, Management, and Innovation (JEMI)	42 volumes journal
16.	Journals for free	>17200 free journals
17.	Malaysian Citation Index (MyCite)	>500 Malaysian journals
18.	ScienceDirect Open Access Journal	4,629 journals and 30,015 e-books
19.	Taylor & Francis Open and Routledge Open	>4,442,000 articles

Table 7.7: The list of e-Theses that are available in the library.

No	Platforms & Links	Quantity
1	British Library Electronic Theses Online Service (EThOS)	>600,000 doctoral theses
2	Open Access Theses & Dissertation (OATD.org)	6,274,924 theses and dissertations
3	OpenThesis	>1,000,000 theses
4	PQDT Open	5 million works
5	Theses Canada	>20,000 publications

Table 7.8: The list of e-Repository that are available in the library.

No	Platforms & Links	Quantity
1	Directory of Open Access Repositories	5,388 data
2	Research Papers in Economics	4,058,364 collections
3	Social Science Research Network	1,140,506 research papers

Table 7.9: The list of physical references that are available in the library.

Library Collections	Quantity
Books	24,052
Past Exam Papers	1,609 (titles)
Companies' Annual Reports	348 (titles)
Theses/ Dissertations	1,754
Periodicals (printed format – by volumes)	1,303
Audiovisual	2,158
Emerald Database (e-Journals)	151 titles
ProQuest Database (e-Journals)	11,791 titles
EBSCOhost Academic eBooks	226,014 titles

Besides providing reading and references materials, the library also equipped with facilities such as:

i. KOHA Library Management System
ii. OPAC station (a computer to access library catalogue)
iii. 12 computer workstations
iv. in 1 photocopy machine
v. Wireless internet access (WiFi)
vi. discussion rooms
vii. 12 carrel tables
viii. Reading areas – 380 seats
ix. Headsets – 11 sets

Library obtains feedback from students and staff through a few ways. Feedback forms are easily accessible at the counter, and suggestion box is located at library entrance area. Verbal feedback, annual library survey, Course Committee Meeting, ISO meeting and Management meeting are another platform for them to give their views on library policy, services and procedures.

7.1.4 Information and Communication Technology Facilities.

FCUC encourages the use of Information and Communication Technology (ICT) for administrative, academic support, research and business activities. Its main function is to plan, develop, implement and maintain appropriate ICT infrastructure such as the university information system and campus network. The FCUC's ICT facilities is for students and FCUC's staff use in support of the vision and corporate objectives of the FCUC; reasonable personal use is also acceptable; however, users should be aware that the FCUC cannot guarantee privacy of network traffic. All users are responsible for seeing that these technologies are used lawfully, ethically and courteously. The workforce in Computer Centre is tabulated in Table 7.10.

Table 7.10: Details of ICT staff in FCUC.

Name	Position	Qualifications
Mr. Theng Beng Haw	IT Manager	BSc (Hons) Software Engineering, Nottingham Trent University, UK.
En. Muhammad Nur Azdan bin Abdul Muhid	IT Support Technician	Diploma in Information Technology, Kolej Polytech MARA, Kuantan, Malaysia.
En. Mohd Hairul Iqram Bin Rohaidzad	IT Support Technician	Sijil Pelajaran Malaysia (SPM, 2009), SMK St. John Institution, Bukit Nanas.
En. Mohammad Arif Bin Mohd Yusof	IT Support Technician	Diploma in Telecommunication Technology (WBL), Kolej Komuniti Ampang.

7.2 Programmes Offered Wholly or Partly in Distance Mode.

Not Applicable.

7.3 Support Facilities.

There is a Student Affairs and Services Department (SASD) managed by its Head of Department and it is supported by several officers to provide services to students. The Head and the officers have the relevant qualification in handling student services.

In order to enhance the student's academic achievements and character building, FCUC has provided a wide range of support facilities within the campus. The facilities cover most aspect of daily routine such as accommodation, sports and recreational centres, student centre, cafes and other amenities. Support services provided are in the following areas:

- Accommodation Service
- Student Counselling Services
- Student Financial Support
- Student Visa
- Recreational Facilities
- Co – Curricular Activities
- Health Treatment Facilities
- Insurance Policy
- Transport Service
- Student Internship

A stationery and bookshop are also located inside the FCUC campus to facilitate students to purchase books and stationery. Lockers are also provided for the students to store their belongings.

A trained counsellor is available in SASD to provide academic and pastoral counselling to students, when necessary. The SASD plays an advisory role to the various clubs and societies in the campus. The SASD advice on the organisation of various sports and other cultural activities. The SASD also works closely with the Student Council to help it to carry out the various projects and activities that would generally involve the student community.

Consultation between students and counsellors are treated as confidential, the SASD practices open door policy as any students can walk – in and approach the counsellor(s) for advice.

Support mechanisms are in place to identify any learning issues and will get the affected students to the appropriate specialists to arrest the identified issues. Remedial lessons

will be arranged for weaker students. In the event of referred examinations, revision classes for referred students will be arranged.

7.3.1 Accommodation.

There are three types of accommodation provided in FCUC, which are on – campus, hostel and student house.

Students can seek accommodation in the FCUC – managed hostel. Application for accommodation is made to the SASD. The SASD assigns rooms based on the availability and on first – come – first served basis. New students staying in the hostel or student houses are expected to take up tenancy for a minimum period of 2 months.

Oversea and outstation students can stay in campus accommodation. All hostel rooms are air-conditioned with en-suite bathrooms. And the residential floor has a designated pantry and discussion area. Students could enjoy using sports facilities like badminton courts, futsal court, basketball court, table tennis area, and football field within the campus.

After staying in the FCUC accommodation for 2 months, students can choose to move out to stay with private landlords. In any case, accommodation in the hostel or student house is provided for a year only. Any request for extension will be considered on a case – to – case basis and is subjected to availability of beds.

With the completion of a second phase of FCUC, there will be more beds and rooms to cater for the student's accommodation.

7.3.2 Sports and Recreational Centres.

FCUC provide space as a student lounge for students for casual activities like chess and puzzle games. The dance studio and music room allow students to use appointments from SASD. Staff in SASD have attended and certificated on basic first aid and emergency response training, they can provide basic first aid to student, they also can arrange student to clinic or hospital when needed

7.3.3 FCUC Bus Service.

The Main Campus maintains a regular free shuttle bus service which ferries students between the campus and the nearby residential areas. The free shuttle service from campus to Kepong, Subang and Petaling Jaya area. A public transport bus comes from MRT Bandar Utama station, and it has a stop in front of CenterPoint Bandar Utama.

7.4 Building Infrastructure Maintenance.

The safety of academics, staff and students are the utmost priority of FCUC; therefore, the safety of the building infrastructure is very important and is maintained periodically. The subsequent sub-sections focus on various aspect.

7.4.1 Laboratory Safety and Rules Briefing.

A briefing with engineering rules and regulation guidelines conducted for the newly enrolled students.

7.4.2 Fire extinguisher maintenance.

At FCUC the fire extinguisher maintenance was perform periodically every year. This periodically maintenance is recommended by Fire Fighter which is the only Malaysian company ISO Certified in both manufacturing, installation, servicing as well as maintenance of fire protection systems. And each engineering laboratory has installed a fire extinguisher.

7.4.3 Emergency exit labelling.

First City University College provides a fire escape plan with proper emergency exit labelling.

7.4.4 Emergency evacuation briefing and procedure.

A briefing about safety and emergency responses was conducted for the newly enrolled students. For this briefing, the students have been introduced to the emergency evacuation procedure.

7.4.5 Updating all first aid boxes.

Each laboratory has individual first aid kit and replenish supply regularly.

7.5 Laboratories Maintenance and Calibration.

The maintenance inspections are periodically conducted by the respective supporting staff in each department or school. The equipment in the laboratories and workshops are maintained in accordance with the specified specification from the original equipment manufacturer (OEM). Furthermore, the MED will periodically inspect the equipment in the laboratories and workshops as an initiative procedure to ensure all the equipment are well maintained before each incoming semester.

7.6 Strength Related to Facilities.

FCUC is dedicated to continuously upgrade and maintain the teaching facilities to support the current demand in teaching and learning. Furthermore, the location between the classroom and other facilities such as library, cafes, hostels and study areas are all within walking distance. The student can easily walk around the campus to reach one location to the other location without spending considerable time and energy.

The main campus is fully gated and 24 hours surveillance is conducted by the police station onsite. The mentioned facilities above have provided a conducive environment to the students and aims in providing the students with ample opportunities in sustainable character building. The MED strongly believe that with the presence of extensive facilities benefit the students with a holistic education during the duration of their studies.

Campus Facilities

		
ATM Machine	Badminton Court	Basketball Court
		
Cafeteria	Career Counselling	Centre for Postgraduate Studies
		

Centre for Excellence in Research and Innovation (CERI)	Counselling Room	Dance Studio
		
Exhibition Area	Table Tennis	IT Centre
		
Indoor Parking	Indoor Greet Atrium	Marketing Area

		
Football Field	Futsal Court	Library
		
Landscape Area	Mac Laboratory	Multipurpose Hall
		
Music Room	Project Exhibition Gallery	Shuttle Bus

		
Student Lounge		

7.7 Self-assessment Related to Facilities.

Aspect	Poor	Satisfactory	Good	Comments
Lecture Rooms - Quantity Provided and Quality of Audio Visual				
Lecture Rooms – Quantity and Quality (in terms of furniture, environment and Audio-Visual Equipment).			✓	
Laboratory /Workshop –Student Laboratory and Equipment				
Average Student Number per Laboratory Experiment where there is no group activity.			✓	
Average Student Number per Laboratory Experiment where group activity is required.			✓	
IT/Computer Laboratory –Adequacy of Software				
IT/Computer Laboratory Average Number of Students per Computer: A minimum of 10:1.			✓	
Library /Resource Centre –Quantity of Books Provided				
The IHL is to have sufficient titles of text and reference books, standards and journals to support teaching and research for the programme evaluated.			✓	

SECTION 8: QUALITY MANAGEMENT SYSTEMS

The quality of an engineering programme depends on the offered degree which fulfils the growing requirements of stakeholders. This quality must be consciously managed to satisfy demands of not only stakeholders but also enrich students attribute development. This section details the structure, procedures, processes and other necessary resources required to manage the quality of the MEP.

8.1 Organisational Structure of FCUC.

This section describes briefly the organisational structures at the FCUC as given in Figure 8.1. The FCUC top management team is led by Vice Chancellor, Prof. Saw Sor Heoh who is assisted by a team of eleven members which includes Deputy Vice Chancellor of Academic and International, Deputy Vice Chancellor of Research and Innovation, Deputy Deans of Academic, Students and Alumni, Deputy Vice Chancellor of Industry and Community Network, Director of the USM Health Campus, Director of the EC and etc.

FCUC Senate is the highest executive body which makes policy and strategic decisions on all matters related to academic. The Senate is chaired by the VC with its members consisting of the deans of the Faculties at FCUC, and selected academics. The organizational structure of FEC is illustrated in Figure 8.2.

The MED is relatively a small school within FCUC, in terms of the number of staff and students; 10 academic staff, 1 administrative staff, and 2 technical staff. The MED is led by PC, Assistant Professor Dr. Lay Kok Keong who is assisted by a team of teaching staff (Lecturers, Senior Lecturers and an Associate Professor). The PC and teaching staff will hold a PRDC meeting from time to time when required. The PC plans and manages the implementation of the MEP and its curriculum. The Corporate Coordinator plans and manages matters related to industry and community.

The organisational structure of FCUC is shown below:

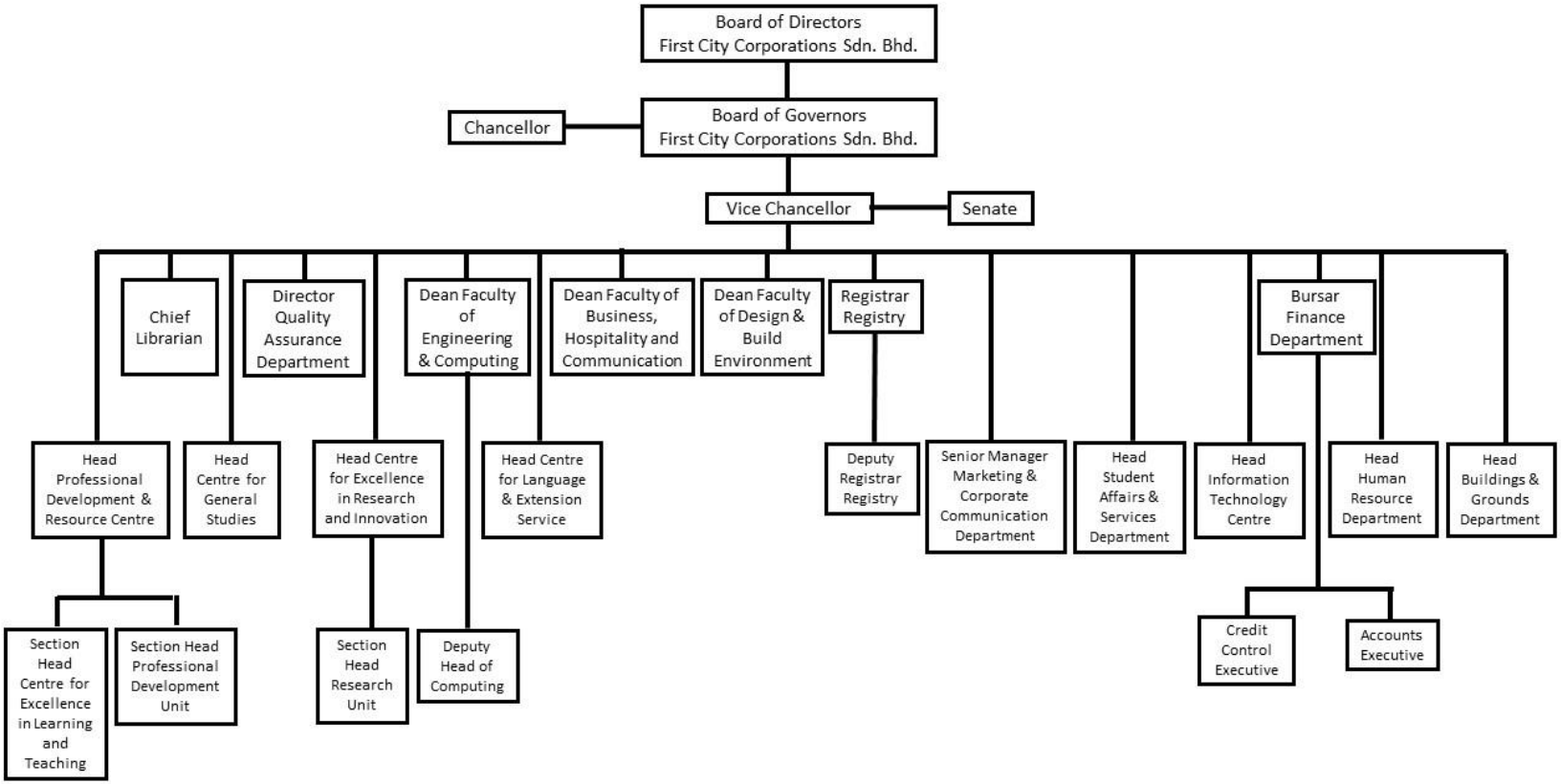


Figure 8.1: The organisational chart of FCUC as of September 2022.

The tasks for each position are introduced and briefly discussed below:

- The university college is governed by the Board of Directors, Board of Governors and Chancellor. Important decision making is done by the Director, Tan Sri Dato' Dr. Teo Chiang Liang and Board of Governors, YM Dr. Raja Lope bin Raja Shahrome and Prof Emeritus Dr. Yong Hoi Sen.
- The Vice-Chancellor (VC), Professor Dr. Saw Sor Heoh leads the academic team and is the chairman of Senate. The VC heads the overall administrative, academic and management functions of the University College, including the general supervision over the arrangements for instruction, research, finance, administration, day to day affairs, welfare and discipline of FCUC.
- The Centre of Excellence in Teaching and Learning (CETL) or known as professional development and resource centre, keep tracks of staff development record along with quality assurance department, programme coordinator and human resource department.
- The Centre for Excellence in Research and Innovation (CERI) leads and manage the research, development and commercialisation programme. The CERI has three operational units:
    - Research Management Centre (RMC) manages the research activities within the FCUC.
    - Postgraduate Centre supports the registry office in managing the postgraduate students' research activity within the FCUC.
    - Intellectual Property and Commercialization Centre manages the patent and commercialization, and intellectual property matters within the FCUC.
- The chief librarian leads the library operation by conducting library user trainings and liaising with suppliers for book purchase and database subscription. The library website (https://libkoha.firstcity.edu.my) has comprehensive information related to teaching resources and university repository, such as subscribed database, past year examination papers, staff publication, student handbook and Research Day information.
- The Quality Assurance Department (QAD) monitors the quality of all programmes of study conducted by FCUC. It ensures the standards and quality of all programmes of study meet the requirements set by partner universities, professional bodies (such as BEM) and the Malaysian Qualifications Agency (MQA). The QAD will be present during interview for new staff recruitment. The QAD is currently led by Pn. Noor Hamizah Binti Hashim.
- There are three main academic faculties in FCUC. The FEC is led by the Dean, Assistant Professor Ir. Mah Siew Kien. The Bachelor of Mechanical Engineering degree programme is offered by the FEC and coordinated by programme coordinator, Assistant Professor Dr. Lay Kok Keong. The Eportal is to support student's online

learning is managed by Mr. Tham Kwong Keong in FEC. The Faculty of Business, Hospitality & Communication Studies (FBHCS) is led by the dean, Associate Professor Lewis Leong Wee Phin and the Faculty of Design and Built Environment (FDBE) is led by the dean, Associate Professor Chua Huwi Huwi.

- The Dean of Centre of General Studies (CGS), Assistant Professor Siti Maria Binti Mohamad leads the team to offer compulsory general studies (*mata pelajaran umum*, MPU), to fulfil the requirement for programme accreditation.
- The head of Centre for Language and Extension Services (CLES), Assistant Professor Pauline Cheah Poh Lyn leads to the team to offer intensive English programme. The intensive English programme helps students to fulfil the English language entry requirement to Bachelor's degree. CLES organizes trainings related to teaching pedagogy and outcome-based education.
- The registrar, Mr. Lye Bon Han, leads the registry department to register subject, certify student's result, keep track of student's academic record, and manage appeal cases. The registry department has the examination department to conduct the final examination systematically at high integrity, by following the standard operating procure for invigilation and handling cheating and appeal cases.
- The bursar, Ms. Lee Mee Wah leads to finance department to handle financial, accounting and taxation matters of FCUC.
- The head of Student Affairs and Services Department (SASD), Ms. Teoh Seok Kean leads the team to offer student services, such as Visa application and extension, career and counselling, student accommodation and student council.
- The Marketing and Corporate Communications is led by a senior manager, Mr. Alex Lim. The Marketing & Corporate Communications Department (MCCD) organize marketing activities and manage digital branding, such as Open Day, education fair and FCUC Facebook.
- The head of Information Technology Centre, Mr. Theng Bing Haw, leads the team to manage IT related matters, such as developing application for work from home (Power App), developing webpage for booking of venues (http://itcentre.firstcity.edu.my), managing printing quota, and staff and student's email system.
- The human resource executive, Ms. Valerie Caroline Anak Philip manages the human resource related matters, such as staff training record. Annual EA form for tax reporting is issued by the human resource executive.
- The property maintenance officer, Mr. Asmawi Ramly manages the Buildings and Grounds Department. Repair work should report to Asmawi, such as water leakages and faulty lamp, in order to prevent wastages of company resources.

The above sub-section outlined the general organisational structure of FCUC. The current sub-section covers in detailed about FEC organisational structure. The computing

department is led by deputy head of department, Mr. Koong Kok Leong; whereas, the engineering department is led by Associate Professor Dr. Chua Ping Yong, dean of the FEC. The programme coordinator leads the programme team to implement the programme, as follows:

- Ms. Lee Shy Yun leads the programme team of Foundation in Engineering, Science and Technology (FEST).
- Mr. Tham Kwong Keong leads the programme team of Diploma in Electronic Engineering and Diploma in Mechatronics.
- Assistant Professor Ir. Dr. Tay Ching En Marcus leads the programme team of Bachelor of Electronic Engineering with Honours.
- Assistant Professor Dr. Lay Kok Keong leads the programme team of Bachelor Mechanical Engineering with Honours.
- Mr. Mohammad Fauzi Rahim leads the programme team of Diploma in Mechanical Engineering.
- Pn. Siti Azirah Binti Azhari leads the programme team of Diploma in Information Technology.
- Mr. Soo Lian Kei leads the programme team of Bachelor of Software Engineering with Honours
- Pn. Khaiziliyah binti Khalid @ Khalil leads the programme team of Bachelor of Computer Science (Intelligent Systems) (Hons).
- Ms. Tan Siok Yoon leads the programme team of Bachelor of Information Systems (Honours) in Business Management.
- Ms. Koong Kok Leong leads the programme team of Bachelor of Information Technology (Networking and Security) (Hons).
- Associate Professor Dr. Christine Lee Siew Ken leads the programme of Master of Software Engineering.

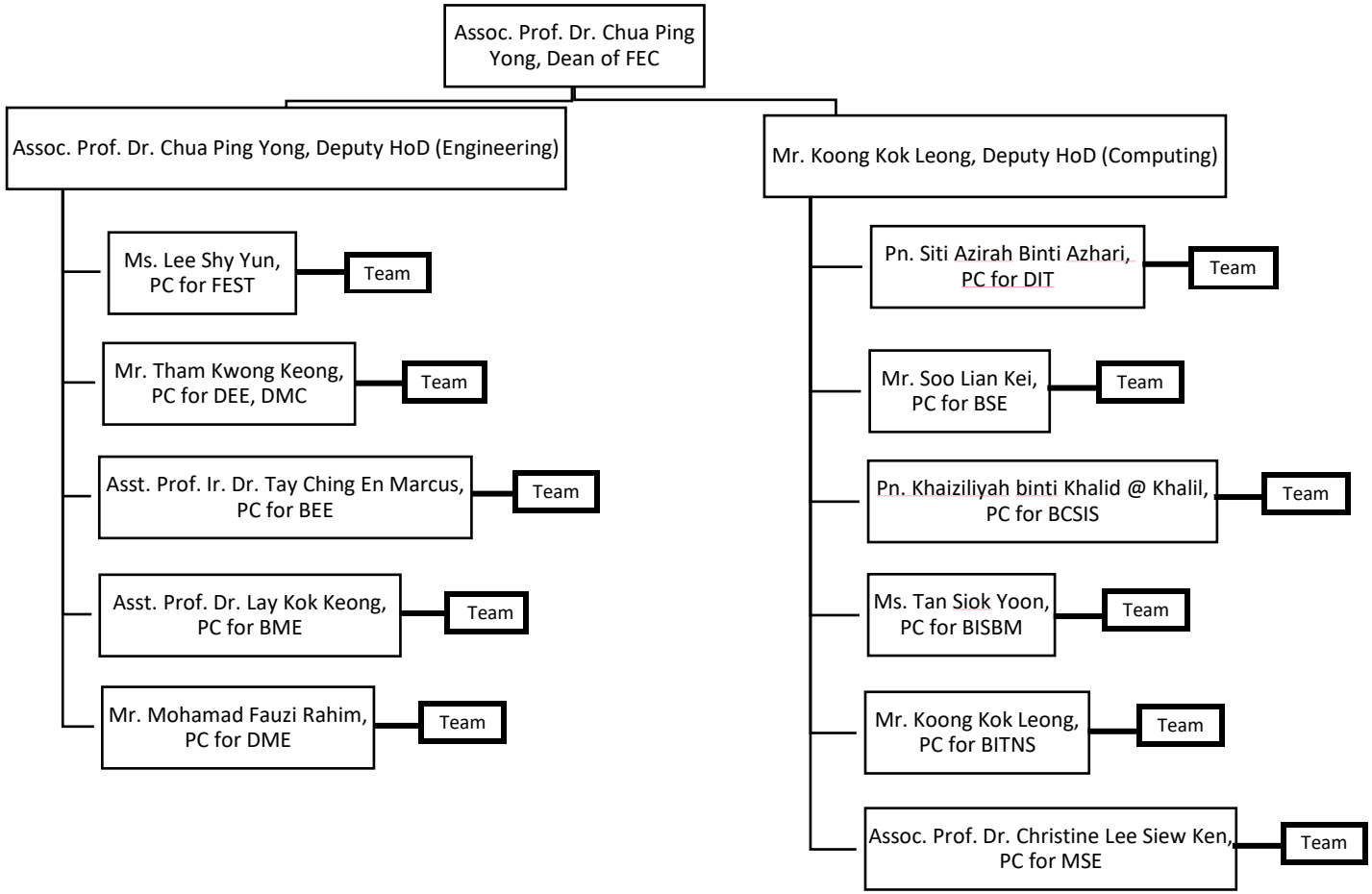


Figure 8.2: Organisational chart of FEC as of September 2022.

8.2 Institutional Support, Operating Environment, and Financial Resources.

This subsection gives the commitment and level of adequacy of institutional support, operating environment, and financial resources in assuring the quality and continuity of the programme, attracted, retained, and rewarded of well-qualified academic and support staff, and the acquired, maintained, and operated facilities and equipment.

8.2.1 Institutional Support.

The details and elements in which the AEP supported by the university are given in list below.

- IT support – this is provided by the ITC. The ITC supports the MED in terms of network and telephony and also in maintaining software such as Microsoft Teams and Eportal.

- Property Maintenance Office – this office takes care of the buildings and maintenance air-conditioning and other amenities. It also takes care the classroom and laboratory basic infrastructure.

- Student Affairs and Services Department (SASD) – supports students' need in particular the sports facilities which include the soccer and rugby fields, tennis, volleyball and basketball courts and indoor facilities. It also supports our students in visits and outdoor activities. Another function of SASD is to support students' organised societies.

- Registrar office – support the employees' requirement and also registration of the students to comply with all the legal requirements. This office also takes care of security, financial transactions and liaison with the Immigration Office for expatriates and international students.

8.2.2 Operating Environment.

In FCUC particularly the MED operating environment is conducive to the delivery of MEP. Frequently, MED operates independently and requires support from other department in the areas where the students need to select option or audit subject from the approved department. The staff teaching workload are regulated and coordinated to provide ample amount of time for self-development, research work and consultation. Almost all the teaching and laboratory work are done during office hours (9am – 5pm) to ensure students and staff have time for reflection and self-study.

8.2.3 Financial Resources.

The operating of the MED is supported by financial resources allocated adequately by the FCUC management through the See Hoy Chan Holding. The Table 8.1 shows the amount received under the operating budget for recent years (2021– 2022).

In addition to the operational budget, there are various research grants secured by academic staff used to support research projects, purchase and maintain laboratory facilities and equipment, support travel expenses related to research projects, etc.

Table 8.1: Annual operational budget (2019 – 2021) for FCUC on MED.

No.	Details	Amount (RM)	
		2021	2022
1	Operational Expenditure (includes salary, EPF and SOCSO)	17566435.41	14158969.00
2	Research Study / Research related matters	7811.50	5480.00
3	Purchase of study materials (books etc)	53030.50	45945.21
4	Laboratory setup.	304789.10	0.00
Total Operational Budget		17932066.51	14210394.21

8.3 Programme Quality Management and Planning.

In this subsection, the mechanism for programme quality management and planning involving 1) curriculum development, 2) curriculum and content review, 3) respond to feedback and inputs from stakeholders, 4) tracking individual courses to the POs, 5) tracking POs performance through assessment, 6) responding to External Examiners, 7) reviewing PEOs and POs; and finally, 8) continual CQI.

8.3.1 Curriculum Development.

A new programme usually begins with the appointment of Board of Studies which consists of the management of the University, representatives of JPA and also the Professional Bodies concerned (in this case BEM). Application document is prepared, generally consists of the programme philosophy, programme structure and the necessary setup required for running the programme and also the resources available and needed.

Market survey is conducted to establish the needs of the programme. The application process takes place in stages as shown in Figure 8.3. The document is first presented and discussed in the Academic Coordination Committee meeting. Then, an accepted application will proceed to Senate for the next level approval.

After accomplishing this, it will then be forwarded to the MoHE for final approval. Once approved the programme is ready for implementation.

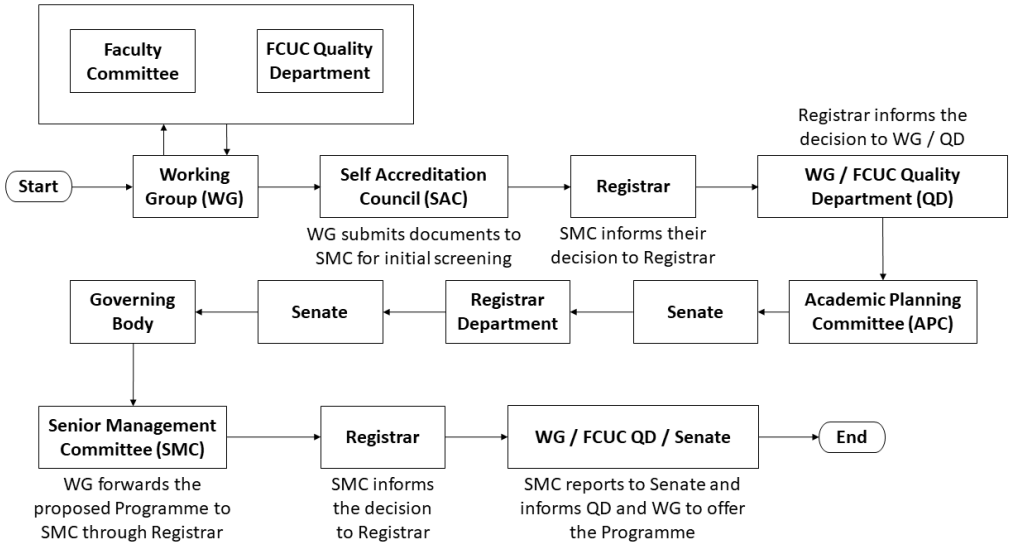


Figure 8.3: Curriculum Development Process.

8.3.2 Curriculum Content and Review.

In order to keep abreast with the evolved industry needs, a curriculum is usually subjected to a major revision every five years. However, within that period, minor changes are permissible, and these are usually carried out by offering new electives, new subjects and removing less relevant subjects. Hence, MED planned reviews the MEP curriculum and its content based on:

1) Feedbacks from EE every 2 years.
2) Feedbacks from IAP every 2 years.
3) Findings from CQI at PEO (4 years after graduation).
4) Findings from CQI at PO.
5) Findings from CQI at course level.
6) Stakeholders' surveys on PEO and PO relevancy every 4 years.

8.3.3 Respond to Feedback and input from Stakeholders.

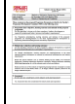
There are various feedbacks and input taken into consideration from various stakeholders for MEP curriculum content and review. These stakeholders include IAP, students and alumni. The current IAP (Table 8.2) who inputs, and feedbacks are obtained for consolidation of the MEP curriculum. This discussion is conducted through ICAP Meeting during which comments from them in terms of PEO and PO

statements relevancy are enquired. The curriculum will also be presented every 2 years to have their overview if it is still aligned with the needs of local industries.

In order to satisfy the EAC requirements for approval of the MEP, IAP members are appointed to assist in the establishment of MEP at FCUC. The Table 8.2 summarises the brief background of IEAP members. Full CV of IEAP members is embedded within Table 8.2.

Suggestions from IAP are listed in Table 8.2a for year 2022 and Table 8.2b for year 2020. Each of the suggestions are being considered and answer accordingly with current condition and future considerations.

Table 8.2: A brief summary of IAP members' qualifications and respective IAP reports for year 2020 and 2022.

No.	Name	Highest Academic Qualification	Professional Qualifications	First Start Date	End Date	Embedded Curriculum Vitae	2020 IAP Report	2022 IAP Report
1	Ir. Jeyachandran Barnabas A/L G. Jesudason	B.Eng. Mechanical (Hons)	P.Eng (BEM)	1st Oct 19	30th Sep 25			
2	Dato' Ir. Noor Azmi bin Jaafar	M.Sc. in Mechanical Engineering	P.Eng (BEM) MIEM	1st Oct 19	30th Sep 25			
3	Ir. Ong Yee Pinn	B.Eng. Mechanical (Hons)	PEPC (BEM)	1st Oct 19	31st Dec 22			
4	Ir. Ts. Mohd Imran bin Abdul Hamid	B.Eng. Mechanical (Hons)	PEPC (BEM) ACPE MIEM PT	1st Oct 19	30th Sep 25			NIL.*

Note: * Ir. Ts. Mohd Imran cannot make it to the schedule meeting due to other commitment. Hence no feedback and report from Ir. Ts. Mohd Imran.

Table 8.2a: Summary of IAP Comments and MED Responds during IAP 2022 meeting.

Industry Advisor Report (ICR)				
Date		7th Oct 2022	**Place**	FCUC
1	**Programme aims / objectives, learning outcomes and rationale of this proposed programme:** ***Are they matching / relevant to the latest regulatory / industry development as required by professional bodies / practices and industry requirements?***			
	Ir. Jeyachandran	Yes. Programme airms/objective, learning outcomes and rationale of the proposed programme are matching/relevant to the latest regulatory/industry development as required by professional bodies/practices and industry requirements.		
	Dato' Ir. Noor	Satisfactory.		
	Ir. Ong	Yes. Noted the transition to project-based learning outcome.		
	Ir. Ts. Mohd Imran	NIL.		
	Response taken by FCUC	No action required.		
2	**Module aims / objectives and learning outcomes.** ***Are they matching / relevant to the latest regulatory / industry development as required by professional bodies/practices and industry requirements?***			
	Ir. Jeyachandran	Yes. Module aims/objective, learning outcomes are matching/relevant to the latest regulatory/industry development as required by professional bodies/practices and industry requirements. Noted that Air Conditioning had been included in the module. Noted modules for Uniform Building By-Laws (UBBL), Fire Protection Engineering, Plumbing Engineering, Building Information Modeling (BIM), Piping Engineering have not been included.		
	Dato' Ir. Noor	Satisfactory.		
	Ir. Ong	Yes. Noted addition of AutoCAD, Solid Edge and 3D printing as per previous recommendation.		
	Ir. Ts. Mohd Imran	NIL.		
	Response taken by FCUC	The modules (Uniform Building By-Laws (UBBL), Fire Protection Engineering, Plumbing Engineering, Building Information Modeling (BIM), Piping Engineering) suggested by Ir. Jeyachandran cannot be considered currently as no academic staff have sufficient knowledge and experiences teaching these modules. In the future, the academic staff recruitment process, candidates with experiences and knowledge on these modules will be highly sorted.		
3	**Assessment:** ***Do they take into consideration current industry needs and expectation?***			
	Ir. Jeyachandran	Yes. Assessment takes into consideration the industry needs and expectation.		
	Dato' Ir. Noor	The courses offered are relevant to the needs of the industries.		

	Ir. Ong	Yes. Much improved compare with previous visit. Noted more emphasis is given to coursework.
	Ir. Ts. Mohd Imran	NIL.
	Response taken by FCUC	No action required.
4	**Are the module contents well-structured and relevant to the field of study?** ***Example pre-requisite requirements, level appropriateness of each semester.***	
	Ir. Jeyachandran	Yes. Module contents are well-structured and relevant to the field of study.
	Dato' Ir. Noor	Satisfactory.
	Ir. Ong	Yes. Noted the changes to some modules to reflect the need of industry.
	Ir. Ts. Mohd Imran	NIL.
	Response taken by FCUC	No action required.
5	**Appropriateness and sufficiency of resources and facilities to support each module.** ***Are the resources and facilities adequate and up to date to support the learning / practical work of each module?***	
	Ir. Jeyachandran	Yes. Resources to support the learning/practical works of some of the modules had been increased accordingly.
	Dato' Ir. Noor	Satisfactory.
	Ir. Ong	Yes. Noted addition of lab equipment. Can consider addition of sustainable energy models eg solar panel, water cool AC system c/w heat recovery / heat pump model.
	Ir. Ts. Mohd Imran	
	Response taken by FCUC	No action required. New laboratory equipment suggested by Ir. Ong will be consider accordingly in the future.
6	**Allocation of contact hours and study load of each module and overall programme.** ***Consider this in relation to industrial collaborative projects and internship programmes, if any.***	
	Ir. Jeyachandran	Allocation of contract hours and study load based on module outline in relation to industrial collaborative projects and internship programmes are sufficient.
	Dato' Ir. Noor	Satisfactory.
	Ir. Ong	For industry training, 10 weeks seem short, can be further extend.
	Ir. Ts. Mohd Imran	NIL.
	Response taken by FCUC	
7	**Programme level appropriate and relevant to the field of study?** ***(Foundation / Diploma / Degree / Post Graduates)***	
	Ir. Jeyachandran	Programme level for Bachelor of Mechanical Engineering with Honours is appropriate and relevant to the field of study.
	Dato' Ir. Noor	Electives are adequate, wide range/field for the student to choose.
	Ir. Ong	Yes.

	Ir. Ts. Mohd Imran	NIL.
	Response taken by FCUC	No action required.
8	**Appropriateness of number and level of modules at each semester / year.**	
	Ir. Jeyachandran	Number and level of modules at each semester/year for Bachelor of Mechanical Engineering with Honours are appropriate. Noted on the constraint to employ resources specialized in M&E [eg. Uniform Building By-Laws (UBBL), Fire Protection Engineering, Plumbing Engineering, Building Information Modeling (BIM), Piping Engineering, etc].
	Dato' Ir. Noor	Satisfactory and adequate.
	Ir. Ong	Yes.
	Ir. Ts. Mohd Imran	NIL.
	Response taken by FCUC	No action required.
9	**Recommended texts are sufficient, relevant and appropriate for the level and field of study.** ***Are the recommended textbooks relevant to the programme of study? Please recommend new textbooks where applicable.***	
	Ir. Jeyachandran	Text for Bachelor of Mechanical Engineering with Honours are sufficient, relevant and appropriate for the level and field of study.
	Dato' Ir. Noor	Sufficient and relevant.
	Ir. Ong	Can add on relevant Act / Bylaws, Malaysia / British standard or any other design guide/handbook.
	Ir. Ts. Mohd Imran	NIL.
	Response taken by FCUC	No action required. Suggestion by Ir. Ong will be considered accordingly in the future.
10	**Indicative syllabus of modules is relevant and appropriate for the level and field of study.** ***Please suggest updating / addition / deletion of modules in order to ensure that the programme aims and learning outcomes are in line with the latest regulatory, professional body's practices and industry requirements. Also be mindful that they are appropriate for the level of study.***	
	Ir. Jeyachandran	Subjects on Contract Law, Contracts Management and M&E [eg. Building By-Laws (UBBL), Fire Protection Engineering, Plumbing Engineering, Building lnformation Modeling (BlM), Piping Engineering, etc] to be included.
	Dato' Ir. Noor	To introduce subject of Quality Control/Quality Assurance as elective in final year.
	Ir. Ong	Can add on Fire Engineering, Piping Design, sustainable energy as elective subject.
	Ir. Ts. Mohd Imran	NIL.
	Response taken by FCUC	Suggestions by Ir. Jeyachandran and Ir. Ong will be considered accordingly as responded in Question 2, future candidates with knowledge and experiences in Building By-Laws (UBBL), Fire Protection Engineering, Plumbing Engineering, Building lnformation Modeling (BlM) and Piping Engineering will be highly sorted to help create the addressed modules.

		The suggestion from Dato Ir. Noor has already included in one of the core modules offered. Within the module "Operations and Quality Management", some elements of Quality Control/Quality Assurance are covered. More content of Quality Control/Quality Assurance will be considered accordingly by the current module lecturer.
11	**Other comments**	
	Ir. Jeyachandran	NIL.
	Dato' Ir. Noor	1) Lab facilities are adequately provided. 2) Courses offered are meeting current industries needs.
	Ir. Ong	NIL.
	Ir. Ts. Mohd Imran	NIL.
	Response taken by FCUC	No action required.

Table 8.2b: Summary of IAP Comments and MED Responds during IAP 2020 meeting.

Industry Advisor Report (ICR)			
Date	2nd Nov 2020	**Place**	FCUC
1	**Programme aims / objectives, learning outcomes and rationale of this proposed programme:** ***Are they matching / relevant to the latest regulatory / industry development as required by professional bodies / practices and industry requirements?***		
	Ir. Jeyachandran	Yes. Programme aims/objective, learning outcomes and rationale of the proposed programme are matching/relevant to the latest regulatory/industry development as required by professional bodies/practices and industry requirements.	
	Dato' Ir. Noor	Bachelor Mechanical Engineering programme follow the guidelines set by the EAC. Currently all the learning outcome is satisfactory.	
	Ir. Ong	Yes. PO7 (Environment and Sustainability) can be emphasized more as the industry is now focusing on green building and usage of renewable energy e.g. solar photovoltaic, solar hot water system, heat exchanger, rain water harvesting, recycling, etc. PO9 (Communication) shall also be emphasized more. By joining IEM Student Chapter they can be linked to IEM activities and talks which can enhance their engineering knowledge related to industry and expand their network.	
	Ir. Ts. Mohd Imran	In general the PEOs meet the current industry requirements and aligned with latest 2020 EAC guidelines. However since the most senior student are currently in 3rd year hence we cannot evaluate or survey until they graduated and start working.	

	Response taken by FCUC	In response to Ir. Ong comments, there are two modules namely Thermodynamics 2 and Heat Transfer had recently amended the contents to include PO7. Previously, only Sustainable Energy System had PO7. There are now a total of 3 modules that have included PO7. With the emphasis on renewable energy, the Thermodynamics 2 and Heat Transfer had some elements covered within. As for PO9, majority of the modules with range of project-based contents covered communication element, i.e., project presentation to convey ideas and solutions to stakeholders. The assessment of PEO can only be done when first graduating cohort completed the course.
2	**Module aims / objectives and learning outcomes.** ***Are they matching / relevant to the latest regulatory / industry development as required by professional bodies/practices and industry requirements?***	
	Ir. Jeyachandran	Yes. Module aims/objective, learning outcomes are matching/relevant to the latest regulatory/industry development as required by professional bodies/practices and industry requirements. Noted that Elective Modules such as Uniform Building By-Laws (UBBL), Fire Protection Engineering, Plumbing Engineering, Mechanical Ventilation, Building Information Modeling (BIM),Piping Engineering, etc will be reflected mainly in final year Modules. Noted also that one of the module on Engineering drawing had been revamped to include extensive work on Solid Works which is a 3D design software especially catered for the design of Mechanical parts.
	Dato' Ir. Noor	All the learning objective for all modules is satisfactory level.
	Ir. Ong	Yes. Noted Solid Works is incorporated in the module. The university can consider to add on AutoCAD Revit software for building services.
	Ir. Ts. Mohd Imran	Respective modules sufficient to meet the latest industry standards with some improvement especially applications of latest software such as a) 3D modelling software used by industries such as SOLIDWORKS by AutoDesk or E3D by Aveva or PDS SmartPlant by Hexagon. b) CFD software - Free Open Sources such as OpenFoam
	Response taken by FCUC	
3	**Assessment:** ***Do they take into consideration current industry needs and expectation?***	
	Ir. Jeyachandran	Yes. Assessment takes into consideration the industry needs and expectation.
	Dato' Ir. Noor	For now, the pandemic of COVID-19 has been taking place. The BME programme must take the initiative to ensure that the delivery of classroom activities goes well: • All staff and students must be equipped and exposed to the latest technology. Online learning is becoming increasingly prevalent today. Several activities, such as quiz, forum, training and conferences, can be carried out through an online session. The test can be performed online as a replacement for the conventional test

		with the exact SOP provided by the BME programme. Certain modules required are lab session can be replaced with the simulation software. For an example, heat transfer/fluid mechanic experiment which can be done via the ANSYS simulation software.
	Ir. Ong	Yes. Noted the university's focus on General Mechanical Engineering. Improvement were made such as provision of Solid Works software, welding set and ANSYS software.
	Ir. Ts. Mohd Imran	With the new-normal during Covid-19 era, assessment was indeed a new challenge. Test was done based on Open Book assessment and video recording. Laboratory practical sessions were allowed and continued as per SOP.
	Response taken by FCUC	
4	**Are the module contents well-structured and relevant to the field of study?** ***Example pre-requisite requirements, level appropriateness of each semester.***	
	Ir. Jeyachandran	Yes. Module contents are well-structured and relevant to the field of study.
	Dato' Ir. Noor	The entire module encompasses all fields of industry (automotive, manufacturing, industrial, and energy). The elective module can be used to incorporate basic knowledge of a particular industrial field.
	Ir. Ong	The module contents are well structured and relevant to the field of study. It is proposed that if BME 4005 (Hydraulics and Pneumatics) is selected as Elective 1, then BME 4007 (Air Conditioning and Refrigeration) shall be selected as Elective 2 as these 2 subjects are closely related in Building Industry.
	Ir. Ts. Mohd Imran	In general for oil and gas industry, mechanical engineering degree provides multiple opportunities such as • Engineering – Mech static, mech rotating/turbo machinery, mech package, pipe • design, pipe stress, pipe materials, HVAC, HFE, • Operations & Maintenance mech engineer The degree program is general/broad mechanical engineering without any specific area of industrial focus.
	Response taken by FCUC	
5	**Appropriateness and sufficiency of resources and facilities to support each module.** ***Are the resources and facilities adequate and up to date to support the learning / practical work of each module?***	
	Ir. Jeyachandran	Yes. Resources to support the learning/practical works of some of the module had been increased accordingly compared to last year 2019.
	Dato' Ir. Noor	The facilities available at the FCUC are exceptional. The machinery and equipment used to facilitate learning and teaching programmes are the latest to meet existing industry requirements. In order to facilitate the learning and teaching activities, the BME purchased ANSYS, Solid Edge, and Mathlab, as previously stated. All services, equipment and software must be implemented by the student and staff to achieve the maximum benefit. I suggest using a certain module to include a project/assignment that needs to use advanced software in order for the student to be more

		accustomed to the use of the modern tool. For instance, via simulation, the lecture may assign one project from the Integrated Design Project to design/solve engineering problems.
	Ir. Ong	Yes. Noted addition of lecturers, software and lab equipment.
	Ir. Ts. Mohd Imran	Resources (Lecturers) and facilities meets the 2020 EAC Guidelines requirements.
	Response taken by FCUC	
6	**Allocation of contact hours and study load of each module and overall programme.** ***Consider this in relation to industrial collaborative projects and internship programmes, if any.***	
	Ir. Jeyachandran	Allocation of contract hours and study load based on module outline of Year 1 and Year 2 in relation to industrial collaborative projects and internship programmes are sufficient.
	Dato' Ir. Noor	BME programme must conduct the at least one for the following activities: Industries visit, MOU agreement and collaboration with industries. There are various benefits through the enhancement of science and innovation through collaborative research ventures, the provision of creative commercial goods, the advancement of teaching, learning and enrichment of the skills and employability of students, and the provision of new funding sources to tertiary institutions. For collaboration with industries, the IAP member can assist.
	Ir. Ong	Acceptable.
	Ir. Ts. Mohd Imran	Sufficient hours for each modules meeting the EAC minimum requirements. (135 hours)
	Response taken by FCUC	
7	**Programme level appropriate and relevant to the field of study?** ***(Foundation / Diploma / Degree / Post Graduates)***	
	Ir. Jeyachandran	Programme level for Bachelor of Mechanical Engineering with Honours is appropriate and relevant to the field of study.
	Dato' Ir. Noor	The existing curriculum is adapted to the level of the degree.
	Ir. Ong	The programme level is appropriate and relevant to the field of study.
	Ir. Ts. Mohd Imran	Propose program is appropriate to the level of study
	Response taken by FCUC	
8	**Appropriateness of number and level of modules at each semester / year.**	
	Ir. Jeyachandran	Number and level of modules at each semester/year for Bachelor of Mechanical Engineering with Honours are appropriate. Noted that for specialization in M&E [eg. Uniform Building By-Laws (UBBL), Fire Protection Engineering, Plumbing Engineering, Mechanical Ventilation, Building Information Modeling (BIM),Piping Engineering, etc] related to building technology would be covered broadly rather than in details due to time constraint in the delivery of the programme materials.
	Dato' Ir. Noor	The number of modules is sufficient for each semester. The module number is close to that of other higher learning institutions.

	Ir. Ong	Yes.
	Ir. Ts. Mohd Imran	Propose program is appropriate to the level of modules at each semester.
	Response taken by FCUC	
9	**Recommended texts are sufficient, relevant and appropriate for the level and field of study.** ***Are the recommended textbooks relevant to the programme of study? Please recommend new textbooks where applicable.***	
	Ir. Jeyachandran	Text for Bachelor of Mechanical Engineering with Honour are sufficient, relevant and appropriate for the level and field of study.
	Dato' Ir. Noor	There are several advantages that students can receive when they join the IEM as a student member. Students can use the e-book library and visit the library. In addition, the IEM organises a variety of classes, workshops, talks and visits that are of interest to the engineering profession. Besides that, The IEM organises many courses, seminars, talks and visits, which are of interest to the engineering profession.
	Ir. Ong	Registration of Engineers Act 1967 (Revised 2015) shall be introduced to the students.
	Ir. Ts. Mohd Imran	Suggest for the students to be registered with IEM as Student Member and try to get online access to available digital publications from IEM database.
	Response taken by FCUC	
10	**Indicative syllabus of modules is relevant and appropriate for the level and field of study.** ***Please suggest updating / addition / deletion of modules in order to ensure that the programme aims and learning outcomes are in line with the latest regulatory, professional body's practices and industry requirements. Also be mindful that they are appropriate for the level of study.***	
	Ir. Jeyachandran	Noted that subjects on Contract Law, Contracts Management and M&E [eg. Uniform Building By-Laws (UBBL), Fire Protection Engineering, Plumbing Engineering, Mechanical Ventilation, Building lnformation Modeling (BlM), Piping Engineering, etc] for the building technology would be covered broadly rather than in details due to time constraint in the delivery of the programme materials.
	Dato' Ir. Noor	The current modules are relevant. However, the lecturer must be alert with the latest developments in the industries. Today, industries focus on sustainable energy and green technology. I notice that the sustainable energy system are included in the modules. The modules is sufficient to give an exposure regarding the green energy system and it important. Modules are sufficient to provide exposure to, and are important to, the green energy system. The lecturer only need to change the syllabus if necessary due to the latest innovation and new technology. Even though, not all the topics can not be include in the the modules. The programme needs to strengthen the basic/fundamental for first year students. The first year student needs to be introduced with more mechanical design and mechanical workshop training. Early introduction will ensure the student build ability to applied in the industrial training and final year project.
	Ir. Ong	Proposed addition of module relevant to Occupational Safety, Health and Environment (OSHE). This covers manufacturing, construction, engineering, oil and gas, and plantation sector.

	Ir. Ts. Mohd Imran	Suggest to introduce a Project Development Program (PDP) from first year until Final year which covers - PO3, PO6, PO7, PO8, PO9, PO10, PO11 and PO12 • professional engineering practice for ongoing professional development as an engineering student, and later as professional engineer. • Topics covered include ➢ communication skills ➢ working in team ➢ project management ➢ ethics ➢ sustainability ➢ decision making ➢ risk assessment ➢ design (IDP) • Course topics will be covered by lectures, workshops, tutorials and a team based design project. This course links to subsequent, discipline-specific courses in engineering management, design, research and sustainability.
	Response taken by FCUC	
11	**Other comments**	
	Ir. Jeyachandran	Nil.
	Dato' Ir. Noor	Nil.
	Ir. Ong	Covid-19 pandemic has given the university opportunity to implement open book quiz and exam. This practice shall be encouraged to carry on after the pandemic, as Engineer shall be trained to apply the knowledge rather than memorize the formula. Students shall be encouraged to utilize the lab equipment with proper SOP during the pandemic. Library resources can be digitalized for the students to access from home. The university shall think of ways to get more student intake in order to sustain the programme and produce next generation of engineers.
	Ir. Ts. Mohd Imran	For improvement related to industry • To arrange lectures/talks by guest lecturers from industry (to specify target) • To attend online courses arranged by BEM/IEM for professional ethics and code of conduct. • To arrange industry visits.(to specify target) • IHL to pursue link with industry for ➢ project based opportunities (R&D) ➢ for lecturers to be seconded/sabbatical leave to prepare for Professional Engineering (PE)

	Response taken by FCUC	

Feedbacks and inputs from students are conducted via course survey at the end every semester. The results from these surveys will be given to the respective lecturer, to be used when preparing the course analysis report. The findings from these data will be used to access on further improves required in teaching and learning of the respective course. Students will provide confidential feedbacks and inputs on the course and each lecturer's delivery.

The Alumni feedbacks and inputs are also considered in MEP curriculum review. Recent graduated alumni will be requested to fill in alumni tracer study, where this data will be used to define our employability rate. Also, alumnus will fill up a stakeholder survey to basically give an input on the relevancy of our PEO and PO statements.

8.3.4 Tracking Individual Course to POs.

The mechanism in tracking the individual courses to the POs has been described in Section 3.8 – POs Delivery and Assessment Plan. Note that this process is performed yearly and any changes on the mapping of the course to the POs will be monitored and tracked.

8.3.5 Tracking POs Performance through Assessment.

The mechanism in tracking the POs Performance through assessment has been clearly discussed in Section 3.9 – Individual's PO attainment.

8.3.6 Responding to External Examiner.

The External Examiner (EE) are scheduled to visit MED once a year. In addition, MED will appoint new external examiner every 2 cycle, which translates to every 4 years. In every visit, the EE will spend two days to examine the curriculum details to provide a report on their findings. This report will be sent to VC, which will then be given to MED for further action plan. Shortly after, MED will respond back to VC; to every comment stated by EE and act upon it accordingly. Later, during the next EE visit cycle, the EE will have a look to ensure implementation on all the action that MED had promise has been planned, implemented and executed.

8.3.7 Reviewing PEOs and POs.

The establishing and reviewing of PEOs process has been well described in Section 2.4 while reviewing process for POs has been well defined in Section 3.4.

8.3.8 Continual CQI.

A continual CQI mechanism has been established with three levels of CQIs activities as shown in Figure 2.2.

8.4 Summary of the EE's visit

The summary of external examiners comments and MED responds has been tabulated in Table 8.3.

Table 8.3: Summary of EE Comments and MED Responds.

No.	Comments	Supporting Document(s)
OBE Implementation		
1	***EE Comments***	
	The current PEOs cover two main area of expectation i.e. "professionalism" and "continuous professional development". These are the aspiration of the ME programme for their graduates and hence the statement of the PEOs could be rephrase to be more inspiring such as "Graduates will establish themselves …… " or "Graduates will take up ….." etc.	
	FEC / MED Comments	
	The Faculty of Engineering and Computing (FEC) expects its alumni, who, after being involved in the industry or academia for at least 4 years, Original: • PEO1: To practice their knowledge and skills in mechanical engineering and related fields • PEO2: To remain committed to professional development Proposed Changes (Changes to be presented in the next available PRDC): • To establish themselves in the practice of their skills in mechanical engineering and related fields. • Are actively engaged in continuous professional development.	
2	***EE Comments***	
	Just a reminder, the ME programme should start thinking about the competency areas that each of the PEOs intend to measure and this competencies are reflected in the alumni survey questionnaire. In doing so the performance targets/indicators could also be develop. The first batch of students are expected to graduate in 2022 and so this recommendation may not be critical at this moment	
	FEC / MED Comments	
	A spider diagram have been developed as a report card for each graduate as to the level attained for all LO and PO This will depict the level of attainment of every learning outcome for graduates. So here we can determine to an extent the preparedness of the graduates for the working world. Hence, we can establish to a certain degree how successful the graduate will be able to perform in the two PEOs. This information is prepared and updated as assessment are conducted through the student's study time with us.	

	We have noted the recommendation from the EE and will be preparing the alumni survey with performance indicators in the final year of study of the first batch of students as a measurement of the accuracy of the spider diagram and the effectiveness of the programmes LO and PO in relation to performance in the workplace.	
3	***EE Comments***	
	The PO5 mentioned of "complex engineering activities or EA" and this is acceptable as long as modules linking to this PO incorporate some of the complex problem activities as stipulated in Appendix B (page B-6) of the EAC Manual 2017. However, the EAC-PO5 on Modern Tool Usage emphasize on "complex engineering problems or WP" rather than EA. It is advisable to also include the phrase "complex engineering problem" in the PO5 statement so as not to lose the emphasis.	
	FEC / MED Comments	
	A Table have been created for modules linked to PO5, to demonstrate the attainment of EA1 to EA5 for each module. Where a module is lacking in the attainment of EA corrective action will be taken to improve the module which will be included in a report written on the module at the end of semester the module was conducted in before the start of the new semester. Engineering activities in appendix B-6 of the EAC guideline will be referenced.	
4	***EE Comments***	
	Similarly, the "complex engineering problems" term should be included in PO6 and PO7 description of the ME Programme	
	FEC / MED Comments	
	Original: • PO6: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal cultural issues and the consequent responsibilities relevant to professional engineering practice. • PO7: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development. Proposed Changes (Changes to be presented in the next available PRDC): • PO6: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems • PO7: Understand the impact of professional engineering solutions of complex engineering problems in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.	
5	***EE Comments***	

	There is also a need for the ME programme to ensure that all modules that links to PO1 to PO7 to cover "complex engineering problems i.e. WP1 + one or more of the other WPs (i.e. WP2 to WP7)". Similarly, all modules that link to PO9 (or EAC-PO10) will need to implement "complex engineering activities i.e. one or more EA (i.e. EA1 to EA5)" as described in Appendix B of the EAC Manual 2017	Appendix A (POs mapping)
	FEC / MED Comments	
	Mapping have been done to link to PO1 to PO7 to the cover complex problems. As the programme is being conducted the mapping will form a better measure of the modules in relation to "complex engineering problems"	
6	***EE Comments***	
	The ME programme should prepare a master mapping to show the coverage between modules, POs, Washington Accord knowledge profile (WK), WP and EA. This document can be used as a control for programme planning and CQI purposes	
	FEC / MED Comments	
	As recommendation to item A to C, we have developed the table for this master mapping.	
7	***EE Comments***	
	The performance indicator (PI) of 50% students achieving 50% scores is rather low as it gives the impression that it is ok to have 50% of the population not meeting the LOs and POs. In addition, with such low PI, many modules could easily meet this target and this may give the impression to the lecturers that CQI may be optional. Academic staff should understand that the ultimate challenge is to have 100% of students achieving 100% score for each of the outcomes. Hence, it will be more appropriate to increase the level, for example at least 70% of students achieving 50% scores. Also, the excel system could be further enhance to provide an insight of the breakdown of percentage of students achieving a range of scores, for example 51 – 59%, 60 – 69% and above 70%. This would then provide an indication on how well the students have done in their module learning outcomes	
	FEC / MED Comments	
	Due to the small number of current students (2 students) and the programme only into the third year of this coming 5th October 2020, a 50% performance indicator has been chosen and deemed appropriate for now. We will change the performance indicator as more students come on the programme and a higher threshold will be selected to better reflect the performance of the students. As the spider diagram will be created, it will demonstrate the performance for each student.	
8	***EE Comments***	Appendix B (LO and PO chart generator)
	It would also be beneficial, to check the percentage of students achieving all the LOs in the course. This would form part of the analysis to justify the need to have CQI although the course may have met the performance indicators for individual LOs or POs	
	FEC / MED Comments	
	After every final assessment, we currently practice the attainment of LO and PO of every student for CQI activities.	

	We have developed the excel spreadsheet to generate the percentage of PO and LO as a measure of cohort achievements.	
9	***EE Comments***	Appendix B (LO and PO Chart generator)
	The Module Report could be further improved by having more detail discussion and action plan based on the LOs result. The lecturer could reflect on the outcome of the LOs and identify shortcomings in his/her teaching and learning processes (delivery and assessment) related to the LOs (very specific abilities related to the topics in the course).	
	FEC / MED Comments	
	Based on the excel spreadsheet chart generator for LO and PO result, all lecturers prepare the module report for CQI and will be discussed further in a meeting (where necessary) when there is issues to be addressed. The report is produced by the module leader and any improvement will be communicated before the next conduct of the module.	
10	***EE Comments***	Appendix C (PO Monitoring)
	There is also a need to put in a process to consolidate the POs attainment at the programme level based on the LOs achievement in the various modules, either based on semesters or yearly. The results could then be used to monitor the achievements of the POs to ensure that programme will achieved all the POs by the time the students graduate.	
	FEC / MED Comments	
	We have a process to consolidate the PO attainment based on the LO achievement. The evaluation of POs is based on per semesters basis. The following are the steps in our procedures. 1. Collect the POs performance from the LO and PO achievement chart generator from every module within the semester. 2. Prepare a programme team meeting for PO monitoring 3. Collect feedback from the lecturers and staff for further action for improvement in the modules or to address problems encountered by students.	
11	***EE Comments***	
	The **final PO attainment model** for the final achievement of **graduating students** will have to be developed and students be informed of their final 12 PO achievement in Sem 8. Taking the average PO attainment from semester 1 to semester 8 would not be appropriate as it does not provide a true reflection of the student's ability. The programme may want to consider taking the PO achievement from culminating core engineering modules including those listed as underpinning in Appendix B of the EAC Manual 2017, FYP, IDP and Industrial Training.	
	FEC / MED Comments	
	As mentioned in part B, the spider diagram will be produced to show the student achievement.	
12	***EE Comments***	
	The EE observed that the direct measurement of the POs are generally in place, however there could be that some of the POs may not be measured explicitly especially in courses that addresses more than 3 POs such as FYP, IDP and Industrial Training. Although the programme has not implemented these modules, this is just a reminder that it is	

	important for the programme to ensure that constructive alignment exist between the learning activities, outcomes and assessment. Below is a detail explanation to help the ME programmme to understand the true meaning of direct and explicit measurement of each of the 12 POs: • Direct measurement of the POs means evidence must be directly linked to the specific outcome being assessed. A limited set of performance indicators have been developed that define each of the outcomes to be assessed. The assessment / measurement tools and performance indicators should be logical, acceptable and can reflect the true achievement of the POs by the students. Assessment of the POs (for e.g. through related COs in the courses) may be in the form of exam, test, quiz questions, project questions/tasks, presentation, interviews, and other direct assessment tools with marks given via answer schemes (normally used to assess cognitive/knowledge based POs), or assessment rubrics developed to assess POs in the psychomotor or affective domains, such as assessment rubrics for lifelong learning, teamwork, leadership, and communication skills. Data collection methods are focused on the indicators and can include such things as: student portfolios; subject content examinations; performance evaluation of work/study, intern or co-ops; and/or performance observations. If the wrong tool (even though direct assessment) such as exam question being used to produce the mark for ability to communicate verbally, the mark obtained will not reflect the true achievement of the ability of the student, and hence will be considered as not valid for the CQI purposes. Surveys and other indirect measures provide secondary evidence and should only be used in conjunction with direct measures such as those above • Explicit measurement of the POs means that the marks for each PO should be independently obtained through the direct assessment. If the marks for each PO are computed by inference/assumption from the same one assessment question or rubrics that mixed many POs in it, then the marks for the POs involved are considered not explicit. In other words, if the marks from an assessment task are used to compute the achievement of more than one PO, the marks, even though obtained from direct assessment as defined earlier, will not be considered explicit to reflect the true achievement of the PO marks.	
	FEC / MED Comments	
Curriculum – Programme Structure & Course Content		
1	***EE Comments***	Appendix D1 (IDP guideline) Appendix D2 (FYP guideline Appendix D3 (Industrial Training)
	It is timely for the ME programme to develop the handbook for IDP, FYP and industrial training. Typically, the handbook would contain the description of the modules, implementation process, the expectation of the programme in terms of students meeting each of the associated POs for each module and the associated rubrics/assessments that would be employed to assess the POs. In doing so, the rubrics should also be designed to include the various WPs and EAs characteristics.	
	FEC / MED Comments	
	We have developed the handbook for IDP, FYP and industrial training. The finalized copies will be distributed to the students before start of IDP, FYP and Industrial training.	
2	***EE Comments***	

	The handbook should also emphasize that the problems or projects given to students cannot be solve without demonstrating in-depth engineering knowledge (WP1) involving fundamental-based, first principal analytical approach and applying some or all of the following attributes, i.e. range of conflicting requirements (WP2), depth of analysis required (WP3), familiarity of issues (WP4), extent of applicable codes (WP5), extend of stakeholder involvement and conflicting requirements (WP6) and interdependence (WP7). Similarly, if PO9 is involve, the emphasis would be that the problem or project shall include complex engineering activities attributes such as range of resources (EA1), level of interactions (EA2), innovation (EA3), consequences to society and the environment (EA4) and/or familiarity (EA5).	
	FEC / MED Comments	
	We have prepared the handbook according to the recommendations of the external examiner, that is, to include complex problems solving and complex engineering activities for student guidance.	
3	***EE Comments***	
	As part of professional practice, the ME programme should arrange for industrial talks delivered by engineers from mechanical and/or related engineering sectors/companies so as to expand the students' knowledge and exposure to the various industries	
	FEC / MED Comments	
	We have noted the recommendation as suggested by the external examiner. We will arrange the industrial talk especially from the appointed IAPs.	
4	***EE Comments***	
	The EE noted that Finite Element Analysis (FEA) is an elective module and not all students would take this module. Hence, there will be a need to incorporate some basic FEA topics in the core modules before the IDP and FYP. This is to ensure that students would be able to incorporate FEA in their IDP as well as FYP. Similarly, the basics of CFD should also be covered in Fluid Mechanicals or related modules where appropriate.	
	FEC / MED Comments	
	The FEA have been implemented in the module Solid Mechanics I (BME2003) in semester September 2019 semester. Currently, the full version of ANSYS software is subscribed beginning September 2020. Therefore, we will also apply FEA in other modules, Solid Mechanics II (BME2004), Fluid Mechanics I (BME2001), Fluid Mechanics II (BME2006), Thermodynamic I (BME 2002), Thermodynamic II (BME2005) and Heat transfer (BME3002). Integrated Design Project and Final Year Project module will take place in year 3 semester 1 and year 4 semester 1 respectively. Therefore, the student can incorporate FEA in IDP and FYP modules.	
Curriculum – Programme Delivery and Assessment Methods		
1	***EE Comments***	
	In the preparation of final exam questions, it is vital to ensure that the questions are linked to the specific course outcomes and prepared at an appropriate level of the Blooms Taxonomy. Questions taken directly from the textbook may not have the necessary depth required since most text book questions are design for practice; to assist the students to apply a specific theory or principle and not designed to meet specific learning outcomes as required in the OBE	

	approach. There is probably a need for staff to be trained (hands-on session) on how to prepare exam questions at the higher level of the Bloom's taxonomy especially the Level 5 and Level 6.	
	FEC / MED Comments	
	We have noted the recommendation as suggested by the external examiner. The training will be arranged before final exam preparation.	
2	***EE Comments***	
	While the lower order thinking skills (LOTS) are demonstrated by the students in the exams, there is also a need to incorporate the higher order thinking skills (HOTS) such as by designing exam questions at the higher level of the taxonomy. This is to challenge the students, regardless of the year of study, and to ensure that students are able to continuously demonstrate the HOTS.	
	FEC / MED Comments	
	We noted the recommendation. HOTs will be incorporated in the final examination assessments.	
3	***EE Comments***	Appendix E (Moderation form).
	On the same note, the moderation form for the final exam could be improved to include the assessment of the Bloom's taxonomy level as well as the characteristics of complex engineering problems where appropriate.	
	FEC / MED Comments	
	The assessment for Bloom's taxonomy level has been added to the moderation. We will add the component for characteristic of complex engineering problem in the near future.	
Academic and support staffs		
1	***EE Comments***	
	In hiring of new academic staff, FCUC should consider hiring senior academic staff with teaching and research experience, and with the PEng. or CEng. qualification to serve in the ME programme. Employing industry practitioner with the PEng. status and have more than 10 years of industrial experience but without academic or research experience are also encouraged. This is necessary to have a balance academic profile on teaching, research and industry experience amongst the staff. In addition, the senior academic staff could act as mentor to the more junior colleagues. The ME programme would need experience academic staff to implement and guide students in IDP and FYP later on when these modules are offered.	
	FEC / MED Comments	
	We recently hired academic staff with PEng. qualification. The detail of those staff are as follows: • Ir Muammar Quadaffi Mohd Ariffin Academic Experience: 1 year with more than 10 years of training conducted in industry. Industrial Experience: More than 20 years • Ir Sukhairul Nizam Bin Abdul Razak Academic Experience: 2 years with a number of years of training conducted in industry. Industrial Experience: More than 20 years	

	• Assoc. Prof. Ir. Dr. Parvathy Rajendran Academic Experience: 8 years We have also recently hired Dr Tio Kek Kiong who have more than 25 years of teaching experience. We currently have in total 8 staff, 3 of which with PEng in the MEP.	
2	***EE Comments***	
	There is also a need for FCUC to put in place an action plan to ensure that the young academic staff gain the necessary industrial exposure (either through industrial attachment or consultancy work with the industries) so that they could qualify to apply for the professional engineer (Ir.) status with the BEM in the near future.	
	FEC / MED Comments	
	FCUC encourages academic staff employed in FEC Engineering programmes to gain industrial exposure through industrial attachment as a staff Dr Marchus in the Electronic Engineering programme have recently completed his industrial attachment and is now awaiting is approval for Peng from IEM.	
3	***EE Comments***	
	Young academic staff will also seek for a stable career path and opportunities to grow in the university, hence there will be a need for FCUC to establish the academic career path and promotion policy for the staff. This also applies to the technical career path for technicians and supporting staff.	
	FEC / MED Comments	
	We recently promoted one laboratory technician to lecturer position as he recently completed his Masters of Science. There opportunities for growth in the university as the FCUC continues to increase the number and variety of programmes conducted with full commitment from Senior management.	
4	***EE Comments***	Appendix F (Staff Info)
	Just a reminder, since BEM considers that teaching of an accredited engineering programme is providing professional engineering services, only qualified staff should be allowed to teach the core engineering modules. Hence, the Faculty should ensure that in the new recruitment of local Malaysian academic staff, besides having the necessary engineering qualification and experiences, the candidate should be a registered Graduate Engineer or Graduate Technologist with BEM. In the case of International Staff, it is advisable to hire those who has a recognized professional engineer qualification obtained from any of the Washington Accord signatories such as CEng.(UK) and CPEng.(Aust). In addition, the international staff will also need to apply to BEM to be registered as a Graduate Engineer or Graduate Technologist.	
	FEC / MED Comments	
	All the staff teaching core modules are registered with BEM as PEng. or Graduate Engineer. This is attested in the timetable depicting staff teaching in core modules.	
Quality Management System		
1	***EE Comments***	

	It is timely for the ME programme to form the IAP. The members should be Engineers from the industry practicing mechanical and/or manufacturing engineering and if possible at least 4 to 5 members should be appointed. There should be a formal appointment of the IAP stating the duration of the appointment, the expected role and function of the members in the programme.	
	FEC / MED Comments	
	We have appointed four industry experts as advisors to the programme. They are: Ir. Jeyachandran Barnabas A/L G.Jesudason No. 59, Jalan SS 5B/1, Taman Kelana Jaya, 47301 Petaling Jaya, Selangor. Dato' Ir. Noor Azmi bin Jaafar Director Delloyd Ventures Sdn. Bhd. Lot 33004, 5, Jalan Kebun, Kampung Jawa, 41000 Klang, Selangor. Ir. Ong Yee Pinn Director PKV Consulting Engineers Sdn. Bhd. No. 552 A – B, Taman Melaka Raya, 75000 Melaka. Ir. Ts. Mohd Imran bin Abdul Hamid 41, Jalan Sukasih 3/2, Bandar Tun Hussein Onn, 43200 Cheras, Selangor. The appointment is effective from 1 October 2019 to 30 September 2022.	
2	***EE Comments***	Appendix G1
	The meeting with the IAP should be done at least once a year and the programme has to make sure that at least more than 50% of members attend the meeting. The discussion of this meeting should be minuted and action plan (if any)	

	drawn up and implemented. Typically, the agenda of the IAP meeting should include OBE implementation (PEO and PO attainment results), Academic Curriculum, Students Activities, Academic Staff, Facilities, CQI Initiatives, Quality Management System and other matters that require the input and action from the IAP.	(Industry advisor attendance) Appendix G2 (IAP report) Appendix G3 (Meeting minute)
	FEC / MED Comments	
	The first meeting with industry advisor panel was held on 11 October 2019. All the industry advisor panel have prepared a report for CQI of Bachelor of Mechanical Engineering programme. We are currently arranging for the second meeting as due to the pandemic there were uncertainties earlier that we could not avoid.	
3	***EE Comments***	
	As part of the students' exposure to professional practice, the programme could also invite the members of IAP to give regular talks to students. Industrial visits could also be arranged via the IAP where possible	
	FEC / MED Comments	
	We have noted the advice of the external examiner and will indeed arrange for this in the coming semester which begin on 5th October 2020. Good candidates for speakers are our own IAP panel members.	
4	***EE Comments***	
	The Faculty could also seek the assistant from the IAP members to help the young academic staff to gain industrial exposure, for example industrial attachment or to seek avenue for staff to be involve in R&D, industrial project or consultancy work. This can be done either through the IAP members' work place or through their network.	
	FEC / MED Comments	
	We have noted the advice of the external examiner and will put this as an agenda in the next scheduled IAP meeting.	
5	***EE Comments***	
	As part of the CQI process, the ME programme should also perform a face-to-face benchmarking visit to other universities offering the Mechanical Engineering degree programme. In doing so, the benchmarking visit should focus on all areas of the accreditation. It is also recommended that table-top curriculum benchmarking exercise could be carried out every 2 years whereas the face-to-face bench marking is done at least once in a 4 years cycle of the programme. This exercise should be part of the initiative under the existing CQI framework of the Faculty.	
	FEC / MED Comments	
	We will conduct benchmarking visit to Universiti Malaya and this is now being arranged. Due to the uncertainties created by the pandemic we could not arrange for this at an earlier date.	

The original report is embedded below:

External Examiner Report 2020

Prepared by

Professor Ir. Dr. Ramesh Singh

Senior Professor of Mechanical Engineering
Faculty of Engineering
University of Malaya
Kuala Lumpur
Malaysia

For

Bachelor of Mechanical Engineering with Honours
Faculty of Engineering and Computing
First City University College (FCUC)

Review Date: 4 – 5 August 2020

8.5 Quality Assurance.

A Quality Management System (QMS) must be in place to assure the achievement of POs. FCUC maintain its QMS, based on an established quality assurance standard.

8.5.1 System for Examination Regulations including Preparation and Moderation of Examination Papers.

Examinations are held at the end of every semester during week 16 – 19 of academic calendar and managed by University Examination Council. However, moderation of exam questions has been done first in vetting meeting in mid semester of academic calendar as stated in Section 4.2.2 - Assessment Methods. This vetting process done (refer Section 4.8 - Condition for Passing Modules) to ensure the questions prepared based on suitable blooms of taxonomy level.

Students have to sit for the examination of courses they have registered. Initially, students are required to settle all fees due and fulfil the standing requirements for lectures/tutorials/practical and other requirements including attendance before allowed sitting for the examination of courses they have registered. The duration of examination depends on the number of units of the course as shown in the Table 8.4.

Table 8.4: Duration of Examination.

Evaluated Courses	Examination Duration
2 units	1 hour for coursework of more than 40%
2 units	2 hours for coursework of 40% and below
3 units or more	2 hours for coursework of more than 40%
3 units or more	3 hours for coursework of 40% and below

Students will be barred from sitting the final examination if they did not satisfy the following conditions:

- Attend lectures and tutorials regularly (at least 70%).
- Complete/fulfil the required components of course work.
- Settle their academic fees.

A grade "X" would be awarded for a course in which a student is barred. In addition, the University Examination Council has the right to terminate any student's studies due to certain reasons (e.g., a student who has not registered for the courses, has not attend examination without valid reasons), as well as medical reasons can be disqualified from pursuing his/her studies. Student evaluation achievements for courses registered are describes as in Table 8.5.

Table 8.5: The Grade Point Average (GPA) System.

Grade	GPA
A	4.00
A–	3.67
B+	3.33
B	3.00
B–	2.67
C+	2.33
C	2.00
C–	1.67
D+	1.33
D	1.00
D–	0.67
F	0.00

The University's regulation has allowed students with "conditional pass" who are awarded grade "C–"and below to be given a chance to improve their grades by repeating the course during the additional semester or normal semester. Students awarded a grade C and above will not be allowed to repeat the course. However, this "conditional pass" status only applicable to all courses offered by a non-engineering school. Thus, for all courses offered by an engineering school, any marks below 40 will be given an "F" grade and required to re-sit the course.

8.5.2 System of Assessment for Examinations, Projects and Industrial Training.

The MEP has established a working system for assessment of examinations, projects, industrial training and other forms of learning delivery which are elaborated in detail in Section 4.2.1 - Programme Delivery and Section 4.2.2 - Assessment Methods. The scope of assessment is wide enough to cover the achievement of POs as explained in depth in Section 3.8 - POs Delivery and Assessment Process. In addition, an example of the implemented system of assessment is given in Section 3.9 - Individual Students' POs Attainment.

8.5.3 Systems for Student Admission and Teaching and Learning.

FCUC accepts applications into its MEP from both local and international students, with due consideration on the guidelines and requirements set forth within the Student Admission Process outlined in Section 5.3 - Requirement and Process for Admission of Students. In addition to the admission of new students, the QMS systems of the MED and FCUC have established clear procedures for the processes of Credit Transfer and Unit Exemption as defined in Section 5.4 - Policies and Processes for Credit Transfer / Exemption.

A variety of techniques are used in the delivery of the teaching and learning in the courses offered at MED as discussed in Section 4.2 - Programme Delivery and Assessment Methods. These techniques are implemented to effectively develop a range of cognitive, affective, and psychomotor skills and addresses desired program outcomes and competencies.

8.5.4 Benchmarking Exercise.

The MED has conducted benchmarking visit to USM, where the details of the review carried out and report highlighting differences, lesson learn, best practices etc. are stated at Section 4.3.1 - Curriculum Review and Section 4.3.2 - Curriculum Benchmarking. In summary, the MEP offered by FCUC, USM, UTM and UM are comparable.

Benchmarking is necessary to ensure this programme is of good standard with other universities locally or internationally. Comparison of programme educational goals, learning outcomes, curriculum contents and facilities visitations and meetings with other collaborative universities will review good practices that can be incorporated into existing programme. The Table 8.6 shows the benchmarking of programme structure that the FEC has done with respect three local universities namely University Malaya (UM), Universiti Sains Malaysia (USM), and Universiti Teknologi Malaysia (UTM). There seems to be high similarity in terms of programme structure with 85%, 82%, and 76% for UM, USM, and UTM, respectively.

Benchmarking is part of a programme quality management effort in accordance to Engineering Accreditation Council (EAC) requirement for programme accreditation. We requested permission to online visit USM for benchmarking of our Bachelor of Mechanical Engineering with Honours degree programme with University of Malaya's Bachelor of Mechanical Engineering degree programme. We chose USM for benchmarking because USM is one of the oldest public universities in Malaysia and is the highest-ranking Malaysian institution of higher education in 2020 and 2021.

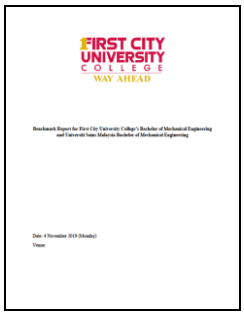
The FEC performed a detail benchmarking with USM to run this proposed MEP on 30th Sep 2021. The FEC sees benchmarking important as this is one of the inputs and feedback to the programme for CQI. Detail of the report is located at the end of this section.

Table 8.6: Programme structure comparison between FCUC with UM, USM and UTM.

FCUC		UM	Remarks	USM	Remarks	UTM	Remarks
CORE COURSES							
BME1001	Engineering Statics	✓		✓		✓	
BME1002	Introduction to Electrical and Electronic Engineering	✓		✓		✓	
BME1003	Engineering Drawing	✓		✓		✓	
BME1004	Engineering Materials I	✓		✓		✓	
BME1005	Engineering Dynamics	✓		✓		✓	
BME1006	Machine Drawing			✓			
BGS1003	Engineering Practice and Communication Skills	✓		✓		✓	
BGS2002	Programming for Engineers	✓		✓		✓	
BME2001	Fluid Mechanics I	✓		✓		✓	
BME2002	Thermodynamics I	✓		✓		✓	
BME2003	Solid Mechanics I	✓		✓		✓	
BME2004	Solid Mechanics II	✓		✓		✓	
BME2005	Thermodynamics II	✓		✓		✓	
BME2006	Fluid Mechanics II	✓		✓		✓	
BME2007	Introduction to Microprocessor						
BME2008	Engineering Materials II	✓					
BME-3001	Mechanical Component Design I	✓		✓		✓	
BME3002	Heat Transfer	✓		✓		✓	
BME3003	Instrumentation and Measurement	✓		✓		✓	
BME3004	Manufacturing Processes	✓		✓		✓	
BGS3001	Engineering Economics	✓		✓		✓	
BME3101	Integrated Design Project	✓		✓		✓	
BME3005	Mechanical Component Design II			✓			
BME3006	Control Systems	✓		✓		✓	
BME3007	Electrical Power and Machines			✓			
BME3102	Industrial Training	✓		✓		✓	
BME4101	Final Year Project	✓		✓		✓	
BME4001	Operations and Quality Management			✓			
BME4002	Sustainable Energy Systems	✓					
BME4003	Mechanical Vibration	✓		✓			
BGS4001	Professional Practice	✓		✓		✓	
BGS4002	Project Management and Product Development	✓					
BGS4003	Entrepreneurship	✓				✓	

	6 Electives		6 Electives		4 Electives		4 Electives
Total credit	137	143	29/34=85%	135	28/34=82%	137	26/34=76%

The full report of the Benchmarking Exercise is embedded below:



8.6 Strength related to QMS.

In this sub-section, the strength related to QMS are explained in detail. The strength includes:

1) Well-structured organization exist at the MED, FEC and FCUC levels.
2) Well-structured various committees relating to academic advisory and authoritative panels (i.e., the Senate, APC and QD committees).
3) Adequate support from an Academic Quality and Accreditation Division (QA) who responsible in formalising accreditation matters with the goal of creating, implementing and maintaining an ongoing mechanism for assessment and improvement of accreditation operations and services to academic programs in FCUC.
4) The QA provides adequate training to MEP staff in understanding and enhance knowledge in OBE system.
5) Strong support within FCUC to provide internal training programs (workshops, seminars, short courses, etc.).
6) Additional financial resources to acquire, maintain and operate facilities and equipment.
7) The MEP curriculum structure are comparable to other established universities that have the similar programme.
8) Implement a systematic database for Course Delivery and Assessment.
9) Explicit mapping of POs in assessment method which enable to clearly identify, monitor and CQI the POs attainment for each student.
10) Established procedures provided by FCUC in maintaining the quality of facilities.
11) Strong support and involvement of industrial panel and EE in discussing and reviewing curriculum.

8.7 CQI Relating to QMS.

There are a few CQI plan relating QMS have been planned where the details are listed below:

1) The MED encourages more academic staff to actively involved in various activities; to increase KPI which enable more financial allocation.

8.8 Self – Assessment on Programme Performance Related to QMS.

Aspect	Poor	Satisfactory	Good	Comments
Institutional Support, Operating Environment, and Financial Resources				
Quality and Continuity of the Programme.		✓		
Attract and Retain a Well-Qualified Academic and Support Staff.		✓		
Acquire, Maintain, and Operate Facilities and Equipment.		✓		
Programme Quality Management and Planning				
System for Programme Planning, Curriculum Development, and Regular Curriculum and Content.		✓		
External Assessment and Advisory System				
External Examiners and how these are being used for Quality Improvement.		✓		
Advisory Evaluation Panel from Industries and other Relevant Stakeholders.		✓		
Quality Assurance				
System for Examination Regulations including Preparation and Moderation of Examination Papers.		✓		
System of Assessment for Examinations, Projects, Industrial Training.		✓		