Continuous Quality Improvement in the Context of OBE- A Case Study

Taqi Ahmad Cheema, PhD.

Dean & Associate Professor

Faculty of Mechanical Engineering,

GIK Institute of Engineering Sciences and Technology, Topi,

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Speaker's Profile Summary

TAQI AHMAD CHEEMA

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EDUCATION

2014 PhD in Mechanical Engineering
Kyungpook National University, Daegu, Korea.

2009 Master of Science in Mechanical Engineering
Hanyang University, Seoul, Korea.

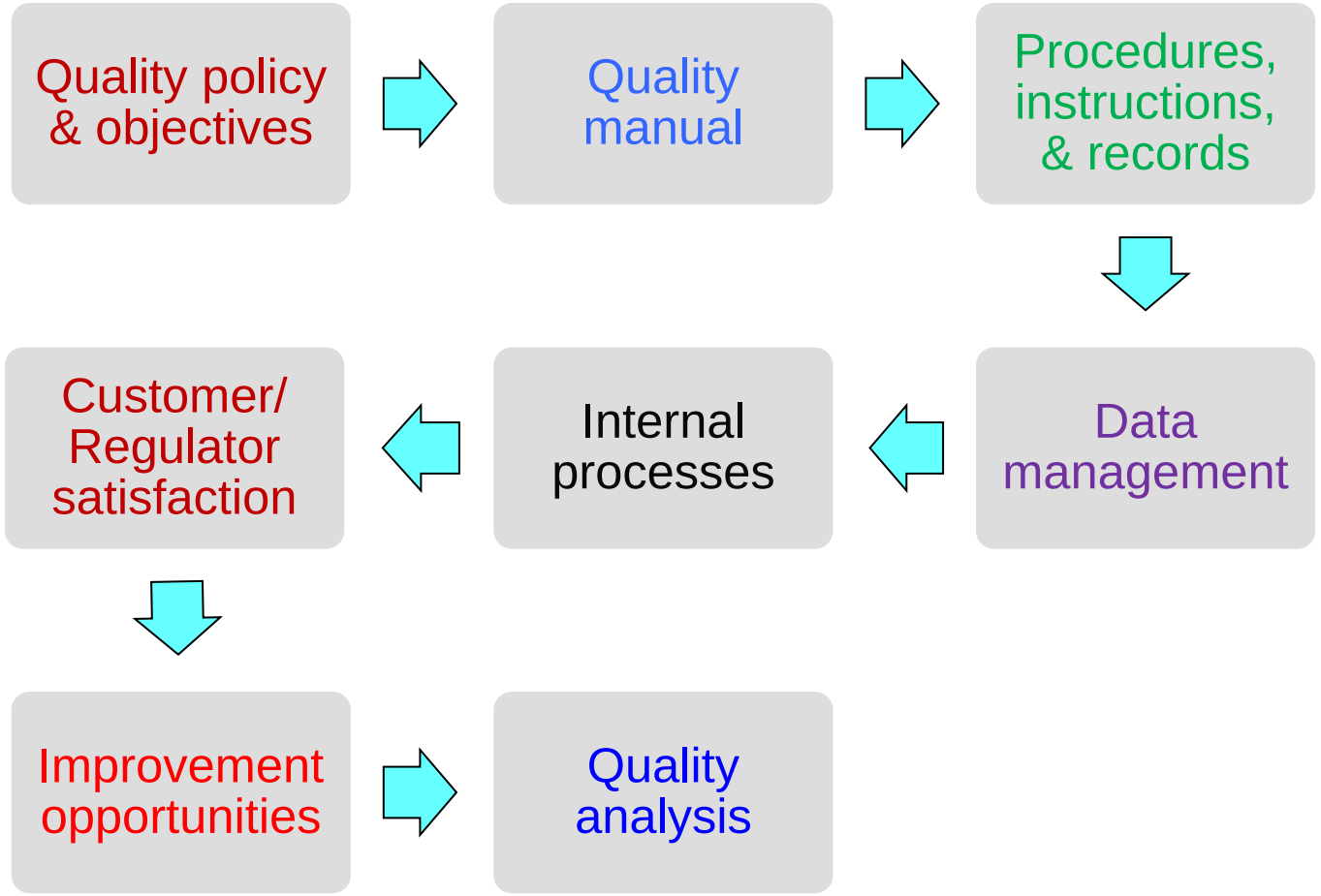
2005 Bachelor of Science in Mechanical Engineering
Univ. Engineering & Technology, Taxila, Pakistan

RESEARCH INTERESTS

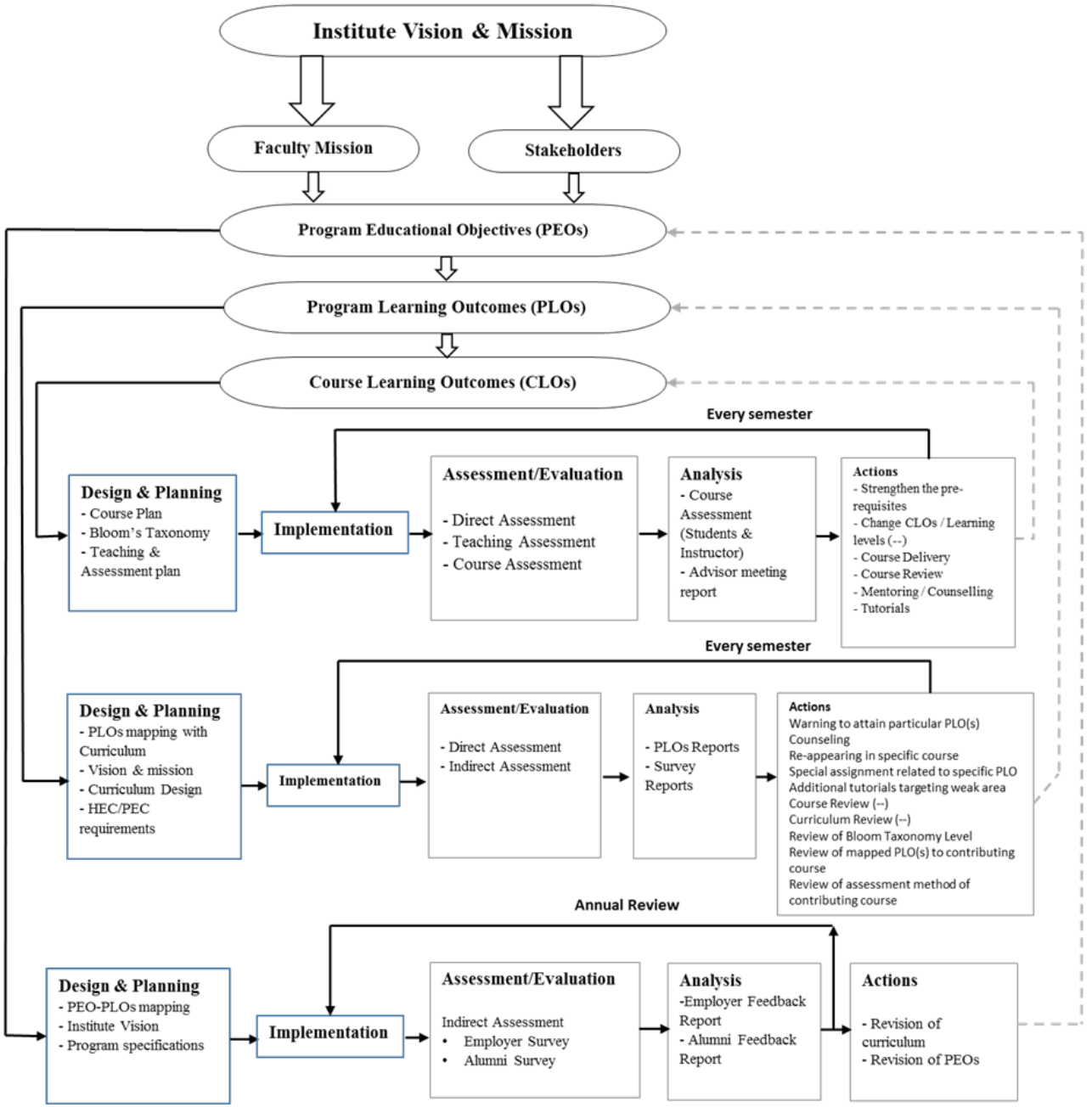
- Thermo-Fluids
- Hemodynamics
- Fluid Structure Interaction (FSI)
- CFD Applications
- Renewable Energy

Quality Management System (QMS)

A formalized system that documents processes, procedures, and responsibilities for achieving quality policies and objectives.



Source: American Society for Quality (ASQ)



FME SAR 2021 – Page 24

Quality Manual Criteria

1) Program Educational Objectives (PEOs)
2) Program Learning Outcomes (PLOs)
3) Curriculum and Learning Processes
4) Students
5) Faculty and Support Staff
6) Facilities & Infrastructure
7) Institutional Support & Financial Resources
8) Continuous Quality Improvement
9) Industrial Linkages

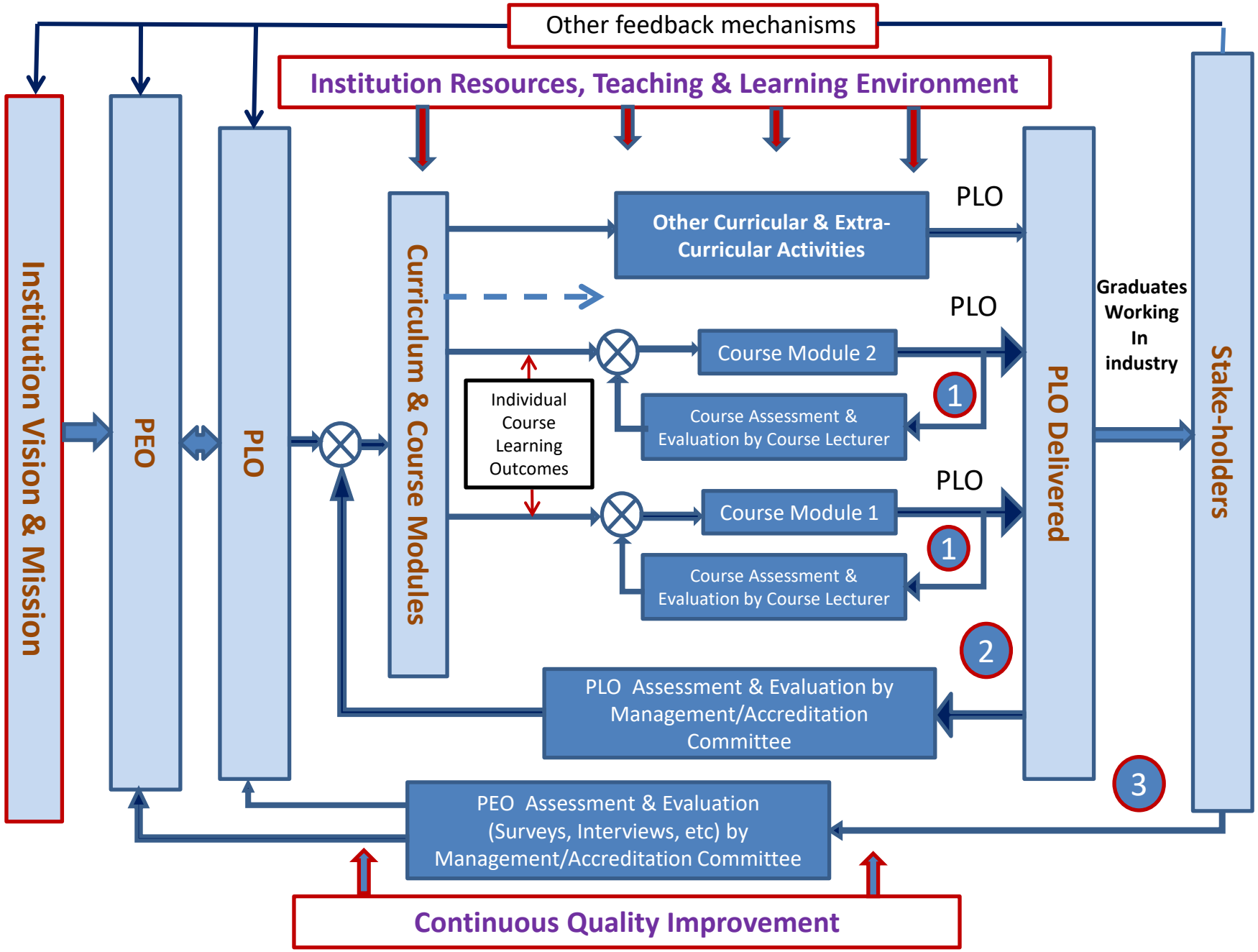
Source: PEC EAB Accreditation Manual 3rd Edition - 2019

Continuous Quality Improvement

The Case Study

Faculty of Mechanical Engineering,
GIK Institute of Engineering Sciences and Technology, Topi,

Continuous Quality Improvement Process in Outcome-based Accreditation



Assessment Method for CLOs

FME/CLO-APP/F-01 REV#01

Faculty of Mechanical Engineering

CLO Approval Form

Course Code: ME321
Course Instructor: Dr. Ali Turab Jafry

Date: 17-09-2020
Course Title: Fluid Mechanics-I
Last Revised: 24-06-2019

S.#	Existing			Revised			
	CLO	PLO	BT/WK	CLO	PLO	BT/WK	Reasons
Student will be able to							
1	apply the principles of fluid statics to solve variety of fluid problems.	PLO1	C3 (Application)	apply the principles of fluid statics to solve variety of fluid problems.	PLO1	C3 (Application) WK3	Revised PLO mapping and Inclusion of CLOs mapping with WK.
2	analyze fluid dynamic systems using basic laws of mechanics.	PLO2	C4 (Analysis)	analyze fluid dynamic systems using basic laws of mechanics.	PLO2	C4 (Analysis) WK4	
3	carry out the dimensional analysis for various problems in fluid mechanics.	PLO3	C3 (Application)	carry out the dimensional analysis for various problems in fluid mechanics.	PLO2	C3 (Application) WK3	
4	analyze various fluid flow systems through optical visualization techniques.	PLO4	C4 (Analysis)	analyze various fluid flow systems through optical visualization techniques.	PLO4	C4 (Analysis) WK4	

CLO – Course Learning Outcomes; PLO – Program Learning Outcomes; BT – Bloom's Taxonomy Level; WK – Knowledge Profiles

Instructor's Signature: 21/10/2020 Dr. Ali Turab Jafry.

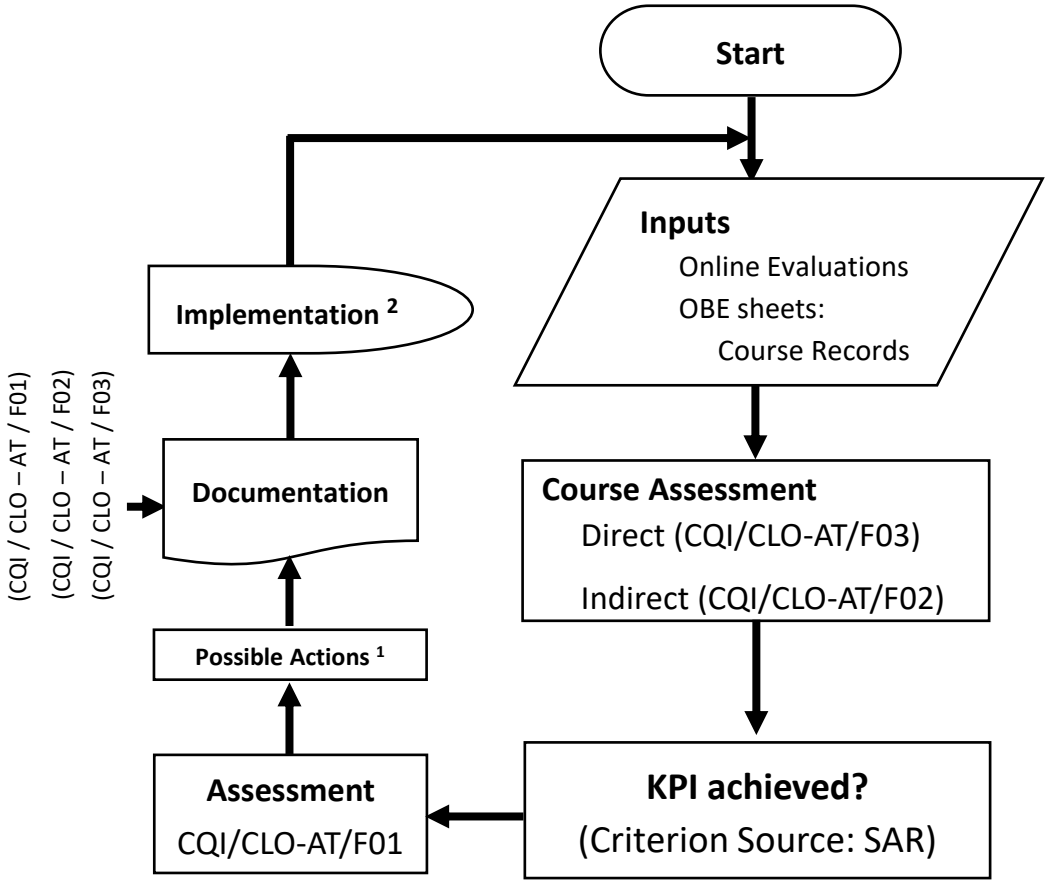
Recommended By OBE Committee: Dr. G. Hussain Jhanji ; T.A. Cheema Tagish

Approved by Dean (FME): (Khalid Rehman) (DR KHALID)

Assessment Method	Level	Assessment Tools	KPI	Assessed by	Frequency
Direct	Individual	Quizzes, Assignments, Lab reports, Mini projects, Senior Design Project, Mid and Final exams	40% marks (cumulative) from the targeted assessment tool(s)	Course & Lab Instructor	Each semester
	Cohort		Number of students achieving CLOs in course ≥ 60%		

FME SAR 2021 – Page 89

CQI Process for attainment of CLOs at Cohort Level



[1] **Possible Actions (CQI)**

Strengthen the fundamentals of students

Additional tutorials

Review of assessment methods/opportunities

Change CLOs / Learning levels

[2] **Implementation**

In case of discrepancy regarding form CQI/CLO-AT/F01, immediate action.

Next time the course is offered

Forms: CQI / CLO – AT / F01 REV#01

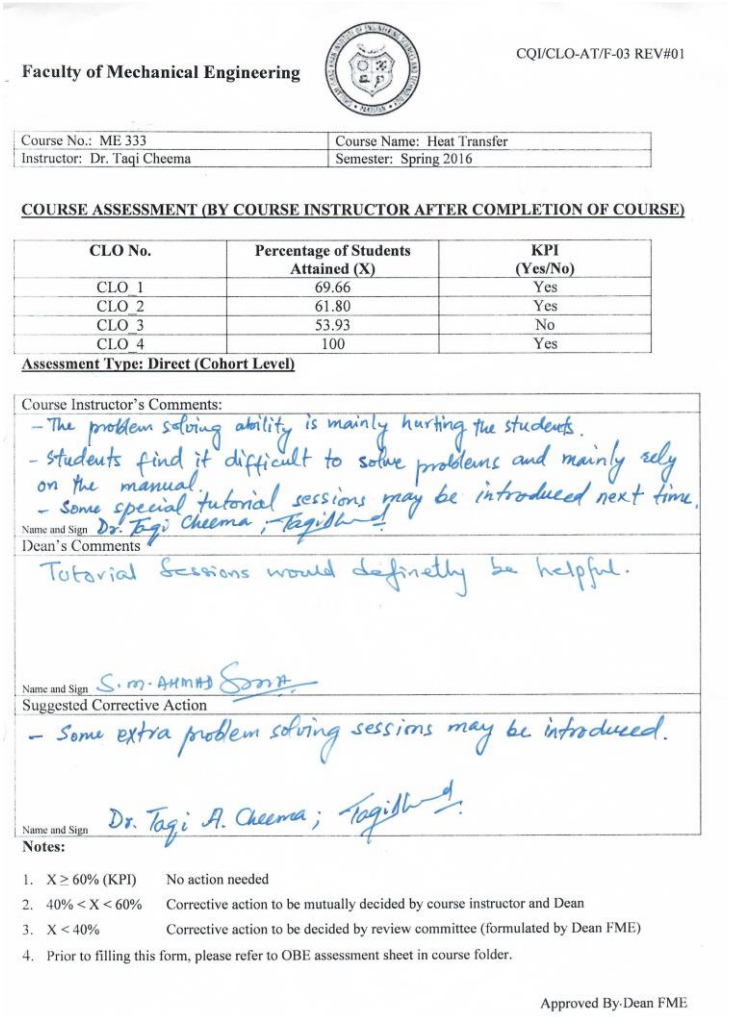
Students feedback during advisor meeting: CQI / CLO – AT / F02 REV#01

Course assessment by students: CQI / CLO – AT / F03 REV#01

Course assessment by course instructor after completion of course

FME SAR 2021 – Page 115

CQI – CLO



Faculty of Mechanical Engineering CQI/CLO-AT/F-03 REV#01

Course No.: ME 333	Course Name: Heat Transfer
Instructor: Dr. Taqi Cheema	Semester: Spring 2016

COURSE ASSESSMENT (BY COURSE INSTRUCTOR AFTER COMPLETION OF COURSE)

CLO No.	Percentage of Students Attained (X)	KPI (Yes/No)
CLO_1	69.66	Yes
CLO_2	61.80	Yes
CLO_3	53.93	No
CLO_4	100	Yes

Assessment Type: Direct (Cohort Level)

Course Instructor's Comments:

- The problem solving ability is mainly hurting the students.
- students find it difficult to solve problems and mainly rely on the manual.
- Some special tutorial sessions may be introduced next time.

Name and Sign Dr. Taqi Cheema ; Taqi

Dean's Comments

Tutorial Sessions would definetly be helpful.

Name and Sign S. M. Ahmed

Suggested Corrective Action

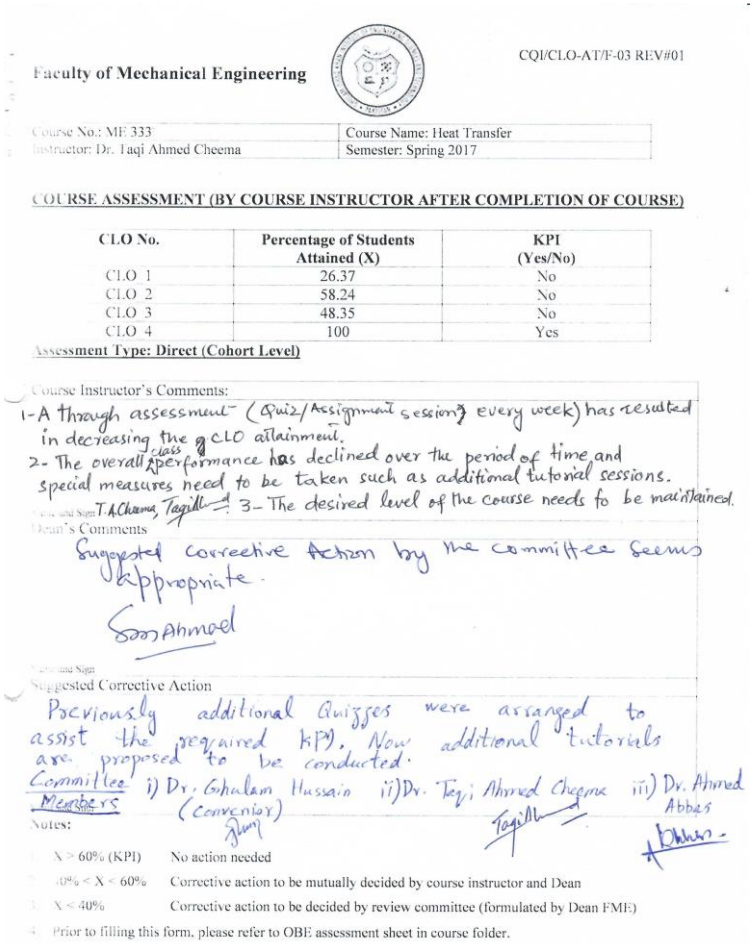
- Some extra problem solving sessions may be introduced.

Name and Sign Dr. Taqi A. Cheema ; Taqi

Notes:

1. X ≥ 60% (KPI) No action needed
2. 40% < X < 60% Corrective action to be mutually decided by course instructor and Dean
3. X < 40% Corrective action to be decided by review committee (formulated by Dean FME)
4. Prior to filling this form, please refer to OBE assessment sheet in course folder.

Approved By Dean FME



Faculty of Mechanical Engineering CQI/CLO-AT/F-03 REV#01

Course No.: ME 333	Course Name: Heat Transfer
Instructor: Dr. Taqi Ahmed Cheema	Semester: Spring 2017

COURSE ASSESSMENT (BY COURSE INSTRUCTOR AFTER COMPLETION OF COURSE)

CLO No.	Percentage of Students Attained (X)	KPI (Yes/No)
CLO_1	26.37	No
CLO_2	58.24	No
CLO_3	48.35	No
CLO_4	100	Yes

Assessment Type: Direct (Cohort Level)

Course Instructor's Comments:

1- A through assessment (Quiz/Assignment/Session) every week) has resulted in decreasing the CLO attainment.
2- The overall class performance has declined over the period of time and special measures need to be taken such as additional tutorial sessions.
3- The desired level of the course needs to be maintained.

Name and Sign T. A Cheema, Taqi

Dean's Comments

Suggested corrective Action by the committee seems appropriate.

Soon Ahmed

Name and Sign

Suggested Corrective Action

Previously additional Quizzes were arranged to assist the required KPI. Now additional tutorials are proposed to be conducted.

Committee Members i) Dr. Ghulam Hussain (convenior) ii) Dr. Taqi Ahmed Cheema iii) Dr. Ahmed Abbas

Taqi

Notes:

1. X ≥ 60% (KPI) No action needed
2. 40% < X < 60% Corrective action to be mutually decided by course instructor and Dean
3. X < 40% Corrective action to be decided by review committee (formulated by Dean FME)
4. Prior to filling this form, please refer to OBE assessment sheet in course folder.

CQI – CLO

Faculty of Mechanical Engineering CQI/CLO-AT/F-03 REV#01

Course No.: ME-333	Course Name: Heat Transfer
Instructor: Dr. Taqi Ahmad Cheema	Semester: Spring 2018

COURSE ASSESSMENT (BY COURSE INSTRUCTOR AFTER COMPLETION OF COURSE)

CLO No.	Percentage of Students Attained (X)	KPI (Yes/No)
CLO_1	38.20%	No
CLO_2	73.03%	Yes
CLO_3	56.18%	Yes
CLO_4	96.63%	Yes

Assessment Type: Direct (Cohort Level)

Course Instructor's Comments:

As per directions given by the committee, the CLO attainment has been improved significantly. However, more work is required to improve the attainment by providing more opportunities to the students in terms of increasing number of questions/activities particularly related to the lacking CLOs.

Name and Sign Dr. T. A. Cheema, Tagi

Dean's Comments

Significant improvement was achieved in CLO attainment, however since CLO-1 is still not attained a committee is constituted to suggest further course of action! Committee: Dr S Hussain & Dr Ahmed Abbas

Name and Sign SMA

Suggested Corrective Action

More opportunities may be provided to students to attain each particular CLO.

Name and Sign Dr. Ghulam Hussain, Dr. Ahmed Abbas, Dr. T.A. Cheema

Notes:

1. X ≥ 60% (KPI) No action needed
2. 40% < X < 60% Corrective action to be mutually decided by course instructor and Dean
3. X < 40% Corrective action to be decided by review committee (formulated by Dean FME)
4. Prior to filling this form, please refer to OBE assessment sheet in course folder.

Approved By Dean FME

Faculty of Mechanical Engineering CQI/CLO-AT/F-03 REV#01

Course No.: ME 333	Course Name: Heat Transfer
Instructor: Dr. Taqi Ahmad Cheema	Semester: Spring 2019

COURSE ASSESSMENT (BY COURSE INSTRUCTOR AFTER COMPLETION OF COURSE)

CLO No.	Percentage of Students Attained (X)	KPI (Yes/No)
CLO_1	61.26	Yes
CLO_2	72.07	Yes
CLO_3	63.04	Yes
CLO_4	97.30	Yes

Assessment Type: Direct (Cohort Level)

Course Instructor's Comments:

On the directions of the committee formed, more opportunities were provided to the students particularly for CLO_1. The result is positive and all the CLOs are achieved for the first time in three years. Further improvement can be made by offering more opportunities for all the CLOs.

Name and Sign Dr. T. A. Cheema, Tagi

Dean's Comments

After three years of CQI, the course KPI's have been attained. A good example of effectiveness of CQI process.

Name and Sign S. M. Ahmed SMA

Suggested Corrective Action

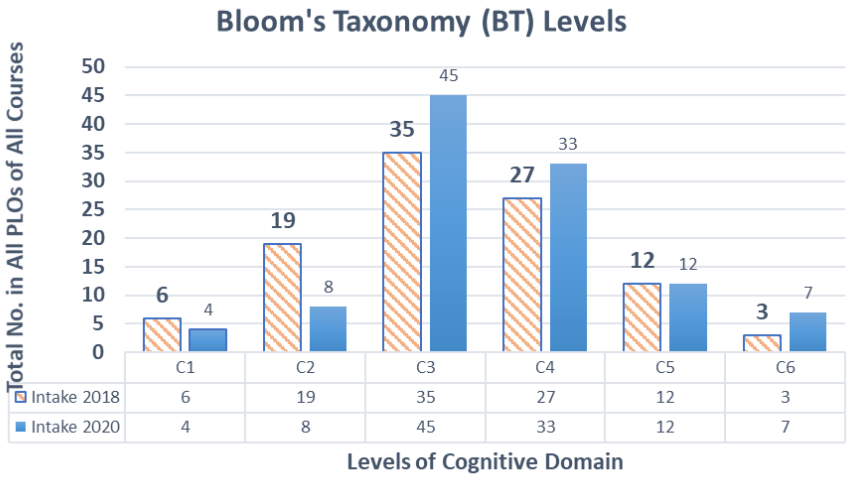
Name and Sign

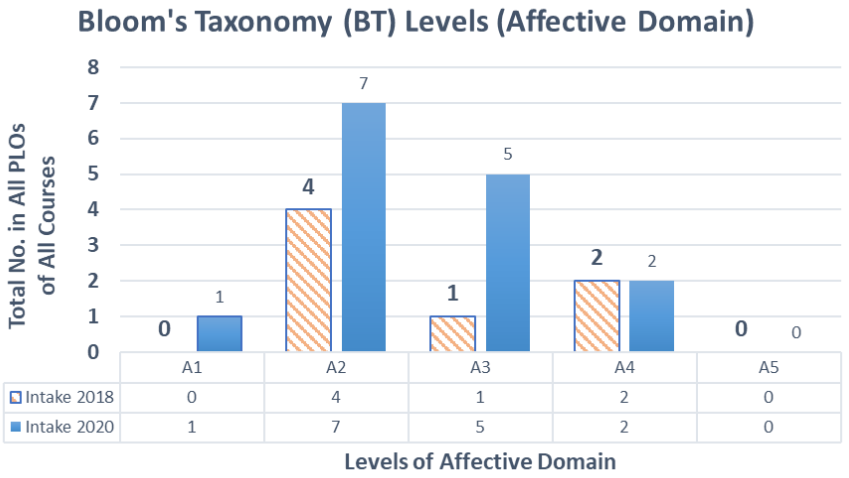
Notes:

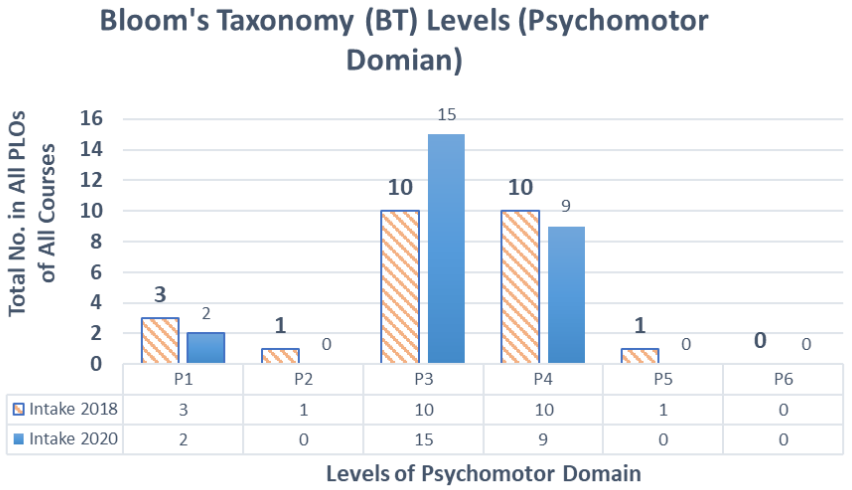
1. X ≥ 60% (KPI) No action needed
2. 40% < X < 60% Corrective action to be mutually decided by course instructor and Dean
3. X < 40% Corrective action to be decided by review committee (formulated by Dean FME)
4. Prior to filling this form, please refer to OBE assessment sheet in course folder.

Approved By Dean FME

CQI – CLO


Bloom's Taxonomy (BT) Levels
Total No. in All PLOs of All Courses
Levels of Cognitive Domain
C1 C2 C3 C4 C5 C6
Intake 2018 6 19 35 27 12 3
Intake 2020 4 8 45 33 12 7


Bloom's Taxonomy (BT) Levels (Affective Domain)
Total No. in All PLOs of All Courses
Levels of Affective Domain
A1 A2 A3 A4 A5
Intake 2018 0 4 1 2 0
Intake 2020 1 7 5 2 0


Bloom's Taxonomy (BT) Levels (Psychomotor Domian)
Total No. in All PLOs of All Courses
Levels of Psychomotor Domain
P1 P2 P3 P4 P5 P6
Intake 2018 3 1 10 10 1 0
Intake 2020 2 0 15 9 0 0

CQI – CLO

FME/CLO-APP/F-01 REV#01

Faculty of Mechanical Engineering

CLO Approval Form

Course Code: ME-213
Course Instructor: Dr. Khalid Rahman

Date: 21-09-2020
Course Title: Mechanics of Solids - I
Last Revised: 23rd July 2019

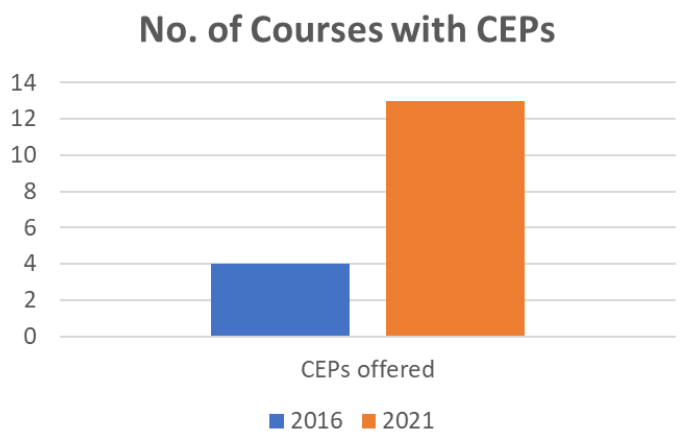
	Existing			Revised			
	CLO	PLO	BT/WK	CLO	PLO	BT/WK	Reasons
Student will be able to							
1	Apply fundamental concepts of stress, strain and elastic behavior of materials on mechanical structural members subject to various loading(s).	PLO1	C3 (Application)	Apply fundamental concepts of stress, strain and elastic behavior of materials on mechanical structural members subject to various loading(s).	PLO1	C3 (Application) WK3	Inclusion of CLOs mapping with WKs
2	Analyze principal stresses produced by combined loads in mechanical structure(s).	PLO2	C4 (Analysis)	Analyze principal stresses produced by combined loads in mechanical structure(s).	PLO2	C4 (Analysis) WK4	

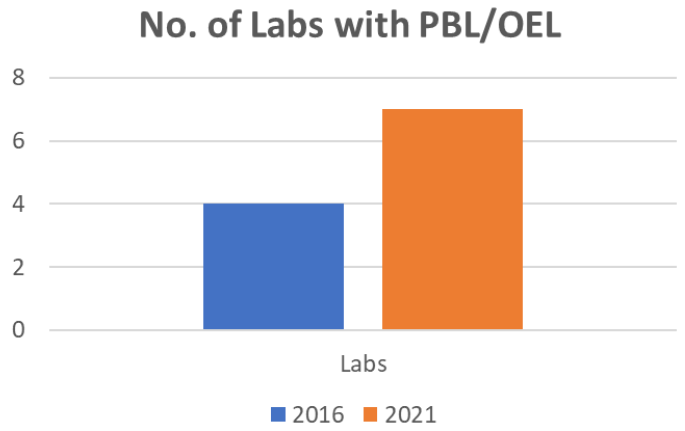
CLO – Course Learning Outcomes; PLO – Program Learning Outcomes; BT – Bloom's Taxonomy Level; WK – Knowledge Profiles

Instructor's Signature: Khalid Rehman

Recommended By OBE Committee: Dr. G. Hussain Jhanji ; T. A. Cheema Tagi

Approved by Dean (FME): (DR. KHALID) Khalid Rehman





Assessment Process of PLOs

Courses – PLO mapping	PLO_1	PLO_2	PLO_3	PLO_4	PLO_5	PLO_6	PLO_7	PLO_8	PLO_9	PLO_10	PLO_11	PLO_12
PLOs Frequency (Intake 2020 onward)	29	20	11	10	14	8	8	5	6	7	5	7

FME SAR 2021 – Page 37 onward

Assessment Method	Attainment Level	Assessment Tool	KPI	Assessed by	Frequency
Direct	Individual	PLO in courses (Quizzes, assignments, mid exam, final exam, course project, lab assessments, Senior Year Design Project, etc.) through CLOs assessment.	Cumulative average from courses ≥ 40%	Course and lab instructor	Every semester
	Cohort	PLO attainment through courses	Cumulative average ≥ 60%	Faculty Study Board	Every year
	Program	Courses	≥ 50% in each of 12 PLOs	Faculty Study Board	At the time of graduation
Indirect	Cohort	Internship Evaluation Form	Cumulative average ≥ 60%	Faculty Study Board	After completion of mandatory internship
		Graduating Batch Survey	Cumulative average ≥ 60%	Faculty Study Board	At the time of graduation

FME SAR 2021 – Page 45

Case Study (ME-333 Heat Transfer)

Mapping of CLOs and PLOs			
Sr. No	**Course Learning Outcomes**	**PLOs**	**Blooms Taxonomy**
The students will be able:			
CLO_1	To illustrate the basic principles of conduction, convection and radiation heat transfer.	PLO1	C3 (Applying)
CLO_2	To conduct heat transfer analysis of various thermal systems using various governing equations of heat flow.	PLO2	C4 (Analyzing)
CLO_3	To design various industrial equipments based on heat transfer calculations.	PLO3	C5 (Synthesizing)
CLO_4a	To assess the design and performance of a thermal system under various conditions using computational tools.	PLO5	C6 (Evaluating)
CLO_4b	To respond to the inspiration steered by the assigned problems.		A2 (Responding)
	Course is evaluated at a level of C6 (Evaluating)		

CLO Assessment Mechanism				
Assessment tools	**CLO_1**	**CLO_2**	**CLO_3**	**CLO_4**
Quiz	35%	0%	0%	0%
Assignment Sessions	0%	21%	32%	0%
Midterm Exam	35%	23%	26%	0%
Complex Engineering Problem	0%	0%	0%	100%
Final Exam	30%	56%	42%	0%

Case Study (ME-333 Heat Transfer)

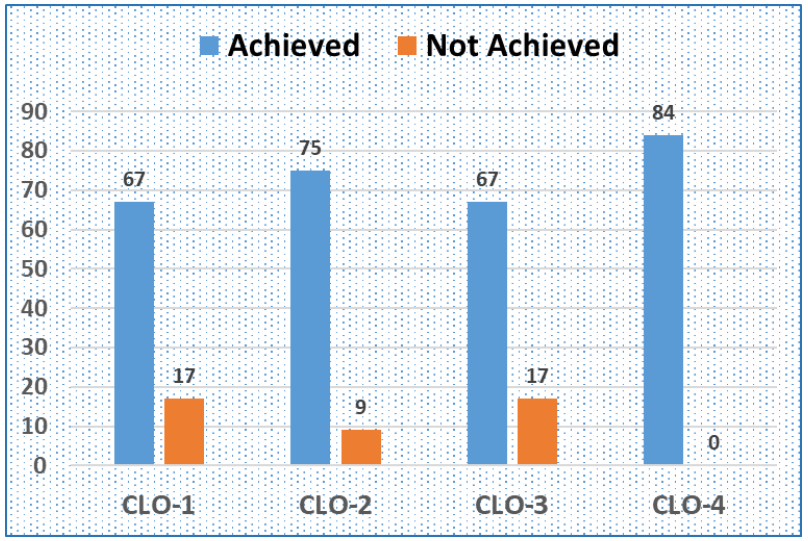
ME-333 Heat Transfer (Spring 2020)

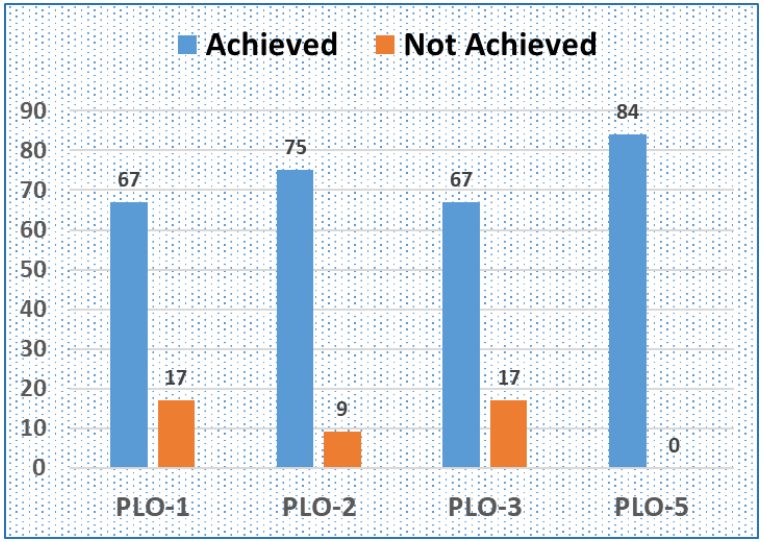
OBE Outcome Based Education			PLO1					PLO2									PLO3							PLO5			
			CLO_1					CLO_2									CLO_3							CLO_4a	CLO_4b	–	
			C3 (Applying)					C4 (Analyzing)									C5 (Synthesizing)							C6 (Evaluating)	A2 (Responding)		
			KPI 40%					KPI 40%									KPI 40%							KPI 40%			
Batch 27			Quizzes	Mid Exam	Final Exam	Total	PLO Attained	Assignment Sessions			Mid Exam		Final Exam		Total	PLO Attained	Assignment Sessions		Mid Exam	Final Exm		Total	PLO Attained	Complex Engineering Problem		Total	PLO Attained
Quiz, Assignment or Question No.		→	1,2,3,4,5,6,7,8	1	1	–		1	2	3	3	4	4	5	–		4	5	2	2	3	–		-	-	–	
Total Marks		→	10	10	8			3	3	3	5	5	8	8			3	3	5	8	8			7	3		
%age of CLOs		→	*35%*	*35%*	*30%*	*100%*	Yes/No	*25%*			*28%*		*45%*		*100%*	Yes/No	*21%*		*21%*	*58%*		*100%*	Yes/No	*70%*	*30%*	*100%*	Yes/No
Sr.No	Reg.No	Name																									
1	2015281	MUHAMMAD LARAIB TAHIR	2.00	0.5	3.25	20.94	No	0	0	0	4	0	2	0	16.83	No	0	1	0	5	3	32.5	No	4.9	2.1	70	Yes
2	2015374	RABBIA BIBI	2.69	2.5	4.25	34.09	No	0	0	1.5	4	2.5	2	8	50.49	Yes	3	2	0	8	3	57.38	Yes	4.9	2.1	70	Yes
3	2016378	MUNEEB UR REHMAN	3.25	6.5	5	52.88	Yes	0	0	3	3.5	5	2	8	60.26	Yes	3	2	3.5	8	3	72.08	Yes	5.6	2.4	80	Yes
4	2016398	QAZI AHMED ALI SIDDIQUI	6.13	2.5	6.75	55.50	Yes	1.5	0	3	0	0.5	3	8	44.84	Yes	3	0.5	0	8	3	52.13	Yes	5.6	2.4	80	Yes
5	2016399	QUDAMA TAHIR	4.56	6.5	7.25	65.91	Yes	2.05	1.25	0	0.5	5	2	8	52.69	Yes	0	0.5	1	8	3	45.83	Yes	5.6	2.4	80	Yes
6	2016553	DANIAL R INAM	3.63	2.5	6	43.94	Yes	0.75	1	0	2	2	2	8	44.19	Yes	3	0.5	0	8	3	52.13	Yes	5.6	2.4	80	Yes
7	2017006	ABDUL KARIM	5.13	6	5.25	58.63	Yes	0.75	1.75	2.25	4.5	3	2	8	62.32	Yes	0	3	2.5	8	3	60.88	Yes	7	3	100	Yes
8	2017019	ABDULLAH LIAQAT	4.69	8	4.75	62.22	Yes	0.75	1.75	2.75	4	2.5	2	8	60.91	Yes	3	3	2	0	3	40.28	Yes	7	3	100	Yes
9	2017022	ABDULLAH ZAHEED	4.44	3	4.75	43.84	Yes	0	0.5	3	3	3	0	6	43.40	Yes	2.5	3	0	6	3	51.88	Yes	4.9	2.1	70	Yes
10	2017024	ABDUR RAFAY	3.81	3	7.5	51.97	Yes	0	1	1	4	4	0	8	50.46	Yes	0	0.5	2	3	3.7	34.44	No	7	3	100	Yes
11	2017027	ABU BAKAR	6.31	6	5.5	63.72	Yes	0.75	2.25	0	2	0	1	6	33.62	No	0	0	5	4	5	53.63	Yes	6.3	2.7	90	Yes
12	2017034	AHAD ASGHAR	3.63	4	7.5	54.81	Yes	1.3	1.25	0	4	3	2	8	54.81	Yes	0	0.5	0.5	6	3	36.48	No	6.3	2.7	90	Yes
13	2017046	AHMED MURTAZA HUSSAIN	5.88	7.5	6	69.31	Yes	3	2.25	3	4	2.5	3	8	72.05	Yes	3	2	5	4	6	74.75	Yes	7	3	100	Yes
14	2017050	AHMED USMAN MOGHIS	5.50	2.5	5.5	48.63	Yes	1.5	1.5	3	4	3	5	8	72.83	Yes	1.5	3	5	8	3	76.63	Yes	5.6	2.4	80	Yes
15	2017052	AHRAD BIN RIAZ	5.88	6.5	5.75	64.88	Yes	3	2.25	3	3.5	5	8	8	91.72	Yes	2	3	3	8	3	69.98	Yes	7	3	100	Yes

Case Study (ME-333 Heat Transfer)

ME333	CLO-1	CLO-2	CLO-3	CLO-4
Achieved	67	75	67	84
Not Achieved	17	9	17	0
%age Achieved	79.76	89.29	79.76	100
%age Not Achieved	20.24	10.71	20.24	0

ME333	PLO-1	PLO-2	PLO-3	PLO-5
Achieved	67	75	67	84
Not Achieved	17	9	17	0
%age Achieved	79.8	89.29	79.76	100
%age Not Achieved	20.2	10.71	20.24	0





PLOs Tracking Process for Students

FME Intake 27 SEMESTER:		8	Cumulative PLO Percentage Attainment (CPPA)											
			1	2	3	4	5	6	7	8	9	10	11	12
S# ↓	Name ↓	Reg# ↓												
1	Abdullah Liaqat	2017019	100	94.1	100	90.9	100	100	100	100	100	100	100	100
2	Abdullah Zaheed	2017022	85.7	93.8	72.7	90.9	100	100	100	100	100	100	100	100
3	Abdur Rafay	2017024	93.1	88.2	83.3	90.9	100	100	100	100	100	100	100	100
4	Abu Bakar	2017027	96.6	94.4	100	80	100	100	100	100	100	100	100	100
5	Ahad Asghar	2017034	86.2	77.8	75	90.9	100	100	100	100	100	100	100	100
6	Ahmad Abdur Rehman	2017036	72	50	80	100	85.7	100	66.7	100	100	80	66.7	100
7	Ahmed Murtaza Hussain	2017046	100	94.4	91.7	90	100	100	100	100	100	100	100	100
8	Ahmed Usman Moghis	2017050	93.1	83.3	91.7	70	100	100	100	100	100	100	100	100
9	Ahrad Bin Riaz	2017052	96.6	94.4	91.7	90.9	100	100	100	100	100	100	100	100
10	Ali Alvi Shabbir	2017059	82.8	77.8	75	80	90	100	75	100	100	100	100	100
11	Ali Hamza	2017061	86.2	89.5	83.3	90	100	100	100	100	100	100	100	100
12	Ali Haseeb Jaffri	2017062	100	88.2	100	90.9	100	100	100	100	100	100	100	100
13	Aqib Naveed Khan	2017076	92.3	75	87.5	100	100	100	100	100	100	100	100	100
14	Arafat Idris	2017077	100	100	91.7	90.9	100	100	100	100	100	100	100	100
15	Arham Rahim	2017079	75	81.3	83.3	80	100	100	100	100	100	100	100	100

PLOs Tracking Process for Students Cont..

Enter the Reg#	2017036
Name Found	Ahmad Abdur Rehman

Semester 1

PLO →	1	2	3	4	5	6	7	8	9	10	11	12
Semester PLO Registration Frequency (SPRF)	7	0	0	0	0	1	1	0	0	2	0	0
Semester PLO Attainment Frequency (SPAF)	6	0	0	0	0	1	0	0	0	2	0	0
Semester PLO Percentage Attainment (SPPA)	86	NR	NR	NR	NR	100	0	NR	NR	100	NR	NR

PLO →	1	2	3	4	5	6	7	8	9	10	11	12
Cumulative PLO Registration Frequency (CPRF)	7	0	0	0	0	1	1	0	0	2	0	0
Cumulative PLO Attainment Frequency (CPAF)	6	0	0	0	0	1	0	0	0	2	0	0
Cumulative PLO Percentage Attainment(CPPA)	86	NR	NR	NR	NR	100	0	NR	NR	100	NR	NR

Semester 2

PLO →	1	2	3	4	5	6	7	8	9	10	11	12
Semester PLO Registration Frequency (SPRF)	4	1	0	0	2	0	0	0	1	2	0	0
Semester PLO Attainment Frequency (SPAF)	3	1	0	0	2	0	0	0	1	1	0	0
Semester PLO Percentage Attainment (SPPA)	75	100	NR	NR	100	NR	NR	NR	100	50	NR	NR

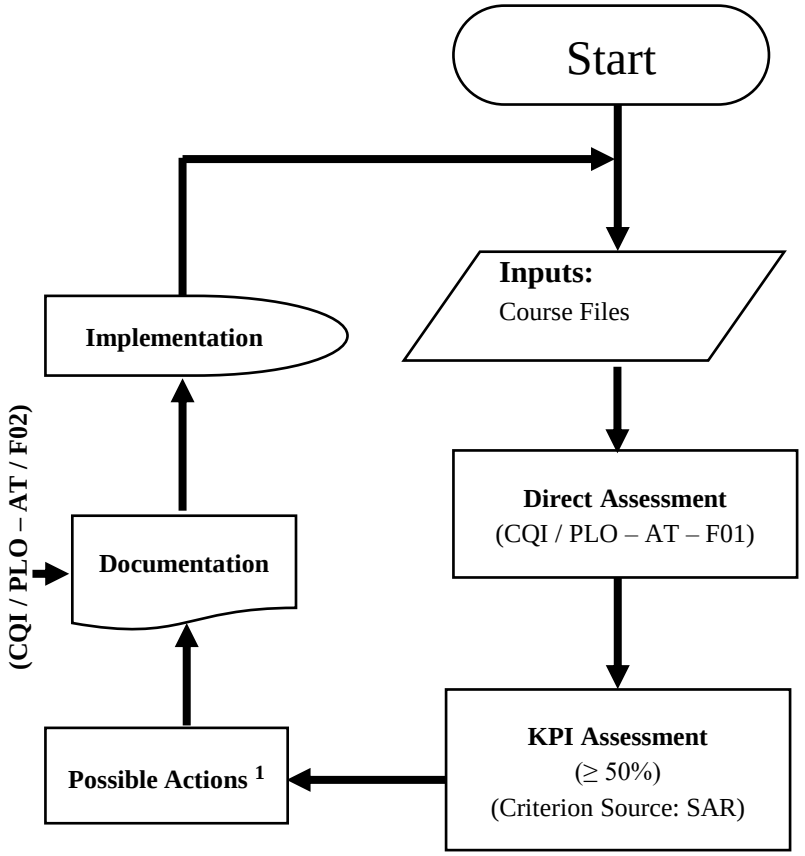
PLO →	1	2	3	4	5	6	7	8	9	10	11	12
Cumulative PLO Registration Frequency (CPRF)	11	1	0	0	2	1	1	0	1	4	0	0
Cumulative PLO Attainment Frequency (CPAF)	9	1	0	0	2	1	0	0	1	3	0	0
Cumulative PLO Percentage Attainment(CPPA)	82	100	NR	NR	100	100	0	NR	100	75	NR	NR

Semester 3

PLO →	1	2	3	4	5	6	7	8	9	10	11	12
Semester PLO Registration Frequency (SPRF)	4	4	2	1	1	1	0	1	0	0	0	0
Semester PLO Attainment Frequency (SPAF)	1	0	1	1	1	1	0	1	0	0	0	0
Semester PLO Percentage Attainment (SPPA)	25	0	50	100	100	100	NR	100	NR	NR	NR	NR

PLO →	1	2	3	4	5	6	7	8	9	10	11	12
Cumulative PLO Registration Frequency (CPRF)	15	5	2	1	3	2	1	1	1	4	0	0
Cumulative PLO Attainment Frequency (CPAF)	10	1	1	1	3	2	0	1	1	3	0	0
Cumulative PLO Percentage Attainment(CPPA)	67	20	50	100	100	100	0	100	100	75	NR	NR

CQI Process for PLOs attainment at Individual Level



[1] **Possible Actions (CQI)**

Warning to attain particular PLO(s)
Counseling
Re-appearing in specific course
Special assignment related to specific PLO
Additional tutorials targeting weak area

Forms:

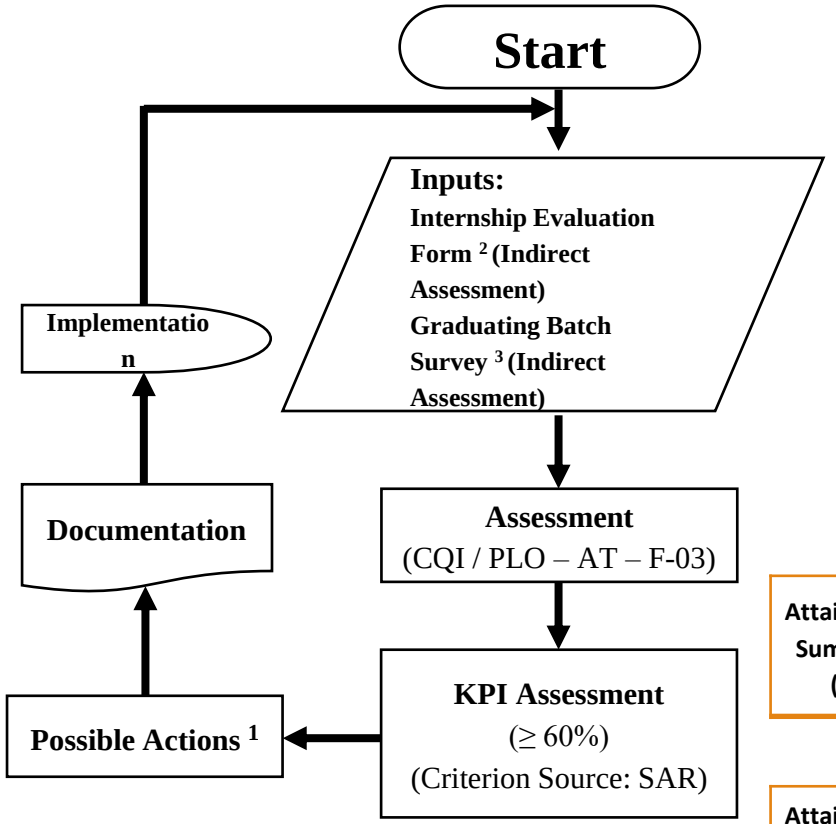
CQI / PLO – AT / F01 PLOs tracking sheet at individual level
CQI / PLO – AT / F02 CQI form for attainment of cumulative PLOs at student level

Semester-wise data for number of warnings/corrective actions – PLO attainment (Updated in August 2021)

Semester	Intake 2015	Intake 2016	Intake 2017	Intake 2018	Intake 2019
3rd	28	46	7	14	5
4th	34	12	11	11	9
5th	32	7	7	9	
6th	11	3	4	8	
7th	7	2	2		
8th	1	1	2		

FME SAR 2021 – Page 64

CQI Process for indirect assessment of PLOs



Possible Actions (CQI)

- Review at Curriculum level
- Revision of contributing course(s) content
- Review of Bloom Taxonomy Level
- Review of mapped PLO(s) to contributing course
- Review of assessment method of contributing course

[2] Required after completing Mandatory Internship

[3] Required for Graduating Batch Only

Graduating Batch Survey

Internship Evaluation Form

Graduating Batch Survey 2021 (Intake 2017)

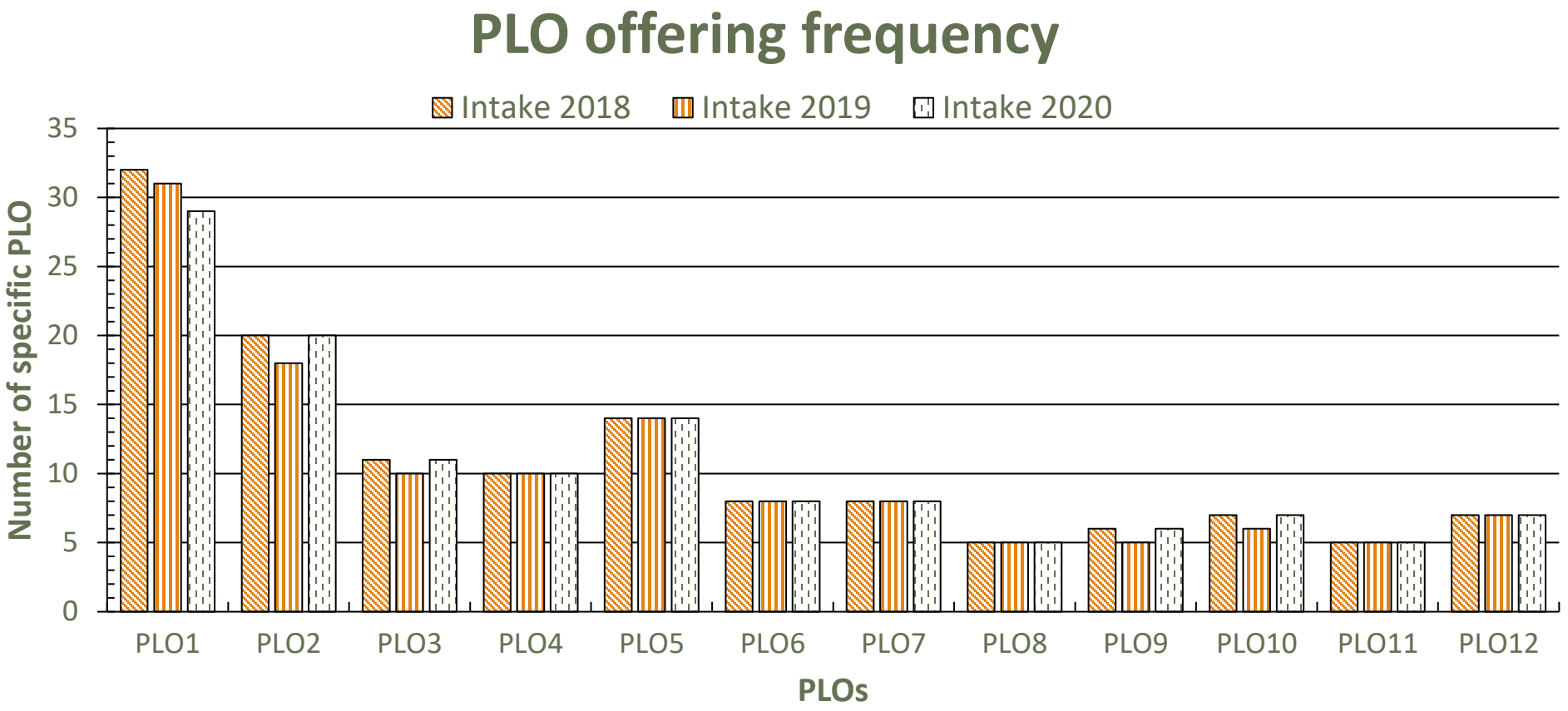
Attainment Summary (%)	PLO1	62.04%	PLO2	71.15%	PLO3	72.09%	PLO4	73.13%
	PLO5	64.60%	PLO6	61.63%	PLO7	64.53%	PLO8	73.84%
	PLO9	71.80%	PLO10	62.34%	PLO11	72.97%	PLO12	73.45%

Internship Evaluation Form 2020 (Intake 2017)

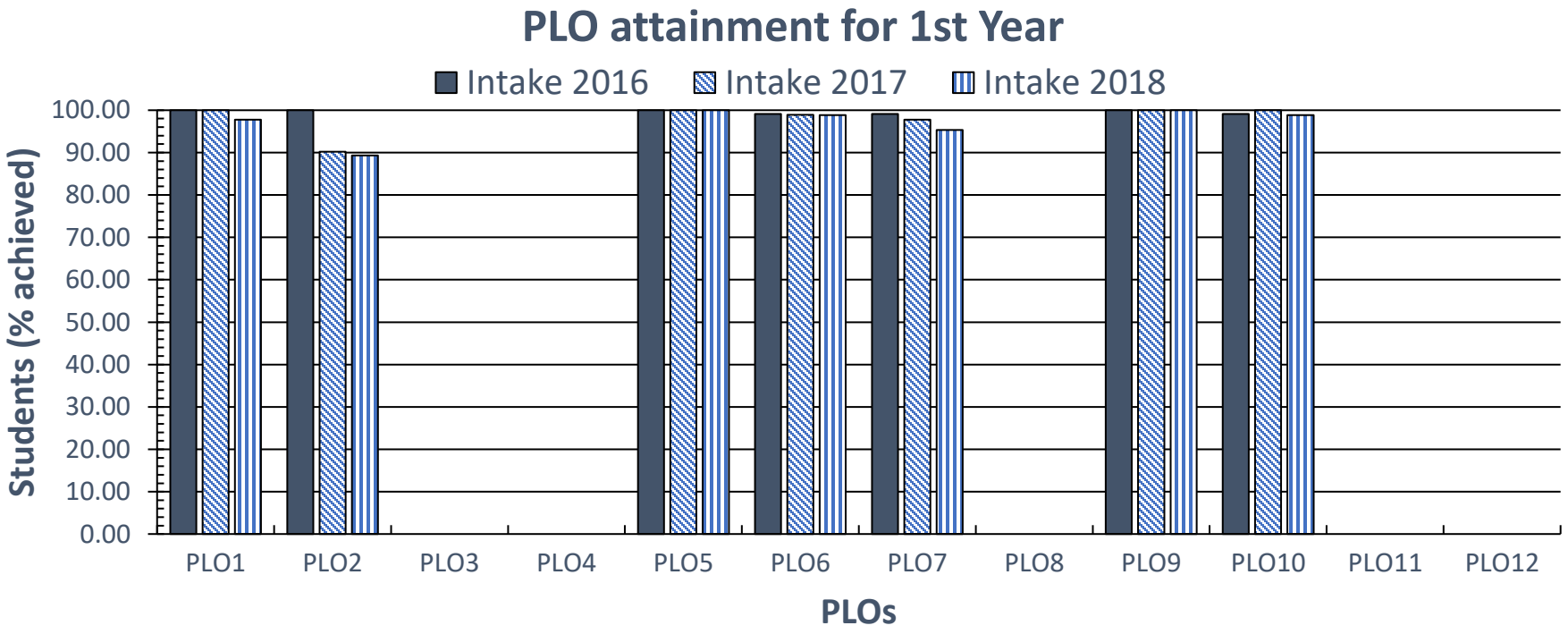
Attainment Summary (%)	PLO1	-	PLO2	-	PLO3	-	PLO4	-
	PLO5	-	PLO6	-	PLO7	84.9%	PLO8	84.2%
	PLO9	-	PLO10	-	PLO11	80.4%	PLO12	86.9%

FME SAR 2021 – Page 66

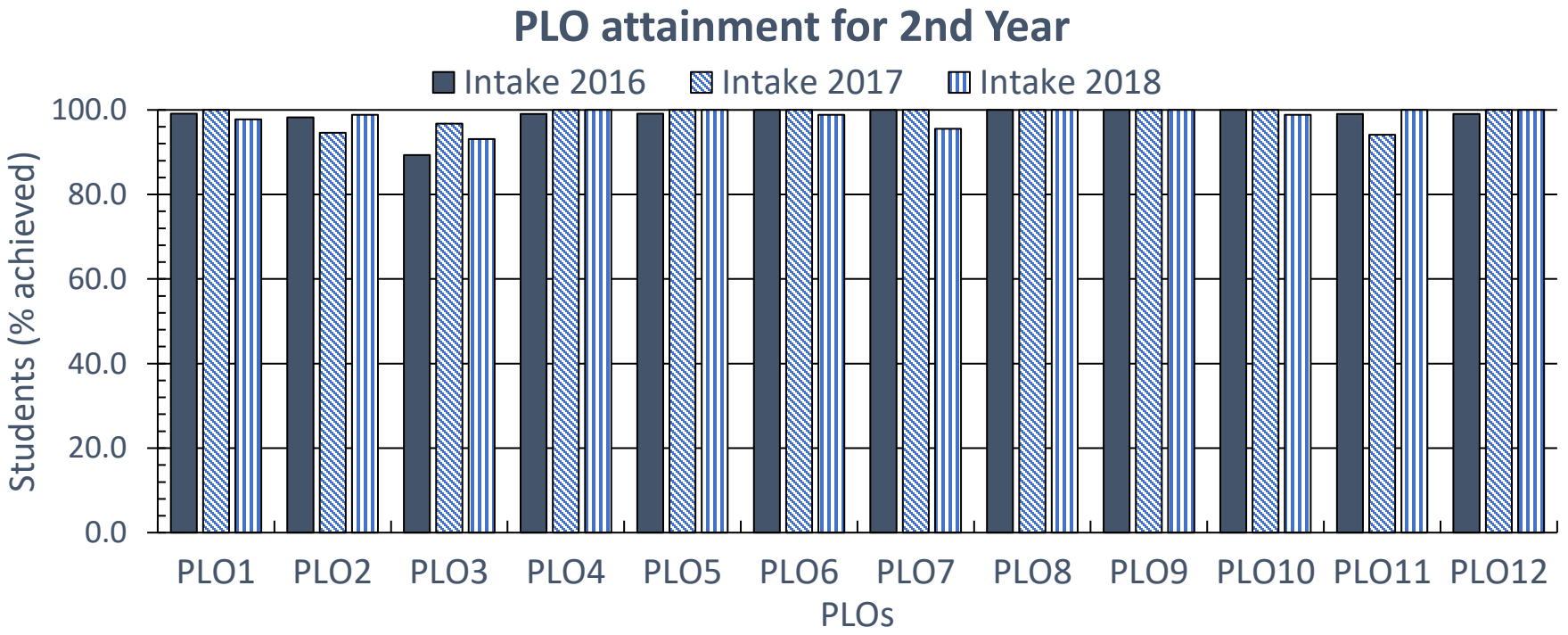
CQI – PLO


PLO offering frequency
Intake 2018
Intake 2019
Intake 2020
Number of specific PLO
35
30
25
20
15
10
5
0
PLO1
PLO2
PLO3
PLO4
PLO5
PLO6
PLO7
PLO8
PLO9
PLO10
PLO11
PLO12
PLOs

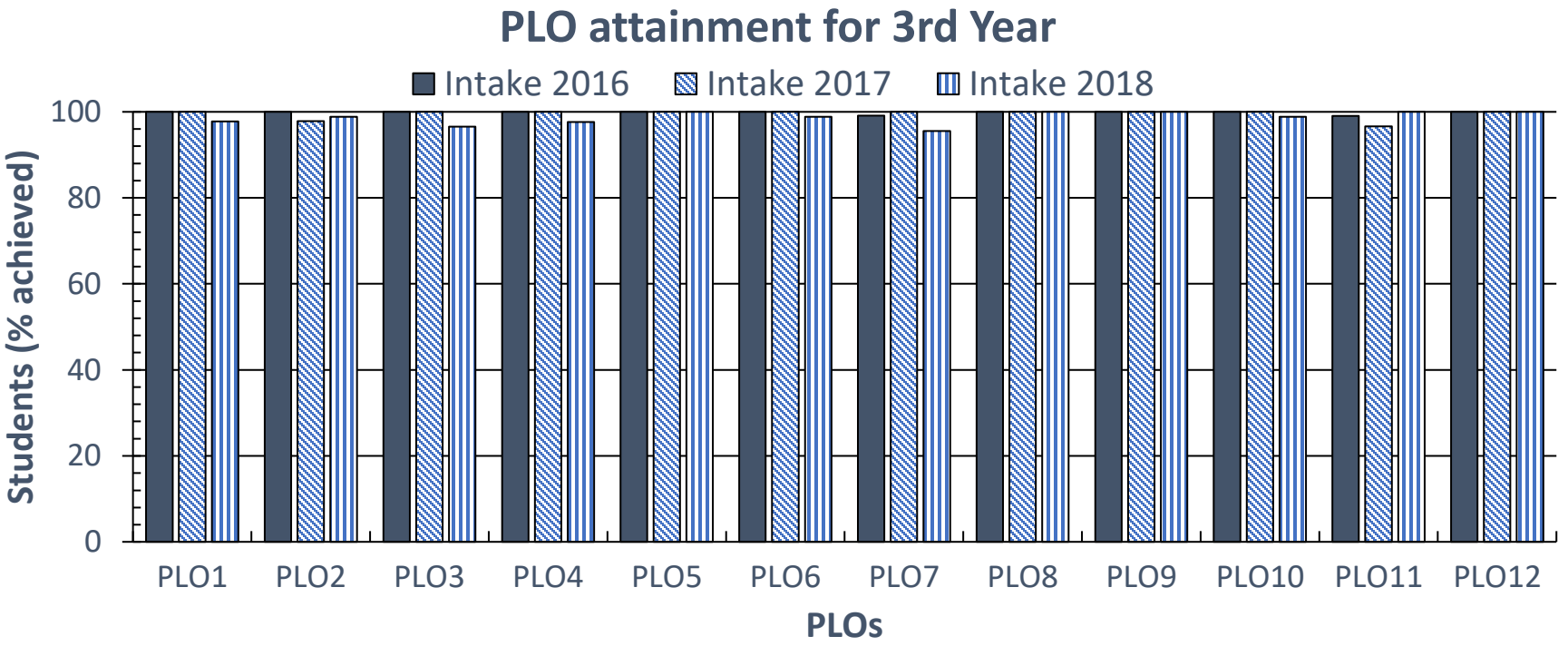
CQI – PLO


PLO attainment for 1st Year
Intake 2016
Intake 2017
Intake 2018
Students (% achieved)
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
PLO1
PLO2
PLO3
PLO4
PLO5
PLO6
PLO7
PLO8
PLO9
PLO10
PLO11
PLO12
PLOs

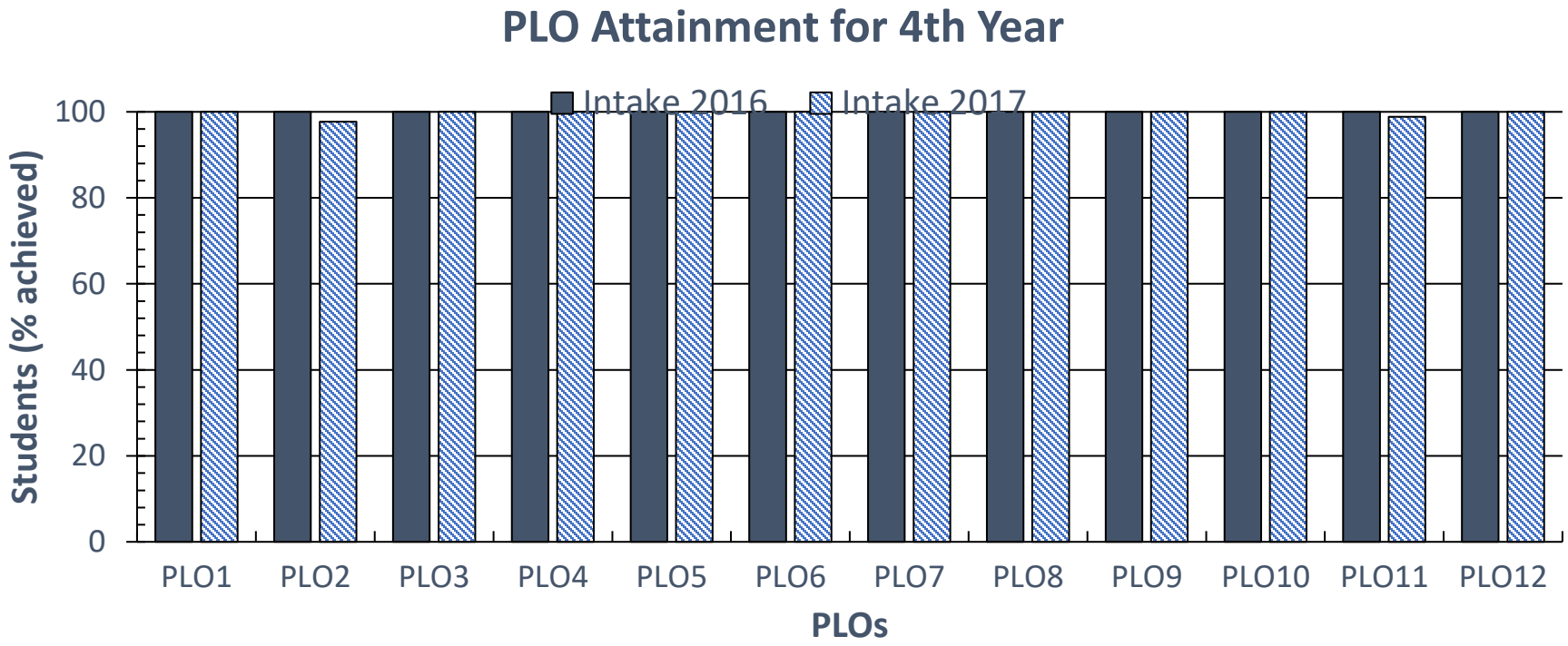
CQI – PLO


PLO attainment for 2nd Year
Intake 2016
Intake 2017
Intake 2018
Students (% achieved)
100.0
80.0
60.0
40.0
20.0
0.0
PLO1
PLO2
PLO3
PLO4
PLO5
PLO6
PLO7
PLO8
PLO9
PLO10
PLO11
PLO12
PLOs

CQI – PLO

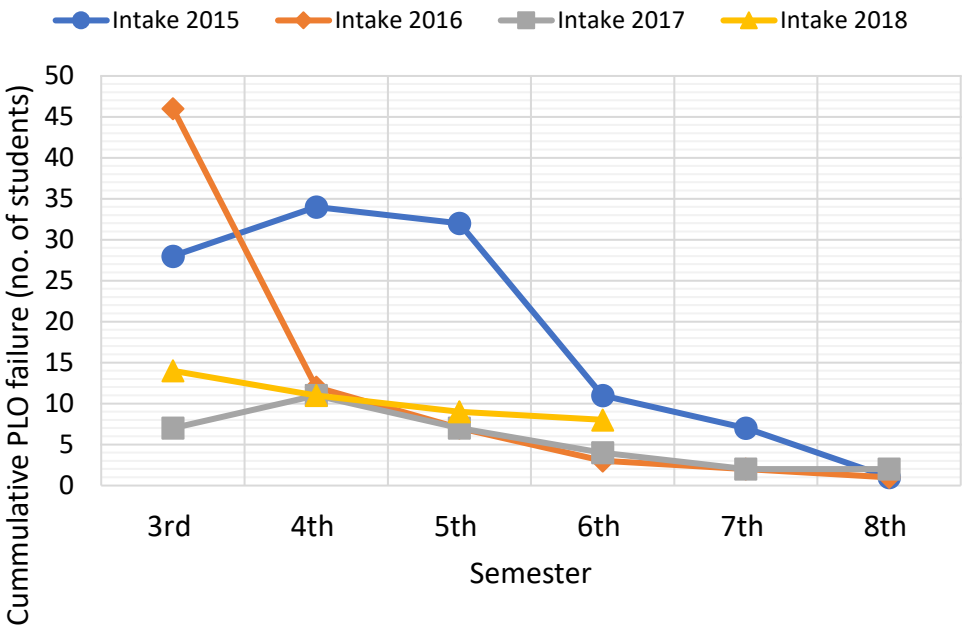

PLO attainment for 3rd Year
Intake 2016
Intake 2017
Intake 2018
Students (% achieved)
100
80
60
40
20
0
PLO1
PLO2
PLO3
PLO4
PLO5
PLO6
PLO7
PLO8
PLO9
PLO10
PLO11
PLO12
PLOs

CQI – PLO

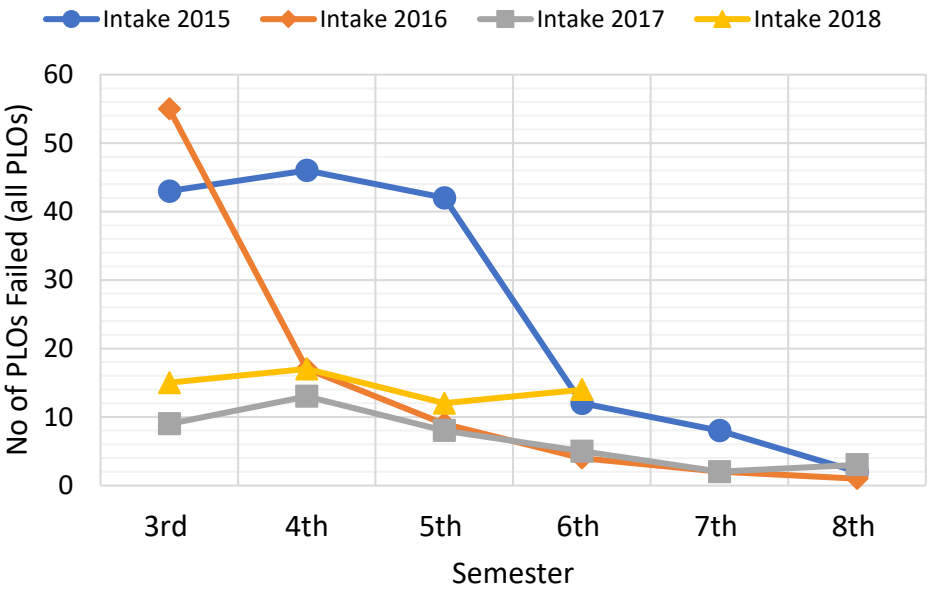

PLO Attainment for 4th Year
Intake 2016
Intake 2017
Students (% achieved)
100
80
60
40
20
0
PLO1
PLO2
PLO3
PLO4
PLO5
PLO6
PLO7
PLO8
PLO9
PLO10
PLO11
PLO12
PLOs

CQI – PLO

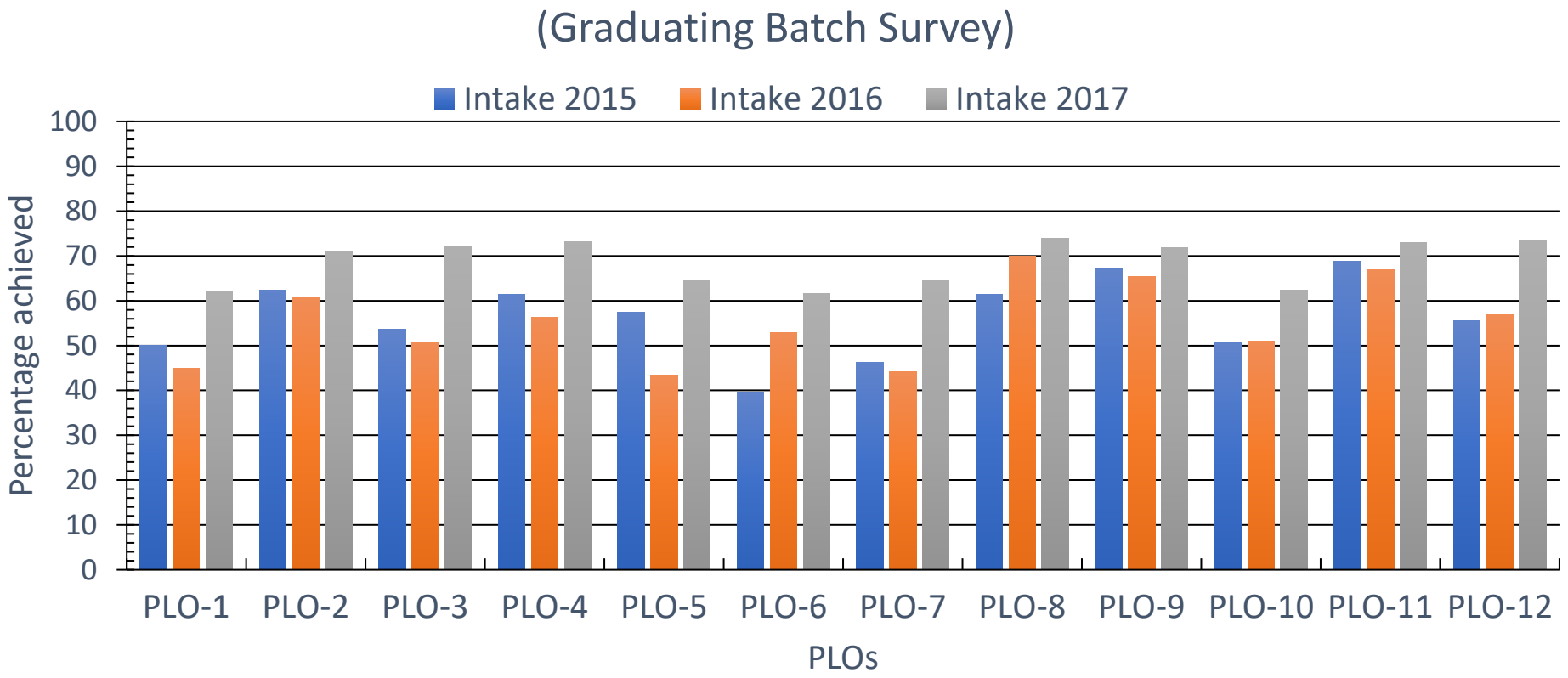
(a) CQI analysis for PLO attainment (Batchwise Students Comparison)



(b) CQI analysis for PLO attainment (Batchwise PLOs Comparison)



CQI – PLO


(Graduating Batch Survey)
Intake 2015
Intake 2016
Intake 2017
Percentage achieved
100
90
80
70
60
50
40
30
20
10
0
PLO-1
PLO-2
PLO-3
PLO-4
PLO-5
PLO-6
PLO-7
PLO-8
PLO-9
PLO-10
PLO-11
PLO-12
PLOs

Assessment of PEOs

PEO_1 Graduates practicing in a variety of Mechanical Engineering and allied disciplines.

PEO_2 Graduates performing in a responsible, professional and ethical manner as an individual and as part of a team.

PEO_3 Graduates advancing their knowledge and excelling in their chosen domain.

Assessment Type	Item Assessed	Assessment Tool	KPI	Frequency
Indirect	PEO_1	Alumni survey	60% alumni would be agreeing	Yearly
		Employer survey	60% employers would be agreeing	
		Alumni Data	85% of graduates should be employed in different industries	
	PEO_2	Alumni survey	60% alumni would be agreeing	
		Employer survey	60% employers would be agreeing	
	PEO_3	Alumni survey	60% alumni would be agreeing	
		Employer survey	60% employers would be agreeing	
		Alumni Data	15% graduates would be pursuing higher education	

FME SAR 2021 – Page 29

CQI Process for PEOs

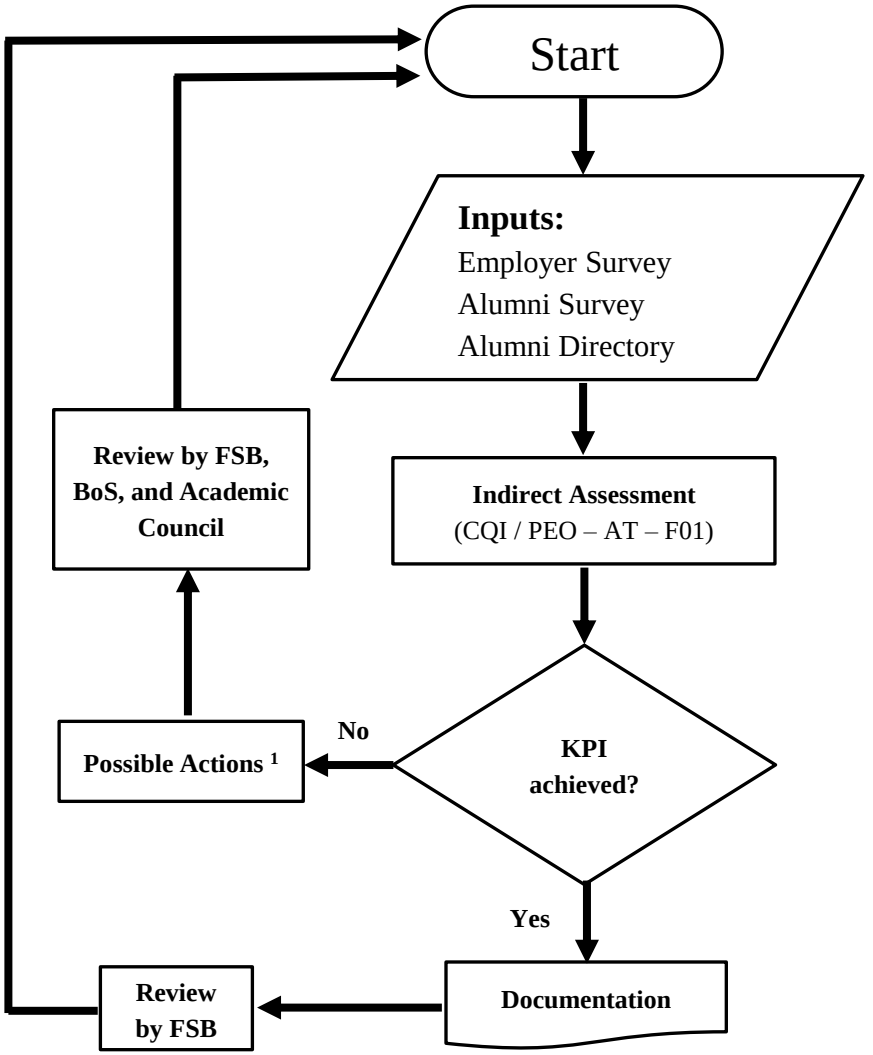
[1] Possible actions (CQI)

Revision of curriculum

Revision of PEOs (stakeholders' feedback will also be included)

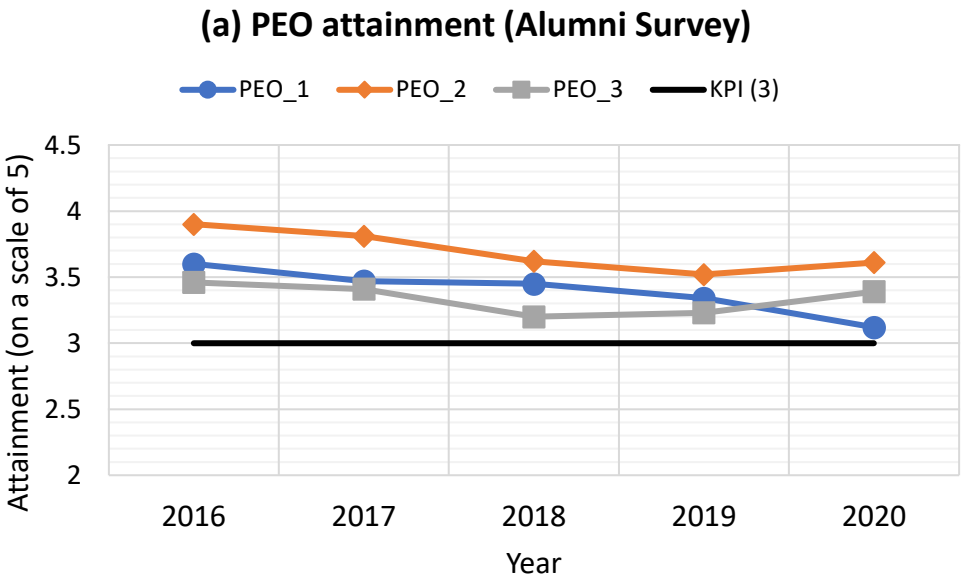
Form:

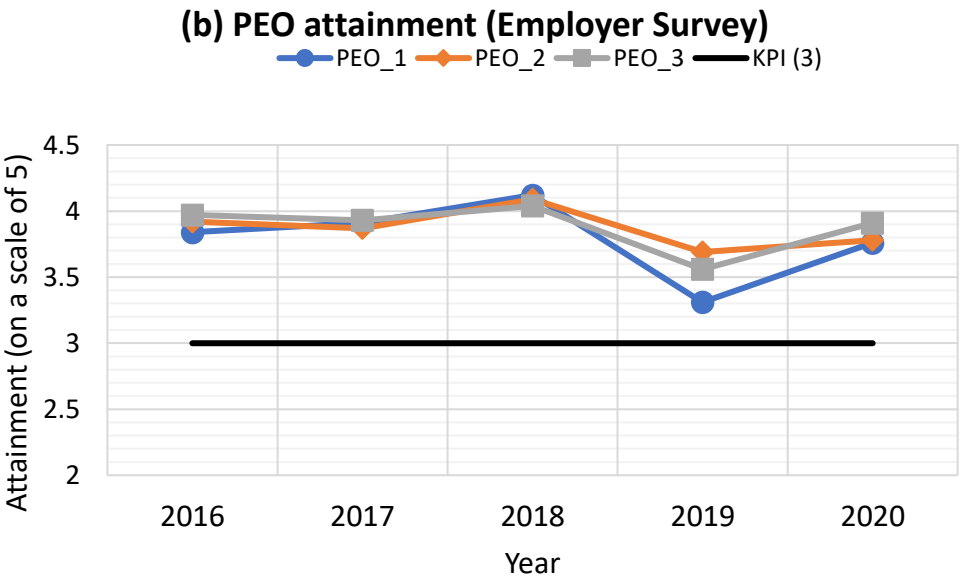
CQI / PEO – AT – F01: CQI form for attainment of PEOs



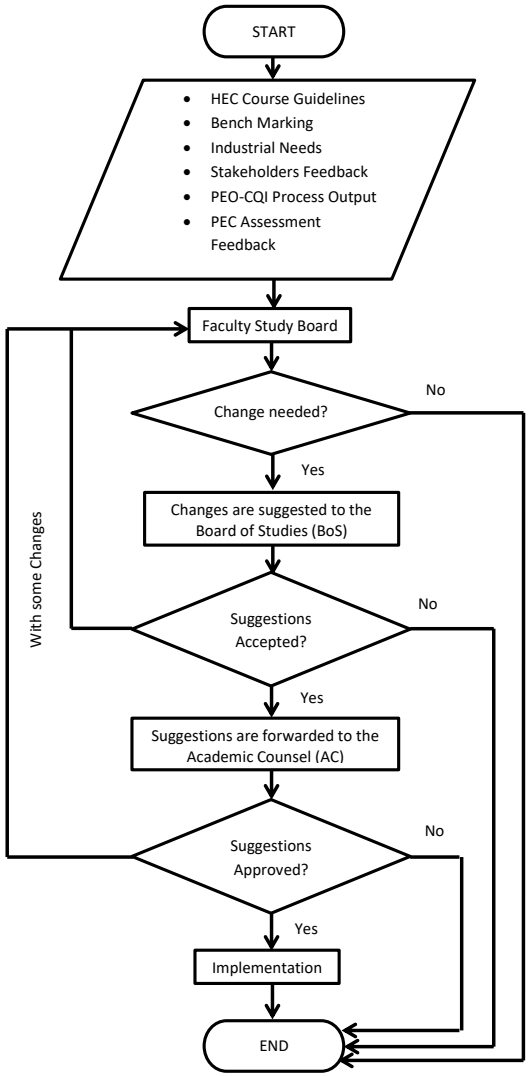
FME SAR 2021 – Page 32

CQI – PEO


(a) PEO attainment (Alumni Survey)
PEO_1
PEO_2
PEO_3
KPI (3)
Attainment (on a scale of 5)
4.5
4
3.5
3
2.5
2
2016
2017
2018
2019
2020
Year


(b) PEO attainment (Employer Survey)
PEO_1
PEO_2
PEO_3
KPI (3)
Attainment (on a scale of 5)
4.5
4
3.5
3
2.5
2
2016
2017
2018
2019
2020
Year

Process for Curriculum Development and Review



- Addition of new streams/trends in Mechanical Engineering Program
- Benchmarking the global trends such as machine learning, Artificial Intelligence, Industry 4.0
- Improvement in semester wise distribution of courses
- Semester wise gap reduction in the courses of similar nature
- Restructuring the sequence of relevant theory and lab courses in same semester
- Addition of several new electives in each stream providing greater choice for students
- Mandatory Community Services

FME SAR 2021 – Page 77 onward

Comparison of FME Program with HEC/PEC Requirements

Domain	Knowledge Area	PEC/ HEC		FME-GIKI (2019)		FME-GIKI (2020)		HKUST (2021)		Concordia University (2021)	
		Total Credits	Overall %	Total Credits	Overall %	Total Credits	Overall %	Total Credits	Overall %	Total Credits	Overall %
Non-Engineering (25%-35%)	Humanities	12	28	15	37	15	35	15	30	6	26
	Management Sciences	6		9		9		6		9	
	Natural Sciences	20		26		23		15		15	
	Sub Total	38		50		47		36		30	
Engineering (65%-75%)	Computing	3	72	4	63	4	65	4	70	0	74
	Engineering Foundation	35		30		31		26		26	
	Major Based Core (Breadth)	27		25		26		24		31	
	Major Based Core (Depth)	21		13		13		21		14	
	Inter-Disciplinary Engineering Breadth	6		8		8		6		7	
	Senior Design Project	6		6		6		6		8	
	Industrial Training (Summer)	0		0		0		0		0	
	Sub Total	98		86		88		87		86	
	Total CHr	136	100	136	100	135	100	123	100	116	100

FME SAR 2021 – Page 82 onward (Curriculum details)

CEP/OEL/PBL

Complex Engineering Problems (Courses)		
S No.	Course Code	Course Title
1.	ME212	Dynamics
2.	ME213	Mechanics of Solids I
3.	ME231	Thermodynamics I
4.	ME232	Thermodynamics-II
5.	ME364	Design of Machine Elements-II
6.	ME314	Mechanics of Solids II
7.	ME313	Theory of Machines
8.	ME315	Mechanical Vibration
9.	ME321	Fluid Mechanics I
10.	ME322	Fluid Mechanics II
11	ME333	Heat Transfer
12.	ME353	Manufacturing Processes
13.	ME464	System Dynamics & Control

Problem Based Learning/Open Ended Labs (Labs)		
S No.	Course Code	Course Title
1.	ME243	Electronics and Instrumentation Lab
2.	ME244	Statics and Dynamics Lab
3.	ME346	Thermo-Fluid Lab-I
4.	ME342	Mechanics of Solids and Manufacturing Processes Lab
5.	ME347	Thermo-Fluid Lab-II
6.	ME446	Mechanical Vibrations and System Dynamics and Control Lab
7.	ME447	Mechatronics Lab

CQI – Curriculum

Inclusion of Engineering Standards in Courses

ME Course	Standard
Design of Machine Elements	AGMA-2001-D04, AGMA-2101-C95-1, AWS D1.1-2010
Electrical Machines and Drives	Nema Standard
Mechanics of Solids	ASTM E8M-13a
Mechanical Vibrations	ISO, ASME, ASTM
Heat transfer	TEMA Standard
Engineering Graphics	GD&T (ASME Y14.5M)
FEA	ASTM
Refrigeration & Air-conditioning	ASHRAE 55-1992, 62-1999
Mechanical Engineering Design	ASTM E-837
Power Plants	ISO 14001 Environmental Management System, TEMA standard for Heat Exchanger Design
Design of Machine Elements - I	ASTM E8M Standard
Fundamentals of Composite Materials	ASTM D3039M Standard ASTM D3518M Standard
CAD/CAM	ISO-841 "Numerical control of Machines" ISO 6983-1:2009" program format and definition of address words"

CQI – Students

Student/Faculty ratio has been improved since the last reaccreditation visit.

Adoption of minimum passing threshold (35%) for theory and lab courses in FME.

Increase in frequency of industrial visits for Junior and Senior year students.

Introduction of mandatory Student Community Service

OBE awareness sessions for students since Fall 2018.

Internship Assessment Criteria

6 to 8 weeks industrial experience (6th semester or above)

Two student societies for international student internships exchange programs (AIESEC and IAESTE)

GIK Institute takes responsibility of placement of all students in over 100 national/ multinational research and industrial organizations

Industrial Feedback Report	**40%**
Presentation + Q/A	**30%**
Report	**30%**

New Infrastructure – GIK Institute

New buildings	Academic Block Boys Hostel (Hostel-11) Bachelor Faculty hostel Family accommodation flats (C/D type flats)
Cafeterias	Academic block café Renovation of GIKafe
Recreational facilities	Renovation of squash courts/ badminton courts Renovation of gymnasium with new equipment.
Transport Section	Additional buses, coaches, and vans.

New Addition in Labs – Since 2016

Solid Mechanics Lab	Thick-Walled Pressure Vessels
Fluid Mechanics Lab	Multi Turbine Test Rig
Workshop	CNC Wood Router and Hybrid Welding setup
Heat Transfer Lab	Steam Engine, COMSOL MULTIPHYSICS (V5.6) Software License, 3D-Doctor Academic Version Software License HP-Workstation IDS Z8 G4 WKS
Control Systems Lab	Liquid Level Control System
	2-DOF Tail plane
	Whirling of Shaft Apparatus
	Spiral Spring Vibration Apparatus
	One DOF Unforced Cantilever Beam System
	One DOF Electromagnetic Levitation of Ferromagnetic Beam
	Natural Frequencies of Rotors Suspended through Slings
	Aero Pendulum
	Condition Monitoring for Rotary Machines
	2-DOF with Base Excitation System
Electronics and Instrumentation lab	Pressure Sensor Apparatus
	Temperature Sensor Apparatus
	Labvolt Transducer Fundamental Training Board
	Rotary Encoder Apparatus
	Spring Mass System with Accelerometer
	NI DAQ CARD.
Advance Manufacturing and CNC Industrial labs	3D Printer, Retrofitting of dynapath milling and industrial lathe
Computational Mechanics Lab	MSCone Licensed Computational Package

New Initiatives

- Curriculum level (first year common courses, semester wise course distribution, upgradation of course files)
- PLO attainment at the program level is increased from 40% to 50% for Intake 2019 onwards
- Inclusion of courses on emerging technologies such as AI, Machine Learning, Industry 4.0, IOT, and MEMS into UG curriculum.
- Establishment of new teaching labs on Circuits and Electronic Devices, Mechatronics, Composite Structures
- Addition of new teaching lab equipment
- Online teaching
- Infrastructure
- Introduction of mandatory Student Community Service
- Inclusion of Knowledge profiles (WKs) for all courses
- Inclusion of more CEPs in various courses
- Senior design project (SDP): Sustainable development goals (SDGs).
- Adoption of MS Teams as LMS
- Introduction of relevant engineering standards in different courses
- Upgradation of FME management system from ISO 9001:2008 to ISO 9001:2015 level.

Opportunities for improvement (Gap Analysis)

S. No.	Identified Areas	Implementation
1	Acquiring advanced OBE software	Fall 2022
2	Strengthening of Industrial Linkages to increase number of industrial visits and FYPs co-supervision.	Fall 2021
3	Liaison between FME, alumni, and employer to be strengthened to improve the feedback quality	Fall 2022
4	Aggressive marketing strategy to improve the quality of intake	Fall 2021
5	Upgradation of licensed CAD/CAM/CAE software such as Solid Works, Ansys, CREO etc.	Fall 2022
6	Increase in CPD activities to be conducted by FME after the improvement in pandemic situation	Spring 2022
7	Resumption of industrial visits and Open House halted because of COVID19	Spring 2022
8	Equipping classrooms with modern teaching tools such as smart boards, multimedia, etc.	Spring 2022
9	Upgradation of Mechatronics Lab (ME447)	Fall 2022
10	Increasing the frequency of meeting of Industrial Advisory Board	Fall 2021

Continuous Quality Improvement

- Establish & implement the close-loop CQI process
- Adopt period review with stakeholders
- Take necessary remedial actions
- Overcoming barriers and objections

Thank you

PLOs

1. **Engineering Knowledge:**
   - An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:**
   - An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PLOs

3. **Design/Development of Solutions:**
   - An ability to 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.
4. **Investigation:**
   - An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.

Back

PLOs

5. **Modern Tool Usage:**
   - An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.
6. **The Engineer and Society:**
   - An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.

PLOs

7. **Environment and Sustainability:**
   - An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
8. **Ethics:**
   - Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

Back

PLOs

9. Individual and Team Work:

- An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.

10. Communication:

- An ability to communicate effectively, orally as well as in writing, 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.

Back

PLOs

11. Project Management:

- An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.

12. Lifelong Learning:

- An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

Back

Programme Education Objectives (FME – GIKI)

PEO_1 Graduates practicing in a variety of Mechanical Engineering and allied disciplines.

PEO_2 Graduates performing in a responsible, professional and ethical manner as an individual and as a part of team.

PEO_3 Graduates advancing their knowledge and excelling in their chosen domain.

GIK Institute Vision and Mission

Institute Vision: The Institute aspires for the leadership role in pursuit of excellence in engineering, sciences and technology.

Institute Mission: The Institute is to provide excellent teaching and research environment to produce graduates who distinguish themselves by their professional competence, research, entrepreneurship, humanistic outlook, ethical rectitude, pragmatic approach to problem solving, managerial skills and ability to respond to the challenge of socio-economic development to serve as the vanguard of techno-industrial transformation of the society.

FME Mission: The faculty is aimed at producing professionals with sound knowledge base, leadership quality and social rectitude. They are also capable to intelligently respond and adapt to technological advancements in the field of Mechanical Engineering

Program Educational Objectives (FME – GIKI)

	PEOs		
Mission / Vision	**PEO 1**	**PEO 2**	**PEO 3**
Institute's Vision	**Excellence in engineering, sciences and technology**	**Leadership role**	**Excellence in engineering, sciences and technology**
Institute's Mission	**Professional competence**	**Entrepreneurship, humanistic outlook, ethical rectitude, pragmatic approach managerial skills and ability to respond to the challenge of socio-economic development**	**Respond to the challenge of socio-economic development research**
FME's Mission	**Sound knowledge base**	**Leadership quality and social rectitude**	**Intelligently respond to compelling market demands through technological advancements**

Back

Mapping of PLOs with PEOs – FME GIKI

Sr. No	Program Learning Outcomes (PLOs)	PEO_1	PEO_2	PEO_3
1.	Engineering Knowledge	✓		
2.	Problem Analysis	✓		
3.	Design/Development of Solutions	✓		
4.	Investigation			✓
5.	Modern Tool Usage			✓
6.	The Engineer and Society		✓	
7.	Environment and Sustainability		✓	
8.	Ethics		✓	
9.	Individual and Team Work		✓	
10.	Communication		✓	
11.	Project Management		✓	
12.	Lifelong Learning			✓

Back

emester No.	Course Code	Course Title	PLOs											
			1	2	3	4	5	6	7	8	9	10	11	12
1	MT101	Calculus I	✓											
	PH101	Mechanics	✓											
	CS101	Introduction to Computing	✓											
	CH101	Chemistry for Engineers	✓						✓			✓		
	HM101	English & Study Skills										✓		
	PH101L	Mechanics Lab	✓											
	ME101	Workshop Practice	✓											
	CS101L	Computing Lab	✓											
	CH161	Occupational Health & Safety						✓						
2	MT102	Calculus II	✓											
	CS102L	Intensive Programming Lab	✓											
	PH102	Electricity & Magnetism	✓											
	HM102	Tech. Report Writing										✓		
	MM102	Introduction to Eng. Materials	✓	✓										
	ME102	Engineering Graphics	✓				✓					✓		
	PH102L	Electricity & Magnetism Lab	✓											
	MM141	Materials Lab					✓				✓			

3	MT201	Linear Algebra & Differential Equations	✓											
	HM211	Pak. & Islamic Studies						✓			✓			
	EE211/ 221	Circuit Analysis/ Logic Design	✓											
	EE211L/ 221L	Circuit Analysis Lab./ Logic Design Lab.				✓	✓			✓				
	ME211	Statics	✓	✓										
	ME231	Thermodynamics I	✓	✓			✓							
	ME241	Statics, Measurement and Instrumentation Lab	✓	✓		✓	✓							
4	ME201/ES202	Engineering Statistics		✓										
	EE231/ 222	Electronics/ Computer Architecture	✓		✓									
	EE231L/ 222L	Electronics Lab / Computer Architecture Lab			✓									
	ME212	Dynamics	✓	✓			✓							
	ME213	Mechanics of Solids	✓	✓										
	MS291	Engineering Economy						✓	✓				✓	
	ME242	Mechanics of Solids and Engineering Dynamics Lab				✓						✓		✓

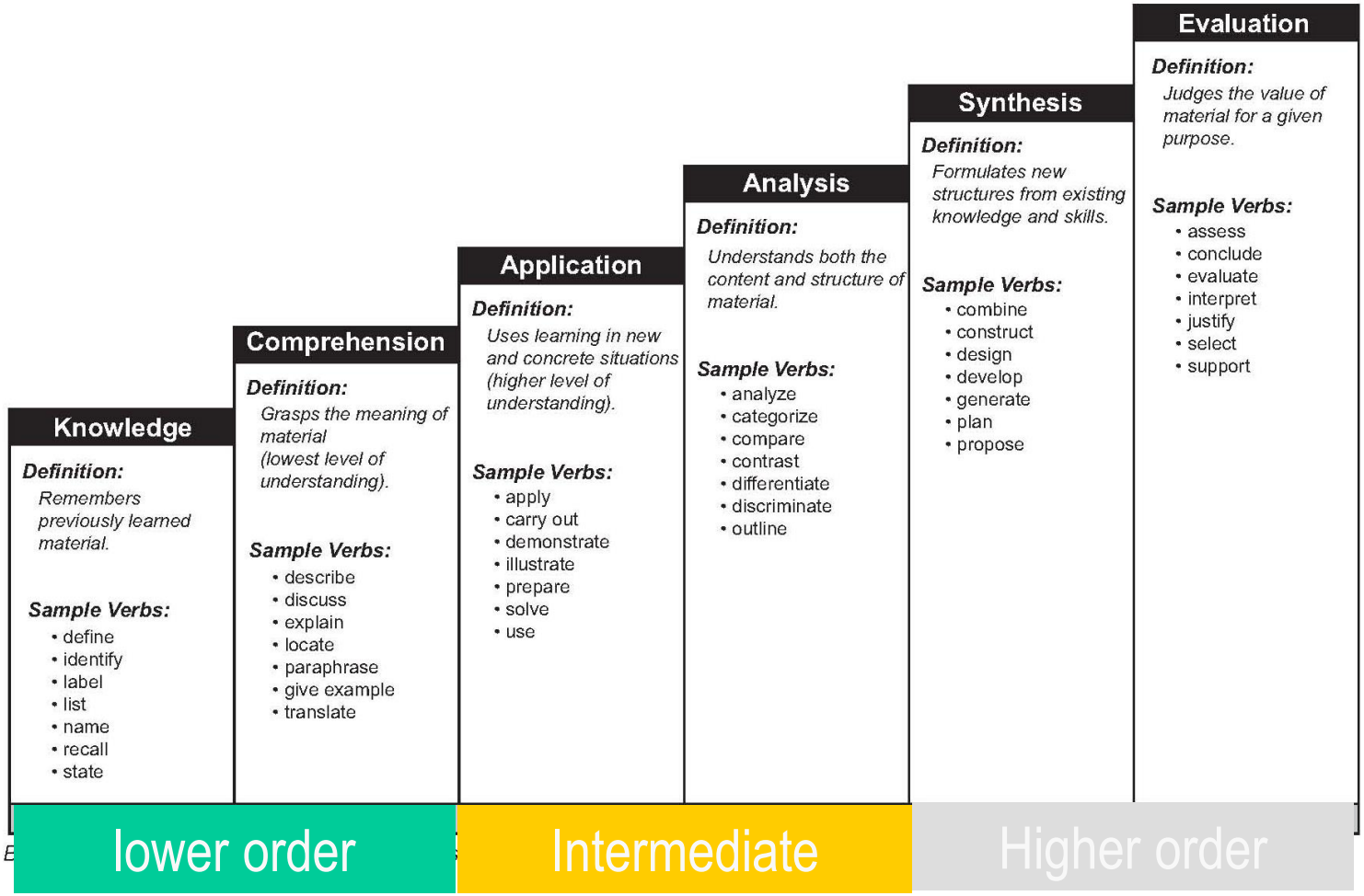
5	ME351	Manufacturing Tech. I	✓	✓										
	HM321	Sociology and Human Behavior						✓						
	ME321	Fluid Mechanics I	✓	✓	✓									
	ME332	Thermodynamics II	✓		✓		✓							
	ME361	Design of Machine Elements		✓	✓									
	ES341/ CS442	Numerical Analysis I	✓				✓							
	ME343	Fluid Mechanics-I Lab				✓	✓							
6	HM322	Ethical and Legal Dimensions of Engineering						✓		✓				
	ME333	Heat Transfer	✓	✓	✓		✓							
	ME313	Theory of Machines		✓										
	ME352	Manufacturing Technology II	✓	✓										
	ME362	Mechanical Eng. Design		✓	✓							✓		
	ME344	Heat Transfer and Manufacturing Processes Lab				✓								✓

7	MM/ MS49X	General Management Elective												
	ME4XX	Tech. Elective I												
	ME416	Stress Analysis	✓	✓	✓									
	ME422	Fluid Mechanics II	✓	✓										
	ME481	Design Project (Part-I)			✓			✓		✓	✓	✓	✓	✓
	ME445	Thermodynamics and Fluid Mechanics-II Lab				✓								✓
8	MM/ MS4 9X	General Management Elective												
	ME417	Mechanical Vibrations	✓		✓	✓								
	ME464	System Dynamics and Control	✓		✓		✓							
	ME4XX	Technical Elective												
	ME446	Mechanical Vibration and System Dynamics & Control Lab				✓					✓			✓
	ME482	Senior Design Project (Part-II)		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
PLOs Frequency			31	17	12	9	12	7	2	4	5	8	3	6

Back

Cognitive Domain

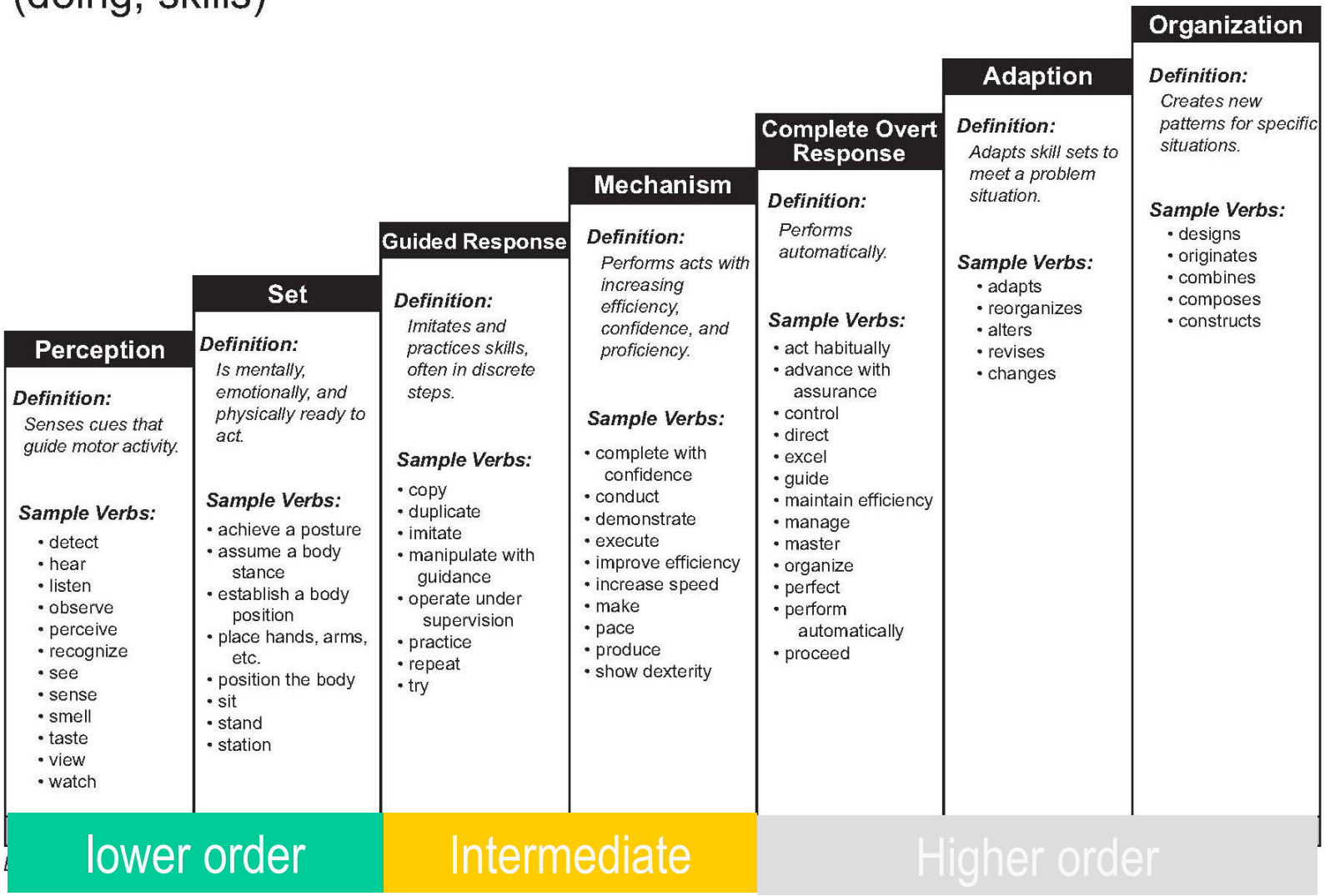
(thinking, knowledge)



Back

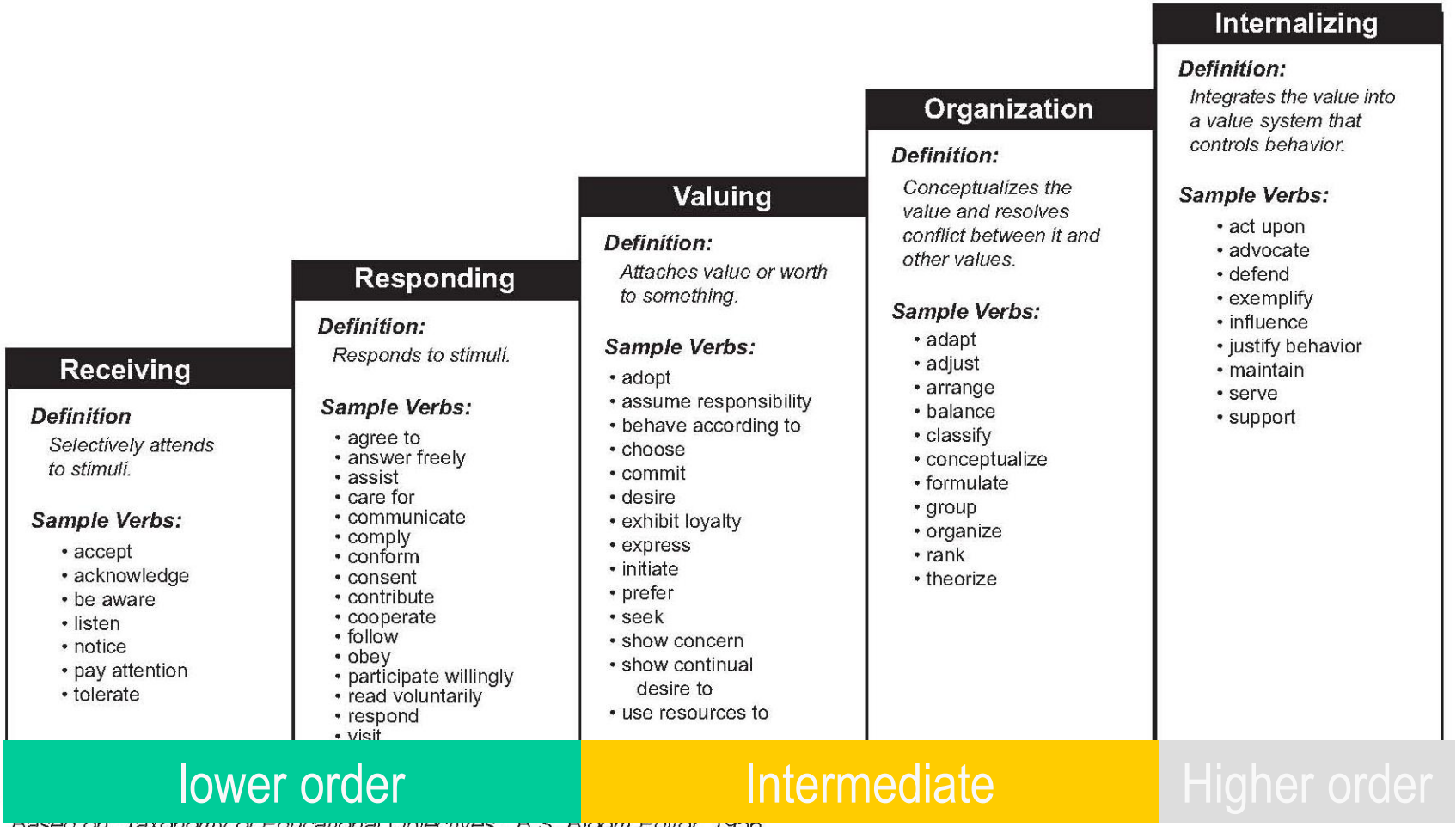
Psychomotor Domain

(doing, skills)



Affective Domain

(feeling, attitudes)



Based on "Taxonomy of Educational Objectives", B.S. Bloom Editor. 1956