

**NED University of Engineering and Technology**

**Department of Polymer & Petrochemical Engineering**

**Bachelor of Engineering in Polymer & Petrochemical  
Engineering**

**DEPARTMENTAL OUTCOME BASED EDUCATION (OBE)  
FRAMEWORK**

**Batch 2021 Onwards**

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## 1. Vision Statement

### a. University Vision

Be a leader in enabling Pakistan's social and economic transformation.

### b. Department Vision

To become a leading institute of national and international repute in the field of Polymer & Petrochemical engineering and exceptionally contribute to solve the technological needs of the global economy and human society.

## 2. Mission Statement

### a. University Mission

Acquire education and research excellence in engineering and allied disciplines to produce leadership and enabling application of knowledge and skills for the benefit of the society with integrity and wisdom.

### a. Programme Mission

The Polymer & Petrochemical Engineering Department is dedicated “to produce professional engineers equipped with theoretical and practical knowledge and skills enabling them to ethically lead and contribute in the constant growth of the knowledge-base and sustainable improvement in the polymer and petrochemical industries, nationally and internationally”.

## 3. Program Educational Objectives (PEOs)

*The graduates of Polymer and Petrochemical Engineering program will:*

**PEO-1:** Demonstrate essential knowledge and skill set needed to pursue dynamic professional career in the discipline of Polymer & Petrochemical Engineering.

**PEO-2:** Exhibit strong leadership, management, and communication skills in multi-disciplinary environments.

**PEO-3:** Manifest engineering ethics while addressing societal, environmental, and global technical and non-technical problems.

**PEO-4:** Engage in life-long learning, research, and innovation over the career.

#### 4. Mapping of PEOs to University and Departmental Vision and Mission

Vision and Mission		Program Educational Objectives (PEOs)			
		PEO-1	PEO-2	PEO-3	PEO-4
University Vision	Be a leader <sup>2</sup> in enabling Pakistan's social <sup>3</sup> and economic transformation <sup>1,4</sup> .	✓	✓	✓	✓
University Mission	Acquire education and research excellence <sup>4</sup> in engineering and allied disciplines to produce leadership <sup>2</sup> and enabling application of knowledge and skills <sup>1</sup> for the benefit of the society <sup>3</sup> with integrity and wisdom.	✓	✓	✓	✓
Department's Vision	To become a leading institute <sup>2</sup> of national and international repute in the field of Polymer & Petrochemical engineering and exceptionally contribute to solve the technological needs of the global economy and human society <sup>1,3,4</sup> .	✓	✓	✓	✓
Programme's Mission	To produce professional engineers equipped with theoretical and practical knowledge and skills <sup>1</sup> enabling them to ethically lead <sup>2</sup> and contribute in the constant growth of the knowledge-base and sustainable improvement <sup>3,4</sup> in the polymer and petrochemical industries, nationally and internationally.	✓	✓	✓	✓

## 5. Program Learning Outcomes (PLOs)

The following graduate attributes as defined by PEC, have been adopted as Program Learning Outcomes (PLOs) by the department.

**PLO-1 Engineering Knowledge:** An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

**PLO-2 Problem Analysis:** An ability to identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

**PLO-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.

**PLO-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.

**PLO-5 Modern Tool Usage:** An ability to 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.

**PLO-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.

**PLO-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.

**PLO-8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

**PLO-9 Individual and Teamwork:** An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.

**PLO-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.

**PLO-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.

**PLO-12 Lifelong Learning:** An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

## 6. Mapping of PLOs to PEOs

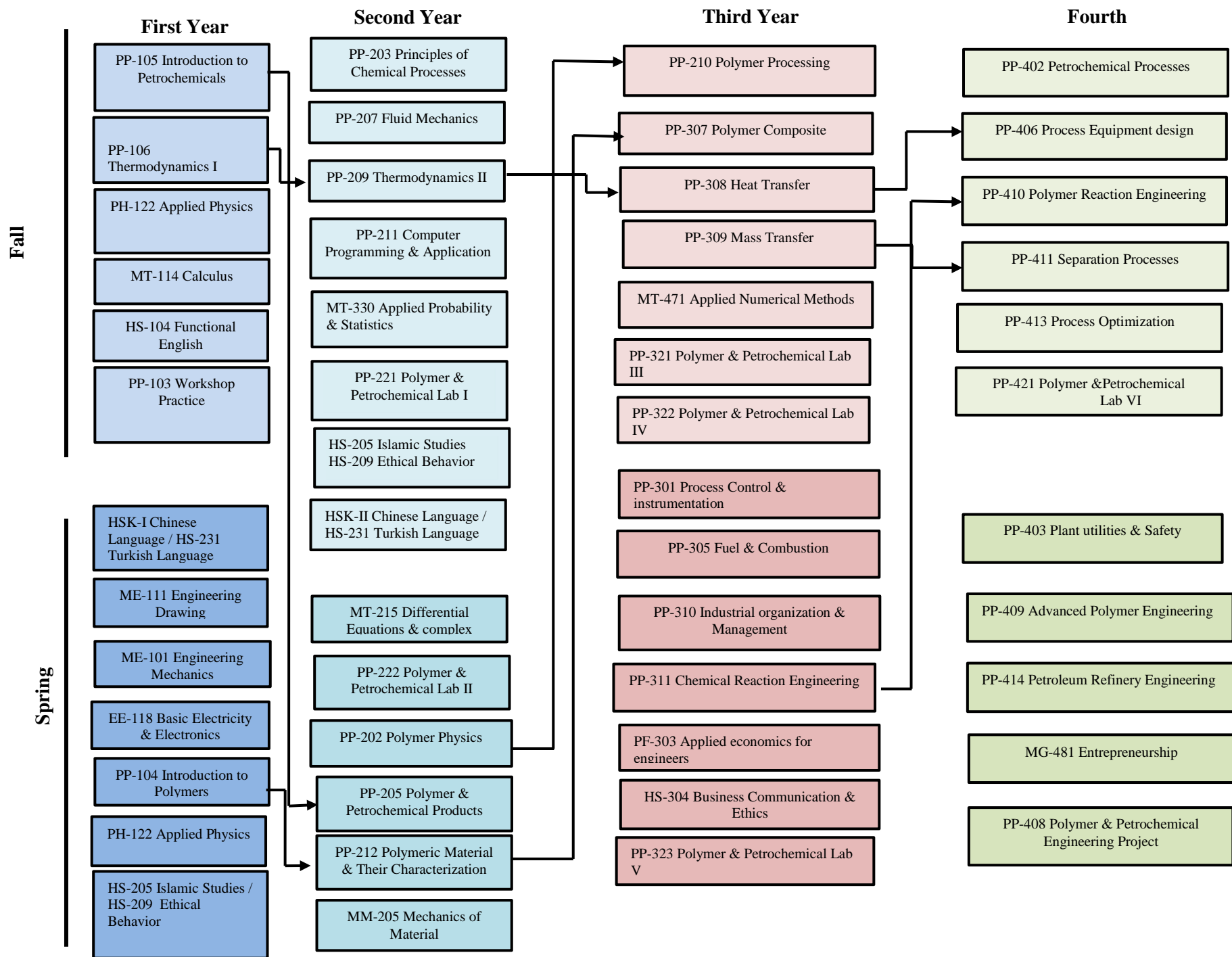
Program Learning Outcomes (PLOs)	Program Educational Objectives (PEOs)			
	PEO-1	PEO-2	PEO-3	PEO-4
PLO 1: Engineering Knowledge	✓			
PLO 2: Problem Analysis	✓			
PLO 3: Design / Development of solutions	✓			
PLO 4: Investigation	✓			
PLO 5: Modern Tool Usage	✓			
PLO 6: The Engineer and Society			✓	
PLO 7: Environment and Sustainability			✓	
PLO 8: Ethics			✓	
PLO 9: Individual and Team Work		✓		
PLO 10: Communication		✓		
PLO 11: Project Management		✓		
PLO 12: Lifelong Learning				✓

## 7. Scheme of Studies

<b>Polymer &amp; Petrochemical Engineering</b>									
<b>First Year</b>									
<b>Fall Semester</b>					<b>Spring Semester</b>				
<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hrs</b>			<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hrs</b>		
		<b>Th</b>	<b>Pr</b>	<b>Total</b>			<b>Th</b>	<b>Pr</b>	<b>Total</b>
PP-104	Introduction to Polymers	3	1	4	PP-105	Introduction to Petrochemical	2	0	2
ME-101	Engineering Mechanics	3	1	4	PP-106	Thermodynamics-I	2	0	2
ME-111	Engineering Drawing	2	1	3	HS-104	Functional English	3	0	3
HS-105 / HS-127	Pakistan Studies / Pakistan Studies (for Foreigners)	2	0	2	PH-122	Applied Physics	3	1	4
EE-118	Basic Electricity & Electronics	3	1	4	MT-114	Calculus	3	0	3
					PP-103	Workshop Practice	0	1	1
<b>Total</b>		13	4	17	<b>Total</b>		13	2	15
<b>Second Year</b>									
<b>Fall Semester</b>					<b>Spring Semester</b>				
<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hrs</b>			<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hrs</b>		
		<b>Th</b>	<b>Pr</b>	<b>Total</b>			<b>Th</b>	<b>Pr</b>	<b>Total</b>
PP-202	Polymer Physics	3	0	3	PP-203	Principles of Chemical Processes	2	1	3
PP-205	Petroleum & Petrochemical Products	2	0	2	PP-207	Fluid Mechanics	3	0	3
PP-212	Polymeric Materials & Their Characterization	3	0	3	PP-209	Thermodynamics-II	3	0	3
MM-205	Mechanics of Material	3	1	4	PP-211	Computer Programming & Applications	2	1	3
MT-215	Differential Equations & Complex Variables	3	0	3	MT-330	Applied Probability & Statistics	2	1	3
PP-222	Polymer & Petrochemical Lab-II	0	1	1	HS-205 or HS-206	Islamic Studies OR Ethical Behaviour	2	0	2
					HS-200	Community Service	--	--	--
					PP-221	Polymer & Petrochemical Lab-I	0	1	1
<b>Total</b>		14	2	16	<b>Total</b>		14	4	18
<b>Third Year</b>									
<b>Fall Semester</b>					<b>Spring Semester</b>				
<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hrs</b>			<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hrs</b>		
		<b>Th</b>	<b>Pr</b>	<b>Total</b>			<b>Th</b>	<b>Pr</b>	<b>Total</b>
PP-301	Process Control & Instrumentation	3	0	3	PP-210	Polymer Processing	2	0	2
PP-305	Fuels & Combustion	2	0	2	PP-307	Polymer Composites	3	0	3
PP-310	Industrial Organization and Management	2	1	3	PP-308	Heat Transfer	3	0	3

PP-311	Chemical Reaction Engineering	3	0	3	PP-309	Mass Transfer	3	0	3
PF-303	Applied Economics For Engineers	3	0	3	MT-471	Applied Numerical Method	2	1	3
HS-304	Business Communication & Ethics	3	0	3	PP-321	Polymer & Petrochemical Lab-III	0	1	1
PP-323	Polymer & Petrochemical Lab-V	0	1	1	PP-322	Polymer & Petrochemical Lab-IV	0	1	1
					HSK-I/HS-231	Chinese/Turkish Language I	--	--	--
<b>Total</b>		16	2	18	<b>Total</b>		13	3	16
<b>Final Year</b>									
<b>Fall Semester</b>					<b>Spring Semester</b>				
Course Code	Course Title	Credit Hrs			Course Code	Course Title	Credit Hrs		
		Th	Pr	Total			Th	Pr	Total
PP-403	Plant Utilities & Safety	2	1	3	PP-402	Petrochemical Processes	3	1	4
PP-409	Advance Polymer Engineering	2	0	2	PP-406	Process Equipment Design	3	0	3
PP-XXX	Elective Course**	2	0	2	PP-410	Polymer Reaction Engineering	3	0	3
PP-414	Petroleum Refinery Engineering	2	1	3	PP-411	Separation Processes	3	1	4
PP-408	Polymer and Petrochemical Engineering Project*	0	3	3	PP-413	Process Optimization	3	0	3
MG-481	Entrepreneurship	3	0	3	PP-408	Polymer & Petrochemical Engineering Project*	0	3	3
HSK II/HS-232	Chinese/Turkish Language II	--	--	--	PP-421	Polymer & Petrochemical Lab-VI	0	1	1
<b>Total</b>		11	5	16	<b>Total</b>		15	6	21
* Duration one academic year: Requires literature survey and preliminary work during this Semester									
<b>**Elective Courses</b>									
<ol style="list-style-type: none"> <li>1. PP-412: Environmental Engineering</li> <li>2. PP-425: Polymer Rheology</li> <li>3. PP-427: Rubber Technology</li> <li>4. PP-428: Process Modeling &amp; Simulation</li> <li>5. PP-429: Gas Engineering</li> </ol>									





## 8. Mapping of Curriculum to PLOs

Polymer & Petrochemical Engineering Courses		Program Learning Outcomes (PLOs)																
		PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11	PLO-12					
First Year	Fall	PP-105, Introduction to Petrochemicals	C1,C2					C1										
		PP-106, Thermodynamics-I	C2	C3,C4														
		HS-104, Functional English										A3, C2,C6						
		PH-122, Applied Physics	C2,P3	C3,C3														
		MT-114, Calculus	C1	C2,C3														
		PP-103, Workshop Practice					P3											
	Spring	PP-104, Introduction to Polymers	C2			P3						A3						
		ME-101, Engineering Mechanics	C1	C3,C3		P1												
		ME-111, Engineering Drawing	C2,P3				C3											
		HS-105, Pakistan Studies or HS-127 Pak Studies foreign						C2								C2		
		EE-118, Basic Electricity and Electronics	C3	C3,P3														
Second Year	Fall	PP-203, Principles of Chemical Processes	C1	C3							A4			C5				
		PP-207, Fluid Mechanics	C2	C3								A4						
		PP-209, Thermodynamics-II			C3			C5	C4									
		PP-211, Computer Programming and Application	C1		C3							C2			C3			
		MT-330, Applied Probability and Statistics	C2	C4,P3														
		HS-205, Islamic Studies or HS-209, Ethical Behavior.									C2,C2							
		PP-221, Polymer and Petrochemical Lab-I				P3												
	Spring	PP-202, Polymer Physics	C2	C3	C3													
		PP-205, Petroleum & Petrochemical Products	C2	C1							C2		A3					
		PP-212, Polymeric Materials and their Characterization.	C3	C4					C3									
		MM-205, Mechanics of Material	C3		C4		C3					P3						

		MT-215, Differential Equation and Complex Variables.	C2	C3											
		PP-222, Polymer and Petrochemical Lab-II					P3								
		HS-200 Community Service						A3						A2	
Third Year	Fall	PP-210, Polymer Processing	C2	C4	C4										
		PP-307, Polymer Composites	C2		C3				C5			A3			
		PP-308, Heat Transfer		C4	C3				C5						
		PP-309, Mass Transfer	C1	C3	C5										
		MT-471, Applied Numerical Method	C3	C2,P3											
		PP-321, Polymer & Petrochemical Lab-III						P3							
		PP-322, Polymer & Petrochemical Lab-IV						P3							
		PP-301, Process Control & Instrumentation	C2	C3	C3										
		PP-305, Fuel & Combustion	C1						C4	C3	C2				
		PP-310, Industrial Organization & Management			C5					A3	C3			C1	
	PP-311, Chemical Reaction Engineering	C2		C5							A3				
	PP-303, Applied Economics for Engineers		C4					C2							
	HS-304 Business Communication and Ethics								C3		A3,C6				
	HSK I/HS-231 Chinese/Turkish Language I														
	PP-323, Polymer & Petrochemical Lab-V						P3								
	PP-402 Petrochemical Processes						P3		C1		C2			C2	
	PP-406 Process Equipment Design	C1		C5					C2		C3				
	PP-410 Polymer Reaction Engineering		C4	C5										A3	
	PP-411 Separation Processes	C2	C3				P3					A3			
	PP-413 Process Optimization	C2	C3											C5	
PP-421 Polymer & Petrochemical Lab-VI													C5		
HSK II Chinese/HS-232 Turkish Language II															
PP-408 Polymer & Petrochemical Engg. Project		C	C					C	A	A	A	A			
Final year	Spring	PP-403 Plant Utilities and Safety		C3			P3			C3				A4	
		PP-409 Advanced Polymer Engineering	C2	C3							A4				
		PP-414 Petroleum Refinery Engineering	C3		C3			P3	C5						
		MG-481 Entrepreneurship									A3			C3	C2
		PP-408 Polymer & Petrochemical Engg.		C	C						A	C,A	C,A	C	C

	<b>Project</b>												
	<b>Elective Courses</b>	<b>C</b>	<b>C</b>								<b>A</b>		
	<b>Internship</b>	<b>C</b>	<b>C</b>				<b>A</b>		<b>A</b>	<b>A</b>	<b>A</b>		

## 9. Key Performance Indicators (KPIs)

		<b>Evaluation Tool</b>	<b>KPI</b>	<b>Data Collection Frequency</b>	<b>Analysis Frequency</b>
<b>PEO</b>	Programme	<ul style="list-style-type: none"> <li>▪ Employer Feedback Survey</li> <li>▪ Alumni Feedback Survey</li> <li>▪ Employment Statistics</li> </ul>	50% of the Survey Form responses must attain a score of 3 or above (on a scale of 1 to 5), and 50% of the graduates must be employed and/or engaged in higher studies.	Every Year	4 years from graduation
<b>PLO</b>	Student	<ul style="list-style-type: none"> <li>▪ CLO scores of the student in the mapped course(s)</li> </ul>	Each PLO must be attained in at least 50% of the respective mapped course(s), with an average score of at least 50%.	Every Semester	Every Semester
	Course	<ul style="list-style-type: none"> <li>▪ PLO scores of all the students in the mapped course</li> </ul>	At least 50% of the students must attain that PLO	Every Semester	Every Semester
	Programme	<ul style="list-style-type: none"> <li>▪ Final PLO attainment statistics of all the courses including FYDP</li> <li>▪ Internship Feedback Form</li> <li>▪ Exit Survey</li> </ul>	At least 50% of the mapped courses must attain the PLO and at least 50% of the students/ responses must attain a score of 3 or above on a scale of 1 to 5.	At graduation	At graduation
<b>CLO</b>	Student	<ul style="list-style-type: none"> <li>▪ Course work</li> </ul>	The student must obtain at least 50% average percentage score from all attempts.	Every Semester	Every Semester
	Course	<ul style="list-style-type: none"> <li>▪ CLO scores of all students in the course</li> </ul>	At least 50% of the students must attain that CLO	Every Semester	Every Semester

## 10. Continuous Quality Improvement (CQI)

The following table shows the post KPI evaluation actions, severity-wise, as outlined in the Manual of Uniform OBE Framework.

	PEO CQI	PLO CQI			CLO CQI	
	Program KPI	Student KPI	Course KPI	Programme KPI	Student KPI	Course KPI
<b>KPIs Achieved</b>	▪ No Action	▪ No Action	▪ No Action	▪ No Action	▪ No Action	▪ No Action
<b>KPIs Not Achieved</b>	<ol style="list-style-type: none"> <li>1. Review of curriculum strategies.</li> <li>2. Review of assessment methods.</li> <li>3. Review of the relevant KPIs.</li> <li>4. Review of PEOs.</li> <li>5. Revisions implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Warning through the progressive attainment sheet.</li> <li>2. Student counselling.</li> </ol>	<ol style="list-style-type: none"> <li>1. Review of teaching and learning process.</li> <li>2. Review of CLOs assessment methods.</li> <li>3. Review of CLO-PLO mapping and the relevant KPIs.</li> <li>4. Review of curriculum design.</li> <li>5. Revisions implemented</li> </ol>	<ol style="list-style-type: none"> <li>1. Review of teaching and learning process.</li> <li>2. Review of PLOs assessment methods.</li> <li>3. Review of Course-PLO mapping and the relevant KPIs.</li> <li>4. Review of curriculum design.</li> <li>5. Revisions implemented</li> </ol>	<ol style="list-style-type: none"> <li>1. Student provided further chances through direct assessment tools.</li> <li>2. Student counselling</li> </ol>	<ol style="list-style-type: none"> <li>1. Review of CLO assessment methods.</li> <li>2. Review of CLOs and taxonomy levels.</li> <li>3. Review of students' course feedback.</li> <li>4. Review of CLO KPIs.</li> <li>5. Faculty advice by Departmental OBE Cell.</li> <li>6. Faculty training.</li> </ol>

The following figure shows the overall OBE framework for an Engineering Programme as outlined in the Manual of Uniform OBE Framework.

