

**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 2024 & 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				✓

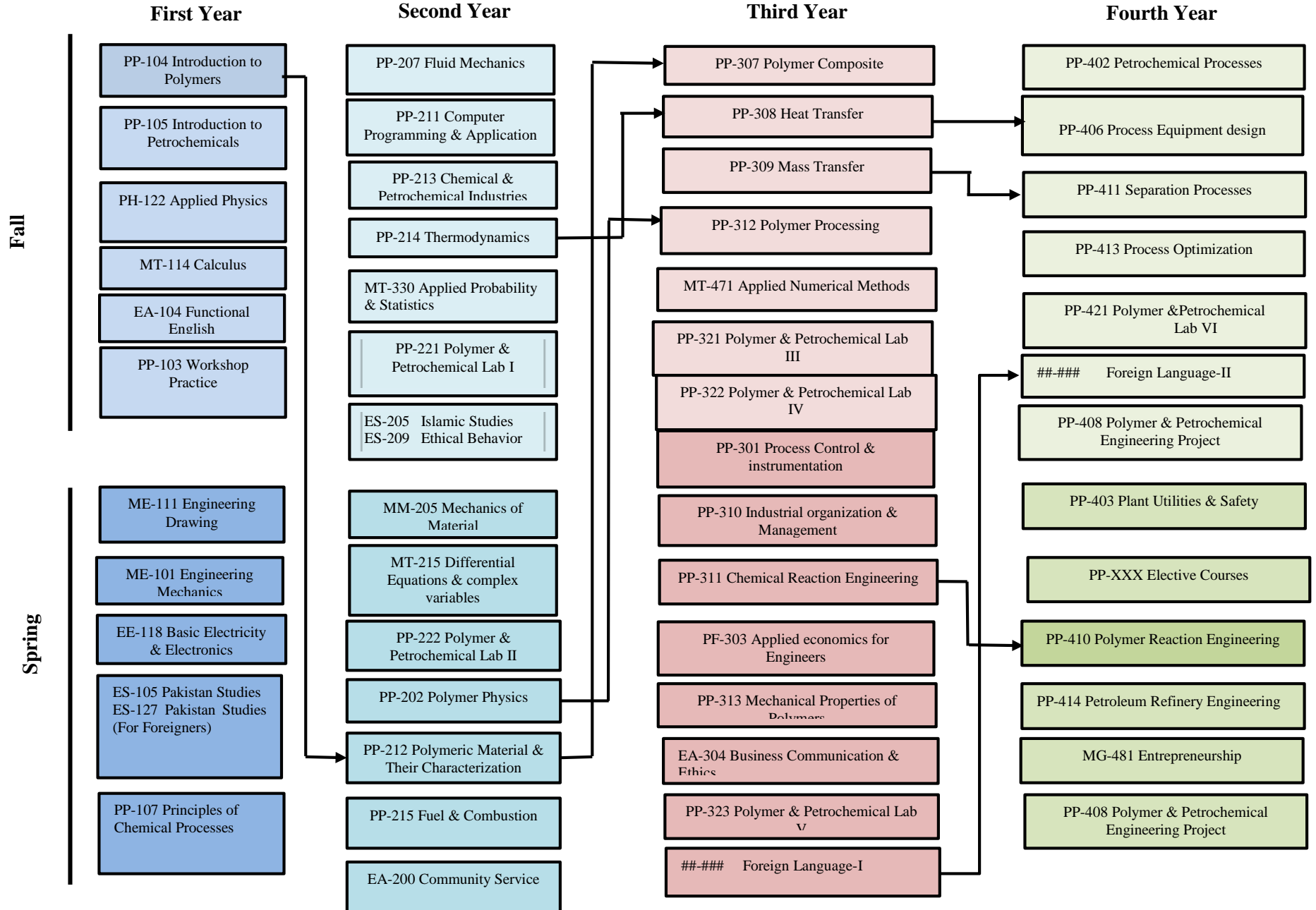
## 7. Scheme of Studies

<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-103	Workshop Practice	0	1	1	PP-107	Principles of Chemical Processes	2	1	3
PP-104	Introduction to Polymers	3	1	4	ME-101	Engineering Mechanics	3	1	4
PP-105	Introduction to Petrochemical	2	0	2	ME-111	Engineering Drawing	2	1	3
EA-104	Functional English	3	0	3	ES-105/ES-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					
<b>Total</b>		<b>14</b>	<b>3</b>	<b>17</b>	<b>Total</b>		<b>12</b>	<b>4</b>	<b>16</b>
<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-207	Fluid Mechanics	3	0	3	PP-202	Polymer Physics	3	0	3
PP-211	Computer Programming & Applications	2	1	3	PP-212	Polymeric Materials & Their Characterization	3	0	3
PP-213	Chemical and Petrochemical Industries	2	0	2	PP-215	Fuels and Combustion	2	0	2
PP-214	Thermodynamics	3	0	3	MM-205	Mechanics of Material	3	1	4
ES-205 / ES-209	Islamic Studies/Ethical Behaviour	2	0	2	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
PP-221	Polymer & Petrochemical Lab-I	0	1	1	EA-200	Community Service	NC		
<b>Total</b>		<b>14</b>	<b>3</b>	<b>17</b>	<b>Total</b>		<b>14</b>	<b>2</b>	<b>16</b>
<b>Third Year</b>									

Fall Semester					Spring Semester				
Course Code	Course Title	Credit Hrs			Course Code	Course Title	Credit Hrs		
		Th	Pr	Total			Th	Pr	Total
PP-307	Polymer Composites	3	0	3	PP-301	Process Control & Instrumentation	3	0	3
PP-308	Heat Transfer	3	0	3	PP-310	Industrial Organization and Management	2	1	3
PP-309	Mass Transfer	3	0	3	PP-311	Chemical Reaction Engineering	3	0	3
PP-312	Polymer Processing	2	0	2	PP-313	Mechanical Properties of Polymers	2	0	2
MT-471	Applied Numerical Method	2	1	3	PF-303	Applied Economics For Engineers	3	0	3
PP-321	Polymer & Petrochemical Lab-III	0	1	1	EA-304	Business Communication & Ethics	3	0	3
PP-322	Polymer & Petrochemical Lab-IV	0	1	1	PP-323	Polymer & Petrochemical Lab-V	0	1	1
					##-###	Foreign Language-I			NC
<b>Total</b>		13	3	16	<b>Total</b>		16	2	18
Final Year									
Fall Semester					Spring Semester				
Course Code	Course Title	Credit Hrs			Course Code	Course Title	Credit Hrs		
		Th	Pr	Total			Th	Pr	Total
PP-402	Petrochemical Processes	3	1	4	PP-403	Plant Utilities & Safety	2	1	3
PP-406	Process Equipment Design	3	0	3	PP-410	Polymer Reaction Engineering	3	0	3
PP-411	Separation Processes	3	1	4	PP-XXX	Elective Course**	2	0	2
PP-413	Process Optimization	3	0	3	PP-414	Petroleum Refinery Engineering	2	1	3
PP-408	Polymer & Petrochemical Engineering Project*	0	3	3	PP-408	Polymer and Petrochemical Engineering Project*	0	3	3
PP-421	Polymer & Petrochemical Lab-VI	0	1	1	MG-481	Entrepreneurship	3	0	3
##-###	Foreign Language-II	NC							
<b>Total</b>		12	6	18	<b>Total</b>		12	5	17
* 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>									



# Course Dependency Chart



## 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-103, Workshop Practice				P3							
		PP-104, Introduction to Polymers	C2			P3					A3		
		PP-105, Introduction to Petrochemicals	C1,C2					C1					
		EA-104 Functional English									A3, C2, C6		
		PH-122, Applied Physics	C2,P3	C3,C3									
		MT-114, Calculus	C1	C2,C3									
	Spring	PP-107 Principles of Chemical Processes	C1	C3		C3							
		ME-101, Engineering Mechanics	C1	C3,C3		P1							
		ME-111, Engineering Drawing	C2,P3				C3						
		ES-105/ ES-127 Pakistan Studies/ Pak Studies foreign						C2					C2
		EE-118, Basic Electricity and Electronics	C3	C3,P3									
Second Year	Fall	PP-207, Fluid Mechanics	C2	C3, C3									
		PP-211, Computer Programming and Application	C1		C3		C3						
		PP-213 Chemical and Petrochemical Industries	C2	C3									
		PP-214 Thermodynamics	C2	C3	C4								
		MT-330, Applied Probability and Statistics	C2	C4,P3									
		ES-205 / ES-209 Islamic Studies / Ethical Behavior							C2,C2				
	PP-221, Polymer and Petrochemical Lab-I				P3								
Sprin	PP-202, Polymer Physics	C2	C3	C3									

		PP-212, Polymeric Materials and their Characterization.	C3	C4				C3					
		PP-215, Fuel & Combustion	C1					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						
		EA-200 Community Service						A3					A2
Third Year	Fall	PP-307, Polymer Composites	C2		C3				C5				
		PP-308, Heat Transfer		C4	C3				C5				
		PP-309, Mass Transfer	C1	C3	C5								
		PP-312, Polymer Processing	C2	C4									C4
		MT-471, Applied Numerical Method	C3	C2,P3									
		PP-321, Polymer & Petrochemical Lab-III					P3						
		Spring	PP-322, Polymer & Petrochemical Lab-IV				P3						
			PP-301, Process Control & Instrumentation	C2	C3	C3							
			PP-310, Industrial Organization & Management			C5					C3		C2
			PP-311, Chemical Reaction Engineering	C2		C5						A3	
			PP-313 Mechanical Properties of Polymers	C2	C3								
			PF-303, Applied Economics for Engineers		C4				C2				
			EA-304 Business Communication and Ethics							C3		A3, C6	
			###-### Foreign Language I										
	PP-323, Polymer & Petrochemical Lab-V					P3							
Final year	Fall	PP-402 Petrochemical Processes				P3		C4		C2		C2	
		PP-406 Process Equipment Design	C2						C3			C6	
		PP-411 Separation Processes	C2	C3			P3				A3		
		PP-413 Process Optimization	C2	C3	C5								
		PP-421 Polymer & Petrochemical Lab-VI					C5						
		###-### Foreign Language II											
		PP-408 Polymer & Petrochemical Engg. Project		C	C				C	A	A	A	A

		<b>PP-403 Plant Utilities and Safety</b>		<b>C3</b>		<b>P3</b>			<b>C3</b>					
		<b>PP-410 Polymer Reaction Engineering</b>		<b>C4</b>	<b>C5</b>									<b>A3</b>
		<b>PP-414 Petroleum Refinery Engineering</b>	<b>C3</b>		<b>C3</b>		<b>P3</b>							
		<b>MG-481 Entrepreneurship</b>								<b>A3</b>			<b>C3</b>	<b>C2</b>
		<b>PP-408 Polymer &amp; Petrochemical Engg. Project</b>		<b>C</b>	<b>C</b>					<b>A</b>	<b>C,A</b>	<b>C,A</b>	<b>C</b>	<b>C</b>
		<b>PP-XXX Elective Course</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>		

### Elective Courses

1. PP-412: Environmental Engineering
2. PP-425: Polymer Rheology
3. PP-427: Rubber Technology
4. PP-428: Process Modeling & Simulation
5. PP-429: Gas Engineering

## 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>	1. Review of curriculum strategies. 2. Review of assessment methods. 3. Review of the relevant KPIs. 4. Review of PEOs. 5. Revisions implemented.	1. Warning through the progressive attainment sheet. 2. Student counselling.	1. Review of teaching and learning process. 2. Review of CLOs assessment methods. 3. Review of CLO-PLO mapping and the relevant KPIs. 4. Review of curriculum design. 5. Revisions implemented.	1. Review of teaching and learning process. 2. Review of PLOs assessment methods. 3. Review of Course-PLO mapping and the relevant KPIs. 4. Review of curriculum design. 5. Revisions implemented.	1. Student provided further chances through direct assessment tools. 2. Student counselling.	1. Review of CLO assessment methods. 2. Review of CLOs and taxonomy levels. 3. Review of students' course feedback. 4. Review of CLO KPIs. 5. Faculty advice by Departmental OBE Cell. 6. Faculty training.

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

