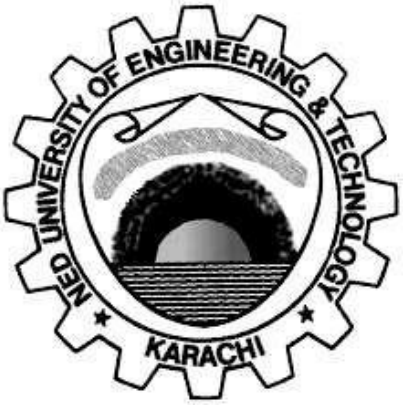


NED University of Engineering and Technology

Department of Metallurgical Engineering

Bachelor of Engineering in Metallurgical Engineering

DEPARTMENTAL OUTCOME BASED EDUCATION (OBE) FRAMEWORK

Batch 2025 & onwards

Contents

1. Vision Statement

a. University Vision

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

b. Department Vision

To lead as country's most productive institution in teaching, research and innovation while producing quality Metallurgical Engineers as per advanced market needs.

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.

b. Programme Mission

It is the mission of the Department to provide excellence in teaching, research and service to the students in order to make them a useful metallurgist to fulfill the needs of the industry for the benefit of country as well as the society.

3. Program Educational Objectives (PEOs)

PEO-1: Demonstrate strong competence and analytical skills in the field of Metallurgical Engineering.

PEO-2: Work efficiently using modern tools and manage and/ or communicate effectively in multi-disciplinary teams.

PEO-3: Carry on professional and ethical values and commitment towards continuous professional growth and embroil with lifelong learning.

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

Vision and Mission		Program Educational Objectives (PEOs)		
		PEO-1	PEO-2	PEO-3
University Vision	Be a leader[1,2] in enabling Pakistan's social and economic transformation[3].	✓	✓	✓
University Mission	Acquire education and research excellence[1] in engineering and allied disciplines[2] to produce leadership and enabling application of knowledge and skills for the benefit of the society[3] with integrity and wisdom.	✓	✓	✓
Department's Vision	To lead as country's most productive institution in teaching, research[1] and innovation while producing quality Metallurgical Engineers[2,3] as per advanced market needs.	✓	✓	✓
Programme's Mission	It is the mission of the Department to provide excellence in teaching, research[1] and service to the students in order to make them a useful metallurgist[2] to fulfill the needs of the industry for the benefit of country as well as the society[3].	✓	✓	✓

5. Knowledge and Attitude (WKs) Profiles

To foster cognitive, psychomotor, and affective development in mathematical, computational, design, and creative thinking, the curriculum incorporates nine knowledge and attitude profiles (WKs) that define the expected learning volume and graduate performance standards.

- **WK1:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
- **WK2:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling; applicable to the discipline.
- **WK3:** A systematic, theory-based formulation of engineering fundamentals required in the relevant engineering discipline.
- **WK4:** 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.
- **WK5:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
- **WK6:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
- **WK7:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development (Represented by the 17 UN Sustainable Development Goals (UN-SDG)
- **WK8:** Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
- **WK9:** Ethics, inclusive behavior 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.

6. Program Learning Outcomes (PLOs)

Programme Learning Outcomes (PLOs) form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level.

- **PLO-1 Engineering Knowledge:** Apply knowledge of mathematics, natural science, engineering fundamentals and Engineering specialization to the solution of complex engineering problems (WK1-WK4).

- **PLO-2 Problem Analysis:** Identify, formulate, conduct research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences (WK1-WK4).

- **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 (WK-5).

- **PLO-4 Investigation:** Conduct investigation of complex Engineering 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 (WK-8).

- **PLO-5 Tool Usage:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex Engineering problems, with an understanding of the limitations (WK-2 and WK-6).

- **PLO-6 The Engineer and the World:** Analyze and evaluate sustainable development impacts to society, the economy, sustainability, health and safety, legal frameworks, and the environment while solving complex engineering problems (WK-1, WK-5, and WK-7).

- **PLO-7 Ethics:** Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (WK-9).

- **PLO-8 Individual and Collaborative Team Work:** Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings (WK-9).

- **PLO-9 Communication:** Communicate effectively and inclusively 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, and make effective presentations, taking into account cultural, language, and learning differences (WK-1 and WK-9).

- **PLO-10 Project Management and Finance:** Demonstrate knowledge and understanding of engineering management principles and economic decision making and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments (WK-2 and WK-5).

- **PLO-11 Lifelong Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (WK-8 and WK-9).

7. Mapping of PLOs to PEOs

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

8. Professional Competence (ECs) Profiles

Engineering Competencies (ECs) are expected to be demonstrated by graduates during their practical experiences, which have been mapped with PLOs to reflect integration in the designed curriculum.

- **EC1 Comprehend and Apply Universal Knowledge:** Comprehend and apply advanced Engineering knowledge of the widely-applied principles underpinning good practices.
- **EC2 Comprehend and Apply Local Knowledge:** Comprehend and apply advanced Engineering knowledge of the widely-applied principles underpinning good practice specific to the jurisdiction of practices.
- **EC3 Problem Analysis:** Define, investigate and analyze complex Engineering problems using data and information technologies where applicable.
- **EC4 Design and Development of Solutions:** Design or develop solutions to complex Engineering problems considering a variety of perspectives and taking account of stakeholder views.
- **EC5 Evaluation:** Evaluate the outcomes and impacts of complex Engineering activities.
- **EC6 Protection of Society:** Recognize the foreseeable economic, social, and environmental effects of complex Engineering activities and seek to achieve sustainable outcomes.
- **EC7 Legal, Regulatory, and Cultural:** Meet all legal, regulatory, and cultural requirements and protect public health and safety in the course of all Engineering activities.
- **EC8 Ethics:** Conduct Engineering activities ethically.
- **EC9 Manage Engineering Activities:** Manage part or all of one or more complex Engineering activities.
- **EC10 Communication and Collaboration:** Communicate and collaborate using multiple media clearly and inclusively with a broad range of stakeholders in the course of all Engineering activities.
- **EC11 Continuing Professional Development (CPD) and Lifelong Learning:** Undertake CPD activities to maintain and extend competences and enhance the ability to adapt to emerging technologies and the ever-changing nature of work.
- **EC12 Judgment:** Recognize complexity and assess alternatives in light of competing requirements and incomplete knowledge. Exercise sound judgement in the course of all complex Engineering activities.
- **EC13 Responsibility for Decisions:** Be responsible for making decisions on part or all of complex Engineering activities.

9. Sustainable Development Goals (SDGs)

The Sustainable Development Goals (SDGs) are a set of 17 interlinked global goals established by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development. They are designed to be a blueprint to achieve a better and more sustainable future for all by addressing various global challenges, including poverty, inequality, climate change, environmental degradation, peace, and justice.

- **SDG 1 No Poverty:** End poverty in all its forms everywhere.
- **SDG 2 Zero Hunger:** End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
- **SDG 3 Good Health and Well-being:** Ensure healthy lives and promote well-being for all at all ages.
- **SDG 4 Quality Education:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
- **SDG 5 Gender Equality:** Achieve gender equality and empower all women and girls.
- **SDG 6 Clean Water and Sanitation:** Ensure availability and sustainable management of water and sanitation for all.
- **SDG 7 Affordable and Clean Energy:** Ensure access to affordable, reliable, sustainable, and modern energy for all.
- **SDG 8 Decent Work and Economic Growth:** Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.
- **SDG 9 Industry, Innovation, and Infrastructure:** Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
- **SDG 10 Reduced Inequalities:** Reduce inequality within and among countries.
- **SDG 11 Sustainable Cities and Communities:** Make cities and human settlements inclusive, safe, resilient, and sustainable.
- **SDG 12 Responsible Consumption and Production:** Ensure sustainable consumption and production patterns.
- **SDG 13 Climate Action:** Take urgent action to combat climate change and its impacts.
- **SDG 14 Life below Water:** Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.
- **SDG 15 Life on Land:** Protect, restore, and promote sustainable use of terrestrial ecosystems, manage forests sustainably, combat desertification, halt and reverse land degradation, and halt biodiversity loss.
- **SDG 16 Peace, Justice, and Strong Institutions:** Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels.
- **SDG 17 Partnerships for the Goals:** Strengthen the means of implementation and revitalize the global partnership for sustainable development.

10. Mapping of Bachelors of Engineering Program with UN SDGs

Description	UN SDGs																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
University vision and mission	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bachelor of Engineering Curriculum (Engg. and Non-Engg. Courses)		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓
Final Year Design Project (FYDP)			✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓		
Other pre-requisite activities (Internship, Community service, Survey camp, etc.)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Co- and Extra-Curricular Activities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

11. Correlation Matrix PLOs-ECs-WKs-SDGs

A correlation matrix has been established to link Program Learning Outcomes (PLOs) with the corresponding engineering competencies (ECs), knowledge and attitude profiles (WKs), as well as the targeted UN Sustainable Development Goals (SDGs) by 2030.

PLOs	ECs	WKs	SDGs
PLO-1 Engineering Knowledge	EC-1 Comprehend and apply universal knowledge EC-2 Comprehend and apply local knowledge	WK-1 Natural sciences and awareness of relevant social sciences WK-2 Mathematics & computing WK-3 Engineering fundamentals WK-4 Engineering specialist knowledge	SDG-9
PLO-2 Problem Analysis	EC-3 Problem analysis	WK-1 Natural sciences and awareness of relevant social sciences WK-2 Mathematics & computing WK-3 Engineering fundamentals WK-4 Engineering specialist knowledge	Selected SDGs from SDG – 1 to 17 (relevance as per curriculum)
PLO-3 Design/ Development of Solutions	EC-4 Design and development of solutions	WK-5 Engineering design and operations	SDG- 1, 2, 3, 6, 9, 10, 11, 12, 13, 14 (relevance as per curriculum)
PLO-4 Investigation	EC-5 Evaluation	WK-8 Research literature	SDG-9
PLO-5 Tool Usage	EC-3 Problem analysis EC-5 Evaluation	WK-2 Mathematics & computing WK-6 Engineering practice	SDG-9

PLO-6 The Engineer and the World	EC-6 Protection of society EC-7 Legal, regulatory, and cultural	WK1 Natural sciences and awareness of relevant social sciences WK-5 Engineering design and operations WK7 Engineering in Society	Selected SDGs from SDG – 1 to 17 (relevance as per curriculum)
PLO-7 Ethics	EC-8 Ethics	WK-9 Ethics, inclusive behavior and conduct	SDG-5 SDG-10 SDG-16
PLO-8 Individual and Collaborative Team work	EC-10 Communication and Collaboration	WK-9 Ethics, inclusive behavior and conduct	SDG-5 SDG-10 SDG-16
PLO-9 Communication	EC-10 Communication and Collaboration	WK-1 Natural sciences and awareness of relevant social sciences WK-9 Ethics, inclusive behavior and conduct.	SDG-5 SDG-10 SDG-16
PLO-10 Project Management and Finance	EC-9 Manage engineering activities	WK-2 Mathematics & computing WK-5 Engineering design and operations	SDG-9 SDG-12
PLO-11 Lifelong Learning	EC-11 Continuing Professional Development (CPD) and lifelong learning EC-12 Judgment EC-13 Responsibility for decisions	WK-8 Research literature	SDG-3 SDG-4 SDG-8 SDG-9 SDG-12 SDG-13

12. Scheme of Studies

Bachelor of Metallurgical Engineering									
First Year									
Fall Semester					**Spring Semester**				
Course Code	**Course Title**	**Credit Hrs**			**Course Code**	**Course Title**	**Credit Hrs**		
		Th	**Pr**	**Total**			**Th**	**Pr**	**Total**
MY-102	Introduction to Metallurgical Engineering	2	0	2	EA-128	Functional English	3	0	3
ES-108	Ideology and Constitution of Pakistan	2	0	2	ES-105/ES-127	Pakistan Studies / Pakistan Studies For Foreigners	2	0	2
CY-110	Applied Chemistry for Engineers	2	1	3	AU-112	Engineering Drawing and Computer Graphics	2	1	3
MT-116	Calculus & Analytical Geometry	3	0	3	PF-101	IT Fundamentals and Application	2	1	3
EE-124	Basic Electricity and Electronics	2	1	3	ES-206/ES-209	Islamic Studies / Ethical Behavior	2	0	2
ME-101	Engineering Mechanics	3	1	4	MT-221	Linear Algebra & Ordinary Differential Equations	3	0	3
CY-100	Essentials of Chemistry (for Computer Science Students Only)	NC			-		-	-	-
	Total	**14**	**3**	**17**		**Total**	**14**	**2**	**16**
Second Year									
Fall Semester					**Spring Semester**				
Course Code	**Course Title**	**Credit Hrs**			**Course Code**	**Course Title**	**Credit Hrs**		
		Th	**Pr**	**Total**			**Th**	**Pr**	**Total**
MT-441	Advanced Mathematical Techniques	3	0	3	MY-210	Iron Making Processes	2	0	2
MY-211	Metallurgical Thermodynamics and Kinetics	3	0	3	MM-303	Inspection and Testing of Materials	3	1	4
MY-212	Physical Metallurgy	3	1	4	MY-214	Metal Forming and Shaping Processes	3	1	4
MY-213	Instrumentation and Control	2	0	2	MY-215	Engineering Ceramics and Refractories	2	0	2
PF-201	Civics and Community Engagement	2	0	2	MT-331	Probability and Statistics	3	0	3
ME-228	Workshop Practice	0	1	1	MY-208	Mineral Processing	2	1	3
MY-207	Mechanical Behavior of Materials	2	1	3	ES-109 / ES-210	Understanding of Holy Quran-I / Introduction to Ethics-I	0	1	1
-	-	-	-	-			1	0	
-	-	-	-	-	PF-205	Community Service	NC		
	Total	**15**	**3**	**18**		**Total**	**15**	**4**	**19**
Third Year									
Fall Semester					**Spring Semester**				
Course Code	**Course Title**	**Credit Hrs**			**Course Code**	**Course Title**	**Credit Hrs**		
		Th	**Pr**	**Total**			**Th**	**Pr**	**Total**
EA-304	Business Communication and Ethics	3	0	3	MY-304	Metallurgy of Welding	2	1	3
MY-308	Polymer and Composite Materials	2	1	3	MY-310	Non-Ferrous Extractive Metallurgy	3	0	3
MY-309	Steel Making Processes	2	0	2	PF-301	Professional Ethics	2	0	2
MY-303	Foundry: Principles, Methods and Practices	3	1	4	MM-304	Heat Treatment of Materials	3	1	4
MY-311	Machine Learning in Metallurgical Engineering	2	1	3	XX-###	Social Sciences Elective	2	0	2
PF-401	Entrepreneurship	2	0	2	MY- 412	Metallurgy of Advanced Steels	2	0	2
ES-110 / ES-211	Understanding of Holy Quran-II / Introduction to Ethics-II	0	1	1	EA/ES###	Foreign Language-I	NC		
		1	0		-	-	-		
	Total	**14**	**4**	**18**		**Total**	**14**	**2**	**16**

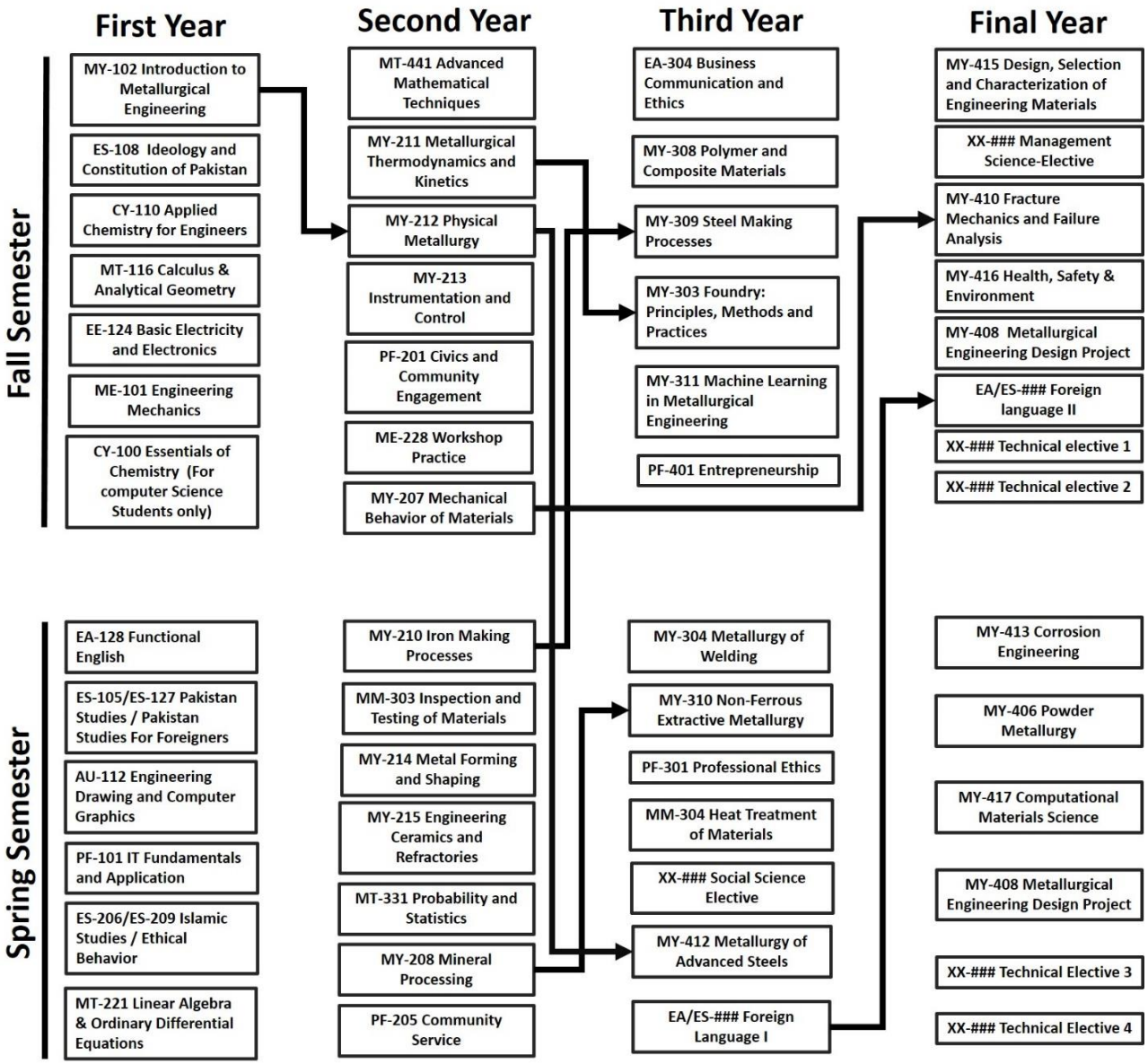
Final Year									
Fall Semester					**Spring Semester**				
Course Code	**Course Title**	**Credit Hrs**			**Course Code**	**Course Title**	**Credit Hrs**		
		Th	**Pr**	**Total**			**Th**	**Pr**	**Total**
MY-415	Design, Selection and Characterization of Engineering Materials	3	1	4	MY-413	Corrosion Engineering	2	1	3
XX-###	Management Sciences Elective	2	0	2	MY-406	Powder Metallurgy	2	1	3
MY-410	Fracture Mechanics and Failure Analysis	2	1	3	MY-417	Computational Materials Science	1	2	3
MY-416	Health, Safety & Environment	1	0	1	MY-408	Metallurgical Engineering Design Project	0	3	3
MY-408	Metallurgical Engineering Design Project *	0	3	3	XX-###	Technical Elective 3	2	0	2
EA/ES###	Foreign Language-II	NC			XX-###	Technical Elective 4	2	0	2
XX-###	Technical Elective 1	2	0	2	-	-	-	-	-
XX-###	Technical Elective 2	2	0	2	-		-	-	-
	Total	**12**	**5**	**17**		**Total**	**9**	**7**	**16**
						Total Credit Hours	**107**	**30**	**137**

** Duration one academic year: Requires literature survey and preliminary work during this Semester*

Social Sciences Electives			**Th**	**Pr**	**Total**
1	EA-321	Logic & Critical Thinking	2	0	2
2	MG-228	Sociology and Development	2	0	2
3	MG-257	Organizational Behavior	2	0	2
4	ME-433	Law for Engineers	2	0	2
Management Sciences Electives			**Th**	**Pr**	**Total**
1	MG-483	Supply Chain Management	2	0	2
2	ME-434	Total Quality Management	2	0	2
3	PF-206	Engineering Economics and Management	2	0	2
Technical Elective 1			**Th**	**Pr**	**Total**
1	MY-418	Advanced Materials	2	0	2
2	MY-419	High-Temperature Metals and Alloys	2	0	2
3	MY-420	Nanotechnology	2	0	2
4	MY-421	Fundamentals of Biomaterials	2	0	2
5	MY-422	Electronic, Magnetic and Optical Materials	2	0	2
Technical Elective 2			**Th**	**Pr**	**Total**
1	MY-423	Thin Films and Coating Techniques	2	0	2
2	MY-424	Surface Engineering	2	0	2
3	MY-425	Additive Manufacturing	2	0	2
Technical Elective 3			**Th**	**Pr**	**Total**
1	MY-426	Phase Transformations in Metals and Alloys	2	0	2
2	MY-427	Metallurgical Plants and Quality Control	2	0	2
3	MY-411	Vacuum Metallurgy	2	0	2
Technical Elective 4			**Th**	**Pr**	**Total**
1	MY-428	Nuclear Metallurgy	2	0	2
2	MM-309	Construction Materials	2	0	2
3	MY-429	Oil Field Metallurgy	2	0	2

FOREIGN LANGUAGE-I	
COURSE CODE	**COURSE TITLE**
EA-220	Chinese Language-I
EA-231	Turkish Language-I
EA-224	German Language-I
EA-226	French Language-I
ES-222	Arabic Language-I
EA-233	Japanese Language-I
EA-235	Russian Language-I
FOREIGN LANGUAGE –II	
EA-221	Chinese Language-II
EA-232	Turkish Language-II
EA-225	German Language-II
EA-227	French Language-II
ES-223	Arabic Language-II
EA-234	Japanese Language-II
EA-236	Russian Language-II

Department of Metallurgical Engineering
Course Dependency Chart



13. Mapping of Curriculum to PLOs

		Metallurgical 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
First Year	Fall	MY-102 Introduction to Metallurgical Engineering	C1				C2						
		ES-108 Ideology and Constitution of Pakistan						C2 C2					
		CY-110 Applied Chemistry for Engineers	C2 P3	C3 C3									
		MT-116 Calculus & Analytical Geometry		C3 C3 C3									
		EE-124 Basic Electricity and Electronics	C3	C4 P3									
		ME-101 Engineering Mechanics	C1 P1	C3 C3									
	Spring	EA-128 Functional English									A3 C2		C6
		ES-105/ES-127 Pakistan Studies / Pakistan Studies For Foreigners						C2 C2					
		AU-112 Engineering Drawing and Computer Graphics	C3				P3				C5		
		PF-101 IT Fundamentals and Application	C2				C3 C3						
		ES-206/ES-209 Islamic Studies / Ethical Behavior							C2 C2				
		MT-221 Linear Algebra & Ordinary Differential Equations	C2	C3									
Second Year	Fall	MT-441 Advanced Mathematical Techniques	C3	C2 C3									
		MY-211 Metallurgical Thermodynamics and Kinetics	C2	C4	C3								
		MY-212 Physical Metallurgy	C2		C3	C4				P3			
		MY-213 Instrumentation and Control	C1	C2									
		PF-201 Civics and Community Engagement						C2					A3
		ME-228 Workshop Practice				P3 P3		A4					
		MY-207 Mechanical Behavior of Materials	C2	C3	C4					P3			
	Spring	MY-210 Iron Making Processes	C1	C2									
		MM-303 Inspection and Testing of Materials	C2			C4	P3						C5
		MY-214 Metal Forming and Shaping Processes	C1	C3		C2				P3			
		MY-215 Engineering Ceramics and Refractories		C4	C5								
		MT-331 Probability and Statistics	C2	C4									
		MY-208 Mineral Processing		C3	C4					P3			
		ES-109 Understanding of Holy Quran-I / ES-210 Introduction to Ethics-I							C2				

		PF-205 Community Service						A3				A2
		Metallurgical 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**
Third Year	**Fall**	EA-304 Business Communication and Ethics							C3		A3 C6		
		MY- 308 Polymer and Composite Materials		C3		C4	P3						
		MY-309 Steel Making Processes			C5	C4							
		MY-303 Foundry: Principles, Methods and Practices	C2	C3	C4							P3	
		MY-311 Machine Learning in Metallurgical Engineering		C3						P3		C4	
		PF-401 Entrepreneurship						C2			A3		C3
		ES-110 Understanding of Holy Quran-II / ES-211 Introduction to Ethics-II							C2				
	Spring	MY-304 Metallurgy of Welding				C4		C5		P3			
		MY-310 Non-Ferrous Extractive Metallurgy	C2		C3			C4					
		PF-301 Professional Ethics						C2	C3				A3
		MM-304 Heat Treatment of Materials			C4	C3	P3	C5					
		XX-### Social Science Elective											
		MY- 412 Metallurgy of Advanced Steels			C5			C3					
		EA/ES### Foreign Language-I											
Final Year	**Fall**	MY-415 Design, Selection and Characterization of Engineering Materials		C4		C6	P3					C5	
		XX-### Management Sciences-Elective											
		MY-410 Fracture Mechanics and Failure Analysis				C4	P3					C6	
		MY-416 Health, Safety & Environment						C3					A3
		MY-408 Metallurgical Engineering Design Project		C	C			C	A	A	A	A	
		XX-### Technical Elective 1				C4		C6					
		XX-### Technical Elective 2				C4	C6						
		EA/ES### Foreign Language-II											
	Spring	MY-413 Corrosion Engineering		C4	P3			C5					
		MY-406 Powder Metallurgy			C4	P3	C5						
		MY-417 Computational Materials Science		C5		P3						P3	
		MY-408 Metallurgical Engineering Design Project		C	C				A	C,A	C,A	C	C
		XX-### Technical Elective 3		C4	C3								
		XX-### Technical Elective 4	C2			C4		C3					
		Internship	C	C				A	A	A	A		

14. Key Performance Indicators (KPIs)

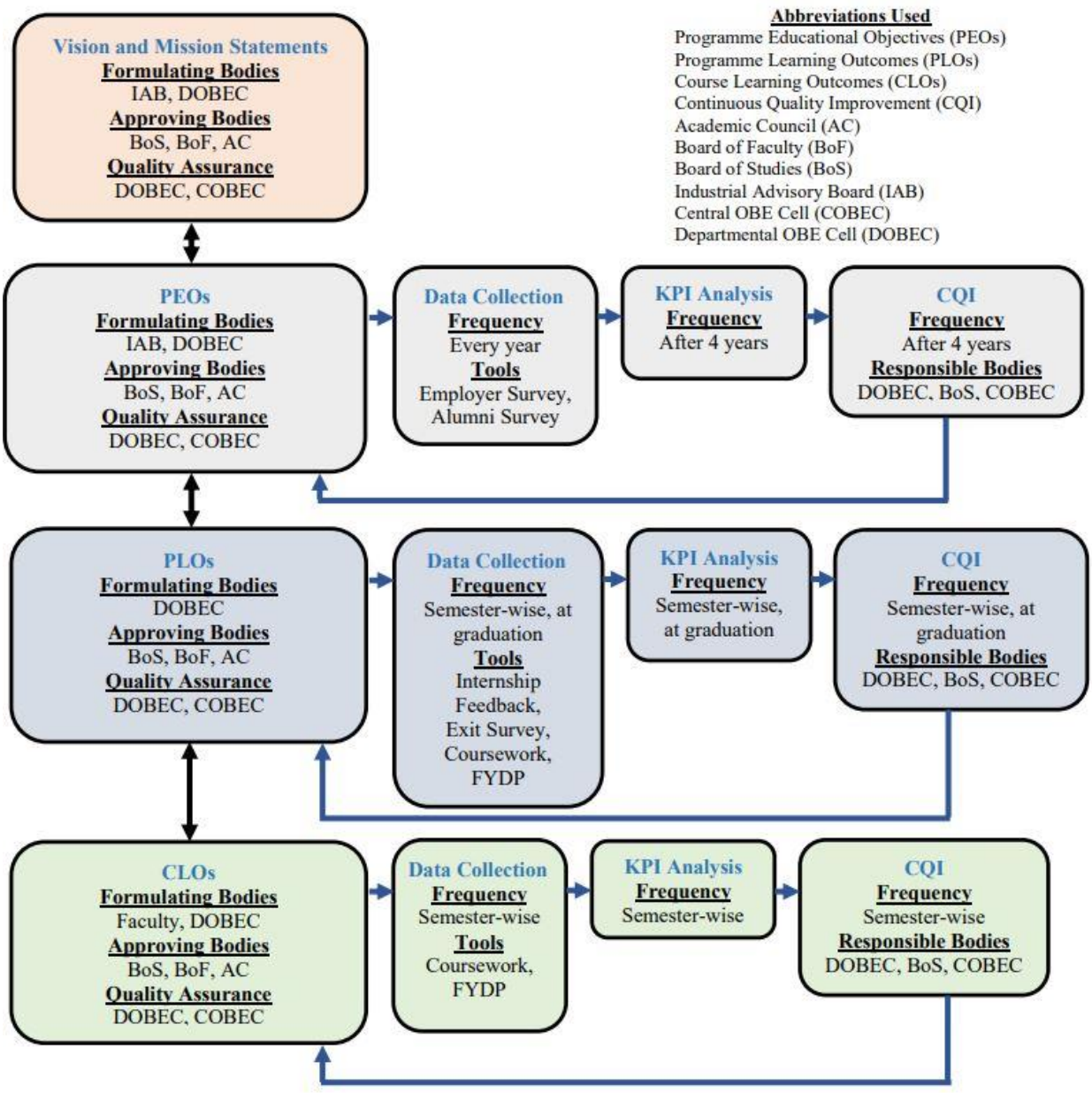
		Evaluation Tool	KPI	Data Collection Frequency	Analysis Frequency
PEO	Programme	▪ Employer Feedback Survey ▪ Alumni Feedback Survey ▪ Employment Statistics	50% of the Survey Form responses must attain a score of 3 or above on a scale of 1 to 5, and 50% of the graduates must be employed and/or engaged in higher studies.	Every Year	4 years from graduation
PLO	Student	▪ CLO scores of the student in the mapped course(s)	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	▪ PLO scores of all the students in the mapped course	At least 50% of the students must attain that PLO	Every Semester	Every Semester
	Programme	▪ Final PLO attainment statistics of all the courses including FYDP ▪ Internship Feedback Form ▪ Exit Survey	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
CLO	Student	▪ Course work	The student must obtain at least 50% average percentage score from all attempts.	Every Semester	Every Semester
	Course	▪ CLO scores of all students in the course	At least 50% of the students must attain that CLO	Every Semester	Every Semester

15. 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**
KPIs Achieved	▪ No Action	▪ No Action	▪ No Action	▪ No Action	▪ No Action	▪ No Action
KPIs Not Achieved	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.


Abbreviations Used
Programme Educational Objectives (PEOs)
Programme Learning Outcomes (PLOs)
Course Learning Outcomes (CLOs)
Continuous Quality Improvement (CQI)
Academic Council (AC)
Board of Faculty (BoF)
Board of Studies (BoS)
Industrial Advisory Board (IAB)
Central OBE Cell (COBEC)
Departmental OBE Cell (DOBEC)
Vision and Mission Statements
Formulating Bodies
IAB, DOBEC
Approving Bodies
BoS, BoF, AC
Quality Assurance
DOBEC, COBEC
PEOs
Formulating Bodies
IAB, DOBEC
Approving Bodies
BoS, BoF, AC
Quality Assurance
DOBEC, COBEC
Data Collection
Frequency
Every year
Tools
Employer Survey, Alumni Survey
KPI Analysis
Frequency
After 4 years
CQI
Frequency
After 4 years
Responsible Bodies
DOBEC, BoS, COBEC
PLOs
Formulating Bodies
DOBEC
Approving Bodies
BoS, BoF, AC
Quality Assurance
DOBEC, COBEC
Data Collection
Frequency
Semester-wise, at graduation
Tools
Internship Feedback, Exit Survey, Coursework, FYDP
KPI Analysis
Frequency
Semester-wise, at graduation
CQI
Frequency
Semester-wise, at graduation
Responsible Bodies
DOBEC, BoS, COBEC
CLOs
Formulating Bodies
Faculty, DOBEC
Approving Bodies
BoS, BoF, AC
Quality Assurance
DOBEC, COBEC
Data Collection
Frequency
Semester-wise
Tools
Coursework, FYDP
KPI Analysis
Frequency
Semester-wise
CQI
Frequency
Semester-wise
Responsible Bodies
DOBEC, BoS, COBEC