

Batch - 2021 and onwards CLO to PLO Mapping

Semester	Code	Course Name	CLO No.	Course Learning Outcome (CLO)	Domain	Taxonomy Level	PLO
SPRING SEMESTER COURSES (FE)	MM-102	Introduction to Engineering Materials	CLO-1	Identify basic properties based on knowledge of atomic composition and chemical bonding and structure of various materials	Cognitive	1	1
			CLO-2	Solve for atomic packing factor, unit cell and lattice parameter of different materials	Cognitive	3	2
			CLO-3	Work as an individual/team member to express the knowledge of engineering materials	Affective	3	9
			CLO-4	Explain the procedure for evaluating different materials properties	Cognitive	2	1
	ME-101	Engineering Mechanics	CLO-1	Define different theoretical concepts related to static and dynamic equilibrium for particles and rigid bodies	Cognitive	1	1
			CLO-2	Solve problems related to force moments and equilibrium in particles and/or rigid bodies	Cognitive	3	2
			CLO-3	Solve problems related to kinematics and kinetics of particles and/or rigid bodies	Cognitive	3	2
			CLO-4	Observe the material properties, stress and strain conditions for various materials	Psychomotor	1	1
	PH-122	Applied Physics	CLO-1	DISCUSS principle of physics; and explain the concept of classical and modern physics to solve related problems	Cognitive	2	1
			CLO-2	USE the concept of classical physics for engineering problems	Cognitive	3	2
			CLO-3	APPLY the concept of Modern physics to solve physical problems	Cognitive	3	2
			CLO-4	PRACTICE of operating equipment/tools to understand principles of physics under supervision.	Psychomotor	3	1
ME-104	Workshop Practice	CLO-1	Practice metal working using equipment and tools as per the provided guideline	Psychomotor	3	4	
		CLO-2	Practice metal working using equipment and tools as per the provided guideline	Psychomotor	3	4	
		CLO-3	Adopt safety protocols as per the health safety and environment (HSE) guidelines	Affective	4	6	
HS-104	Functional English	CLO-1	Demonstrate effective presentation skills in academic settings.	Affective	3	10	
		CLO-2	Comprehend explicit and implicit information through reading and listening strategies.	Cognitive	2	10	
		CLO-3	Compose drafts of various academic genres using writing processes and strategies.	Cognitive	6	10	
FALL SEMESTER COURSES (FE)	EE-118	Basic Electricity and Electronics	CLO-1	Have understanding of basic circuit analysis law and APPLY them to solve various electric circuits	Cognitive	3	1
			CLO-2	To enable students to USE various techniques to SOLVE and analyze electric circuits and problems effectively	Cognitive	3	2
			CLO-4	Have ability to manipulate various electrical circuits UNDER GUIDANCE and are able to verify different network theorem experimentally	Psychomotor	3	2
	AU-102	Engineering Drawing and Computer Graphics	CLO-1	Draw geometric curves, simple machine parts, sections and assembly drawings.	Psychomotor	3	1
			CLO-2	Interpret working drawings	Cognitive	4	10
			CLO-3	Use software for simple 2D and 3D drawings.	Cognitive	3	5
	CY-109	Applied Chemistry	CLO-1	EXPLAIN the concepts of physical and analytical chemistry for engineering applications.	Cognitive	2	1
			CLO-2	SOLVE problems of fluids and fields, thermo & electrochemistry.	Cognitive	3	2
			CLO-3	APPLY the concepts of applied chemistry to industrial processes.	Cognitive	3	2
			CLO-4	OPERATE the equipment with guidance to measure physical & chemical parameters	Psychomotor	3	1
	MT-114	Calculus	CLO-1	Identify functions and define real and complex numbers	Cognitive	1	1
			CLO-2	Apply differential and integral calculus to engineering problems.	Cognitive	3	2
CLO-3			Discuss the behavior of sequence and series.	Cognitive	2	2	
HS-105	Pakistan Studies	CLO-1	Understand the historical and ideological perspectives of Pakistan and their implications for individuals and professionals in societal contexts	Cognitive	2	6	
		CLO-2	Explain the strategic implications of international conventions and treaties applicable to Pakistan at the national and international level	Cognitive	2	12	

SPRING SEMESTER COURSES (SE)	Physical Metallurgy	CLO-1	Discuss fundamental concepts and properties of metals/alloys, crystal structure, phases , solid solution, diffusion, etc.	Cognitive	2	1
		CLO-2	Illustrate different type of phase diagrams for ferrous and non ferrous materials	Cognitive	3	3
		CLO-3	Apply the knowledge of physical metallurgy to solve the related problems using quantitative and qualitative methods	Cognitive	3	4
		CLO-4	Use under supervision various techniques of metallography to reveal macro and microstructures of metals	Psychomotor	3	4
	Engineering Ceramics & Refractory Materials	CLO-1	Discuss the raw materials used in the processing of ceramics & refractories keeping in view their environmental impact and utilization of local resources	Cognitive	2	7
		CLO-2	Compare different ceramic materials for specific application.	Cognitive	4	3
		CLO-3	Analyze the structure- property relationship of ceramics, glasses and refractories	Cognitive	4	4
		CLO-1	Calculate internal loads based on different support reaction	Cognitive	3	1
		CLO-2	Correlate the internal stresses with different external loading conditions	Cognitive	4	3
		CLO-3	Construct the Mohr circle to find stresses in materials at different angles	Cognitive	3	5
		CLO-4	Operate under supervision different equipments and techniques to determine mechanical properties	Psychomotor	3	9
		CLO-1	Describe formation of differential equations to explain physical situations	Cognitive	2	1
	Differential Equations & Complex Variables	CLO-2	APPLY appropriate methods to solve differential equations and complex integrals of relevant engineering problems.	Cognitive	3	2
		CLO-1	To explain the thermodynamics & kinetics of phase transformations.	Cognitive	2	1
		CLO-2	To apply thermodynamic principles for extraction and refining of various metals from their ores.	Cognitive	3	2
		CLO-3	To solve thermodynamic problems for different materials and processes.	Cognitive	3	3
Production and Refining of Metals	CLO-1	Discuss different parameters and raw materials used in the processing of Ferrous and non-ferrous Materials keeping in view their environmental impact and utilization of local resources.	Cognitive	2	7	
	CLO-2	Describe basic chemistry and operations for production and refining of materials	Cognitive	2	3	
	CLO-3	Conceptualize the knowledge of Production and Refining through effective communication	Affective	4	10	
	CLO-4	Compare appropriate and economical production and refining techniques for materials	Cognitive	4	6	
	CLO-1	Comprehend the principles of melting and casting.	Cognitive	2	1	
	CLO-2	Illustrate various melting furnaces and casting techniques	Cognitive	3	4	
	CLO-3	Contrast different techniques required to produce component of required shape	Cognitive	4	12	
	CLO-4	Practice different manufacturing and foundry techniques under supervision	Psychomotor	3	9	
	CLO-1	Compare and contrast modern joining techniques in relation with accessories/equipment/principles, etc.	Cognitive	4	5	
	CLO-2	Analyze the physical and chemical changes occurring during joining of materials and its consequences	Cognitive	4	6	
Joining of Materials	CLO-4	Work on mini-project to evaluate the effect of joining processes on material properties	Cognitive	5	11	
	CLO-5	Work under supervision to produce different joints using various joining techniques	Psychomotor	3	3	
	CLO-1	Understanding the basic concepts of all construction materials, their properties, production and processing.	Cognitive	2	1	
	CLO-2	Describe the raw materials used in construction industry keeping in view their environmental impact and utilization of local resources	Cognitive	2	7	
	CLO-3	Compare and Contrast various construction material keeping in view the health, safety, legal and cultural issues	Cognitive	4	6	
Construction Materials	CLO-1	To describe basic computational concepts of programming languages (e.g. C++) and computer aided drafting for the solution of engineering problems and behaviour of elements of programming language code	Cognitive	2	1	
	CLO-2	To apply the knowledge of computer programming to write, compile and execute simple programs, showing how input data is processed, output data is produced and how the values of variables change	Cognitive	3	3	
	CLO-3	To practice simple programs/mechanical parts using Computer Programming & drafting software's.	Psychomotor	3	5	
Computer Programming and Drafting	CLO-1	Explain the given Quranic verses and Hadiths to their tangible meaning and message.	Cognitive	2	8	
	CLO-2	Describe the basic concepts of Shariah, the features of Seerat-un-Nabi (SAW), and the impact of Islam on our society.	Cognitive	2	8	
Islamic Studies or Ethical Behaviour	CLO-1	Express an interest in contributing to the community and society individually and collectively through social projects.	Affective	3	6	
	CLO-2	Volunteer to help make a difference to a specific group, community, or organization.	Affective	2	12	
FALL SEMESTER COURSES (SE)	Community Service	CLO-1				
		CLO-2				
		CLO-3				
		CLO-4				
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		CLO-4				
		CLO-1				
		CLO-2				
		CLO-3				

SPRING SEMESTER COURSES (TE)		FALL SEMESTER COURSES (TE)				
MM-301	Corrosion: Protection and Prevention	CLO-1	Demonstrate fundamental principles and knowledge of corrosion and its preventive measure keeping in view the health and safety issues	Cognitive	3	6
		CLO-2	Solve various numerical problems related to basic phenomenon, corrosion rate, thermodynamics and cathodic protection	Cognitive	3	2
		CLO-3	Analyze corrosion problem from daily life/industrial environment and propose corrective measure	Cognitive	4	7
		CLO-4	Operate Under Supervision different electrochemical and other techniques to study the corrosion behaviour of metal and cathodic protection system	Psychomotor	3	5
MM-303	Inspection and Testing of Materials	CLO-1	Compare and contrast various DT/ NDT techniques	Cognitive	4	12
		CLO-2	Analyze the result of destructive and nondestructive examinations	Cognitive	4	4
		CLO-3	Select an appropriate Destructive/ Nondestructive testing technique for specific application	Cognitive	5	6
		CLO-4	Operate under supervision different DT/NDT techniques	Psychomotor	3	5
MM-304	Heat Treatment of Materials	CLO-1	Compare and contrast various heat treatment processes for different materials	Cognitive	4	3
		CLO-2	Demonstrate the use and synthesis of information from various transformation diagrams	Cognitive	3	4
		CLO-3	Select an appropriate heat treatment process to tailor microstructure for a particular application	Cognitive	5	6
		CLO-4	Under supervision, perform various heat treatment processes	Psychomotor	3	5
HS-304	Business Communication and ethics	CLO-1	Demonstrate effective oral communication and interpersonal skills in simulated professional and business situations.	Affective	3	10
		CLO-2	Compose effective business messages for various purposes and audiences.	Cognitive	6	10
		CLO-3	Apply principles, theories, and codes of ethics in situations related to professional practice.	Cognitive	3	8
MT-315	Mathematical Methods	CLO-1	Describe formation of system of linear equations and solid geometry to explain physical situations	Cognitive	2	1
		CLO-2	APPLY appropriate methods to solve system of linear equations and vector calculus in relevant engineering problems.	Cognitive	3	2
		CLO-1	Select appropriate type of polymer/composite material and its manufacturing routes keeping in view the environment and sustainability	Cognitive	5	7
MM-305	Polymer and Composite Materials	CLO-2	Compare polymer and composite materials on the basis of their fundamental characteristics and application	Cognitive	4	4
		CLO-3	Solve various numerical problems related to polymers and composite materials	Cognitive	3	2
		CLO-4	Operate under supervision different production techniques of polymer and composite materials and their mechanical properties analysis	Psychomotor	3	5
MM-308	Materials Characterization Techniques	CLO-1	Compare and contrast various characterization and analytical techniques	Cognitive	4	4
		CLO-2	Select the most promising technique for a particular situation	Cognitive	5	12
		CLO-3	Conclude the results obtained from various characterization techniques in the form of report	Cognitive	5	10
		CLO-4	Operate under supervision the technique used to characterize various materials	Psychomotor	3	5
PF-303	Applied Economics for Engineers	CLO-1	Discuss significance of economic analysis in engineering profession	Cognitive	2	6
		CLO-2	Analyze alternatives using economic analysis techniques to accomplish given objective.	Cognitive	4	2
MG-481	Entrepreneurship	CLO-1	Explain basic functions and importance of entrepreneurship	Cognitive	2	12
		CLO-2	Value business ethics on entrepreneurial activities.	Affective	3	8
		CLO-3	Demonstrate the entrepreneurial skills to develop business plan.	Cognitive	3	11
		CLO-1	Discuss numerical differentiation, numerical integration, and complex variable.	Cognitive	2	2
		CLO-2	Apply Elliptic integral and complex variable in relevant engineering problems..	Cognitive	3	1
MT-441	Advanced Mathematical Techniques	CLO-3	Apply numerical differentiation and numerical integration in relevant engineering problems	Cognitive	3	2

SPRING SEMESTER COURSES (BE)		FALL SEMESTER COURSES (BE)				
MM-404	Phase Transformation in Materials	CLO-1	Demonstrate an understanding thermodynamic concepts related to Phase transformations	Cognitive	3	2
		CLO-2	Solve problems related to microstructure and phase diagram	Cognitive	3	12
		CLO-3	Analyze the nucleation and growth mechanism and distribution of phases	Cognitive	4	5
		CLO-4	Work under supervision on different heat treatment processes to nucleate desired phases in materials	Psychomotor	3	11
MM-411	Nanomaterials and Nanotechnology	CLO-1	Compare and Contrast the properties of nano structured materials with conventional materials	Cognitive	4	12
		CLO-2	Demonstrate the equipment and processes available to synthesize and characterize the nanostructured materials	Cognitive	3	5
		CLO-3	Carry out necessary investigations in relation to synthesis, characterization and applications of nanomaterials	Cognitive	3	7
		CLO-1	Compare and Contrast conventional and advanced surface engineering methods for engineering applications	Cognitive	4	3
MM-412	Engineering	CLO-2	Evaluate merits and demerits of different coating processes keeping in view of the environmental concerns	Cognitive	5	7
		CLO-3	Work on a project to formulate a report to justify coating characterization/selection for a given application	Affective	4	11
		CLO-4	Operate under supervision various equipments and techniques to determine surface properties	Psychomotor	3	5
MM-413	Nuclear Materials	CLO-1	Illustrate various types of nuclear reactors as per application, environmental impact and sustainable development	Cognitive	3	7
		CLO-2	Analyze health and safety issues in nuclear reactors and related materials	Cognitive	4	6
		CLO-3	Select materials for design and processing of nuclear reactors and disposal of nuclear waste, with emphasis on ethical and legal considerations	Cognitive	5	8
MM-414	Total Quality Management	CLO-1	Apply tools and techniques of quality management.	Cognitive	3	5
		CLO-2	Compare and contrast different quality management philosophies and frameworks.	Cognitive	4	6
		CLO-3	Evaluate projects using modern project management tools.	Cognitive	5	11
		CLO-4	Express issue in management and their solutions with critical consideration	Affective	3	8
MM-410	Materials Engineering Project		(PLOs 2,3,7,8,9,10,11 are covered in first semester of FYP)			
MM-402	Design and Selection of Materials	CLO-1	Carry out the process of material selection using Material property charts	Cognitive	3	6
		CLO-2	Evaluate the role of function, material, process, and shape during design and selection of materials	Cognitive	5	12
		CLO-3	Work as a team member on a relevant project and present the findings.	Affective	4	9
		CLO-4	Practice different software tools to assist in design and selection of materials	Psychomotor	3	5
MY-402	Advance Materials	CLO-1	Demonstrate an understanding of properties and applications of advanced materials	Cognitive	3	1
		CLO-2	Compare and Contrast processing and characterization on different types of advanced materials	Cognitive	4	4
		CLO-3	Solve problems related to the design and manufacturing processes of advanced materials.	Cognitive	3	7
MM-415	Materials n & Deformation Analysis	CLO-1	Demonstrate the role of crystal structure and defects in deformation behavior of materials	Cognitive	3	2
		CLO-2	Analyze the role of different parameters on failure mechanism of different materials	Cognitive	4	12
		CLO-3	Formulate a report on root cause analysis of a particular failure and present the findings	Affective	4	10
MM-416	Biomedical Materials and Functional Materials	CLO-1	Demonstrate the basic knowledge of naturally occurring sustainable biomedical materials	Cognitive	3	7
		CLO-2	Evaluation of biomedical materials as per ethical issues, and functional materials as per applications	Cognitive	5	8
		CLO-3	Synthesize of the biomaterials and functional materials by applying knowledge and skills	Cognitive	6	12
MM-410	Materials Engineering Project		(PLOs 2,3,7,8,9,10,11,12 are covered in second semester of FYP)			
IM-417	Health, Safety and Environment	CLO-1	Define and Explain the fundamentals of Health and safety based on OHSAS 18000 or other equivalent standards applied in different workplace environment.	Cognitive	2	1
		CLO-2	Apply the ISO 14000 or equivalent standards to the real-world problem.	Cognitive	3	7
		CLO-3	Comply with the OHSAS 18000 or equivalent standard to analyze the hazardous conditions and practices to implement effective hazard control strategies in workplace environment.	Affective	3	12
		CLO-4	Exhibit the proper use of safety instruments/equipment and Personal Protective Equipment (PPE) as per defined standard in the workplace environment.	Psychomotor	3	9