

<u>Semester</u>	<u>Code</u>	<u>Course Name</u>	<u>CLO No.</u>	<u>Course Learning Outcome (CLO)</u>	<u>Domain</u>	<u>Taxonomy Level</u>	<u>PLO</u>
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 on mini project to demonstrate basic knowledge of materials engineering	Cognitive	3	11
			CLO-4	Recognize the procedure for evaluating different materials properties	Cognitive	2	1
	ME-101	Engineering Mechanics	CLO-1	Discuss static and dynamic equilibrium condition for particles and rigid bodies	Cognitive	1	1
			CLO-2	Analyze equilibrium and force, moments in particles and rigid bodies	Cognitive	4	2
			CLO-3	Solve for kinematics and kinetics of particles of particles and rigid bodies	Cognitive	3	2
			CLO-4	Observation, performance and analysis of experimental work	Psychomotor	1	1
	Ph-122	Applied Physics	CLO-1	Apply the knowledge of physical laws in the discipline of engineering	Cognitive	3	1
			CLO-2	Student can recognize common patterns in problems, break problems down into manageable steps and apply appropriate techniques	Cognitive	3	2
			CLO-3	Imitate the laboratory experimental setup thereafter analyze and interpret data to produce the results	Psychomotor	3	1
	ME-104	Workshop Practice	CLO-1	Operate equipment and tools in metal working and distinguish between their applications	Psychomotor	3	4
			CLO-2	Operate equipment and tools in wood working and distinguish between their applications	Psychomotor	3	4
			CLO-3	Participation in workshop activities individually as well as in group	Affective	2	9
	HS-104	Functional English	CLO-1	Use Language Skills and Strategies in different situations and for a variety of functions	Cognitive	3	10
			CLO-2	Complete Academic Writing tasks using writing process and strategies according to genres	Cognitive	3	10
			CLO-3	Deliver effective presentations and participate actively in group discussions	Affective	3	12
	FALL SEMESTER COURSES (F.E)	EE-118	Basic Electricity and Electronics	CLO-1	Analyze DC circuits by applying different techniques i.e nodal analysis, mesh analysis, superposition theorem, thevenin theorem, norton theorem	Cognitive	4
CLO-2				Analyze AC circuit by applying different techniques i.e nodal analysis, mesh analysis, superposition theorem, thevenin theorem norton theorem.	Cognitive	4	2
CLO-3				Understand operating principal, types and application of different electrical machines transformers, generators motors.	Cognitive	3	1
CLO-4				Construct circuits on breadboards and perform electrical measurements and analyze using modern engineering tool	Psychomotor	3	5
AU-102		Engineering Drawing and Computer Graphics	CLO-1	Draw geometric curves including plane curves, cycloids, and involutes.	Psychomotor	4	1
			CLO-2	Draw simple machine parts, sections and assembly in orthographic projections.	Psychomotor	2	10
			CLO-3	Interpret geometric dimensioning and tolerancing in working drawings.	Cognitive	2	1
			CLO-4	Use software for simple 2D and 3D drawings.	Psychomotor	4	5
CY-109		Applied Chemistry	CLO-1	Apply knowledge of the fundamental concept of behavior of gases, liquid and electrochemistry in engineering	Cognitive	3	1
			CLO-2	Identify and Solve applied chemistry problems.	Cognitive	3	4
			CLO-3	An ability to perform experiments, as well as to analyze and interpret data	Psychomotor	4	2
MT-111		Calculus	CLO-1	Identify functions and sketch their graphs using tools of calculus in relevant engineering problems.	Cognitive	1	1
			CLO-2	Apply differential and integral calculus to interpret the physical systems and processes.	Cognitive	3	2
			CLO-3	Identify real and complex numbers and develop the concept of 3D geometry	Cognitive	1	2
HS-105		Pakistan Studies	CLO-1	Demonstrate the basic knowledge of the historical and ideological perspectives of Pakistan, its current challenges and its relationship with the neighboring countries	Cognitive	2	9
			CLO-2	Identify the role of different systems, treaties and conventions established to cater human rights at national and international level.	Cognitive	4	12

SPRING SEMESTER COURSES (SE)		FALL SEMESTER COURSES (SE)					
SPRING SEMESTER COURSES (SE)	MM-201	Physical Metallurgy	CLO-1	Discuss fundamental concepts and properties of metals/alloys, crystal structure, phase transformation, solid solution and diffusion	Cognitive	2	1
			CLO-2	Illustrate phase transformation with the help of various phase and transformation diagrams	Cognitive	3	3
			CLO-3	Solve various problems related to metals/alloys basic properties, crystal structure, phase transformation, solid solution and diffusion	Cognitive	3	4
			CLO-4	Use under supervision various techniques of metallography to reveal macro and microstructures of metals	Psychomotor	3	5
	MM-204	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
	MM-205	Mechanics of Materials	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
	MT-215	Differential Equations & Complex Variables	CLO-1	Analyze physical situations whose behavior can be described by differential equations.	Cognitive	4	1
			CLO-2	Apply appropriate methods to solve differential equations and complex integrals.	Cognitive	3	2
	MY-211	Metallurgical Thermodynamics & Kinetic	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	1
FALL SEMESTER COURSES (SE)	MM-202	Production and Refining of Materials	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	Demonstrate the knowledge of Production and Refining through effective communication	Cognitive	3	10
			CLO-4	Compare appropriate and economical production and refining techniques for materials	Cognitive	4	6
	MM-208	Fundamentals of Modern Manufacturing and Foundry	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	Under supervision design and develop a mould for defect free casting	Psychomotor	3	11
			CLO-5	Perform under supervision different machining operations using machine tools	Psychomotor	3	9
	MM-307	Joining of Materials	CLO-1	Compare and contrast various joining techniques	Cognitive	2	2
			CLO-2	Analyze the physical and chemical changes occurring during joining of materials	Cognitive	4	6
			CLO-3	Describe the accessories/equipment/techniques associated with various joining techniques	Cognitive	2	7
			CLO-4	Work on mini-project to analyze the effect of joining process on material properties	Cognitive	4	11
			CLO-5	Produce different joints using various joining techniques	Psychomotor	3	5
	MM-309	Construction Materials	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	
IME-207	Computer Programming and Drafting	CLO-1	Explain Operating System, Software, basic networks, Network Topologies.	Cognitive	2	1	
		CLO-2	Understanding of Applications and Limitations of computers and technology. Working of Computer hardware	Cognitive	2	1	
		CLO-3	Apply C language to make an efficient program to solve large and complex problems.	Cognitive	3	3	
		CLO-4	Investigate solutions in C language and try to modify the running codes in order to increase the efficiency. Demonstrate skill of AutoCAD Software for drafting engineering drawings.	Psychomotor	4	4	
HIS-205	Islamic Studies or Ethical Behaviour	CLO-1	Students will be able to Interpret the given Quranic Verses and Hadiths to their tangible meaning and message.	Cognitive	2	8	
		CLO-2	Students will be able to Explain the features of Seerat- un - Nabi (S.A.W)	Cognitive	2	8	
		CLO-3	Student will be able to Follow the value system of Islam through the study of impacts of Islamic Culture and civilization on the world.	Affective	2	8	

SPRING 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	Select appropriate Destructive / Nondestructive testing technique for specific application	Cognitive	5	5
			CLO-2	Analyze the result of destructive and nondestructive examinations	Cognitive	4	4
			CLO-3	Compare and contrast various DT / NDT techniques	Cognitive	4	12
			CLO-4	Operate under supervision different DT/NDT techniques	Psychomotor	3	5
	MM-304	Heat Treatment of Materials	CLO-1	Compare heat treatment processes for ferrous and non-ferrous metals	Cognitive	4	3
			CLO-2	Demonstrate knowledge of various transformation diagrams and its affecting factors	Cognitive	3	2
			CLO-3	Select an appropriate heat treatment process to tailor microstructure for a particular application	Cognitive	5	5
			CLO-4	Under supervision, perform various heat treatment processes	Psychomotor	3	5
	HS-304	Business Communication and ethics	CLO-1	Conform to the framework of communication in all professional and organizational communication	Cognitive	3	10
			CLO-2	Communicate orally in interpersonal and presentation situation	Affective	3	10
			CLO-3	Develop written communication effectively using variety to technical genres	Cognitive	3	10
			CLO-4	Know framework of engineering ethics that incorporate moral, legal societal ethical principles connected with the applied engineering ethics	Affective	3	8
MT-315	Mathematical Methods	CLO-1	Analyze physical situations whose behavior can be described by System of linear equations.	Cognitive	4	4	
		CLO-2	Evaluate multiple integrals, system of linear equations and equation of surfaces.	Cognitive	5	5	
FALL SEMESTER COURSES (TE)	MM-305	Polymer and Composite Materials	CLO-1	Select appropriate type of polymer/composite material and its manufacturing routes keeping in view the environment and sustainability	Cognitive	5	7
			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	Work on a project to organize a report on synthesis/processing of polymers/composites	Affective	4	11
			CLO-5	Operate under supervision different production techniques of polymer and composite materials and their mechanical properties analysis	Psychomotor	3	5
	MM-308	Materials Characterisation and Analytical 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	Demonstrate an understanding of basic principles of economics and engineering economics	Cognitive	3	6
			CLO-2	Apply engineering economics principles and analysis method to solve real world problems.	Cognitive	3	6
			CLO-3	Demonstrate the knowledge of ethical aspects of economic decision making	Cognitive	3	8
	MG-481	Entrepreneurship	CLO-1	Apply ethical and legal practices of entrepreneurship in business world.	Cognitive	3	8
			CLO-2	Analyze different cases both actual and imaginary by applying the theoretical concepts and know the actual cases of successful and unsuccessful entrepreneurial initiatives	Cognitive	4	12
			CLO-3	Demonstrate an understanding of taught concepts through a business plan development that integrates all technical dimensions of a successful business start up	Cognitive	3	9
	MT-441	Advance Mathematical Techniques	CLO-1	To develop numerical methods as an alternate to analytical methods of mathematics.	Cognitive	6	12
CLO-2			To apply numerical methods to different complex engineering problems.	Cognitive	3	3	

SPRING SEMESTER COURSES (BE)	MM-404	Phase Transformation in Materials	CLO-1	Demonstrate an understanding of 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	Mechanism of different heat treatment processes to nucleate desired phases in materials	Psychomotor	4	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	
	MM-412	Surface Engineering	CLO-1	Compare and Contrast physical and chemical coating methods for different surface engineering applications	Cognitive	4	1	
			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 a given nuclear reactor component	Cognitive	5	12	
	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	
	MM-410	Materials Engineering Project	(ALL PLOs are covered in FYP)					1-12
	FALL SEMESTER COURSES (BE)	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				Execute different software tools to assist in design and selection of materials	Psychomotor	4	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 Deformation & Failure: Mechanism and 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 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 and characterize biomaterials and functional materials by applying knowledge and skills	Cognitive	6	12	
MM-410		Materials Engineering Project	(ALL PLOs are covered in FYP)					1-12
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	2	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	