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	**Determine** atomic packing factor, unit cell and lattice parameter of different materials	Cognitive	4	2
			CLO-3	**Recognize** the procedure for evaluating different materials properties	Cognitive	2	1
	ME-101	Engineering Mechanics	CLO-1	**Discuss** static and dynamic equilibirium condition for particles and rigid bodies	Cognitive	1	1
			CLO-2	**Analyze** equilibirum 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
			CL0-4	**Observation, performance** and **analysis** of experimental work	Psychomotor	1	1
	Ph-122	Applied Physics	CLO-1	**Apply** the knowledge of physical laws in the descipline of engineering	Cognitive	3	1
			CLO-2	Student can **recongnize** common patterns in problems, break problems down into manageable steps and apply appropriate techniques	Congnitive	3	2
			CLO-3	**Imitate** the laboratory experimental setup therefter 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	Fuctional English	CLO-1	**Use** Language Skills and Strategies in different situations and for a variety of functions	Congnitive	3	10
			CLO-2	**Complete** Academic Writing tasks using writing process and strategies according to genres	Congnitive	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 therem, thevenin theorem, norton theorem	Congnitive	4	2
			CLO-2	**Analyze** AC circuit by applying different tecniques i.e nodal analysis, mesh analysis, superposition theorem, thevenin theorem norton theorem.	Congnitive	4	2
			CLO-3	**Understand** operating principal, types and application of different electrical machines transformers, generators motors.	Congnitive	3	1
			CLO-4	**Construct** circuits on breadboards and perform electrical measurments 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	**Iidentify** and **Solve** applied chemistry problems.	Congnitive	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.	Congnitive	1	1
			CLO-2	**Apply** differential and integral calculus to interpret the physical systems and processes.	Congnitive	3	2
			CLO-3	**Identify** real and complex numbers and Develop the concept of 3D geometry	Cognitive	6	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)	**MM-201**	**Physical Metallurgy**	**CLO-1**	Basic **understanding** of crystal structure of materials, properties and application	Cognitive	1	1
			CLO-2	**Illustrate** the concept of implementing various terminologies in physical metallurgy	Cognitive	3	3
			CLO-3	**Apply** the knowledge of phase diagram to recongnize basic microstructures with demonstration of isothermal phase reaction	Cognitive	3	4
			CLO-4	**Apply** techniques of metallography to reveal macro and microstructures of metals	Psychomotive	2	5
	MM-204	**Engineering Ceramics & Refractory Materials**	**CLO-1**	**Identify** raw materials used in the processing of ceramics & refractories keeping in view their environmental impact and utilization of local resources	Cognitive	1	7
			CLO-2	**Design/synthesis** of ceramic materials for specific application.	Cognitive	6	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	**Use** of mechanical testing machines to find the stresses and strains experimentally	Psychomotive	1	9
	MT-21	**Differential Equations & Complex Variabl**	**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**	**Use** thermodynamics principles to be able to explain the extraction and refining of various metals from their oxides	Cognitive	3	1
			CLO-2	**Solve** thermo dynamics problems for simple real materials and processess.	Cognitive	3	2
			CLO-3	**Define** the thermo dynamics and kinetics of phase transformation	Cognitive	1	1
FALL SEMESTER COURSES (SE)	**MM-202**	**Production and Refining of Materials**	**CLO-1**	**Identify** 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	1	7
			CLO-2	**Describe** basic chemistry and operations for production and refining of materials	Cognitive	2	3
			CLO-3	**Selection** of appropriate and economical production and refining techniques for materials	Cognitive	5	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	**Select** tool(s) required to produce component of required shape	Cognitive	5	5
			CLO-4	**Design** and **develop** a mould for defect free casting	Psychomotive	4	11
			CLO-5	**Perform** different machining operations using machine tools	Psychomotive	4	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	**Produce** different joints using various joining techniques	Psychomotor	3	5
	IM-207	**Computer Programming and Draftuting**	**CLO-1**	**Define** Operating System, Software, basic networks, Network Topologies.	Cognitive	1	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.	Psychomotive	4	4
	HS-205	**Islamic Studies or Ethical Behaviour**	**CLO-1**	To **know** some Qur'anic verses and Hadith in regards to **recognize** the importance of religion and ethics	Cognitive	1	8
			CLO-2	To **understand** the basic principles of Islamic teachings through learning Quran and Sunnah	Cognitive	1	12
			CLO-3	To **distinguish** the features of Seeratun Nabi (S.A.W) and the impacts of Islamic Culture and Civilization on our society	Cognitive	3	6

SPRING SEMESTER COURSES (TE)	**MM-301**	**Corrosion: Protection a**	**CLO-1**	**Explain** the basic phenomenon, types of corrosion, passivity and polarization on corrosion behavior of metals with various preventive measures.	Cognitive	2	1
			CLO-2	**Solve** different numerical problems related to basic phenomenon of corrosion, determination of corrosion rate and design for new installation.	Cognitive	3	2
			CLO-3	**Analyze** the type of corrosion from practical life and propose corrective measure.(Case Study)	Cognitive	4	7
			CLO-4	**Determine** the corrosion rate, electrode potential and behaviour of metals and coatings through electrochemical techniques and design a prototype cathodic protection system.	Psychomotive	3	5
	MM-303	**Inspection and Testing of Materrials**	**CLO-1**	**Select** appropriate Destructive / Nondestructive testing technique for an specific application	Cognitive	5	5
			CLO-2	**Analyze** the result of destructive and nondestructive examinations	Cognitive	4	4
			CLO-3	**Explain** the use and limitations of various DT / NDT techniques	Cognitive	2	1
			CLO-4	Mini project to **use** DT and NDT techniques and **analyze**	Psychomotive	3	9
	MM-304	**Heat Treatment of Materials**	**CLO-1**	**Design** heat treatment cycles for desired properties	Cognitive	2	3
			CLO-2	**Explain** the construction of transformation diagram and various factors affecting it	Cognitive	2	2
			CLO-3	**Select** an appropriate heat treatment process to tailor microstructure for a particular application	Cognitive	5	5
			CLO-4	**Apply** heat treatment cycle on various metals with hands on experience of using furnaces	Psychomotive	4	12
	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	**Mathematic al Methods**	**CLO-1**	**Analyze** physical situations whose behavior can be described by System of linear equations.	Cognitive	4	1
			CLO-4	**Apply** appropriate methods to solve system of linear equations. EVALUATE multiple integrals. DISCUSS equations of surfaces.	Cognitive	5	2
FALL SEMESTER COURSES (TE)	**MM-305**	**Polymer and Composite Materials**	**CLO-1**	**Explain** different type of polymer and composite materials and their manufacturing routes	Cognitive	2	1
			CLO-2	**Compare** polymer and composite materials on the basis of their fundamental characteristics and applications	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	Psychomotive	3	5
	MM-308	**Materials Characterisati on and Analytical Techniques**	**CLO-1**	**Define** a characterization strategy appropriate to the issue at hand	Cognitive	1	1
			CLO-2	**Select** the most promising technique for a particular situation	Cognitive	5	12
			CLO-3	**Report** the results obtained from various characterization techniques	Cognitive	5	5
			CLO-4	**Operate under supervision** the technique used to characterize various materials	Psychomotive	3	9
	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	**Selection** of appropriate construction material keeping in view the health, safety, legal and cultural issues	Cognitive	5	6
	PF-303	**Applied Economics for Engineers**	**CLO-1**	**Comprehend** and explain basic principles of economics and engineering economics, important cost types, and engineering economics analysis method (NPV, IRR, Profitability Index, Payback period, benefit-cost ratio etc) descriptively.	Cognitive	2	6
			CLO-2	**Apply** engineering economics principles and analysis method to solve real world problems.	Cognitive	3	6
			CLO-3	**Use** computer tools such as Excel spreadsheets for analysis.	Cognitive	3	5
	HS-403	**Enterpreneurship**	**CLO-1**	**Identify** the ethical and legal practices in entrepreneurship applied in business world.	Cognitive	1	6
			CLO-3	**Know** the actual cases of successful and unsuccessful entrepreneurial initiatives and are able to **analyze** different cases both actual and imaginary by applying the theoretical concepts	Cognitive	4	12
			CLO-4	**Demonstrate** an understanding of taught concepts through a **business plan development** that integrates all technical dimensions of a successful business start up	Cognitive	6	9
	MT-441	**Advance Mathem atical Techniq ues**	**CLO-1**	To **develop** numerical methods as an alternate to analytical methods of mathematics.	Cognitive	6	2
			CLO-3	To **apply** numerical methods to different complex engineering problems.	Cognitive	3	1

SPRING SEMESTER COURSES (BE)	**MM-404**	**Phase Transformation in Materials**	**CLO-1**	**Interpret** phase diagrams in relation to the development of microstructure	Cognitive	5	2
			CLO-2	**Correlate** microstructure and properties	Cognitive	4	12
			CLO-3	**Analyse** the nucleation and growth mechanism and distribution of phases	Cognitive	4	5
			CLO-4	**Apply** different heat treatment processes to nucleate desired phases in materials	Psychomotive	4	11
	MM-411	**Nanomaterials and Nanotechnology**	**CLO-1**	**Compare** and **contrast** the properties of nano structured materials with conventional materials	Cognitive	4	2
			CLO-2	**Understanding** the equipment and processes avaialable to synthesize and characterize the nanostructured materials	Cognitive	2	5
			CLO-3	**Identify** the role of nano materials and nano technology on environment and sustainablity	Cognitive	1	7
	MM-412	**Surface Engineering**	**CLO-1**	**Describe** tribological properties and different surface engineering techniques	Cognitive	2	1
			CLO-2	**Evaluate** merits and demerits of different coating processes keeping in view of the environmental concerns	Cognitive	5	7
			CLO-3	**Apply** knowledge of surface engineering to enhance the surface properties keeping in view the health, safety, legal and cultural issues	Psychomotive	4	6
	MM-413	**Nuclear Materials**	**CLO-1**	**Describe** various types of nuclear reactors	Cognitive	2	1
			CLO-2	**Propose** materials for a given nuclear reactor component	Cognitive	5	3
			CLO-3	**Illustrate** the health, safety, legal and cultural issues in nuclear reactors and related materials	Cognitive	3	6
	MM-414	**Total Quality Management**	**CLO-1**	**Define** quality management philosophies and frameworks.	Cognitive	1	5
			CLO-2	**Describe** tools and techniques of quality management.	Cognitive	2	6
			CLO-3	**Apply** quality tools and techniques in management.	Cognitive	3	12
	MM-410	**Materials Engineering Project**	(ALL PLOs are covered in FYP)				1--12
FALL SEMESTER COURSES (BE)	**MM-402**	**Designe and Selection of Materials**	CLO-1	**Evaluate** the role of function, material, process, and shape during design and selection of materials	Cognitive	5	6
			CLO-2	**Complete** the process of material selection using Material property charts	Cognitive	3	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	2	5
	MY-402	**Advance Materials**	**CLO-1**	**Explain** properties and applications of advanced materials	Cognitive	2	1
			CLO-2	**Compare and Contrast** processing and characterization on different types of advanced materials	Cognitive	4	4
			CLO-3	**Comprehend** the environmental and safety issues associated with new materials	Cognitive	2	7
	MM-415	**Matrials Deformation & Failure: Mechanism and Analysis**	**CLO-1**	**Explain** 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	2	4
			CLO-3	**Forumlate** a report on root cause analysis of a particular failure and present the findings	Affective	4	10
	MM-409	**Biomedical and Functional Materials**	**CLO-1**	**Comprehend** the basic knowledge of biomedical and functional materials	Cognitive	2	1
			CLO-2	**Illustrate** the processes for the preparation of biomaterials / functional materials	Cognitive	4	3
			CLO-3	**Evaluation** of biomedical and functional materials	Cognitive	5	4
	MM-410	**Materials Engineering Project**	(ALL PLOs are covered in FYP)				1--12
	IM-417	**Health, Safety and Enviornment**	**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.	Psychomotive	3	9