TABLE 1: MAPPING OF COURSES

Knowledge profile	Courses with Code		Course Learning Outcomes (CLOs)	Taxonomy Domain	PLOs Addressed by Course (PLO No.)
WK1	BS1-101	Islamic Studies	To know about Quran, Hadith, life of Holy Prophet (S.A.W), Holy Wars and Pillars of Islam	C1	The Engineers and Society (vi)
			To explain Islamic heritage, civilization, solution to humanitarian problems, oneness, and importance of honest character	C2	Ethics (viii)
			To practice ways for avoiding sins, and employ Sidq.	C3	Ethics (viii)
WK2	BS1-122	Calculus	To know about different types of function, their graphs, limits, continuities, derivatives and integrations.	C1	Engineering Knowledge (i)
			Describe the concept of differential calculus.	C2	Problem Analysis (ii)
			Apply calculus to the problems involving rate of change, optimization, area under and between the curves, volumes, are length and area of surface of revolution etc;	C3	Design and Development of Solution (iii)
	IE-115	Introduction to computing	Know about computer hardware, software's, programming languages and communication networks	C1	Engineering Knowledge (i)
			Practice word processing, spread sheet, presentation software's, and different programming languages	C3	Modern Tool Usage (v)
	IE-115L	Introduction to computing lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)

			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	BSI-231	Differential Equations	To know about various types of differential equations and their solution procedures (Knowledge).	C1	Engineering Knowledge (i)
			Describe concepts of equations, differential equations, and partial differential equations.	C2	Problem Analysis (ii)
			To solve different types of differential equations by understanding fundamental methods and techniques	C3	Design and Development of Solution (iii)
	BSI-111	Applied Linear Algebra	To know about the systems of equations	C1	Engineering Knowledge (i)
			To describe different concepts of linear algebra, matrices and linear transformation	C2	Problem analysis (ii)
			To solve engineering and science problems with the help of systems of equations.,	C4	Design/development of solutions (iii)
	BSI-351	Probability and Statistics	To discuss different methods and concepts use for the organization and description of a numerical data set. (Comprehension	C2	Problem Analysis (ii)
			To apply different concepts such as measure of central tendency, dispersion, regression, and probability distribution. (Applications)	C3	Investigation (iv)
			To defend the decision taken on the basis of statistical techniques. (Evaluation)	C6	Design and Development of Solution (iii)
	IE-360	Industrial System Simulation	To know the fundamental concepts and techniques of discrete-event modelling & simulation in the context of manufacturing systems	C1	Engineering Knowledge (i)
			To apply the mathematical and statistical techniques to transform the real-world system into a simulation model	C3	Modern Tool Usage (v)
			To verify, validate and interpret the results of simulation model	C6	Investigation (iv)
	IE-360L	Industrial System Simulation Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)

			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-401	Management Information System	To know about different types of industrial information, retrieval systems, data processing technologies, networking, data backup and security and databases. (knowledge)	C1	Engineering Knowledge (i)
			To apply various information processing methods and develop different industrial databases (Application).	C3	Engineering Knowledge (i)
			To analyze secure networks and databases. (Evaluation)	C4	Problem Analysis(ii)
	IE-401L	Management Information System Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)

			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
WK3	BSI-142	English Composition and Comprehension	Practice English composition correctly in speaking and writing	C3	Communication (x),
			Show sound vocabulary and critical thinking skills, to use English in formal situations	C2	Communication (x),
	IE-111	Basic Industrial Electronics	Describe fundamental concepts and working principles of semiconductor devices, transducers, modulation, demodulation, and microprocessors based digital systems	C2	Engineering Knowledge (i)
			Apply the theory and methods for analysis of electric circuits, operational amplifier, and digital logic design.	C3	Problem Analysis (ii)
	IE-111L	Basic Industrial Electronics Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	BSI-110	Pakistan Studies	To know about Pakistan’s historical perspective, geo location, constitutional phases, contemporary affairs, and future challenges	C1	The Engineers and Society (vi)
			To summarize major events and life of prominent personalities related to Pakistan.	C5	The Engineers and Society (vi)

			To assess national institutions, social issues, Ethincity, Foerign policy and future challenges.	C6	The Engineers and Society (vi)
	IE-313	Introduction to thermofluids	To be able to recognize the role of thermo fluids in industry	C1	Engineering knowledge (i)
			To comprehend basic concepts of thermodynamics, fluid mechanics, refrigeration and air conditioning	C2	Engineering knowledge (i)
			To be able to apply basic formulae of thermo fluids for calculation of various thermal cycles, fluids and their flows	C3	Problem Analysis (ii)
	IE-313L	Introduction to thermofluids Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-367	Industrial Maintenance and Safety	To organize different types of safety and maintenance along with water and environmental issues for better decision making on economical, legal and humanitarian grounds.	C5	The Engineers and Society (vi)
			To assess air emissions, waste, safety, and maintenance management systems	C6	Environment and Sustainability (vii)
WK4	IE-118L	Engineering Drawing and Graphics Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)

			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-235	Materials Engineering	Understand engineering materials, their types, and classification of materials. (Comprehension)	C2	Engineering knowledge (i)
			To discuss the structure, mechanical and physical properties of materials, and their applications (Application)	C3	Problem analysis (ii)
			To outline the properties of engineering materials, heat treatment processes. (Analysis)	C4	Engineering Knowledge (i)
			To be able to outline the environmental effects of materials (Application)	C3	The Engineer and society(vi)
	IE 235L	Materials Engineering Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-356	Operation Research	Formulate real life problems into optimization problems	C4	Problem Analysis (ii)

			Apply different optimization methods and techniques especially on linear programming problems, and queuing problems	C3	Design and Development of Solution (iii)
			To interpret solution obtained from different optimization methods and softwares	C6	Investigation (iv)
	IE-356L	Operation Research Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-324	Projects Management	Understand project management terminologies, project management knowledge areas and project life cycle (Comprehension)	C2	Project Management (xi)
			Apply project management tools and communication techniques. (Application)	C3	Project Management (xi)
			Analyze and manage risks and progress of a project (Analysis)	C4	Project Management (xi)
	IE-324L	Projects Management Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)

			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-366	Production Planning and Control	To be able to know about production, forecasting, inventory, scheduling, aggregate and capacity planning. (Knowledge)	C1	Engineering Knowledge(i),
			Apply the quantitative models of productivity, forecasting, production planning, scheduling, inventory control and capacity planning (Application)	C3	Problem Analysis (ii),
			Evaluate appropriate production model for a manufacturing environment. (Evaluation)	C6	Design/Development of Solutions (iii)
	IE-366L	Production Planning and Control Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)

			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-472	Design of Experiment	Know the importance of basic principles in engineering experimental design in conducting experiments and strategies in planning and conducting experiments	C1	Engineering Knowledge (i)
			Design an appropriate hypothesis and drawing appropriate conclusion through statistical analysis	C5	Design and Development of Solution (iii)
			Analyze experimental data through analysis of variance (ANOVA)	C4	Problem Analysis (ii)
			Choose an appropriate experiment to evaluate a new product design or process improvement through experimentation strategy, data analysis, and interpretation of experimental results using factorial design approach	C6	Investigation (iv)
	IE-358	Industrial Facilities Design	To acquire the knowledge and understanding of the different stages of Location Analysis, Facilities Planning, Layouts, and Material Handling Systems.	C1	Engineering Knowledge (i)
			To solve Facility Location and Layout problems by Applying analytical facilities location and layout methods.	C3	Engineering Knowledge (i)
			To design and propose layout and material handling systems.	C5	Design/Development of Solutions(iii)
	IE-358L	Industrial Facilities Design Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)

			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-412	Operations of Manufacturing Systems	To know concepts and applications of material requirement planning (MRP), enterprise resource planning (ERP), just in time production. (Knowledge)	C1	Engineering Knowledge (i)
			Apply forecasting and inventory models and techniques to create and recommend appropriate stocking solutions in various organizations. (Application)	C3	Design and Development of Solution (iii)
			To assess and justify push, pull and hybrid system, the key drivers of supply chain performance and their inter-relationships with strategy and other functions of the company such as marketing, manufacturing, and accounting. (Evaluation)	C6	Investigation (iv)
	IE-412L	Operations of Manufacturing Systems Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-480	Metal Forming and Cutting Analysis	To know about metal forming and machining processes and its classification.	C1	Engineering Knowledge (i)
			To analyze the forming processes and the effect of tool material and tool geometry. To determine cutting mechanisms, materials and material removal operations.	C4	Problem Analysis (ii)

			To explain the machine performance and its optimization. Able to design of jigs and fixtures.	C5	Design and Development of Solution (iii)
	IE-480L	Metal Forming and Cutting Analysis Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
WK5	IE-114	Engineering Mechanics	Determine Resultant of force vectors using Scalar or Vector approach. Compute moments about a point and about an axis by Scalar or Vector approach. Determine couple, draw Free Body Diagram and apply equations of equilibrium in 2 and 3 dimensions	C3	Engineering Knowledge (i)
			Analyze structures such as trusses, joints and friction in mechanical elements. Determine work and energy problems.	C4	Problem Analysis (ii)
	IE-114L	Engineering Mechanics Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)

			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE 237	Mechanics of Materials	Know the theory based concept of mechanics of deformable bodies, stress, strain, deformation, torsion, bending, and failure criteria.	C1	Engineering knowledge (i)
			Calculate the shear, torsional, axial, and bending stresses which occur at a point or which act on a section, and express this state of stress either algebraically or graphically using Mohr's Circle for Stress	C3	Engineering knowledge (i)
			To analyze deflection, angle of twist, power transformation in circular shafts, yield and failure criteria of materials	C4	Problem Analysis (ii)
	IE 237L	Mechanics of Materials Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
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			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-223	Machine Deisgn and CAD	To be able to recognize the role of machine design and CAD in Industrial Engineering and industry	C1	Engineering Knowledge (i)
			To comprehend the basic concepts of machine design and applications & benefits of CAD	C2	Engineering Knowledge (i)

			To be able to apply basic formulae of design of Shafts, pulleys, belts, keys, cotters, couplings, Welded and riveted joints etc.	C3	Problem Analysis (ii)
	IE-223L	Machine Deisgn and CAD Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-352	Manufacturing System	To define the basic concept of lean manufacturing, flexible manufacturing, cellular manufacturing and material handling system	C1	Engineering Knowledge (i)
			Have skills to analyze the different manufacturing systems, material handling system and assembly lines	C4	Problem Analysis (ii)
			Be able to design and improve the manufacturing system and its relative parameters	C5	Design and Development of Solution (iii)
	IE-352L	Manufacturing System Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)

			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-355	Work Study and Method Engineering	Acquire knowledge of work study, time study its measurement, applications, and limitations.	C1	Engineering Knowledge (i)
			Apply time and motion study principles for calculating various dimensions of time and motion study on existing methods and improved methods.	C3	Investigation (iv)
			Evaluation of improvement in proposed method by optimizing work techniques in human machine systems utilizing pre-determined motion time studies (PMTS), and standard times principles.	C6	Design and Development of Solution (iii)
	IE-355L	Work Study and Method Engineering Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE- 414	Human Resource Management	To describe basic theories and practice of HRM and its role in industry	C2	Engineering Knowledge (i)

			Examine basic concepts of HRM including Job analysis and design, hiring and firing, salary and wages, job appraisal, human factor, facilities, rewards and bonuses	C3	Investigation (iv)
			Synthesize basic concepts of Human Resource Management for an industrial application (Application).	C5	Design and Development of Solution (iii)
	IE-416	Computer Integrated Manufacturing (CIM)	To know about CIM, its importance, applications, flow diagrams, decision support systems, computer networks and IDEF Models. (Knowledge)	C1	Engineering Knowledge (i)
			To assess and justify CIM usage and its investment and integration impact (Evaluation).	C6	Problem Analysis (ii)
			To apply decision support system for CIM investment and implementation. (Application)	C3	Design and Development of Solution (iii)
	IE-416L	Computer Integrated Manufacturing (CIM) Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-430	Tool and Die Design	To describe tool and die, their design parameters, and different presses	C2	Engineering Knowledge (i)
			Discuss different types of tools for inspection, gauging, presses, die casting etc;	C3	Problem Analysis (ii)

			Design different types of tools and die for industrial applications	C5	Design and Development of Solution (iii)
	IE-430L	Tool and Die Design Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-362	Total Quality Management	To describe quality management quality assurance, ISO 9001, Six Sigma and other TQM terms	C2	Engineering Knowledge (i)
			To examine different TQM topics mentioned in courses contents	C3	Problem Analysis (ii)
			To propose solutions on the basis of TQM principles and methods	C5	Design and Development of Solution (iii)
	IE-362L	Total Quality Management Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)

			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
WK6	IE-312	CAM	Identify and recognize the fundamental theory and concepts of CAM, NC machining, group technologies.	C2	Engineering Knowledge (i)
			Develop the concepts of NC programming of parts and underlying theory of its integration with hardware. Illustration of group technologies and its application in the design on cellular manufacturing in systems application. Develop concept of different CNC machine tools	C3	Problem Analysis (ii)
	IE-312L	CAM Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-121L	Workshop Practice	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)

			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-244	Manufacturing Processes	To be able to know basic concepts of various manufacturing processes (knowledge)	C1	Engineering Knowledge (i)
			To be able to recognize the strong interrelationships between material properties and manufacturing processes (Comprehsion)	C2	Engineering Knowledge (i)
			To be able to apply basic formulae for calculation of various process parameters (Analysis)	C4	Problem Analysis (ii)
	IE-244 L	Manufacturing Processes Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)

	BSI-243	Numerical Analysis and Computer Applications	To describe different numerical techniques such as interpolation, numerical differentiation, numerical integration, solution of nonlinear equations in one variable, systems of linear equations and numerical methods for ordinary differential equations	C2	Engineering Knowledge (i)
			To apply these techniques for the solution of applied problems	C3	Problem Analysis (ii)
	BSI-243L	Numerical Analysis and Computer Application	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-353	Metrology and SQC	Define metrology and Geometric dimensioning and tolerances (GDT), its importance and applications. (Knowledge)	C1	Engineering Knowledge (i)
			Discuss frequency distributions, and calculate measures of central tendency, dispersion, skewness	C2	Engineering Knowledge (i)
			Classify sources of variations in processes for quality improvement and calculate process capability indices	C4	Problem Analysis (ii)
			Construct control charts for variables and attributes.	C5	Design and Development of Solution (iii)
	IE-353L	Metrology and SQC Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)

			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-474	CAD/CAM	To know the fundamental theory and concepts of the CAD/CAM and CNC machines. (Knowledge)	C1	Engineering Knowledge (i)
			Apply the concepts of computer graphics and underlying theory of modeling and the usage of models in different engineering application. (Application)	C3	Problem Analysis (ii)
			Compare and distinguish between the operation and programming of a CNC machine tool using manual programming and using CAD/CAM systems. (Analysis)	C5	Design and Development of Solution (iii)
	IE-474L	CAD/CAM Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)

			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-410	Automation and Control	To know about process control fundamentals, sensors, architecture of PLC, DCS , SCADA, Relays and Robots (knowledge)	C1	Engineering Knowledge (i)
			To differentiate and use different PLCs, Sensors, and robots (Application).	C3	Modern Tool Usage (v)
			To assess and justify various control devices, microprocessors, microcontrollers and robots (Evaluation)	C6	Life-long Learning (xii)
	IE-410L	Automation and Control Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)
			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
	IE-425	Reliability Analysis	To describe basic concepts of reliability and failure.	C2	Engineering Knowledge (i)
			To be able to develop models for evaluation of reliability of a component and system.	C3	Problem Analysis (ii)
			To be able to perform testing of reliability.	C5	Investigation(iv)
WK7	IE-122	Engineering Management	Know the basic management functions, planning & decision making of organizations by applying engineering management concepts (knowledge)	C1	Engineering Knowledge (i)

			Explain organizational structures, tools for developing solutions, human aspects of management and describe elements to control them (compréhension)	C2	The engineer and society(vi)
			Analyze the market and new business ideas select methods to motivate and lead technical people (analysis)	C4	The engineer and society(vi)
	BSI-143	Presentation and Communication Skills	Practice translations, official letters, memorandums, essay writing, and reports and also be able to produce these documents in a professional manner	C3	Communication (x)
			Demonstrate communicative activities on the learned rules	C5	Communication (x)
	IE 242	Engineering Economics	To know about the fundamental concepts and terminologies used in engineering economics.	C1	Engineering Knowledge (i)
			Use engineering economy factors to account for time value of money	C3	Problem Analysis (ii)
			To evaluate the cost effectiveness of alternatives using the engineering economy methods and draw inferences for the investment decisions.	C6	Investigation (iv)
	IE-243	Logical and Critical Thinking	To discuss relationship between language and reasoning, and to define and clarify the expressions.	C2	Engineering Knowledge (i)
			To distinguish between Deductive and inductive reasoning, classify the relevant criteria or the evaluation of each kind of reasoning and differentiate formal and informal logical fallacies	C4	Investigation (iv)
			The ability to evaluate evidence, Reliable sources and other information relevant to the support of conclusions of reasoning. (Evaluate)	C6	Investigation (iv)
	IE-361	Human Factor Engineering	To know basics of ergonomics such as illustration of information by text and graphics, Climatic Factors, Noise, Vibration and its Effects of on various organs and anthropometry.	C1	The Engineers and Society (vi)
			Illustrate and apply ergonomic Principles at workplace and equipment design along with controls in advance technology.(Application)	C3	Design and development of solution (iii),
	IE-361L	Human Factors Engineering Lab	To use the proper safety gadgets, safety precautions and other resources including dressing	A3	Ethics (viii)
			To actively Contribute individually and as team member	A2	Individual and Team Work (ix)
			To Practice the Experimental Task and writing skills as per subject requirements (List of Practicals of each course)	P3	Modern Tool Usage (v)

			To be able to apply, explain, express and collect information regarding the course contents and labs	C3	Investigation (iv)
			To organize report in a given format	A4	Communication (x)
			To recognize the need and purpose of all aspects (technological change and lifelong learning)	C2	Life Long Learning (xii)
			Presenting and applying new ideas which are safe, healthy, legal, and culturally acceptable.	A3	The Engineer and Society (vi)
			To manage, executed and demonstrate all the deliverables.	P4	Project Management (xi)
			To advocate the impact of the lab and its contribution to field and society	A5	Environment and Sustainability (vii)
WK7	IE-425	Entrepreneurship	Understanding the basic concepts of Entrepreneurship, its characteristics, factors affecting entrepreneurship growth, Business plan and issues, marketing strategies	C2	Engineer & Society (vi)
			Applying the entrepreneurial concepts for preparing the process cycle of starting and managing a new venture	C3	Project Management (xi)
			Developing an entrepreneurial process individually and as team member during assignments and projects for different case studies	C5	Communication (x)
WK8	IE248	Technical Writing and Comprehension	To Know the attributes of Technical Writing and write covering letters, emails etc. for job and research grants (knowledge)	C1	Communication (x)
			To interpret and practice technical writing and reading for graphs, tables, figures and process diagrams etc. (Application).	C3	Communication (x)
			To document and present research article, research proposals, reports and thesis. (Synthesis).	C5	Communication (x)
	IE-422	Logistics Management	To describe basic concepts of supply chain and logistics management.	C2	Engineering Knowledge (i)
			To determine different logistics parameters and facilities requirement profile	C4	Problem Analysis (ii)
			To develop logistics plan for organization and customers/users.	C5	Design and Development of Solution (iii)
	IE-441	Supply chain management	Describe the role of supply chain management and logistics activities in manufacturing and service organizations.	C2	Engineering Knowledge (i)

			Analyze the increasing significance of supply chain and its impact on both costs and service in business.	C4	Investigation (iv)
			Analyze criteria and standards to achieve improved business performance by integrating and optimizing the total logistics and supply-chain process. (Synthesis)	C5	Modern Tool Usage (V)

TABLE 2: SAMPLE OF COURSE ASSESSMENT SHEET OF IE-356 OPERATIONS RESEARCH

CLO No.	Course Learning Outcomes (CLOs)	Assessment Activities & Weight Percentage		Taxonomy Domain	PLOs Addressed by Course (PLO No.)
1	Formulate real life problems into optimization problems	Quiz 1	10	C4	Problem Analysis (ii)
		Assignment 1	10		
		Mid Term Paper	40		
		Final Term Paper	40		
2	Apply different optimization methods and techniques especially on linear programming problems, and queuing problems	Quiz 2	10	C3	Engineering Knowledge (i)
		Assignment 2	10		
		Mid Term Paper	40		
		Final Term Paper	40		
3	To assess and interpret solution obtained from different optimization techniques and methods including duality and sensitivity analysis	Quiz 3	10	C6	Problem Analysis (ii)
		Assignment 3	10		
		Mid Term paper	40		
		Final Term Paper	40		