University of Engineering and Technology Lahore

Mapping of Courses to PLOs

B.Sc Electrical Engineering 2017 (Fall)

Department: Electrical Engineering

Code	Subject Title	Semester No	PLOs Emphasis ✔											
			PLO01	PLO02	PLO03	PLO04	PLO05	PLO06	PLO07	PLO08	PLO09	PLO10	PLO11	PLO12
PHY-111	Applied Physics	1	✔											
PHY-111L	Applied Physics		✔											
ME-100L	Workshop Practice		✔											
MA-123	Calculus		✔	✔										
EE-103	Introduction to Computing													
EE-103L	Introduction to Computing													
ME-110	Applied Thermodynamics		✔	✔	✔	✔	✔							
ME-110L	Applied Thermodynamics		✔		✔	✔								
MGT-103	Sociology for Engineering			✔				✔	✔					
HU-001	Basic English													
EE-101L	Electrical and Electronics Workshop				✔		✔				✔			
HU-101L	Communication Skills						✔	✔			✔	✔		
MA-228	Differential Equations		✔	✔										

Code	Title	Sem												
ME-124L	Engineering Drawing	2	✔	✔										
IS-101	Islamic & Pakistan Studies-I								✔					✔
EE-170	Programming Fundamentals		✔	✔	✔	✔								
EE-170L	Programming Fundamentals		✔	✔	✔		✔							
EE-100	Electric Circuit		✔	✔		✔								
EE-100L	Electric Circuits		✔	✔			✔							
EE-212	Semiconductor Devices	3	✔	✔	✔									
EE-212L	Semiconductor Devices		✔			✔	✔				✔			
HU-221	Technical Writing & Presentation Skills			✔		✔						✔		
MA-234	Linear Algebra		✔	✔										
EE-272	Digital Systems				✔		✔							
EE-272L	Digital Systems		✔		✔									✔
EE-110	Circuit Analysis & Design		✔	✔										
EE-110L	Circuit Analysis & Design		✔	✔							✔			
EE-213	Analog & Digital Electronic Circuits		✔	✔	✔									
EE-213L	Analog & Digital Electronic Circuits			✔			✔				✔			
EE-220	Signals and Systems		✔	✔			✔							

Code	Course	Sem												
EE-232	Data Strucures and Algorithms	4	✔	✔	✔	✔								
EE-232L	Data Strucures and Algorithms				✔		✔			✔				
MA-346	Numerical Methods			✔	✔									
EE-250	Electric Machinery Fundamentals		✔	✔		✔								
EE-250L	Electric Machinery Fundamentals		✔											
EE-340	Control Systems	5	✔	✔	✔									
EE-340L	Control Systems		✔		✔					✔				
EE-273L	Microprocessor Systems						✔				✔		✔	
EE-273	Microprocessor Systems		✔	✔	✔		✔							
EE-380	Electromagnetic Theory		✔	✔										
EE-302	Applied Probablity		✔	✔										
EE-357	Power System Analysis		✔	✔	✔									
EE-357L	Power System Analysis		✔		✔		✔							
EE-358	Power Distribution Systems		✔			✔								
EE-312	Power Electronics			✔	✔									
EE-312L	Power Electronics			✔	✔	✔								
EE-300L	Embedded Systems Laboratory													

Code	Course	Sem	1	2	3	4	5	6	7	8	9	10	11	12
IME-251	Social & Ethical Aspects in Engineering	6						✔	✔	✔		✔		
EE-322	Analog and Digital Communications		✔	✔										
EE-322L	Analog and Digital Communications					✔	✔					✔		
EE-384	Digital Signal Processing		✔		✔									
EE-384L	Digital Signal Processing						✔							
EE-499a	Project(Phase-I)	7												
IS-201	Islamic & Pakistan Studies-II													
MGT-211	Principles of Management													
EE-439	Introduction to Machine Learning													
EE-432	Computer Networks													
EE-432L	Computer Networks													
EE-436	Database Engineering													
EE-436L	Database Engineering													
EE-482L	Microwave Engineering - Passive Devices													
EE-482	Microwave Engineering - Passive Devices													
EE-483	Antenna Systems													

Code	Course	Credits												
EE-483L	Antenna Systems													
EE-461	Electric Machine Design													
EE-454L	Power System Protection													
EE-454	Power System Protection													
EE-499bL	Project(Phase-II)	8												
MGT-460	Engineering Economics													
EE-425	Wireless Communication													
EE-425L	Wireless Communication													
EE-431	Operating Systems													
EE-431L	Operating Systems													
EE-450	High Voltage Engineering													
EE-450L	High Voltage Engineering													
EE-453	Power System Operation & Control													
EE-453L	Power System Operation & Control													
EE-475	Computer Architecture													
EE-475L	Computer Architecture													
EE-476	Introduction to VLSI systems													
EE-476L	Introduction to VLSI systems													

Semester No.	Code	Title	Theory/Laboratory		CLOs Discription	Taxonomy Domain Cognitive, Pyschomotor, Affective	Taxonomy Level	PLO1 Engineering Knowledge	PLO2 Problem Analysis	PLO3 Design/ Development of Solutions	PLO4 Investigation	PLO5 Modern Tool Usage	PLO6 The Engineer and Society	PLO7 Environment and Sustainability	PLO8 Ethics	PLO9 Individual and Team Work	PLO10 Communication	PLO11 Project Management	PLO12 Lifelong Learning
Semester 1	ME 110	Applied Thermodynamics	Theory	CLO1	UNDERSTAND the fundamental principles of thermodynamics based upon its relevant application	Cognitive	Understand (2)	1											
				CLO2	ANALYZE the problems related to heat engines and air standard cycles by applying the basic laws and processes of thermodynamics	Cognitive	Analyze (4)		1										
				CLO3	UNDERSTAND the nature and role of the thermodynamics properties of matter and relevant processes.	Cognitive	Understand (2)	1											
			Laboratory	CLO1	An ability to CONDUCT experiment on bourden pressure gauge, planimeter and demonstration of basic principles of steam & gas turbine power plant, 2 stroke and 4 stroke SI and CI engines	Cognitive	Understand (2)	1											
				CLO2	To be able to PERFORM experiments on 2 stroke and 4 stroke engines and mechanical heart pump as well as ANALYSE and interpret data	Cognitive	Apply (3)				1								
				CLO3	DEMONSTRATE the ability to work in a team by participating in class activities, timely submission of assignment/lab report and to ACKNOWLEDGE the class decorum	Psychomotor	Precision (3)									1			
Elective	MGT103	Sociology	Theory	CLO1	Develop a comprehensive understanding of how this world works.	Cognitive	Apply (3)									1			
				CLO2	Demonstrate discipline of sociology in larger perspective in relation to management.	Psychomotor	Precision (3)						1						
				CLO3	Identify needs of an individual and critically evaluate their social interaction in the society	Psychomotor	Imitation (1)						1						
				CLO4	Discuss and examine practical issues, problems and other human interactions.	Psychomotor	Manipulation (2)									1			

Semester	Course	Subject	Type	CLO	Description	Domain	Level	1	2	3	4	5	6	7	8	9	10	11	12
Semester 1	ME 100L	Workshop Practice	Lab	CLO1	To follow the comprehensive technical knowledge of basic Machining, fitting & fabrication, woodworking and electrical wiring processes	Psychomotor	Imitation (1)	1											
				CLO2	To understand the basic Machining, fitting & fabrication, woodworking and electrical wiring processes and Tools to accomplish the given tasks.	Affective	Receiving (1)									1			
				CLO3	To explain the practical use of basic Machining, fitting & fabrication, woodworking and electrical wiring processes and tool handling	Cognitive	Understand (2)											1	
				CLO4	To reproduce the working procedures with precision by applying engineering knowledge and managing the activities.	Psychomotor	Precision (3)	1											
				CLO5	To be able to follow the instructions and perform the assigned tasks within given time limits.	Affective	Receiving (1)									1			
				CLO6	To perform the operations accurately and complete their tasks within group or individually.	Psychomotor	Precision (3)										1		
				CLO7	To grasp the instructions related to personal protective equipment (PPE) and implement them carefully	Psychomotor	Imitation (1)							1					
				CLO8	Students are supposed to conform disciplinary and safety precautions during presence in workshop	Affective	Responding (2)							1					
Semester 1	PHY111	Applied Physics	Theory	CLO1	Demonstrate understanding of the mathematical concepts required to describe electromagnetism and apply Gauss's Law to solve practical problems.	Cognitive	Understand (2)	1											
				CLO2	Use Ampere's Law to calculate magnetic fields and apply Faraday's Law to various physical problems. Demonstrate understanding of the integral form of Maxwell's equation including the implications of the displacement current in Ampere's Law	Cognitive	Understand (2)	1											
				CLO3	Students will be able to calculate the electric fields produced by continuous uniform and non-uniform charge distributions. Students will also be able to solve the problems involving electric flux to calculate the electric field in different configurations using Gauss's Law. Students will also be able to determine the force on charged particle thrown in a constant magnetic field. They will also be able to know about the concentration and flow of charge carriers using Hall effect.	Cognitive	Understand (2)	1											
				CLO4	Students will be able to distinguish between different types of waves and how to develop the wave equations? It will be easy for students to calculate the intensity of sound waves. They can also employ the Doppler effect to study and understand different physical phenomena occurring in laboratory as well as in space.	Cognitive	Understand (2)	1											
				CLO5	Students will understand the basic concepts of optics which will help them to understand the underlying physic of fiber optics. Students will be able to differentiate between different types of lenses and their usages in different optical instruments. Students will also be able to prove laws of refraction and diffraction on the basis of wave nature of light	Cognitive	Understand (2)	1											
			Laboratory	CLO1	Be able to perform experiments related to Applied Physics	Pyschomotor	Manipulation (2)	1											
				CLO2	Be able to interpret experimental results in written and graphical format	Cognitive	Understand (2)	1											

Semester	Course	Title	Type	CLO	Description	Domain	Level	1	2	3	4	5	6	7	8	9	10	11	12
Semester 1	MA 123	Calculus	Theory	CLO1	Demonstrate understanding of the key concepts of single variable calculus, graphs, and matrices	Cognitive	Apply (3)	1											
				CLO2	Apply differential calculus to solve practical problems.	Cognitive	Apply (3)	1											
				CLO3	Evaluate double integrals and line integrals.	Cognitive	Evaluate (5)		1										
				CLO4	Apply techniques of surface integration and triple integration to real-world problems	Cognitive	Apply (3)		1										
Semester 1	CS 141	Introduction to Computing	Theory	CLO1	Use standard programming constructs such as loops, conditionals, functions, recursion, and aggregated data	Cognitive	Apply (3)	1											
				CLO2	Test and debug Python code	Cognitive	Apply (3)	1											
				CLO3	Solve simple problems using object-oriented design	Cognitive	Apply (3)		1										
				CLO4	Apply elementary statistical techniques to real-world problems.	Cognitive	Apply (3)		1										
			Laboratory	CLO1	Design and execute fully functional programs based on the requirements of the user	Psychomotor	Imitation (1)		1										
				CLO2	Conduct testing and debugging process on the program written.	Psychomotor	Manipulation (2)			1									
				CLO3	Master the programming skills to design and develop enhanced software programs.	Psychomotor	Manipulation (2)		1										

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Semester 2	EE 101	Electrical and Electronics Workshop	Laboratory	CLO1	Demonstrate the basic tools needed for Electrical and Electronics Workshop	Psychomotor	Precision (3)					1							
				CLO2	Construct a Vero-Board based circuit for different electrical & semiconductor circuits	Psychomotor	Articulation (4)			1									
				CLO3	Develop and design of printed circuit boards for electrical & semiconductor circuits	Psychomotor	Articulation (4)					1							
				CLO4	Demonstrate the working of different electrical actuators, transducers and wiring schemes.	Psychomotor	Precision (3)									1			
Semester 2	EE100	Electric Circuits	Theory	CLO1	Identify basic v-i characteristics of resistors, capacitors and inductors.	Cognitive	Remember (1)		1										
				CLO2	Analyze resistive circuits using node and loop analysis techniques with independent and dependent voltage/current sources.	Cognitive	Analyze (4)			1									
				CLO3	Analyze electric circuits using active and passive elements.	Cognitive	Analyze (4)		1										
				CLO4	Evaluate dynamic behavior of first-order (RC, RL) circuits by solving differential equations.	Cognitive	Evaluate (5)				1								
			Laboratory	CLO1	Familiarity with lab equipment	Psychomotor	Imitation (1)	1											
				CLO2	Patching and analyzing an electric circuit	Psychomotor	Precision (3)									1			
				CLO3	Design and implementation of a complex circuit	Cognitive	Analyze (4)			1									

Semester	Code	Course	Type	CLO	Description	Domain	Level	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
Semester 2	ME 124L	Engineering Drawing	Laboratory	CLO1	Construct orthographic projections of given isometric views using drawing basic visualization principles and projections theory	Psychomotor	Manipulation (2)	1											
				CLO2	Student will be able to Explain object form, proportions and justify design details using drawing knowledge	Psychomotor	Precision (3)		1										
Semester 2	IS 101	Islamic and Pakistan Studies-I/Ethics	Theory	CLO1	Comprehend the basic teachings of Islam in the light of Qur'an and Sunnah and ethical and moral teachings of contemporary religions	Cognitive	Understand (2)								1				
				CLO2	Identify the ethical and social ways of life and evaluate un-social values and extremism	Affective	Receiving (1)								1				
				CLO3	Describe the ideology of Pakistan and its historical emergence that culminated in the formation of Pakistan	Affective	Receiving (1)												1
Semester 2	EE 170	Programming Fundamentals	Theory	CLO1	Identify the basic components of C programming and explain the basics functions of compilers and linkers	Cognitive	Understand (2)	1											
				CLO2	Apply basic programming knowledge to debug and dry run the program in C language	Cognitive	Apply (3)		1										
				CLO3	Understand, analyze and demonstrate problem-solving skills using algorithms, and apply the acquired knowledge to develop short computer programs in C language	Cognitive	Analyze (4)			1									
				CLO4	Assess engineering problems and implement them using C	Cognitive	Evaluate (5)	1											
			Laboratory	CLO1	Design and execute fully functional programs based on the requirements of the user.	Psychomotor	Imitation (1)			1									
				CLO2	Conduct testing and debugging process on the code.	Psychomotor	Manipulation (2)				1								
				CLO3	Master the programming skills to design and execute enhanced software programs.	Psychomotor	Manipulation (2)			1									
Semester 2	HU 104	Communication Skills	Theory	CLO1	Developing fluency, accuracy and self-confidence.	Cognitive	Remember (1)										1		
				CLO2	Developing presentation skills & polishing the use of multimedia	Cognitive	Understand (2)					1							
				CLO3	Developing ethics in students' communication	Cognitive	Understand (2)								1				
Semester 2	MA 228	Differential Equations	Theory	CLO1	Solve first order (linear or nonlinear) and higher order ODEs with their application	Cognitive	Apply (3)	1											
				CLO2	Use Laplace transform to solve initial value problems.	Cognitive	Apply (3)		1										
				CLO3	Develop the understanding of separation of variables and the use of Fourier series to solve PDEs.	Cognitive	Apply (3)		1										

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Semester 3	EE 212	Semiconductor Devices	Theory	CLO1	Explain basic theory, fundamentals and operation of semiconductor devices	Cognitive	Understand (2)	1											
				CLO2	Apply concepts of semiconductor devices to design and analyze circuits.	Cognitive	Apply (3)			1									
				CLO3	Explain basic understanding of transistors, BJT biasing, BJT amplifiers, JFETS, MOSFETs and their applications.	Cognitive	Understand (2)		1										
				CLO4	Explain special semiconductor electronic devices and diodes, their scope of electronics in modern applications and explain semiconductor device fabrication techniques	Cognitive	Apply (3)	1											
			Laboratory	CLO1	Build electronic circuits to investigate characteristics of basic semiconductor devices	Psychomotor	Manipulation (2)	1											
				CLO2	Demonstrate the application of diodes as rectifiers, multipliers, logic gates, regulators, clippers and wave shapers	Psychomotor	Precision (3)	1											
				CLO3	Develop a group project working in a team environment	Psychomotor	Articulation (4)									1			

Semester	Course	Course Name	Type	CLO	Description	Domain	Taxonomy Level	1	2	3	4	5	6	7	8	9	10	11	12
Semester 3	EE 110	Circuit Analysis and Design	Theory	CLO1	Analyze the second-order RLC circuit analysis techniques	Cognitive	Analyze (4)		1										
			Theory	CLO2	Analyze RLC circuits using phasor analysis and Laplace Transform.	Cognitive	Analyze (4)		1										
			Theory	CLO3	Evaluate RLC circuits by applying s-domain analysis techniques including frequency response of simple circuits.	Cognitive	Evaluate (5)	1											
			Theory	CLO4	Analyze the working of single-phase ideal transformer and single phase and three-phase ac power systems	Cognitive	Analyze (4)		1										
			Laboratory	CLO1	Demonstrate the basic concepts related to series RC, RL, RCL and parallel RCL.	Affective	Valuing (3)		1										
			Laboratory	CLO2	Demonstrate power flow in single phase and three phase ac power system and parameter calculations for two-port networks.	Affective	Valuing (3)	1											
			Laboratory	CLO3	Perform the MATLAB based simulation to check the Laplace transform and S-domain analysis of various circuits.	Affective	Organization (4)								1				
Semester 3	EE 272	Digital Systems	Theory	CLO1	Design combinational logic circuits.	Cognitive	Create (6)			1									
			Theory	CLO2	Design sequential logic circuits using data path and controller paradigm.	Cognitive	Create (6)			1									
			Theory	CLO3	Describe combinational and sequential logic circuits in the Verilog hardware descriptive language (HDL).	Cognitive	Apply (3)				1								
			Laboratory	CLO1	Implement Boolean functions and demonstrate techniques for simplification of boolean functions.	Psychomotor	Manipulation (2)	1											
			Laboratory	CLO2	Design combinational and sequential circuits using a software tool	Psychomotor	Naturalization (5)		1										
			Laboratory	CLO3	Show a practical implementation of a digital system	Psychomotor	Precision (3)											1	
			Laboratory	CLO4	Report calculations, design summary, desired results and implementation details of module	Affective	Responding (2)										1		

Semester	Code	Course		CLO	Description	Domain	Level	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
Semester 3	HU 221	Technical Writing and Presentation Skills	Theory	CLO1	Learning principles of effective Technical Writing and Presentation Skills to develop proficiency in written and oral communication	Cognitive	Understand (2)											1	
				CLO2	Developing effective writing strategies for devising clear, concise and meaningful documents ranging from Memos, Emails, Business Letters to CV Writing.	Cognitive	Apply (3)		1										
				CLO3	Providing an effective framework for the development and presentation of Technical and Research Reports to the target audience.	Cognitive	Analyze (4)			1									
Semester 3	MA 234	Linear Algebra	Theory	CLO1	Recognize and solve system of linear equations, then apply to flow models.	Cognitive	Remember (1)	1											
				CLO2	Analyze the finite and infinite dimensional linear spaces and their bases	Cognitive	Analyze (4)		1										
				CLO3	Evaluate the Eigen values and Eigen vectors by using the characteristic polynomial.	Cognitive	Evaluate (5)		1										
				CLO4	Exemplify linear transformations in Rn and distinguish linear transformation from non-linear mappings	Cognitive	Understand (2)	1											

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Semester 4	EE 213	Analog and Digital Electronic Circuits	Theory	CLO1	Understand fundamental knowledge of BJT amplifiers (MOSFETs, JFETS) and biasing circuits	Cognitive	Understand (2)	1											
				CLO2	Analysis of small signal transistors, single stage and multistage amplifiers and their frequency response.	Cognitive	Analyze (4)		1										
				CLO3	Design and analyze power amplifiers, and their modern applications.	Cognitive	Analyze (4)			1									
				CLO4	Design of switching circuits and understanding the concept of positive/negative feedback, oscillators and multivibrators.	Cognitive	Analyze (4)			1									
			Lab	CLO1	Demonstrate the basic operation of digital and analog circuits, and frequency response of various amplifiers.	Psychomotor	Precision (3)		1										
				CLO2	Modern tool usage to simulate digital and analog electronic circuits.	Psychomotor	Articulation (4)					1							
				CLO3	Inculcate team work and project management skills	Psychomotor	Manipulation (2)									1			
Semester 4	EE 220	Signals and Systems	Theory	CLO1	Understand the mathematical foundations of continuous-time and discrete-time signals and systems	Cognitive	Understand (2)	1											
				CLO2	Analyze signals and systems via the Fourier and z transforms	Cognitive	Analyze (4)		1										
				CLO3	Evaluate LTI systems using software	Cognitive	Evaluate (5)					1							

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Semester 4	EE 250	Electric Machinery Fundamentals	Theory	CLO1	Apply the concepts of magnetic circuits for the performance evaluation of electrical machines	Cognitive	Apply (3)	1											
			Theory	CLO2	Evaluate the operation and characteristics of DC machines	Cognitive	Evaluate (5)		1										
			Theory	CLO3	Analyze the performance of transformers and three phase machines	Cognitive	Analyze (4)		1										
			Theory	CLO4	Assess the operation of synchronous machines in a power system	Cognitive	Analyze (4)			1									
			Lab	CLO1	Demonstrate and analyze the characteristics of AC machines.	Psychomotor	Analyze (4)	1											
			Lab	CLO2	Demonstrate and analyze the characteristics of DC machines	Psychomotor	Analyze (4)	1											
Semester 4	EE 232	Data Structures and Algorithms	Theory	CLO1	Understand algorithm analysis in terms of their computational time	Cognitive	Understand (2)	1											
			Theory	CLO2	Understand various data structures.	Cognitive	Understand (2)		1										
			Theory	CLO3	Understand working of sorting, searching and graph algorithms.	Cognitive	Understand (2)		1										
			Theory	CLO4	Develop solutions for engineering problems related to data structures and algorithms.	Cognitive	Create (6)			1									
			Laboratory	CLO1	Demonstrate basic programming skills including good programming practices, using modern tools.	Psychomotor	Manipulation (2)					1							
			Laboratory	CLO2	Develop applications of various data structures utilizingprogramming expertise.	Psychomotor	Articulation (4)			1									
			Laboratory	CLO3	Present the developed solution effectively to enhance written and oral skills.	Affective	Responding (2)										1		
Semester 4	MA 346	Numerical Methods	Theory	CLO1	To develop understanding of different types of errors, finding roots of non-linear equations, and solving systems of algebraic equations.	Cognitive	Understand (2)		1										
			Theory	CLO2	The ability to perform numerical differentiation and numerical integration of data to polynomials and functions.	Cognitive	Apply (3)		1										
			Theory	CLO3	The ability to obtain an intuitive and working understanding of some numerical methods for the numerical approximations of basic physical and engineering problems.	Cognitive	Apply (3)		1										

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Semester 5	EE 373	Microprocessor Systems	Theory	CLO1	Recognize the key building blocks of an embedded system and fundamental attributes used to differentiate among different processor architectures.	Cognitive	Remember (1)	1											
				CLO2	Explain Cortex-M based ARM Microprocessor/microcontroller architecture.	Cognitive	Understand (2)	1											
				CLO3	Design and develop the system firmware using ARM assembly as well as C programming.	Cognitive	Create (6)					1							
				CLO4	Identify the need for different available digital and analog interfaces in a microcontroller as well as their use to perform a specific task.	Cognitive	Remember (1)		1										
				CLO5	Recognize the underlying tradeoffs when using different interfaces and hardware-software synchronization mechanisms.	Cognitive	Remember (1)			1									
			Laboratory	CLO1	Demonstrate the correct use of basic programming constructs and design fully functional programs	Psychomotor	Precision (3)					1							
				CLO2	Perform hardware interfacing on a microcontroller platform effectively as an individual or in a team.	Psychomotor	Manipulation (2)									1			
				CLO3	Design and implement a project to master programming skills.	Psychomotor	Naturalization (5)											1	

Semester	Course	Course Title	Type	CLO	Description	Domain	Taxonomy Level	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
Semester 5	EE 340	Control Systems	Theory	CLO1	Apply the concept of mathematical modeling and block diagram construction for LTI systems in conventional and state-space form	Cognitive	Apply (3)	1											
			Theory	CLO2	Evaluate time-domain performance and response parameters of first and second order control systems	Cognitive	Evaluate (5)		1										
			Theory	CLO3	Analyze the stability of control systems using frequency response and root-locus methods along with the selection of suitable controllers (P, PI and PID)	Cognitive	Analyze (4)		1										
			Lab	CLO1	Report the results of a given Complex Engineering Problem/Lab assignment	Affective	Responding (2)										1		
			Lab	CLO2	Complete tasks based on linear control systems in laboratory	Psychomotor	Precision (3)	1											
			Lab	CLO3	Build a control system based on given specifications	Psychomotor	Manipulation (2)		1										
Semester 5	EE 302	Applied Probability	Theory	CLO1	Apply elements of probability theory to various problems in engineering	Cognitive	Apply (3)	1											
			Theory	CLO2	Determine densities/distributions and expectations of discrete and continuous, single and multiple, random variables	Cognitive	Apply (3)		1										
			Theory	CLO3	Apply second moment theory to random processes	Cognitive	Apply (3)	1											
Semester 5	EE 357	Power System Analysis	Theory	CLO1	Apply the per unit model to calculate network parameters.	Cognitive	Apply (3)	1											
			Theory	CLO2	Apply the concept of flux linkages and voltage drop for the calculation of inductance and capacitance of transmission lines.	Cognitive	Apply (3)	1											
			Theory	CLO3	Analyze basic operation, behaviour, and modelling of transmission lines under steady state conditions.	Cognitive	Analyze (4)		1										
			Theory	CLO4	Solve load flow problem using numerical techniques.	Cognitive	Apply (3)		1										
			Theory	CLO5	Design of an overhead high voltage transmission line.	Cognitive	Create (6)			1									
			Lab	CLO1	Demonstrate the basic operation and performance of a transmission line under steady-state conditions.	Psychomotor	Precision (3)	1											
			Lab	CLO2	Perform load flow analysis using modern simulation tools.	Psychomotor	Precision (3)				1								
			Lab	CLO3	Demonstrate the application of basic compensation techniques in the planning of an interconnected power system	Psychomotor	Manipulation (2)		1										

Semester 5	EE 380	Electromagnetic Theory	Theory	CLO1	Explain space time electromagnetic waves based on Maxwell equations	Cognitive	Understand (2)		1											
				CLO2	Evaluate behavior of static electric fields	Cognitive	Evaluate (5)	1												
				CLO3	Evaluate behavior of steady electric currents and their associated static magnetic fields	Cognitive	Evaluate (5)	1												
				CLO4	Analyze time-varying magnetic field and Faraday's law for quasi-static approximation. .	Cognitive	Analyze (4)		1											

Semester No.	Code	Title	Theory/Laboratory		CLOs Discription	Taxonomy Domain Cognitive, Pyschomotor, Affective	Taxonomy Level	PLO1 Engineering Knowledge	PLO2 Problem Analysis	PLO3 Design/ Development of Solutions	PLO4 Investigation	PLO5 Modern Tool Usage	PLO6 The Engineer and Society	PLO7 Environment and Sustainability	PLO8 Ethics	PLO9 Individual and Team Work	PLO10 Communication	PLO11 Project Management	PLO12 Lifelong Learning
Semester 6	EE 322	Analog and Digital Communications	Theory	CLO1	Compute time and frequency domain behavior of signals and noise in context of a communication systems	Cognitive	Apply (3)	1											
				CLO2	Analyze amplitude and angle modulation/demodulation and their variants	Cognitive	Analyze (4)		1										
				CLO3	Analyze the performance of digital modulation techniques in AWGN channels.	Cognitive	Analyze (4)		1										
			Lab	CLO1	Perform hardware experiments for Analog modulation/ demodulation techniques as well as sampling of Analog signals	Psychomotor	Manipulation (2)					1							
				CLO2	Develop software simulations to observe the performance of digital communications systems	Psychomotor	Articulation (4)					1							
				CLO3	Report desired results, proofs and calculations	Affective	Responding (2)										1		

Semester	Course	Course Title	Type	CLO	Description	Domain	Level	1	2	3	4	5	6	7	8	9	10	11	12	13
Semester 6	EE 384	Digital Signal Processing	Theory	CLO1	Apply mathematical tools needed to analyze discrete-time systems	Cognitive	Apply (3)	1												
			Theory	CLO2	Design single-rate and multirate discrete-time filters.	Cognitive	Create (6)			1										
			Theory	CLO3	Classify different implementation structures of discrete-time filters	Cognitive	Understand (2)	1												
			Lab	CLO1	Develop MATLAB scripts to analyze discrete-time signals.	Affective	Responding (2)								1					
			Lab	CLO2	Design single-rate and multirate digital filters in MATLAB.	Affective	Receiving (1)								1					
Semester 6	EE 312	Power Electronics	Theory	CLO1	Apply basic principles of rectification, power electronics circuits, power switches, and control systems to develop a single-phase and three-phase rectifiers for the different load.	Cognitive	Analyze (4)		1											
			Theory	CLO2	Analyze the basic operation, behavior, design, and modeling of DC-DC converters.	Cognitive	Analyze (4)		1											
			Theory	CLO3	Design and analyze the performance of DC to AC conversion with different PWM techniques.	Cognitive	Analyze (4)			1										
			Theory	CLO4	Evaluate the gate driver circuits, thermal design, snubber circuits, and performance of AC-AC converters.	Cognitive	Evaluate (5)		1											
			Laboratory	CLO1	Demonstrate the basic operation and control of thyristor and rectifier circuits.	Psychomotor	Precision (3)		1											
			Laboratory	CLO2	Demonstrate the basic operation and control of DC-DC converters and gate driver circuits	Psychomotor	Precision (3)			1										
			Laboratory	CLO3	Perform the simulation and develop PCB to demonstrate the working of single-phase and three-phase inverters with different control techniques.	Psychomotor	Manipulation (2)				1									
Semester 6	EE 300L	Embedded Systems Laboratory	Laboratory	CLO1	Construct, operate, and troubleshoot an embedded system and its peripherals for different engineering applications	Psychomotor	Articulation (4)		1											
			Laboratory	CLO2	Design a project, investigate individual blocks of the project and debug errors in the design and assembly	Psychomotor	Neutralization (5)			1										
			Laboratory	CLO3	Report results of experiment and project in written form	Affective	Responding (2)										1			

Semester	Code	Course	Type	CLO	Description	Domain	Level	1	2	3	4	5	6	7	8	9	10	11	12
Semester 6	EE 358	Power Distribution Systems	Theory	CLO1	Illustrate the configuration, structure and operation of distribution system and its components.	Cognitive	Understand (2)	1											
				CLO2	Assess the voltage profile and losses of a feeder and present remedial methods to improve the voltage regulation and system efficiency.	Cognitive	Evaluate (5)				1								
				CLO3	Carry out symmetrical and unsymmetrical short circuit fault current calculations for sizing and setting of protection equipment.	Cognitive	Apply (3)				1								
				CLO4	Explain the structure of smart power distribution system and the challenges of its realization (implementation).	Cognitive	Understand (2)	1											
Semester 6	IME 251	Social & Ethical Aspects in Engineering	Theory	CLO1	Understand basic ethical theories, moral frameworks, social values and beliefs.	Cognitive	Remember (1)						1						
				CLO2	Recognize the issues and impacts related to specific ethical problems.	Cognitive	Remember (1)						1						
				CLO3	Analyze ethical and moral frameworks by using prevalent and acquired personal, ethical and societal aspects.	Cognitive	Analyze (4)								1				
				CLO4	Presents views effectively while dealing with the ethical issues related to professional lives.	Affective	Responding (2)									1			
				CLO5	Appraise the environmental and sustainability issues in engineering.	Cognitive	Evaluate (5)							1					

Semester No.	Code	Title	Theory/Laboratory	CLO	CLOs Discription	Taxonomy Domain (Cognitive, Pyschomotor, Affective)	Taxonomy Level	PLO1 Engineering Knowledge	PLO2 Problem Analysis	PLO3 Design/ Development of Solutions	PLO4 Investigation	PLO5 Modern Tool Usage	PLO6 The Engineer and Society	PLO7 Environment and Sustainability	PLO8 Ethics	PLO9 Individual and Team Work	PLO10 Communication	PLO11 Project Management	PLO12 Lifelong Learning
Semester 7	IS 401	Islamic and Pakistan Studies-II/Ethics	Theory	CLO1	Explain doctrines of Islam with reference to Islamic primary sources.	Cognitive	Understanding (2)								1				
				CLO2	Deduce ethical and social values from the life of the Holy Prophet (PBUH) and identify criminal behavior in the light of Islamic penal law.	Affective	Receiving (1)								1				
				CLO3	Recognize the geography, resources and foreign policy of Pakistan which emphasizes on progression and peaceful co-existence.	Affective	Receiving (1)												1
Semester 7	MGT 211	Principles of Management	Theory	CLO1	Focus on the foundations of management, covering the essential concepts in management.	Cognitive	Understanding (2)											1	
				CLO2	Reflection of contemporary trends in management	Cognitive	Understanding (2)												1
				CLO3	To analyze various topics relating to management like social responsibility and managerial ethics and managing change and innovation.	Cognitive	Analyze (4)								1				

Semester	Course	Project	Type	CLO	Description	Domain	Taxonomy Level	1	2	3	4	5	6	7	8	9	10	11	12	13
Semester 7 and 8	EE-499a	Project Phase 1 and 2	Type C	CLO1	Apply knowledge of mathematics to complex engineering problems.	Cognitive	Apply (3)	1												
				CLO2	Verify, through research and analysis, the solution to a complex engineering problem.	Physcomotor	Precision (3)		1											
				CLO3	Design a solution to solve complex engineering problems.	Cognitive	Create (6)			1										
				CLO4	Derive a valid conclusion after investigating complex engineering problems.	Cognitive	Evaluate (5)				1									
				CLO5	Utilize modern computational and analytical tools in a solution of complex engineering problems.	Affective	Characterization (5)					1								
				CLO6	Develop the ability to assess social, health, safety, legal, and cultural issues in finding solutions to complex engineering problems.	Affective	Characterization (5)						1							
				CLO7	Assess environmental and sustainability issues in solving complex engineering problems.	Cognitive	Analyze (4)							1						
				CLO8	Demonstrate high ethical and moral values in solving complex engineering problems.	Affective	Valuing (3)								1					
				CLO9	Develop ability to work in a team in solving complex engineering problems.	Physcomotor	Articulation (4)									1				
				CLO10	Write an effective and methodical document narrating the literative search, problem formulation and solution, methodology adopted and the conclusion drawn in solving a complex engineering problem.	Affective	Organization (4)											1		
				CLO11	Demonstrate management skills in handling the project team.	Physcomotor	Precision (3)												1	
				CLO12	Recommend innovation in future work to improve proposed solution to the complex engineering problems.	Cognitive	Create (6)													1

Category	Course	Course Name	Type	CLO	Description	Domain	Taxonomy Level	1	2	3	4	5	6	7	8	9	10	11	12
Elective		Introduction to Machine Learning	Theory	CLO1	Explain working of supervised and unsupervised machine learning algorithms.	Cognitive	Understand (2)	1											
				CLO2	Develop a solution for problems using machine learning algorithms.	Cognitive	Apply (3)			1									
				CLO3	Design a solution and conduct experiments for a real-life machine learning problem after surveying the literature.	Cognitive	Create (6)				1								
Semester 7	EE 454	Power System Protection	Theory	CLO1	Illustrate the basic working principles and requirements of different relaying schemes and relaying components.	Cognitive	Understand (2)	1											
				CLO2	Determine the impact of current and voltage transformers on the performance of protection system	Cognitive	Apply (3)		1										
				CLO3	overcurrent and distance relays in distribution and transmission lines respectively	Cognitive	Evaluate (5)				1								
				CLO4	components like transformers, rotating machinery, bus-bars, shunt and series compensating devices	Cognitive	Create (6)			1									
	EE 454L		Laboratory	CLO1	Demonstrate the characteristics and operation of relaying	Psychomotor	Precision (3)	1											
				CLO2	mplement various relaying schemes for the protection of power system equipment	Psychomotor	Manipulation (2)	1											
				CLO3	Practice appropriate professional and ethical standards for producing self-motivated graduates.	Affective	Responding (2)							1					
Elective	EE 432	Computer Networks	Theory	CLO1	Explain services offered by the layers of Internet protocol stack	Cognitive	Understand (2)	1											
				CLO2	Analyze modern applications of the Internet.	Cognitive	Analyze (4)		1										
				CLO3	Design and develop solutions for different aspects of computer networks.	Cognitive	Create (6)			1									
	EE 432L		Laboratory	CLO1	Implement communication between various nodes using programming.	Affective	Organization (4)			1									
				CLO2	Master a tool to analyze network traffic.	Affective	Responding (2)					1							
				CLO3	Design fully functional networks based on given user specifications.	Affective	Receiving (1)			1									

						Domain	Level	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
Elective	EE 482	Microwave Engineering -Passive Devices	Theory	CLO1	Evaluate and justify behavior of Electromagnetic waves in guided and non-guided media, Field & network analysis and microwave components	Cognitive	Evaluate (5)		1										
				CLO2	Solve related engineering problems of Electromagnetic waves in guided and non-guided media, Field & network analysis and microwave components	Cognitive	Apply (3)			1									
				CLO3	Design of microwave components like impedance matching networks, microwave resonators, power dividers and couplers.	Cognitive	Create (6)			1									
				CLO4	Discuss and answer concepts and questions respectively.	Psychomotor	Manipulation (2)										1		
	EE 482L		Laboratory	CLO1	Perform measurements for verification of various parameters of guided media as well as of features of EM wave propagation in non-guided media.	Affective	Responding (2)				1								
				CLO2	Follow S-parameters and Smith chart measurements of a given network through a Vector Network Analyzer (VNA)	Affective	Receiving (1)					1							
				CLO3	Design passive microwave circuits via software as per given specifications.	Affective	Characterization (5)					1							
				CLO4	Report desired results, proofs and calculations	Psychomotor	Manipulation (2)										1		
Elective	EE 461	Design of Electrical Machines	Theory	CLO1	Apply the basic principles of magnetic circuits and develop the philosophy of transformer design.	Cognitive	Apply (3)	1											
				CLO2	Design the core, windings and cooling system of power transformers.	Cognitive	Create (6)			1									
				CLO3	Evaluate the design parameters of various rotating electric machines.	Cognitive	Evaluate (5)			1									
				CLO4	Form teams to encourage the development of collaborative practitioners.	Affective	Valuing (3)										1		

Semester No.	Code	Title	Theory/Laboratory		CLOs Discription	Taxonomy Domain & Level (Cognitive, Pyschomotor, Affective)	Taxonomy Level	PLO1 Engineering Knowledge	PLO2 Problem Analysis	PLO3 Design/Development of Solutions	PLO4 Investigation	PLO5 Modern Tool Usage	PLO6 The Engineer and Society	PLO7 Environment and Sustainability	PLO8 Ethics	PLO9 Individual and Team Work	PLO10 Communication	PLO11 Project Management	PLO12 Lifelong Learning
Semester 8	MGT-410	Project Management	Theory	CLO1	Describe the fundamental concepts about project Management, manger responsibilities and .selection of projects.	Cognitive	Understand (2)	1											
				CLO2	discussion of students about multiple questions related to the field of project management and organizational behaviors.	Affective	Responding (2)											1	
				CLO3	How students apply techniques and mathematical models to reach an optimum project suitable for the organization in each respect that is minimum cost, maximum profit, shortest route etc.	Cognitive	Apply (3)											1	
Elective	EE-431	Operating Systems	Theory	CLO1	Apply various aspects of virtualization including scheduling and memory management	Cognitive	Apply (3)	1											
				CLO2	Apply concepts of concurrent programming	Cognitive	Apply (3)	1											
				CLO3	Understand persistence in operating systems	Cognitive	Understand (2)	1											
	EE-431L		Laboratory	CLO1	Design and construct moderately complex software in C language: includes pointers, memory management, and management of multiple processes	Cognitive	Apply (3)	1											
				CLO2	Apply various aspects of virtualization including scheduling and memory management.	Cognitive	Apply (3)	1											
				CLO3	Apply concepts of concurrent programming	Cognitive	Apply (3)	1											

Category	Course	Course Title	Type	CLO	Description	Domain	Taxonomy	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
Elective	EE-436	Database Engineering	Theory	CLO1	Illustrate database architecture, and database management system by giving examples of real-life databases.	Cognitive	Understand (2)	1											
				CLO2	Implement databases conceptually as well as using a programming language (SQL) for relational databases.	Cognitive	Apply (3)			1									
				CLO3	Integrate essential elements required to design a database system	Cognitive	Create (6)		1										
	EE-436L		Laboratory	CLO1	Demonstrate multiple databases in form of entity relationship diagrams.	Psychomotor	Precision (3)					1							
				CLO2	Design a complete database system using a programming language for relational database system	Psychomotor	Naturalization (5)			1									
				CLO3	Manage project groups to inculcate team work in students while designing a real world database application.	Psychomotor	Precision (3)											1	
Elective	EE-413	Industrial Electronics	Theory	CLO1	Apply critical thinking in solving industrial electronic problems.	Cognitive	Apply (3)	1											
				CLO2	Demonstrate the operation/working of electronic sensors and actuators.	Cognitive	Apply (3)			1									
				CLO3	Analyze and evaluate performance parameters of PLCs and Motor drives.	Cognitive	Analyze (4)		1										
				CLO4	Evaluate the importance of industrial data communications, telemetry and SCADA systems.	Cognitive	Evaluate (5)				1								
	EE-413L		Lab	CLO1	Perform lab tasks for understanding fundamental of PLC System and Sensors.	Psychomotor	Manipulation (2)	1											
				CLO2	Build project on basic industrial application	Psychomotor	Manipulation (2)			1									
Elective	EE 453	Power System Operation & Control	Theory	CLO1	Apply various optimization techniques in a constrained environment of optimal power generation.	Cognitive	Apply (3)		1										
				CLO2	Determine generation dispatch using unit commitment to ensure optimal power flow.	Cognitive	Apply (3)		1										
				CLO3	Understand the dynamic behavior of synchronous machines in a power system.	Cognitive	Understand (2)	1											
				CLO4	Carry out steady-state and transient stability studies of a power system using numerical techniques.	Cognitive	Analyze (4)			1									
				CLO5	Evaluate control techniques in load-frequency and automatic voltage regulator systems	Cognitive	Evaluate (5)				1								
	EE 453L		Laboratory	CLO1	Adapt engineering methods in optimal power flow.	Psychomotor	Articulation (4)		1										
				CLO2	Demonstrate the power system stability and control using software tools.	Psychomotor	Precision (3)				1								
				CLO3	Use co-operative groups to maximize learning.	Affective	Characterization (5)											1	

Elective	EE-450	High Voltage Engineering	Theory	CLO1	Analyze the transient operation of transmission lines.	Cognitive	Analyze (4)	1										
				CLO2	Explain the breakdown mechanisms in solid, liquid and gaseous dielectrics.	Cognitive	Understand (2)	1										
				CLO3	Analyze the methods of high-voltage generation and measurement.	Cognitive	Analyze (4)		1									
				CLO4	Apply diagnostic tests to assess the quality of insulation	Cognitive	Apply (3)	1										
				CLO5	Complex engineering problem: Evaluate electric field distribution in a high voltage bushing using finite element method	Cognitive	Evaluate (5)			1								
	EE-450L		Laboratory	CLO1	Practice a wide range of testing and measurement methods to characterize insulation materials.	Affective	Articulation (4)	1										
				CLO2	Implement modeling of electric field and its control using numerical simulation tools.	Psychomotor	Manipulation (2)			1								
				CLO3	Show professional responsibility by adapting meticulous safety procedures	Psychomotor	Valuing (3)				1							

Semester No.	Code	Title	Theory/Laboratory		CLOs Discription	Taxonomy Domain Cognitive, Pyschomotor, Affective	Taxonomy Level	PLO1 Engineering Knowledge	PLO2 Problem Analysis	PLO3 Design/ Development of Solutions	PLO4 Investigation	PLO5 Modern Tool Usage	PLO6 The Engineer and Society	PLO7 Environment and Sustainability	PLO8 Ethics	PLO9 Individual and Team Work	PLO10 Communication	PLO11 Project Management	PLO12 Lifelong Learning
Elective	EE 452	(Renewable) Electrical Energy Systems	Theory	CLO1	Assess energy potential in several resources of universe.	Cognitive	Understand (2)	1											
Elective	EE 452	(Renewable) Electrical Energy Systems	Theory	CLO2	Analyze the ways of harnessing energy from different renewable energy resources.	Cognitive	Analyze (4)	1											
Elective	EE 452	(Renewable) Electrical Energy Systems	Theory	CLO3	Design and analyze a standalone and grid connected renewable energy systems.	Cognitive	Analyze (4)			1									
Elective	EE 461	Design of Electrical Machines	Theory	CLO1	Apply the basic principles of magnetic circuits and develop the philosophy of transformer design.	Cognitive	Apply (3)	1											
Elective	EE 461	Design of Electrical Machines	Theory	CLO2	Design the core, windings and cooling system of power transformers.	Cognitive	Create (6)			1									
Elective	EE 461	Design of Electrical Machines	Theory	CLO3	Evaluate the design parameters of various rotating electric machines.	Cognitive	Evaluate (5)			1									
Elective	EE 461	Design of Electrical Machines	Theory	CLO4	Form teams to encourage the development of collaborative practitioners.	Affective	Valuing (3)										1		

Elective	Course	Course Title	Type	CLO	Description	Domain	Level	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
Elective	EE 453	Power System Operation and Control (L)	Theory	CLO1	Apply various optimization techniques in a constrained environment of optimal power generation.	Cognitive	Apply (3)		1										
			Theory	CLO2	Determine generation dispatch using unit commitment to ensure optimal power flow.	Cognitive	Apply (3)		1										
			Theory	CLO3	Understand the dynamic behavior of synchronous machines in a power system.	Cognitive	Understand (2)	1											
			Theory	CLO4	Carry out steady-state and transient stability studies of a power system using numerical techniques.	Cognitive	Analyze (4)			1									
			Theory	CLO5	Evaluate control techniques in load-frequency and automatic voltage regulator systems	Cognitive	Evaluate (5)				1								
			Laboratory	CLO1	Adapt engineering methods in optimal power flow.	Psychomotor	Articulation (4)		1										
			Laboratory	CLO2	Demonstrate the power system stability and control using software tools.	Psychomotor	Precision (3)				1								
			Laboratory	CLO3	Use co-operative groups to maximize learning.	Affective	Characterization (5)										1		
Elective	EE 454	Power System Protection (L)	Theory	CLO1	Illustrate the basic working principles and requirements of different relaying schemes and relaying components.	Cognitive	Understand (2)	1											
			Theory	CLO2	Determine the impact of current and voltage transformers on the performance of protection system	Cognitive	Apply (3)		1										
			Theory	CLO3	Evaluate the relay settings for the coordination of overcurrent and distance relays in distribution and transmission lines respectively	Cognitive	Evaluate (5)				1								
			Theory	CLO4	Design appropriate protection schemes for various components like transformers, rotating machinery, bus-bars, shunt and series compensating devices	Cognitive	Create (6)			1									
			Laboratory	CLO1	Demonstrate the characteristics and operation of relaying equipment.	Psychomotor	Precision (3)	1											
			Laboratory	CLO2	Implement various relaying schemes for the protection of power system equipment	Psychomotor	Manipulation (2)	1											
			Laboratory	CLO3	Practice appropriate professional and ethical standards for producing self-motivated graduates.	Affective	Responding (2)									1			

					Description	Domain	Level	1	2	3	4	5	6								
Elective	EE 456	Introduction to Smart Grids	Theory	CLO1	Discuss the global vision of smart grids and to understand the information and communication technologies used in smart grids	Cognitive	Understand (2)	1													
				CLO2	Identify the the sensing, measurement, control and automation technologies of smart grids and analyze their working.	Cognitive	Analyze (4)		1												
				CLO3	Analyze the renewable energy sources based generations, power electronics and energy storage methods and technologies used in smart grids.	Cognitive	Analyze (4)			1											
Elective	EE 475	Computer Architecture (L)	Theory	CLO1	Demonstrate knowledge of fundamental concepts of Computer abstractions and technology: Instructions: Language of the computer ,Arithmetic for computers	Cognitive	Remember (1)	1													
				CLO2	Architecture, organization and design concepts of Single and multi cycle processors	Cognitive	Apply (3)		1												
				CLO3	Architecture, organization and design concepts of multicore microprocessors	Cognitive	Analyze (4)			1											
				CLO4	Architecture and Design of memory hierarchy and I/O techniques.	Cognitive	Evaluate (5)			1											
			Laborat	CLO1	Design and analysis of simple digital systems	Psychomotor	Manipulation (2)		1												
				CLO2	Design of Microprocessor	Psychomotor	Articulation (4)			1											
				CLO3	Design of complex microprocessor	Psychomotor	Articulation (4)					1									
Elective	EE 476	Introduction to VLSI Systems (L)	Theory	CLO1	Describe basic theories and techniques of digital VLSI design in CMOS technology.	Cognitive	Understand (2)	1													
				CLO2	Analyze real-world problems where the fundamental concepts and structures of designing digital VLSI systems can be used.	Cognitive	Analyze (4)		1												
				CLO3	Design and develop solutions for problems based on VLSI fundamentals.	Cognitive	Create (6)			1											
Elective	EE 477	Software Construction	Theory	CLO1	Describe basic theories and techniques of software development.	Cognitive	Understand (2)	1													
				CLO2	Analyze real-world problems where software development techniques are used.	Cognitive	Analyze (4)		1												
				CLO3	Design and develop software based solutions for real-life problems.	Cognitive	Create (6)			1											

					Description	Domain	Level	1	2	3	4	5	6	7	8	9	10	11	12
Elective	EE 481	Optical Circuits and Systems	Theory	CLO1	Explain theoretical methods for modeling of optical waveguides and fibres.	Cognitive	Understand (2)	1											
				CLO2	Identify fundamental properties and relations of multi-mode and single-mode optical fibres.	Cognitive	Apply (3)		1										
				CLO3	Outline technical issues and considerations when using optical fibres in communication systems and networks.	Cognitive	Analyze (4)		1										
				CLO4	Design and application of optical circuits and systems.	Cognitive	Create (6)			1									
Elective	EE 482	Microwave Engineering -Passive Devices (L)	Theory	CLO1	Evaluate and justify behavior of Electromagnetic waves in guided and non-guided media, Field & network analysis and microwave components	Cognitive	Evaluate (5)		1										
				CLO2	Solve related engineering problems of Electromagnetic waves in guided and non-guided media, Field & network analysis and microwave components	Cognitive	Apply (3)			1									
				CLO3	Design of microwave components like impedance matching networks, microwave resonators, power dividers and couplers.	Cognitive	Create (6)			1									
				CLO4	Discuss and answer concepts and questions respectively.	Psychomotor	Manipulation (2)									1			
			Laboratory	CLO1	Perform measurements for verification of various parameters of guided media as well as of features of EM wave propagation in non-guided media.	Affective	Responding (2)					1							
				CLO2	Follow S-parameters and Smith chart measurements of a given network through a Vector Network Analyzer (VNA)	Affective	Receiving (1)						1						
				CLO3	Design passive microwave circuits via software as per given specifications.	Affective	Characterization (5)						1						
				CLO4	Report desired results, proofs and calculations	Psychomotor	Manipulation (2)									1			

Elective	Course	Course Title		CLO	Description	Domain	Taxonomy Level	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
Elective	EE 484	Microwave Engineering - Active Devices (L)	Theory	CLO1	Design microwave filters and microwave amplifier by various methods and for different specifications.	Cognitive	Create (6)			1									
				CLO2	Analyze sources of noise in RF and microwave circuits, noise temperature, noise figure, non-linear distortion and dynamic range.	Cognitive	Analyze (4)		1										
				CLO3	Analyze microwave frequency oscillators, oscillator phase noise, detectors, single ended mixers, basic characteristics of active RF and microwave devices,	Cognitive	Analyze (4)		1										
				CLO4	Outline different microwave integrated circuits and industrial applications of microwave technology in Wireless, Radar, Remote Sensing and Medicine.	Cognitive	Analyze (4)				1								
				CLO5	Discuss and answer concepts and questions respectively.	Affective	Valuing (3)										1		
			Laboratory	CLO1	Perform measurements of parameters of noise, amplifier, RF power amplifier and switch.	Psychomotor	Precision (3)		1										
				CLO2	Demonstrate different measurements of dielectric resonator, noisy oscillator, Gunn diode and verification of square law operation of a diode detector.	Psychomotor	Articulation (4)	1											
				CLO3	Design a low pass filter, transmit receive switch and RF front end of wireless system via ADS.	Psychomotor	Articulation (4)			1									
				CLO4	Implement software designs using industrial standard machinery.	Psychomotor	Articulation (4)				1								
Elective	EE 485	Electromagnetic Compatability	Theory	CLO1	Explain history, units and requirements of EMC	Cognitive	Understand (2)	1											
				CLO2	Outline techniques for radiated and conducted emissions, susceptibility along with electrostatic discharge (ESD) for compliance with EMC standards.	Cognitive	Analyze (4)		1										
				CLO3	Analyze the relationship between time and frequency domain of test signal (e.g., transmission line and signal integrity) using various tools.	Cognitive	Analyze (4)				1								
				CLO4	Illustrate the use of LISN, spectrum analyzer, current sources, power supply filters and antennas for EMC.	Cognitive	Apply (3)		1										
				CLO5	Construct solutions for EMC problems by shielding, grounding, PCB design tips, appropriate circuit components and electromechanical devices.	Cognitive	Create (6)			1									

Elective	Course	Course Name	Type	CLO	Description	Domain	Taxonomy Level	1	2	3	4	5	6	7	8	9	10	11	12
Elective	EE 491	Electrical Instruments and Measurements	Theory	CLO1	Illustrate the use of various electrical/electronic instruments, their construction, principles of operation, standards & units of measurements.	Cognitive	Understand (2)	1											
				CLO2	Apply basic principles of measurements & comprehend the operation of various instrumentation transducers.	Cognitive	Apply (3)		1										
				CLO3	Use & identify instruments and sensors for measuring various physical quantities	Cognitive	Apply (3)			1									
				CLO4	Demonstrate industrial applications of programmable logic controllers and data acquisition.	Cognitive	Apply (3)				1								
Elective	EE 412	Integrated Electronic Circuits (L)	Theory	CLO1	Apply the fundamental concepts of electronics & analyze building blocks of integrated electronic circuits.	Cognitive	Apply (3)		1										
				CLO2	Identify Integrated Circuit (IC) components and apply the theory, and operation of fundamental electronic devices and circuits.	Cognitive	Apply (3)			1									
				CLO3	Design & analyze fundamental IC components, such as amplifiers, current mirrors, which are used in electronic systems.	Cognitive	Analyze (4)			1									
				CLO4	Evaluate the performance of fundamental analog circuits.	Cognitive	Evaluate (5)				1								
			Laboratory	CLO1	Study the characteristics of op-amp circuits and limitations of a practical op-amp; design techniques to overcome the shortcomings in performance of a practical op-amp	Psychomotor	Manipulation (2)	1											
				CLO2	Investigate the characteristics of different BJT amplifier configurations (common emitter, common collector, common base, cascode), multistage BJT amplifier and current mirror circuits.	Psychomotor	Articulation (4)				1								
				CLO3	Learn the use of modern simulation tools	Psychomotor	Articulation (4)					1							
				CLO4	Design and study of BJT open loop and closed loop (feedback) differential amplifier circuits.	Psychomotor	Articulation (4)			1									
Elective	EE 413	Industrial Electronics (L)	Theory	CLO1	Apply critical thinking in solving industrial electronic problems.	Cognitive	Apply (3)	1											
				CLO2	Demonstrate the operation/working of electronic sensors and actuators.	Cognitive	Apply (3)			1									
				CLO3	Analyze and evaluate performance parameters of PLCs and Motor drives.	Cognitive	Analyze (4)		1										
				CLO4	Evaluate the importance of industrial data communications, telemetry and SCADA systems.	Cognitive	Evaluate (5)				1								
			Lab	CLO1	Perform lab tasks for understanding fundamental of PLC System and Sensors.	Psychomotor	Manipulation (2)	1											

Type	Code	Course	Part	CLO	Description	Domain	Taxonomy Level	1	2	3	4	5	6	7	8	9	10	11	12
			Lab	CLO2	Build project on basic industrial application	Psychomotor	Manipulation (2)			1									
Elective	EE 424	Satellite Engineering	Theory	CLO1	Clarify conceptual knowledge about orbits, trajectories, launch, in-orbit operations and explain different subsystems of satellites.	Cognitive	Understand (2)	1											
				CLO2	Solve engineering problems about orbits, trajectories, launch, in-orbital maneuvers and subsystems of satellites.	Cognitive	Apply (3)		1										
				CLO3	Discuss satellite program of Pakistan with SUPARCO officials.	Affective	Organization (4)			1									
				CLO4	Present industrial applications of satellites in Communication, Remote sensing, Weather, Navigation, Scientific research, Military as well as discuss and answer concepts and questions respectively.	Affective	Valuing (3)						1						
Elective	EE 425	Wireless Communications (L)	Theory	CLO1	Describe the fundamental features and basic building blocks of digital communications systems	Cognitive	Understand (2)	1											
				CLO2	Analyze the performance of digital modulation techniques in AWGN and bandlimited channels	Cognitive	Analyze (4)					1							
				CLO3	Design receivers for AWGN and bandlimited channels.	Cognitive	Create (6)			1									
				CLO4	Develop mitigation techniques for frequency offset, timing offset and wireless channel	Cognitive	Create (6)			1									
				CLO5	Analyze advanced digital communication techniques – OFDM and MIMO.	Cognitive	Analyze (4)				1								
			Laboratory	CLO1	Develop software simulations to assess the performance of digital communications systems	Psychomotor	Articulation (4)				1								
				CLO2	Report results of simulations effectively.	Affective	Valuing (3)											1	
Elective	EE 426	Digital Image Processing (L)	Theory	CLO1	Describe various image processing algorithms.	Cognitive	Understand (2)	1											
				CLO2	Analyze real-world problems where image processing algorithms can be applied.	Cognitive	Analyze (4)		1										
				CLO3	Design and develop solutions for problems using image processing algorithms.	Cognitive	Create (6)			1									
Elective	EE 432	Computer Networks (L)	Theory	CLO1	Explain services offered by the layers of Internet protocol stack	Cognitive	Understand (2)	1											
				CLO2	Analyze modern applications of the Internet.	Cognitive	Analyze (4)		1										
				CLO3	Design and develop solutions for different aspects of computer networks.	Cognitive	Create (6)			1									
			Lab	CLO1	Implement communication between various nodes using programming.	Affective	Organization (4)			1									
				CLO2	Master a tool to analyze network traffic.	Affective	Responding (2)				1								
				CLO3	Design fully functional networks based on given user specifications.	Affective	Receiving (1)			1									

Category	Code	Course		CLO	Description	Domain	Taxonomy	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
Elective	EE 436	Database Engineering (L)	Theory	CLO1	Illustrate database architecture, and database management system by giving examples of real-life databases.	Cognitive	Understand (2)	1											
				CLO2	Implement databases conceptually as well as using a programming language (SQL) for relational databases.	Cognitive	Apply (3)			1									
				CLO3	Integrate essential elements required to design a database system	Cognitive	Create (6)		1										
			Laboratory	CLO1	Demonstrate multiple databases in form of entity relationship diagrams.	Psychomotor	Precision (3)					1							
				CLO2	Design a complete database system using a programming language for relational database system	Psychomotor	Naturalization (5)			1									
				CLO3	Manage project groups to inculcate team work in students while designing a real world database application.	Psychomotor	Precision (3)									1			
Elective	EE 439	Introduction to Machine Learning	Theory	CLO1	Explain working of supervised and unsupervised machine learning algorithms.	Cognitive	Understand (2)	1											
				CLO2	Develop a solution for problems using machine learning algorithms.	Cognitive	Apply (3)			1									
				CLO3	Design a solution and conduct experiments for a real-life machine learning problem after surveying the literature.	Cognitive	Create (6)				1								
Elective	EE 450	High Voltage Engineering (L)	Theory	CLO1	Analyze the transient operation of transmission lines.	Cognitive	Analyze (4)	1											
				CLO2	Explain the breakdown mechanisms in solid, liquid and gaseous dielectrics.	Cognitive	Understand (2)	1											
				CLO3	Analyze the methods of high-voltage generation and measurement.	Cognitive	Analyze (4)		1										
				CLO4	Apply diagnostic tests to assess the quality of insulation	Cognitive	Apply (3)	1											
				CLO5	Complex engineering problem: Evaluate electric field distribution in a high voltage bushing using finite element method	Cognitive	Evaluate (5)				1								
			Laboratory	CLO1	Practice a wide range of testing and measurement methods to characterize insulation materials.	Affective	Articulation (4)	1											
				CLO2	Implement modeling of electric field and its control using numerical simulation tools.	Psychomotor	Manipulation (2)				1								
				CLO3	Show professional responsibility by adapting meticulous safety procedures	Psychomotor	Valuing (3)						1						