



BAHRIA UNIVERSITY PROSPECTUS (FALL 2024)



Bahria University
Discovering Knowledge
A PROJECT OF PAKISTAN NAVY



DEPARTMENT OF ELECTRICAL ENGINEERING

Programs offered:

- Bachelor of Electrical Engineering (BEE)
- MS (Electrical Engineering)
- PhD (Electrical Engineering)

Electrical engineering is one of the oldest disciplines of engineering. Initially it was confined to few areas such as power generation, transmission and distribution, radio communication and wireless telephony. However, in the last half of the century it has seen tremendous growth and expansion. The diversification and expansion in some areas of Electrical Engineering has been of such a large magnitude that they seem to be independent disciplines in their own. However, in a large part of the world electrical engineering is still considered to be the parent discipline. This curriculum has been developed on this rationale. It facilitates the teaching of common core courses and selection of courses of a particular area depending upon the need and availability of the resources.

Bachelor of Electrical Engineering

Eligibility Criteria:

Passed intermediate examination or it's equivalent with a minimum of 60% marks in Pre-Engineering.

Objectives of the Degree Program

PEO 1: To provide viable solutions to complex engineering problems based on systematic theoretical and technical approaches in the field of electrical engineering.

PEO 2: To manage and develop sustainable electrical systems to meet desired objectives and explore new entrepreneurial possibilities in a multidisciplinary environment.

PEO 3: To pursue academic and professional growth by taking up higher studies, discovering new technologies and developing proficiency in the usage of latest tools.

PEO 4: To work in a multicultural environment and be responsive to ethical, moral, and societal issues showing leadership in their domain.



Learning outcome of the Degree Program

Engineering Knowledge: An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

Problem Analysis: An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Design/Development of Solutions: An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

Investigation: An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data and synthesis of information to derive valid conclusions.

Modern Tool Usage: An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.

The Engineer and Society: An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.

Environment and Sustainability: An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of, and need for, sustainable development.

Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

Individual and Team Work: An ability to work effectively, as an individual or in a



team, on multifaceted and /or multidisciplinary settings.

Communication: An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Project Management: An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.

Lifelong Learning: An ability to recognize the need for, and have the preparation and ability to engage in, independent and life-long learning in the broadest context of technological change.

Bachelor of Electrical Engineering Scheme of Studies

Campus	Islamabad/Karachi
Department	Department of Electrical Engineering
Program title	BEE
Program level	Bachelors
Total duration of program	4 years
Total number of semesters	8 Semesters
Total number of credit hours	136
Number of credit hours per semester	16-18
Engineering courses	28 Courses, 95 Cr hrs., 69.9 % of total
Non-Engineering courses	15 Courses, 41 Cr hrs., 30.1 % of total

Courses of Non-Engineering Domain

Knowledge Area	Sub Area	Name of Course	Lec. Cr. Hrs	Lab Cr. Hrs	Total Cr. Hrs.	Total Courses	Total Credits	% Area	% Overall
Humanities and Social Sciences	English	Functional English	2	0	2	3	7	17	5.1
		Comm. Skills	2	0	2				
		Technical Report Writing & Present. Skills	3	0	3				
	Culture	Islamic Studies/ Ethics	2	0	2	2	4	9.7	2.9
		Pakistan Studies	2	0	2				
	Social Sciences	Social Sciences Elective 1	3	0	3	2	6	14.6	4.4
		Social Sciences Elective 2	3	0	3				
Management Sciences		Management Sciences Elective 1	2	0	2	2	5	12.2	3.7
		Management Sciences Elective 2	3	0	3				
Natural Sciences	Math	Calculus and Analytical Geometry	3	0	3	4	12	29.2	8.8
		Linear Algebra	3	0	3				
		Differential Equations	3	0	3				
		Complex Variable and Transform	3	0	3				
	Physics	Applied Physics	3	1	4	1	4	9.8	2.9

	Electives	Elective 1*	3	0	3	1	3	7.3	2.2
Total			40	1	41	15	41	100%	30.1%

Courses of Engineering Domain

Knowledge Area	Name of Course	Lec. Cr. Hrs.	Lab Cr. Hrs.	Total Cr. Hrs.	Total Courses	Total Cr. Hrs.	% Area	% Overall
Computing	Introduction to Computing	1	1	2	3	9	9.5	6.6
	Programming Fundamentals	2	1	3				
	Computing Elective	3	1	4				
Electrical Engineering Foundation	Linear Circuit Analysis	3	1	4	9	28	29.5	20.6
	Electrical Network Analysis	3	1	4				
	Workshop Practice	0	1	1				
	Signals and Systems	3	1	4				
	Electronic Devices & Circuits	3	1	4				
	Digital Logic Design	3	1	4				
	Electromagnetic field theory	3	0	3				
	Probability Methods in Engineering	3	0	3				
	Engineering Drawing	0	1	1				
Electrical Engineering Core (Breadth)	Communication Systems	3	1	4	7	28	29.5	20.6
	Embedded system design	3	1	4				
	Electrical Machines	3	1	4				
	Linear Control Systems	3	1	4				
	Electronic Circuit Design	3	1	4				
	Breadth Core 1	3	1	4				
	Breadth Core 2	3	1	4				
Electrical Engineering Core (Depth)	Depth Elective 1	3	1	4	5	19	20	13.9
	Depth Elective 2	3	1	4				
	Depth Elective 3	3	1	4				
	Depth Elective 4	3	1	4				
	Depth Elective 5	3	0	3				
IDEE	IDEE-1	2	0	2	2	5	5.2	3.8
	IDEE-2	3	0	3				
Senior Design Project	Senior Design Project 1	0	3	3	2	6	6.3	4.4
	Senior Design Project 2	0	3	3				
Internship (Summer)		0	0	0	0	0	0	0
Total					28	95	100	69.9%

Semester-1

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	None	GSC 110	Applied Calculus and Analytical Geometry	3+0	3	0
2	None	CSC 111	Introduction to Computing	1+1	1	1
3	None	ENG 104	Functional English	2+0	2	0
4	None	ISL 101	Islamic Studies/ Ethics	2+0	2	0
5	None	XXXX	IDEED-1	2+0	2	0
6	None	GSC 113	Applied Physics	3+1	3	1
7	None	EEL 112	Workshop Practice	0+1	0	1
Total Credit Hours in Semester-1				16	13	3

Semester-2

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	None	EEL 121	Engineering Drawing & CAD	0+1	0	1
2	GSC 110	GSC 210	Differential Equations	3+0	3	0
3	CSC 111	CSC 112	Programming Fundamentals	2+1	2	1
4	None	EEN 110	Linear Circuit Analysis	3+1	3	1
5	None	CEN 120	Digital Logic Design	3+1	3	1
6	None	PAK 101	Pakistan Studies	2+0	2	0
Total Credit Hours in Semester-2				17	13	4

Semester-3

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	None	HSS 118	Communication Skills	2+0	2	0
2	EEN 110	EEN 224	Electronic Devices and Circuits	3+1	3	1
3	EEN 110	EEN 211	Electrical Network Analysis	3+1	3	1
4	CSC 112	CSC XXX	Computing Elective	3+1	3	1
5	GSC 110	GSC 220	Complex Variables and Transforms	3+0	3	0
Total Credit Hours in Semester-3				17	14	3

Semester-4

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	None	GSC 121	Linear algebra	3+0	3	0
2	None	HSS XXX	Humanities & Social Sciences Elective -1	3+0	3	0
3	None	EEN 313	Signals and Systems	3+1	3	1
4	EEN 224	EEN 225	Electronic Circuit Design	3+1	3	1
5	GSC 110	EEN 226	Probability Methods in Engineering	3+0	3	0
Total Credit Hours in Semester-4				17	15	2

Semester-5

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	GSC 110	EEN 311	Electromagnetic Field Theory	3+0	3	0
2	CEN 120	CEN 440	Embedded systems Design	3+1	3	1
3	XXXX	XXXX	Natural Science Elective	3+0/2+1	3/2	0/1
4	EEN 313	EET 321	Communication Systems	3+1	3	1
5	EEN 211	EEN 312	Electrical Machines	3+1	3	1
Total Credit Hours in Semester-5				18	15/14	3/4

Semester-6

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	XXXX	EEXXX	Breadth Core- 1	3+1	3	1
2	EEN 313	EEN 412	Linear Control Systems	3+1	3	1
3	None	MGTXXX/ HSS XXX	Management Science Elective 1	2+0	2	0
4	XXXX	EEXXXX	Depth Elective 1	3+1	3	1
5	XXXX	EEXXXX	Breadth Core-2	3+1	3	1
Total Credit Hours in Semester-6				18	14	4

Semester-7

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	None	ESC 498	Project – 1	0+3	0	3
2	None	HSS 320	Tech. Writing & Presentation Skills	3+0	3	0
3	XXXX	EEXXX	Depth Elective 2	3+1	3	1
4	XXXX	EEXXX	Depth Elective 3	3+1	3	1
5	XXXX	XXXX	IDEE-2	3+0	3	0
Total Credit Hours in Semester-7				17	12	5

Semester-8

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	XXXX	ESC 499	Project-2	0+3	0	3
2	None	HSSXXX	Humanities & SS Elective-2	3+0	3	0
3	None	HSSXXX	Management sciences Elective - 2	3+0	3	0
4	XXXX	EEXXXX	Depth Elective 4	3+1	3	1
5	XXXX	EEXXXX	Depth Elective 5	3+0	3	0
Total Credit Hours in Semester-8				16	12	4

List of Elective Courses Non-Engineering Domain Electives

A. Humanities and Social Sciences Electives

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	None	HSS 422	Engineering Ethics	3+0	3	0
2	None	HSS 202	Introduction to Sociology	3+0	3	0
3	None	BES 103	Critical Thinking	3+0	3	0
4	None	HSS 456	Organizational Behavior	3+0	3	0
5	None	PSY 401	Professional Psychology	3+0	3	0
6	None	HSS 111	Introduction to International Relations	3+0	3	0

B. Management Science Electives

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	None	HSS 423	Entrepreneurship	2+0	2	0
2	None	MGT 421	Leadership	2+0	2	0
3	None	MGT 422	Personal Grooming	2+0	2	0
4	None	MGT 111	Principles of Management	3+0	3	0
5	None	MGT 423	Engineering Management	3+0	3	0
6	None	MGT 424	Engineering Economics	3+0	3	0
7	None	MGT 425	Project Management in Engineering	3+0	3	0

C. Natural Sciences Electives

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	GSC 110	GSC 211	Multivariable Calculus	3+0	3	0
2	GSC 210	GSC 320	Numerical Analysis	3+0	3	0
3	None	GSC 221	Discrete Mathematics	3+0	3	0
4	None	GSC 340	Chemistry	2+1	2	1

Engineering Domain Electives

A. Computing Electives

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	CSC 112	CSC 210	Object Oriented Programming	3+1	3	1
2	CSC 112	CSC 221	Data structure and Algorithm	3+1	3	1

B. Breadth Core Electives

1. Power Engineering

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	EEN 211	EEP 331	Power System Analysis Breadth Core 1	3+1	3	1
2	EEN 219	EEN 433	Power Distribution and Utilization Breadth Core 2	3+1	3	1

2. Electronics Engineering

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	EEN 224	EEP 468	Power Electronics Breadth Core 1	3+1	3	1

2	EEN 313	EEN 325	Digital Signal Processing Breadth Core 2	3+1	3	1
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3. Telecommunication Engineering

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	None	CEN 223	Computer Communication & Networks Breadth Core 1	3+1	3	1
2	EEN 313	EEN 325	Digital Signal Processing Breadth Core 2	3+1	3	1

C. Breadth Core Electives

1. Telecommunication Engineering

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	EEN 311	EEN 431	RF and Microwave Engineering	3+1	3	1
2	None	EET 463	Optical Fiber Communication	3+1	3	1
3	EEN 311	EET 447	Navigation and Radar Systems	3+1	3	1
4	EET 321	EEN 436	Wireless and Mobile Communication	3+1	3	1
5	EET 321	EET 449	Satellite Communications	3+1	3	1
6	EEN 311	EET 451	Wave Propagation and Antennas	3+1	3	1
7	CEN 223	EET 452	Multimedia Communications	3+1	3	1

8	None	CSC 453	Information Theory	3+1	3	1
9	CEN223	EEN 434	Computer Networks	3+1	3	1
10	EET 321	EET 411	Digital Communications	3+1	3	1
11	None	EET 456	Telecom Transmission and Switching Systems	3+0	3	0
12	EEN 313	CEN 444	Digital Image Processing	3+0	3	0
13	CEN 120	CEN 441	FPGA- Based System Design	3+1	3	1
14	EEN 224	EEN 469	Linear Integrated Circuits and Applications	3+1	3	1
15	EEN 224	EEN 316	Instrumentation and measurement	3+1	3	1
16	None	EET 471	Emerging Wireless Technologies and RF planning	3+0	3	0
17	None	EET 472	Telecommunication policies and standards	3+0	3	0
18	None	EET 462	Cryptography and Network Security	3+0	3	0
19	None	EET 459	Introduction to Block chain	3+0	3	0
20	CEN 222	ITC 411	Cyber Security	3+0	3	0

2. Electronics Engineering

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	EEN 224	EEN 316	Instrumentation and measurement	3+1	3	1
2	EEN 224	EEN 462	Integrated Electronics	3+1	3	1

3	None	EEN 441	Industrial Process Control	3+1	3	1
4	EEN 224	EEN 442	Digital Electronics	3+1	3	1
5	EEN 224	EEN 444	Opto Electronics	3+1	3	1
6	EEN 224	CEN 452	VLSI Design	3+1	3	1
7	EEN 224	EEN 445	Industrial Electronics	3+1	3	1
8	CEN 120	CEN 442	Digital System Design	3+1	3	1
9	EEN 224	EEN 469	Linear Integrated Circuits & Applications	3+1	3	1
10	EEN 224	EEN 466	Introduction to Nano Technology	3+0	3	0
11	EEN 311	EET 451	Wave Propagation and Antennas	3+1	3	1
12	EEN 313	CEN 444	Digital Image Processing	3+0	3	0
13	EEN 224	EEN 435	Solid State Devices	3+1	3	1
14	EEN 412	EEN 437	Digital Control Systems	3+1	3	1
15	EEN 219	EEN 433	Power Distribution and Utilization	3+1	3	1
16	CEN 120	CEN 441	FPGA- Based System Design	3+1	3	1
17	EEN 312	EEN 420	Industrial Automation	3+1	3	1
18	EEN 224	EEN 471	Microelectronics Technology	3+1	3	1
19	EEN 311	EEN 431	RF and Microwave Engineering	3+1	3	1
20	EEN 325	ESC 471	Biomedical Instrumentation	3+1	3	1
21	None	CEN 223	Computer Communication & Networking	3+1	3	1
22	None	ESC 472	Medical Robots	3+0	3	0
23	CSC 411	CEN 458	Robotics	3+1	3	1

3. Power Engineering

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	EEN 224	EEN 316	Instrumentation and Measurements	3+1	3	1
2	EEN 219	EEP 441	Advanced Electrical Machines	3+1	3	1
3	EEN 219	EEP 442	Power Generation	3+1	3	1
4	EEN 433	EEP 443	Electrical Power Transmission	3+1	3	1
5	EEN 224	EEP 468	Power Electronics	3+1	3	1
6	EEP 331	EEP 444	Power System Protection	3+1	3	1
7	EEP 331	EEP 445	Power System Stability & Control	3+0	3	0
8	EEN 219	EEP 471	Electrical Machine Design and Maintenance	3+1	3	1
9	EEN 211	EEP 446	High Voltage Engineering	3+1	3	1
10		EEP 448	Renewable Energy Systems	3+0	3	0
11	EEN 313	EEN 325	Digital Signal Processing	3+1	3	1
12	EEN 224	EEP 472	Industrial Drives	3+1	3	1
13	EEP 331	EEP 475	FACTS and HVDC Transmission	3+1	3	1
14	None	CEN 223	Computer Communication & Networking	3+1	3	1
15	None	EEP 474	Smart Grid	3+0	3	0
16	EEN 412	EEN 437	Digital Control System	3+1	3	1

17	EET 321	EET 474	Digital Communication System	3+1	3	1
18	EEN 224	EEN 469	Linear Integrated Circuits and Applications	3+1	3	1
19	EEN 224	EEP 474	PLC and Industrial Drives	3+1	3	1
20	EEN 224	EEN 445	Industrial Electronics	3+1	3	1
21	None	EEP 331	Power System Analysis	3+0	3	0
22	None	EEN 434	Computer Networks	3+1	3	1

D. IDEE Electives

Sr. No.	Pre-requisite course code	Course Code	Course Title	Credit Hours	Theory	Practical
1	None	ESC 111	Basic Mechanical Engr.	2+0	2	0
2	None	GSC 104	Surveying and Leveling	2+0	2	0
3	None	GSC 486	Geographical Information System	2+0	2	0
4	None	ENV 440	Energy and Environment	2+0	2	0
5	None	EEA 430	Introduction to Mechatronics	3+0	3	0
6	None	EEN 438	Introduction to Biomedical Engineering	3+0	3	0
7	None	CSC 320	Operating Systems	3+0	3	0
8	None	CSC 419	Introduction to Machine Learning	3+0	3	0
9	None	CSC 488	Big Data Analytics	3+0	3	0
10	None	CSC 410	Introduction to Cloud Computing	3+0	3	0
11	None	CSC 412	Artificial Intelligence	3+0	3	0
12	None	EET 461	Industrial Internet Of Things (IIoTs)	3+0	3	0
13	None	EET 451	Introduction to System Engineering	3+0	3	0
14	None	CSC-464	Computer Vision	3+0	3	0
15	-	EEN 462	Fundamentals of Quantum Computing	3+1	2	1

MS EE

Campus: Islamabad & Karachi

Regular Programme Duration: 2 Years (4 Semesters)

Available Specialization:

Power System, Automation & Control, Communication Systems and IoT Networks (Islamabad/Karachi Campus)

Program Timing: Evening (Islamabad/Karachi Campus), Weekend (Karachi Campus)

Eligibility Criteria:

Four Year Degree in Electrical/Electronic/Computer or Allied Discipline with minimum CGPA 2.0/4.0 or 50% marks. Students will be required to complete deficiency in earned credit hours.

Graduates from other engineering disciplines or 16-year degree in Computer Science, Electronics, Physics or any related discipline may be eligible for this program, subject to passing the prerequisite courses with minimum GPA 3.0 of 4.0 in each course, as recommended by the departmental graduate committee at admission time.

ROADMAP

Semester - I		
i.	ESC 501	Core – I Research Methodology (University Requirement)
ii.		Core – II
		Core – III
Semester-II		
i.		Core-IV
ii.		Core-V
iii.		Elective-I
Semester-III		
i.		Elective-II
ii.		Thesis-I/ Elective-IV
Semester-IV		
i.		Elective-III
ii.		Thesis-II/ Elective-V



Core Courses

MS EE (Automation and Control)

Course Code	Core Course Title	Credit Hours
ESC 501	Research Methodology	3
EEN 510	Stochastic Process	3
EET 724	Optimization Techniques in Electrical Engineering	3
EEA 600	Artificial Intelligence for Control Systems	3
EEN 726	Modern Control Theory	3

Elective Courses

Course Code	Elective Course Title	Credit Hours
EEA 713	Robust Multivariable Control System	3
EEA 703	Dynamic Modeling system	3
EEA 749	Fuzzy Logic and Intelligent Control Systems	3
EEA 509	Nonlinear Control Systems	3
EEA 704	Adaptive Control Systems	3
CEN 758	Robotics and Intelligent Sensors	3
CEN 722	Advanced Interfacing Techniques	3
EEA 540	Mechatronics	3
EEN 506	Advanced Solid State Devices	3
EEA 601	Industrial Automation Technologies	3
EEA 602	System Integration	3
EEA 715	Industrial Project Management	3
EEA 716	Control Instrumentation and Robotics	3
EEA 717	Process Control Commissioning and Production Management	3

MS EE (Power Systems)

Course Code	Core Course Title	Credit Hours
ESC 501	Research Methodology	3
EEN 510	Stochastic Process	3
EET 724	Optimization Techniques in Electrical Engineering	3
EEP 558	Power Transmission and Distribution	3



EEP 559	Power Generation and Plant Operation	3
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Elective Courses

Course Code	Elective Course Title	Credit Hours
EEP 716	Advanced Power System Analysis	3
EEP 717	Advanced Power System Planning	3
EEP 718	Advanced Power System Protection	3
EEP 561	High Voltage Engineering Design	3
EEP 754	Smart Grid System Operation	3
EEP 521	Design of Electrical Machines	3
EEP 564	Hydel Power Generation	3
EEP 565	Integration of Distributed Generation	3
EEP 566	Power System Reliability	3
EEP 719	Advanced Topics in Power Systems Engineering	3
EEP 514	Renewable Energy	3
EEP 757	Non-Conventional Energy Systems	3
EEP 516	Solar Power Generation	3
EEP 517	Wind Power Generation	3
EEP 519	Hybrid Power Systems	3
EEP 714	Advanced Topics in Renewable Energy	3
EEP 723	Thermal and Nuclear Power Generation	3
EEP 720	Computer Methods in Power Systems	3
EEP 721	Insulation Co-ordination in Power Systems	3
EEP 712	Advanced Power Electronics	3
EEP 502	Advanced Power System Operation and Control	3
EEP 780	EMS & SCADA	3
EEA 713	Robust Multivariable Control System	3
EEA 749	Fuzzy Logic and Intelligent Control Systems	3
EEA 509	Nonlinear Control Systems	3



MS EE (Communication Systems & IoT Networks)

Core Courses

Course Code	Core Course Title	Credit Hours
ESC 501	Research Methodology	3
EEN 510	Stochastic Process	3
EET 724	Optimization Techniques in Electrical Engineering	3
EEN 712	Advanced Digital Communication Systems	3
EET 603	Communication Technologies & Platforms for IoT	3

Elective Courses

Course Code	Elective Course Title	Credit Hours
EET 729	Wireless Sensor Networks	3
EET 762	Communication Network Architecture and Protocols	3
EET 766	RF System Engineering and Design	3
EET 750	Antennas Theory, Design and Applications	3
EET 768	Cognitive & software Defined Radio	3
EET 755	Wireless Communication Techniques	3
EEN 740	Embedded System Design for Telecommunications	3
EET 756	Telecommunication Switching Systems	3
EET 702	Advanced Network Security	3
CEN 745	Advanced Digital Image Processing	3
ESC 716	Advanced Topics in Wireless & Networking	3
EEN 725	Advanced Digital Signal Processing	3
EET 560	Telecommunication Network Management	3
EET 555	Wireless & Mobile Communications	3
EET 552	Multimedia Networking	3
EET 553	Information Theory and Coding	3
EET 546	Radio & Microwave Engineering	3
EET 555	Wireless & Mobile Communications	3
EET 558	5G And Internet of Things	3

EET 559	Programming of Internet of Things	3
EET 601	Narrow Band IoT Systems	3
EET 731	IoT for Industry 4.0	3
EET 730	AI for Internet of Things	3
EET 603	SDN for Internet of Things	3
EET 728	Security for Internet of Things	3
EET 602	Ultra-Low Power Radios for IoT	3

PhD – EE

Campus: Islamabad & Karachi

Regular Program Duration: 3 Years (6 Semesters)

Available Specialization:

Electrical Engineering related field of studies

Program Timing: Evening

Entry Requirements:

- 18 Years Education (MS/MPhil/equivalent) in the relevant discipline from an HEC recognized university with minimum CGPA 3.0/4.0 (Semester System) or 60% marks (Annual System).
- NTS-GAT (Subject) or GRE (Subject) Test passed with minimum 60% marks or BU Admission Test (70% passing marks).
- Initial Research Proposal/Statement of Purpose is required at the time of PhD admission.

ROADMAP

Semester 1

Sr.#	Course Code	Course Title	Credit Hours
1	ESC 801	Research Methods in PhD Studies	3
2		Elective I	3
3		Elective II	3

Semester 2

Sr.#	Course Code	Course Title	Credit Hours
1		Elective III	3
2		Elective IV	3
3		Elective V	3

Semester 3

Sr.#	Course Code	Course Title	Credit Hours
1		Comprehensive exam	0
2	THS 900	PhD Thesis	9

Semester 4

Sr.#	Course Code	Course Title	Credit Hours
1	THS 900	PhD Thesis	9

Semester 5

Sr.#	Course Code	Course Title	Credit Hours
1	THS 900	PhD Thesis	9

Semester 6

Sr.#	Course Code	Course Title	Credit Hours
1	THS 900	PhD Thesis	9

List of Electives Courses

Sr.#	Course Code	Course Title	Credit Hours
1	EEN 827	Modern Control Theory	3



2	EEN 828	Advanced Nonlinear Control Systems	3
3	EEP 801	Power Management in Wired and Wireless communications Systems	3
4	EEP 802	Advanced Low Power System Design	3
5	EEP 803	Advanced Power System Deregulation	3
6	EEN 829	Design and Applications of Real Time DSP Systems	3
7	EET 830	Emerging Trend in Cognitive Cooperative Networks	3
8	EET 831	Modern Digital Communications Systems	3
9	EEN 830	Dynamic Systems Modeling & Simulation	3
10	EET 832	Advance topics in Network Security	3
11	EET 833	Smart Antennas	3
12	EET 827	Advanced Wireless Communication Systems	3
13	EEP 804	Advanced Power System Stability and Dynamics	3
14	EET 834	Emerging Trend in Optical Fiber Networks	3
15	EEP 805	Artificial Intelligence Techniques in Power Systems Design	3

17	EET 835	Advance Topics in 5G and Beyond Communications	3
18	EEN 831	Statistical Signal Processing	3
19	CEN 807	Distributed Systems Architecture and Design	3
20	CEN 808	Advanced Techniques in System Modeling and Simulation	3
21	CEN 821	Microprocessor System Optimization and customization	3
22	CEN 840	Advanced Embedded System Design	3
23	CEN 842	Digital Systems Integration and Design	3
24	CEN 845	Image Analysis and Pattern Recognition	3
25	CEN 852	Modern Approaches in VLSI System Design	3
26	CEN 853	Real-Time Systems Engineering & Design	3
27	CEN 855	Advanced Parallel Processing Computer Systems	3
28	DSC 807	Advanced Deep Learning	3
29	CSC 819	Research Trends in Machine Learning	3



30	CSC 851	Advanced Pattern Recognition	3
31	CSC 864	Advanced Computer Vision	3
32	CSC 881	Advanced Cloud Computing	3
33	SEN 862	Emerging Trends in Big Data Analytics	3
34	SEN 810	Advanced Neural Networks & Fuzzy Logic	3
35	EET 829	Optimization Techniques	3
36	EEN 832	Fuzzy Logic and Neural Network Based Intelligent control systems	3
37	EEN 833	Advanced Computer vision for Robotics	3
38	EEN 834	Human-Robot Interaction	3
39	EEN 835	Medical Devices & Robotics	3
40	EET 836	AI for Future Communication Systems	3
41	EET 837	Advanced Data Communication Systems	3
42	EEP 806	Modern Trends in Power system Analysis	3
43	EEP 807	Modern Power System Protection	3



44	CEN 820	High Performance Computer Architecture	3
45	CEN 841	ASIC Design Methodology	3
46	CEN 854	MOS VLSI Circuit Design	3
47	DSC 800	Advanced Data Analytics	3
48	CSC 800	Advanced AI Networking	3
49	SEN 809	Internet of Things: Design and Applications	3
50	SEN 808	Computer and Cybersecurity	3

List of Deficiency Courses

Deficiency courses can be selected from 700-level courses of MS EE Roadmap, as recommended by the Admission Committee.



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