DEPARTMENT OF ELECTRICAL ENGINEERING

Dr. Noor M. Khan
HoD EE

Department of Electrical Engineering

BS Electrical Engineering

The Department of Electrical Engineering is dedicated to continued innovation through its high quality academic programs and competitive research. The department offers undergraduate program in Electrical Engineering and graduate programs in Electrical Engineering and Computer Engineering which cover a wide spectrum of fields while keeping up with their fast pace of technological advancement.

We consider educating and nourishing the next generation of engineers as a key role in the technological development of the society. Undergraduate and graduate students of Electrical Engineering Department are highly valued by industry due to their technical competence, solid analytical skills and critical thinking. The faculty at Electrical Engineering Department is equipped with vast industrial, academic and research experience, and is instrumental in providing excellence both theoretically and practically.

Program Educational Objectives

i. Serve competently in national and international industry or academia by showing excellent skills and knowledge in the field of Electrical Engineering.
ii. Exhibit quest for learning and initiative through elevation in education or growth in professional status.
iii. Demonstrate commitment to ethical practices, community service and societal contribution.

EE Graduate Attributes

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

iii. [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.

iv. [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.

v. [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.

vi. [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.

vii. [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.

viii. [Ethics]Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

ix. [Individual and Team Work]An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.

x. [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.

xi. [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.

xii. [Lifelong Learning]An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

BS Electrical Engineering

1. Admission Requirements

a. Higher Secondary School Certificate (FSc Pre-Engineering) or Equivalent with Physics, Chemistry and Mathematics securing at least 60% marks in aggregate.

In case of foreign qualification, equivalence from IBCC will be required.

OR

Diploma of Associate Engineer Examination in relevant discipline securing at least 60% marks in aggregate (upto 2% of maximum allowed seats).

b. CUST Admission Test or NTS Engineering test.

2. Degree Requirements

Each candidate for the BS Electrical Engineering degree is required to successfully earn 134-135 credit hours as per the following detail:

	Area	Cr. Hrs.
(a)	Electrical Foundation Courses	25
(b)	Natural Sciences	19
(c)	Computing	09
(d)	Electrical Engineering Core Courses	27
(e)	Electrical Engineering Elective Courses/ Depth Courses	18
(f)	Humanities	19
(g)	Management Sciences	06
(h)	Inter Departmental Engineering Elective (IDEE)	06
(i)	Internship	00
(j)	Project	06
	Total	**135**

(a) Electrical Engineering Foundation Courses (25 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Engineering Drawing (CAD)	EE 1011	1
Workshop Practice	EE 1021	1
Linear Circuit Analysis	EE 1213	3

Electrical Network Analysis	EE 2253	3
Basic Electronics	EE 2223	3
Digital Logic Design	EE 2313	3
Signals and Systems	EE 2613	3
Microprocessor and Computer Architecture	EE 3323	3
Linear Circuit Analysis Lab	EE 1211	1
Basic Electronics Lab	EE 2221	1
Digital Logic Design Lab	EE 2311	1
Microprocessor and Computer Architecture Lab	EE 3321	1
Signals and Systems Lab	EE 2611	1

(b) Natural Sciences Courses (19 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Calculus and Analytical Geometry	MTEE1013	3
Linear Algebra	MTEE1033	3
Differential Equations	MTEE 1043	3
Complex Variables and Transforms	MTEE 2053	3
Applied Physics with Lab	PHEE 1013, PHEE 1011	3+1
Probability and Random Variables	EE2413	3

(c) Computing Courses (09 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Introduction to Computing with lab	CSEE1112	1+1
Computer Programming	CSEE1122	2
Computer Programming lab	CSEE 1121	1
Data Structures	CSEE1133	3
Data Structures lab	CSEE 1131	1

(d) Electrical Engineering Core Courses (27 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Electronics Circuit Design	EE2233	3
Communication Systems	EE3713	3
Electrical Machines	EE3283	3
Electromagnetic Fields and Waves	EE 2513	3
Power Distribution and Utilization	EE3143	3
Instrumentation and Measurements	EE3263	3
Control Systems	EE4813	3
Electronics Circuit Design Lab	EE2231	1
Communication Systems Lab	EE3711	1
Power Distribution and Utilization Lab	EE3141	1
Instrumentation and Measurements Lab	EE3261	1
Control Systems Lab	EE4811	1
Electrical Machines Lab	EE3281	1

(e) Electrical Engineering Elective Courses (Depth Electives, 18 Cr. Hrs)
i. Electronics Engineering

Course Title	Code	Cr. Hrs.
Digital Signal Processing with Lab (Depth Core I)	EE4623, EE4621	3+1
ASIC Design and FPGAs with Lab (Depth Core II)	EE 4273, EE 4271	3+1
Solid State Electronics	EE 3243	3
Semiconductor Devices	EE 3273	3
Embedded Systems with Lab	EE 3333, EE 3331	3+1
Digital Communications with Lab	EE 3723, EE 3721	3+1
Analog Integrated Electronics	EE 4223	3
VLSI Design	EE 4253	3

Industrial Electronics	EE 4273	3
Digital Electronics	EE 4273	3
Power Electronics	EE 4293	3
Microwave Engineering with Lab	EE 4523, EE 4521	3+1
Antenna Theory and Design	EE 4533	3
Digital Image Processing	EE 4633	3
Computer Vision	EE 4643	3
Wireless Communication	EE 4733	3
Computer Communication and Networks	EE 4753	3
Systems Programming	CSEE 3423	3
Digital Control Systems	EE 4823	3
Numerical Analysis	EE2403	3

ii. Telecommunication Engineering

Course Title	Code	Cr. Hrs.
Digital Signal Processing with Lab (Depth Core I)	EE 4623, EE 4621	3+1
Digital Communications with Lab (Depth Core II)	EE 3723, EE 3721	3+1
Microwave Engineering with Lab	EE 4523, EE 4521	3+1
Antenna Theory and Design	EE 4533	3
Optical Communication	EE 4553	3
RF Electronics	EE 4563	3
Digital Image Processing	EE 4633	3
Computer Vision	EE 4643	3
Pattern Recognition	EE 4653	3
Cellular and Mobile Communication	EE 4713	3
Wireless Communications	EE 4733	3
Satellite Communications	EE 4743	3
Computer Communications and Networks	EE 4753	3
Network Design and Management	EE 4763	3
Network Programming	EE 4773	3
Transmission and Switching Systems	EE 4473	3
Software Defined Radio	EE 4783	3
Information Theory and Coding	EE 4463	3
Mobile and Pervasive Computing	EE 4493	3
Wireless Sensor Networks	EE 4793	3
Numerical Analysis	EE 2403	3

iii. Power Engineering

Course Title	Code	Cr. Hrs.
Power System Analysis with Lab (Depth Core I)	EE 3113, EE 3111	3+1
Electrical Power Transmission with Lab (Depth Core II)	EE 4123, EE 4121	3+1
Advanced Electrical Machines	EE 4133	3
Power Generation	EE 4143	3
Power Electronics	EE 4293	3
Industrial Electronics	EE 4283	3
Power System Protection with Lab	EE 4153, EE 4151	3+1
Power Stability and Control	EE 4163	3
Advanced Electrical Machine Design	EE 4173	3
High Voltage Engineering with Lab	EE 4183, EE 4181	3+1
Renewable Energy Systems	EE 4193	3
PLCs and Industrial Drives	EE 4843	3
Smart Grid	EE 4483	3
Embedded Systems	EE 3333	3
Digital Control Systems	EE 4823	3
Numerical Analysis	EE 2403	3

(f) Humanities Courses (19 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Pakistan Studies	HMEE 1002	2
English I (Functional English)	HMEE 1013	3
English II (Communication Skills)	HMEE 1023	3
Technical Report Writing	HMEE 2033	3
Islamic Studies	HMEE 2012	2

Humanities I:	Professional Ethics	HMEE 3133	3
	or Introduction to Psychology	HMEE 2053	3
Humanities II:	Sociology for Engineers	HMEE 3063	3
	or Introduction to Logic	HMEE 3123	3

(g) Management Sciences (06 Cr. Hrs)

Course Title		Code	Cr. Hrs.
Management I:	Leadership	MGTE 4113	3
	or Introduction to Management	MGTE 4xx3	3
Management II:	Project Management	MGTE 4063	3
	or Organizational Behavior	MGTE 4073	3
	or Engineering Economics	ECOE 4503	3

(h) Inter Departmental Engineering Elective (IDEE) (06 Cr. Hrs)

Course Title		Code	Cr. Hrs.
IDEE I:	Applied Thermodynamics	MEEE 1113	3
	or Engineering Surveying with lab	CEEE 1113	2+1
	or Geoinformatics	CEEE 2133	3
IDEE II:	Machine Design	MEEE 3043	3
	or Environmental Engineering	CEEE 3712	3
	or Applied Mechanics	MEEE 3023	3
	Applied Mechanics Lab	MEEE 3021	1

(i) Design Project
After the completion of 90 Cr. Hrs., the students are required to demonstrate their practical skills in the field of Electrical Engineering by designing and implementing a design project worth 6 Cr. Hrs. The project shall be completed in two parts as given below:

Course Title	Code	Cr. Hrs.
Design Project-I	EE 4912	2
Design Project-II	EE 4924	4

(j) Industrial Internship (EE4000)
Each student is required to complete an 8-week industrial internship training usually after 6 semesters or on the completion of 90 Cr. Hrs. The internship shall be graded as pass/fail.

(k) Community Work (EE3000)
Each student is required to complete 60 hours community work, usually after 4th semester which would be a prerequisite for the award of degree.

3. Program Duration
This is a four year degree program comprising of 8 semesters. There will be a Fall and a Spring semester in each year. The summer semester will be utilized for internship or deficiency courses. The maximum duration to complete BS Electrical Engineering degree is 07 years.

Scheme of Study
BS Electrical Engineering Program

Semester - I (17Cr. Hrs.)

Course Code		Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
HMEE	1002	Pakistan Studies	Humanities	2	0	2
HMEE	1013	English-1(Functional English)	Humanities	3	0	3
MTEE	1013	Calculus and Analytical Geometry	Natural Sciences	3	0	3
PHEE	1013	Applied Physics	Natural Sciences	3	0	3
PHEE	1011	Applied Physics Lab	Natural Sciences	0	3	1
CSEE	1112	Introduction to Computing	Computing	1	3	2
EE	1011	Engineering Drawing (CAD)	EE Foundation	0	3	1

Semester-2 (17 SCH)

Course Code		Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
HMEE	1023	English-II (Communication Skills)	Humanities	3	0	3
MTEE	1033	Linear Algebra	Natural Sciences	3	0	3
MTEE	1043	Differential Equations	Natural Sciences	3	0	3
CSEE	1122	Computer Programming	Computing	2	0	2
CSEE	1121	Computer Programming Lab	Computing	0	3	1
EE	1213	Linear Circuit Analysis	EE Foundation	3	0	3
EE	1211	Linear Circuit Analysis Lab	EE Foundation	0	3	1
EE	1021	Workshop Practice	EE Foundation	0	3	1

Semester-3 (18 SCH)

Course Code		Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
MTEE	2053	Complex Variables and Transforms	Natural Sciences	3	0	3
CSEE	1133	Data Structures	Computing	3	0	3
CSEE	1131	Data Structures Lab	Computing	0	3	1
EE	2253	Electrical Network Analysis	EE Foundation	3	0	3
EE	2223	Basic Electronics	EE Foundation	3	0	3
EE	2221	Basic Electronics Lab	EE Foundation	0	3	1
EE	2313	Digital Logic Design	EE Foundation	3	0	3
EE	2311	Digital Logic Design Lab	EE Foundation	0	3	1

Semester-4 (16 SCH)

Course Code		Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
HMEE	2012	Islamic Studies/Ethics	Humanities	2	0	2
EE	2413	Probability and Random Variables	Natural Sciences	3	0	3
EE	2613	Signals & Systems	EE Foundation	3	0	3
EE	2611	Signals & Systems Lab	EE Foundation	0	3	1
EE	2233	Electronics Circuit Design	EE Core	3	0	3
EE	2231	Electronics Circuit Design Lab	EE Core	0	3	1
ME/CE	2xx3	IDEE Elective-I	IDEE	3	0	3

Semester-5 (16 SCH)

Course Code		Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
HMEE	3xx3	Humanities-I	Humanities	3	0	3
ME/CE	3xx3	IDEE Elective-II	IDEE	3	0	3
EE	37xx1	IDEE II: ME Lab	IDEE	0	3	1
EE	2513	Electromagnetic Fields & Waves	EE Foundation	3	0	3
EE	3323	Micro. & Comp. Architecture	EE Foundation	3	0	3
EE	3321	Micro. & Comp. Architecture Lab	EE Foundation	0	3	1
EE	3283	Electrical Machines	EE Core	3	0	3
EE	3281	Electrical Machines Lab	EE Core	0	3	1

Semester-6 (18 SCH)

Course Code		Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
HMEE	3xx3	Humanities-II	Humanities	3	0	3
HMEE	2033	Technical Report Writing	Humanities	3	0	3
EE	3713	Communication Systems	EE Core	3	0	3
EE	3711	Communication Systems Lab	EE Core	0	3	1
EE	3103	Power Distribution and Utilization	Breadth Core	3	0	3
EE	3101	Power Distribution and Utilization Lab	Breadth Core	0	3	1
EE	3263	Instrumentation and Measurements	Breadth Core	3	0	3
EE	3261	Instr. and Measurements Lab	Breadth Core	0	3	1

Semester-7 (18 SCH)

Course Code		Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
EE	4xx3	Depth Elective-I (Depth Core I)	EE Elective	3	0	3
EE	4xx1	Depth Elective-I (Depth Core I) Lab	EE Elective	0	3	1
EE	4813	Control Systems	EE Core	3	0	3
EE	4811	Control Systems Lab	EE Core	0	3	1
EE	4xx3	Depth Elective-II (Depth Core II)	EE Elective	3	0	3
EE	4xx1	Depth Elective-II (Depth Core II) Lab	EE Elective	0	3	1
MGT	4xx3	Management Elective-I	Mgt. Elective	3	0	3
EE	4912	Design Project Part I	Design Project	0	6	2

Semester-8 (17 SCH)

Course Code		Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
HMEE	4xx3	Management Elective-II	Mgt. Elective	3	0	3
EE	4xx3	Depth Elective-III	EE Elective	3	0	3
EE	4xx1	Depth Elective-III Lab	EE Elective	0	3	1
EE	4xx3	Depth Elective-IV	EE Elective	3	0	3
EE	4xx3	Depth Elective-V	EE Elective	3	0	3
EE	4924	Design Project (Part-II)	Design Project	0	12	4

MS Electrical Engineering

1. Admission Requirements

a) A minimum of 16 years of education leading to BS/ BE/ BSc in Electrical/ Electronics/ Telecommunications Engineering or equivalent[4].

b) Minimum 2.00/4.00 CGPA or 50% marks

c) Admission Test / HEC Approved Test

2. Degree Requirements

A student admitted in this program will have to complete the degree requirements by following any one of the options given below:

	Area	Cr. Hrs.
a)	24 Cr. Hrs course work with 6 Cr. Hrs Thesis	30
b)	27 Cr. Hrs course work with 3 Cr. Hrs Project	30
c)	Course work only (10 Courses)	30

3. Specialization Requirements

A student can claim a specialization if he/ she has completed 15 Cr. Hrs. including research work, if opted, from one of the specialization areas mentioned below. Otherwise, on the completion of 30 Cr. Hrs., he/she will be awarded the MS Degree without any specialization.

[4]Applicants with undergraduate degree from non-relevant areas may be required to take some undergraduate courses to fulfill pre-requisite deficiencies as determined by the Graduate Admission Committee. The deficiency Cr. Hrs. will not be counted towards the minimum Cr. Hrs. requirement for the award of the MS degree.

i. Control Systems

Course Title	Code	Cr. Hrs.
Linear System Theory	EE 5813	3
Nonlinear Control Systems	EE 5823	3
Digital Control Systems	EE 5833	3
Control Systems Design	EE 5843	3
Robust Control Systems	EE 6843	3
Adaptive Control systems	EE 6853	3
LMI in Control	EE 6863	3
Sliding Mode Control	EE 6893	3
Robotics and Control	EE 7833	3
Process Control	EE 6873	3
Neuro & Fuzzy Control Systems	EE 6883	3
Automotive Control Systems	EE 7813	3
Flight Control Systems	EE 7823	3
Advanced Nonlinear Control System	EE 7843	3
Advanced Topics in Control Engineering	EE 78x3	3

ii. Signal Processing

Course Title	Code	Cr. Hrs.
Advanced Digital Signal Processing	EE 5613	3
Advanced Digital Image Processing	EE 5623	3
Adaptive Signal Processing	EE 6633	3
Pattern Recognition	EE 6643	3
Radar Signal Processing	EE 6663	3
Computer Vision	EE 6653	3

Machine Learning	EE 6683	3
Robotic Vision	EE 6693	3
Filter Banks and Wavelet Theory	EE 6673	3
Advanced Analog Filter Design	EE 6223	3
Advanced Topics in Computer Vision	EE 7613	3
Advanced Topics in Signal Processing	EE 7623	3
Medical Image Processing	EE 6663	3
Neural Networks and Deep Learning	EE 7633	3
Video Encoding and Processing	EE 7643	3

iii. Telecommunications

Course Title	Code	Cr. Hrs.
Stochastic Processes	EE 5413	3
Advanced Digital Communications	EE 5713	3
Information and Coding Theory	EE 5723	3
Advanced Computer Networks	EE 6713	3
Cellular and Mobile Communications	EE 6733	3
Mobile and Wireless Networks	EE 6763	3
Cognitive Radio Communications	EE 67x3	3
Multimedia Services Over IP Networks	EE 6773	3
Networks Security	EE 5733	3
Networks Programming	EE 5743	3
Network Architecture Design	EE 6783	3
Smart Grid Communication	EE 5753	3
Principles of Digital Communications	EE 5703	3

Advanced Cryptography	EE 5433	3
Advanced Satellite Communications	EE 6743	3
Advanced Optical Communications	EE 6543	3
Advanced Topics in Computer Networks	EE 77x3	3
Advanced Topics in Communications	EE 77x3	3
Advanced Antenna Theory and Design	EE 6523	3
Software Defined Radios	EE 6723	3

iv. Electronics and Microwave

Course Title	Code	Cr. Hrs.
Solid State Electronics	EE 5233	3
Analog Integrated Electronic Circuits	EE 6213	3
RF Circuits Design	EE 6253	3
Advanced Antenna Theory and Design	EE 6523	3
Advanced Microwave Engineering	EE 6533	3
Advanced Power Electronics	EE 5123	3
Computer-Aided Digital VLSI Design	EE 6323	3
Advanced ASIC Design and FPGA	EE 6333	3
Embedded Systems Design	EE 6343	3
Advanced Electromagnetic Theory	EE 5513	3
Advanced Semi-conductor Devices	EE 6233	3
Advanced Computer Architecture	EE 6313	3
Processing of Semiconductor Devices	EE 6353	3

4. Research Thesis/Project

Course Title	Code	Cr. Hrs.
Research Thesis	EE 6916	6
Research Project	EE 6913	3

5. CGPA Requirement

A student is required to earn a minimum 3.00/4.00 CGPA on the completion of his degree requirements.

6. Program Duration

This is normally a two year program comprising of 4 semesters. There will be a Fall and a Spring semester in each year. The maximum duration to complete MS in Electrical Engineering is 4 years.

PhD ELECTRICAL ENGINEERING

The Department of Electrical Engineering is dedicated to continued innovation through its vibrant dynamic environment and competitive research. The department offers PhD program in Electrical Engineering which covers a wide spectrum of fields keeping up with their fast pace of technological advancement. Its carefully designed PhD program aims at producing researchers in the areas of Telecommunications, Control Systems, Signal and Image Processing, Power Systems, Networks and Computer Systems. To achieve this goal, the department has got a team of highly qualified and dedicated faculty members while establishing a strong liaison with research and development organizations and industry.

Admission Requirements

- MS degree in relevant discipline*
- Minimum CGPA 3.0/4.0 (Semester System) or 60% marks (Annual System)
- Admission Test / HEC approved Test
- Interview

Degree Requirements

A PhD candidate shall be awarded degree on successful completion of the following requirements:

a) 18 Cr. Hrs. Course Work with CGPA > 3
b) Comprehensive Examination (written and oral)
c) 30 Cr. Hrs. Research Work
d) Synopsis Defense
e) Thesis Foreign Evaluation
f) Publication/Acceptance of at least one research paper.
g) Local Defense

PhD scholars are required to comply with the following time line:

Activity	Preferred Time	Maximum
Course Work	2 Semesters	3 Semesters
Comprehensive Exam	3 Semesters	5 Semesters
Synopsis Qualification	4 Semesters	6 Semesters
Thesis Submission	6 Semesters	10 Semesters

* Relevancy shall be established by the Graduate Admission Committee.