FACULTY OF ENGINEERING

The Faculty of Engineering aims to produce engineers and researchers, who are equipped with knowledge and expertise to meet the challenges of dynamic and evolving engineering domains. To achieve this objective, a team of highly qualified and dedicated faculty members is available full time and is committed to train and groom the students who have selected engineering as their profession. The academic program is supported by well-equipped labs that strengthen the applied aspect of the discipline, and provides hand-on skills to future engineers and researchers. A numbers of highly reputed research groups exist in the Faculty of Engineering, which are involved in extensive applied research on novel ideas and industrial problems. In these groups, various projects under which research and development work is in progress in close collaboration with R&D organizations and industry, supported by the national & international funding agencies.

The Faculty of Engineering currently offers graduate and undergraduate programs in Electrical Engineering, Computer Engineering, Civil Engineering, Mechanical Engineering and Engineering Management. The students are being prepared for a career in industry, academia or research, by providing them with a thorough foundation of the fundamental concepts and analytical tools of contemporary engineering domains. The faculty envisions to contribute towards a knowledge-based economy of the country, with skilled professionals having curious minds, learning attitude and ethical behaviors, who are ready to undertake engineering challenges of our society.

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

The Department of Electrical and Computer Engineering is dedicated to continued innovation through its high-quality academic programs and competitive research. The department offers undergraduate programs in Electrical Engineering and Computer Engineering and graduate programs in Electrical 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. Trained in well-equipped state-of-the-art laboratories, the graduates of the Department of Electrical and Computer Engineering are highly valued by industry due to their technical competence, solid analytical skills and critical thinking. The faculty at the Department of Electrical and Computer Engineering is equipped with vast industrial, academic and research experience, and is instrumental in providing excellence both theoretically and practically.

BS Electrical Engineering

■ Program Educational Objectives (PEOs)

The BS(EE) program aims to produce leading professionals who will:

(i) Serve competently in national and international industry or academia by showing requisite knowledge and skills 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.

■ Program Learning Outcomes (PLOs)

At the time of graduation the graduates of BS(EE) program will possess the following 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.

■ **Admission Requirements**

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

OR

Intermediate of Computer Science (ICS) or Equivalent with Physics, Computer Science and Mathematics securing at least 60% marks in aggregate.

OR

Diploma of Associate Engineering in relevant disciplines securing at least 60% marks in aggregate.

(ii) CUST Admission Test/HEC Approved Test

■ **Degree Requirements**

Each candidate for the BS Electrical Engineering degree is required to successfully earn 136 credit hours (Cr. Hrs.) as per the following detail:

	Area	Cr. Hrs.
a)	General Education Courses	38
b)	Disciplinary or Major Courses	75
c)	Interdisciplinary / Allied Courses	14
d)	Field Experience / Internship	03
e)	Capstone / Design Project	06
f)	Community Service	00
	Total	**136**

■ **General Education Courses (38 Cr. Hrs)**

Course Title	Code	Cr. Hrs.
Calculus and Analytical Geometry	EEG1513	3
Probability and Statistics	EEG2523	3
Applied Physics	EEG1312	2

Applied Physics Lab	EEG1311	1
Functional English	EEG1113	3
Expository Writing	EEG1123	3
Islamic Studies/Ethics	EEG1012	2
Ideology and Constitution of Pakistan	EEG1022	2
Personal Grooming	EEG1212	2
Sociology	EEG1412	2
Applications of Information and Communication Technologies	EEG1612	2
Applications of Information and Communication Technologies Lab	EEG1611	1
Civics and Professional Ethics	EEG2812	2
Entrepreneurship	EEG2712	2
Applied Differential Equations	MTEE1043	3
Complex Variables and Transforms	MTEE2053	3
Project Management	MGTE4062	2

■ Disciplinary or Major Courses (75 Cr. Hrs.)

a) Foundation Courses (22 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Linear Circuit Analysis	EE1213	3
Linear Circuit Analysis Lab	EE1211	1
Basic Electronics	EE2223	3
Basic Electronics Lab	EE2221	1
Signals & Systems	EE2613	3
Signals & Systems Lab	EE2611	1
Electrical Network Analysis	EE2253	3
Electromagnetic Fields & Waves	EE2513	3
Digital Logic Design	EE2313	3
Digital Logic Design Lab	EE2311	1

b) Breadth Courses (24 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Micro-processor and Computer Architecture	EE3323	3
Micro-processor and Computer Architecture Lab	EE3321	1
Communication Systems	EE3713	3
Communication Systems Lab	EE3711	1
Electrical Machines	EE3283	3
Electrical Machines Lab	EE3281	1
Linear Control System	EE4813	3
Linear Control System Lab	EE4811	1
Power Generation Transmission and Distribution	EE3123	3
Power Generation Transmission and Distribution Lab	EE3121	1
Instrumentation and Measurements	EE3263	3
Instrumentation and Measurements Lab	EE3261	1

c) Depth Courses (22 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Electronics Circuit Design	EE2233	3
Electronics Circuit Design Lab	EE2231	1
Power System Analysis and Protection	EE4193	3
Power System Analysis and Protection Lab	EE4191	1
ASIC Design and FPGA	EE4273	3
ASIC Design and FPGA Lab	EE4271	1
Power Electronics	EE4293	3
Power Electronics Lab	EE4291	1
*Technical Elective-I	EE4xx3	3
*Technical Elective-II	EE4xx3	3

Capital University of Science and Technology

■ *Technical Elective Courses

Students are required to take 6 Cr. Hrs. as technical elective courses. A list of technical elective courses is given below:

Course Title	Code	Cr. Hrs.
Electric Vehicles	EE4413	3
Embedded Systems	EE3333	3
Digital Signal Processing	EE4623	3
Computer Vision	EE4683	3
Digital Image Processing	EE4633	3
High Voltage Engineering	EE4813	3
Internet of Things	EE4423	3
Network Design & Management	EE4763	3
Industrial Electronics	EE4263	3
Smart Grid & Renewable Energy Systems	EE4433	3
Microwave Engineering	EE4523	3
Antenna Theory & Design	EE4533	3
Numerical Analysis	EE2403	3
Computer Communication Networks	EE4713	3
Wireless Communication	EE4733	3

■ Computer and Information Systems – C & I (07 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Artificial Intelligence	EE4693	3
Artificial Intelligence Lab	EE4691	1
Computer Programming	CSEE1122	2
Computer Programming Lab	CSEE1121	1

■ Interdisciplinary / Allied Courses – IDC (14 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Basic Mechanical Engineering	MEEE2023	3
Basic Mechanical Engineering Lab	MEEE2021	1
Geoinformatics	CEEE2131	1
Occupational Health & Safety	HMEE1071	1
Engineering Drawing	EE1011	1
OOP and Data Structures	CSEE2123	3
OOP and Data Structures Lab	CSEE2121	1
Linear Algebra	MTEE1032	2
Workshop Practice	EE1021	1

■ Capstone / Design Project (06 Cr. Hrs.)

After the completion of 90 Cr. Hrs., the students are required to register for Design Project (Part-I) of 2 Cr. Hrs. in the 7th semester of their degree program. Design Project (Part-II) of 4 Cr. Hrs. can be taken in the next i.e. 8th semester provided Design Project (Part-I) is passed.

Course Title	Code	Cr. Hrs.
Design Project (Part-I)	EE4912	02
Design Project (Part-II)	EE4924	04

■ Field Experience / Internship (03 Cr. Hrs.)

Each student is required to complete 8 weeks industrial internship training usually after 6 semesters or on the completion of 90 Cr. Hrs.

Course Title	Code	Cr. Hrs.
Field Experience / Internship	EE4003	03

■ Community Service (VIS4000)

Each student is required to complete 65 hours community work, usually after 1st semester which would be a prerequisite for the award of degree. It will be assessed as satisfactory (S) / unsatisfactory (US). In case of unsatisfactory, it will be done from scratch.

■ CGPA Requirement

A student is required to earn a minimum 2.00/4.00 CGPA on the completion of his/her degree requirements.

■ 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.
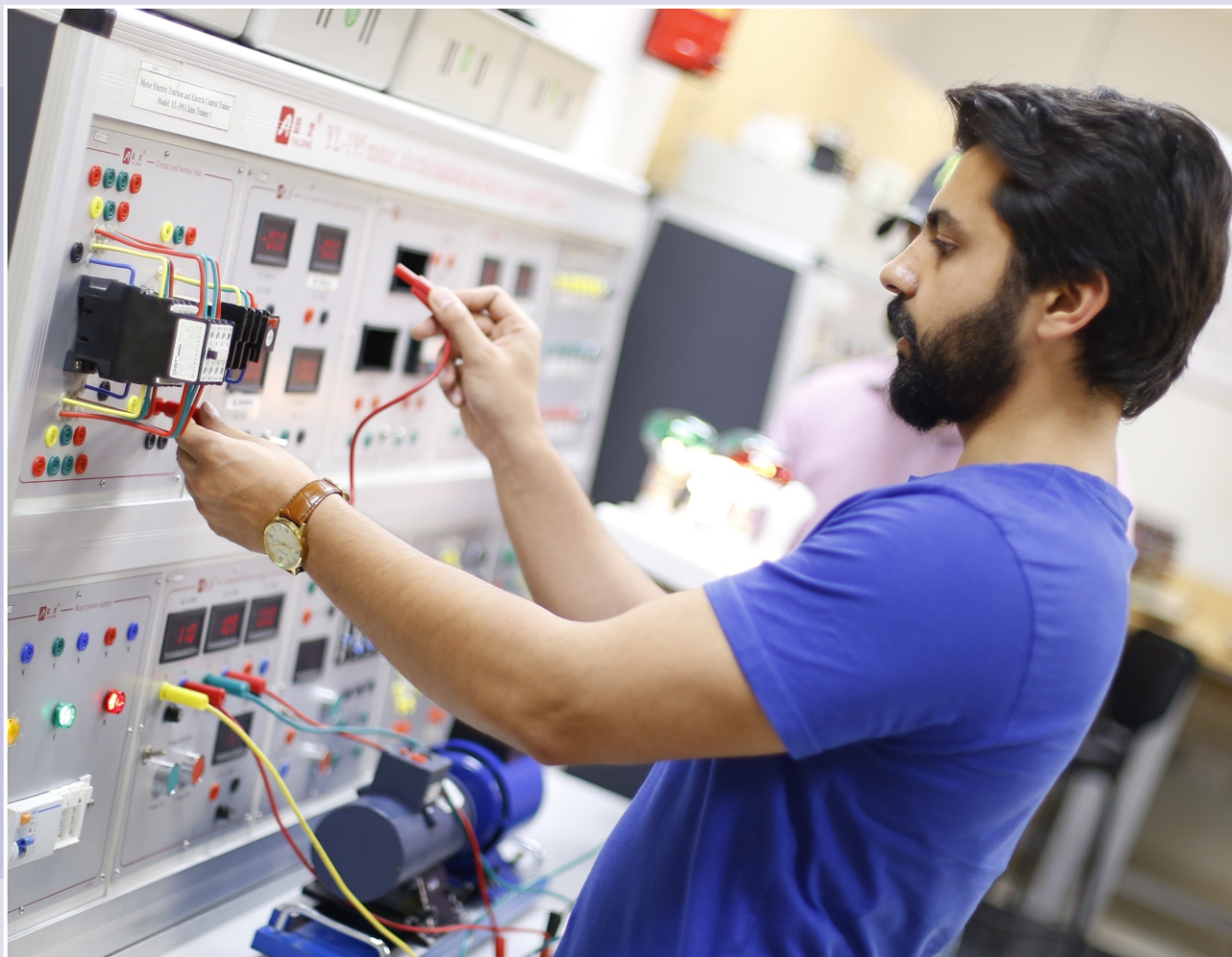
SCHEME OF STUDIES
BS Electrical Engineering Program

☐ **Semester-I (16 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
EEG1022	Ideology and Constitution of Pakistan	2
EEG1113	Functional English	3
EEG1513	Calculus and Analytical Geometry	3
EEG1312	Applied Physics	2
EEG1311	Applied Physics Lab	1
EEG1612	Applications of Information and Communication Technologies	2
EEG1611	Applications of Information and Communication Technologies Lab	1
EE1011	Engineering Drawing	1
HMEE1071	Occupational Health & Safety	1

☐ **Semester-II (17 Cr. Hrs)**

Course Code	Course Title	Cr. Hrs.
MTEE1032	Linear Algebra	2
MTEE1043	Applied Differential Equations	3
CSEE1122	Computer Programming	2
CSEE1121	Computer Programming Lab	1
EE1213	Linear Circuit Analysis	3
EE1211	Linear Circuit Analysis Lab	1
EE1021	Workshop Practice	1
EEG1212	Personal Grooming	2
EEG1412	Sociology	2

☐ **Semester-III (17 Cr. Hrs)**

Course Code	Course Title	Cr. Hrs.
CSEE2123	OOP and Data Structures	3
CSEE2121	OOP and Data Structures Lab	1

EE2253	Electrical Network Analysis	3
EEG2712	Entrepreneurship	2
EEG1123	Expository Writing	3
EEG2523	Probability and Statistics	3
EEG1012	Islamic Studies/Ethics	2

☐ Semester-IV (17 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
MTEE2053	Complex Variables and Transforms	3
EE3283	Electrical Machines	3
EE3281	Electrical Machines Lab	1
EE2223	Basic Electronics	3
EE2221	Basic Electronics Lab	1
EEG2812	Civics and Professional Ethics	2
EE2313	Digital Logic Design	3
EE2311	Digital Logic Design Lab	1

☐ Semester-V (17 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
EE2513	Electromagnetic Fields & Waves	3
EE3323	Micro-processor and Computer Architecture	3
EE3321	Micro-processor and Computer Architecture Lab	1
MGTE4062	Project Management	2
EE2233	Electronics Circuit Design	3
EE2231	Electronics Circuit Design Lab	1
EE2613	Signal & Systems	3
EE2611	Signal & Systems Lab	1

☐ Semester-VI (16 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
EE3123	Power Generation Transmission and Distribution	3
EE3121	Power Generation Transmission and Distribution Lab	1

Course Code	Course Title	Cr. Hrs.
EE3263	Instrumentation and Measurements	3
EE3261	Instrumentation and Measurements Lab	1
EE3713	Communication Systems	3
EE3711	Communication Systems Lab	1
MEEE3023	Basic Mechanical Engineering	3
MEEE3021	Basic Mechanical Engineering Lab	1

☐ Semester-VII (17 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
EE4193	Power System Analysis and Protection	3
EE4191	Power System Analysis and Protection Lab	1
EE4273	ASIC Design and FPGA	3
EE4271	ASIC Design and FPGA Lab	1
EE4912	Design Project (Part-I)	2
EE4xx3	Technical Elective-I	3
EE4693	Artificial Intelligence	3
EE4691	Artificial Intelligence Lab	1

☐ Semester-VIII (16 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
EE4293	Power Electronics	3
EE4291	Power Electronics Lab	1
EE4813	Linear Control Systems	3
EE4811	Linear Control Systems Lab	1
EE4924	Design Project (Part-II)	4
EE4xx3	Technical Elective -II	3
CEEE2131	Geoinformatics	1

BS Computer Engineering

■ **Program Educational Objectives (PEOs)**

The BS Computer Engineering program aims to produce leading professionals who will:

(i) Contribute competently in the field of Computer Engineering to fulfill the contemporary requirements of industry or academia both at national and international levels.

(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.

■ **Program Learning Outcomes (PLOs)**

At the time of graduation the graduates of BS Computer Engineering program will possess the following 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.

■ **Admission Requirements**

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

OR

Intermediate of Computer Science (ICS) or Equivalent with Physics, Computer Science and Mathematics securing at least 60% marks in aggregate.

OR

Diploma of Associate Engineering in relevant disciplines securing at least 60% marks in aggregate.

(ii) CUST Admission Test/HEC Approved Test

■ **Degree Requirements**

Each candidate for the BS Computer Engineering degree is required to complete successfully 136 credit hours (Cr. Hrs.) as per the following details:

	Area	Cr. Hrs.
a)	General Education Courses	38
b)	Disciplinary or Major Courses	75
c)	Interdisciplinary / Allied Courses	14
d)	Field Experience / Internship	03
e)	Capstone / Design Project	06
f)	Community Service	00
	Total	**136**

■ General Education Courses (38 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Functional English	CPEG1113	3
Expository Writing	CPEG1123	3
Islamic Studies/Ethics	CPEG1012	2
Ideology and Constitution of Pakistan	CPEG1022	2
Personal Grooming	CPEG1212	2
Sociology	CPEG1412	2
Applications of Information and Communication Technologies	CPEG1612	2
Applications of Information and Communication Technologies Lab	CPEG1611	1
Civics and Professional Ethics	CPEG2812	2
Calculus and Analytical Geometry	CPEG1513	3
Probability and Statistics	CPEG2523	3
Applied Physics	CPEG1312	2
Applied Physics Lab	CPEG1311	1
Entrepreneurship	CPEG2712	2
Applied Differential Equations	MCPE1043	3
Complex Variables and Transforms	MCPE2053	3
Project Management	HCPE4062	2

■ Disciplinary or Major Courses (75 Cr. Hrs.)

a) Foundation Courses (22 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Circuit Analysis	CPE1213	3
Circuit Analysis Lab	CPE1211	1
Digital Logic Design	CPE2313	3
Digital Logic Design Lab	CPE2311	1
Electronic Devices and Circuits	CPE2233	3

	CPE2231	1
Electronic Devices and Circuits Lab	CPE2231	1
Discrete Structures	CPE2052	2
Signals and Systems	CPE2613	3
Signals and Systems Lab	CPE2611	1
Computer Architecture and Organization	CPE2323	3
Computer Architecture and Organization Lab	CPE2321	1

b) Breadth Courses (24 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Object Oriented Programming	CPE2123	3
Object Oriented Programming Lab	CPE2121	1
Microprocessors and Interfacing	CPE3333	3
Microprocessors and Interfacing Lab	CPE3331	1
Digital Signal Processing	CPE3623	3
Digital Signal Processing Lab	CPE3621	1
Computer and Communication Networks	CPE4713	3
Computer and Communication Networks Lab	CPE4711	1
Digital System Design	CPE3343	3
Digital System Design Lab	CPE3341	1
Operating Systems	CPE3413	3
Operating Systems Lab	CPE3411	1

c) Depth Courses (22 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Database Management Systems	CPE4513	3
Database Management Systems Lab	CPE4511	1
Software Engineering	CPE4523	3
*Depth Elective-I	CPE3xx3	3

*Depth Elective-I Lab	CPE3xx1	1
*Depth Elective-II	CPE4xx3	3
*Depth Elective-II Lab	CPE4xx1	1
*Depth Elective-III	CPE4xx3	3
*Depth Elective-III Lab	CPE4xx1	1
*Depth Elective-IV	CPE4xx3	3

■ *Depth Elective Courses

Students are required to take 15 Cr. Hrs. as depth elective courses. A list of technical elective courses is given below:

Course Title	Code	Cr. Hrs.
Communication Systems	CPE3713	3
Communication Systems Lab	CPE3711	1
Internet of Things	CPE4733	3
Internet of Things Lab	CPE4731	1
Digital Image Processing	CPE3643	3
Digital Image Processing Lab	CPE3641	1
System Programming	CPE4143	3
Systems Programming Lab	CPE4141	1
Embedded systems	CPE4353	3
Embedded Systems Lab	CPE4351	1
Control Systems	CPE4813	3
Control Systems Lab	CPE4811	1
Cloud and Distributed Computing	CPE4543	3
High Performance Computing	CPE4553	3
Computer Vision	CPE4653	3
Design and Analysis of Algorithms	CPE4153	3
Network and Cyber Security	CPE4743	3

d) Computer and Information Sciences (C&I) - 07 Cr. Hrs.

Course Title	Code	Cr. Hrs.
Artificial Intelligence	CPE3633	3
Artificial Intelligence Lab	CPE3631	1
Computer Programming	CCPE1122	2
Computer Programming Lab	CCPE1121	1

■ Interdisciplinary / Allied Courses (IDC) - 14 Cr. Hrs.

Course Title	Code	Cr. Hrs.
Computer Graphics	CCPE3423	3
Numerical Analysis	MCPE3072	2
Occupational Health & Safety	HCPE1071	1
Data Structures and Algorithms	CPE2133	3
Data Structures and Algorithms Lab	CPE2131	1
Engineering Drawing	CPE1011	1
Linear Algebra	MCPE1032	2
Workshop Practice	CPE1021	1

■ Capstone / Design Project (06 Cr. Hrs.)

After the completion of 90 Cr. Hrs., the students are required to register for Design Project (Part-I) of 3 Cr. Hrs. in the 7th semester of their degree program. Design Project (Part-II) of 3 Cr. Hrs. can be taken in the next i.e. 8th semester provided Design Project (Part-I) is passed.

Course Title	Code	Cr. Hrs.
Design Project (Part-I)	CPE4912	02
Design Project (Part-II)	CPE4924	04

■ Field Experience / Internship (03 Cr. Hrs.)

Each student is required to complete an 8-week industrial internship training usually after 6 semesters or on the completion of 90 Cr. Hrs.

Course Title	Code	Cr. Hrs.
Field Experience / Internship	CPE4003	03

■ Community Service (VIS4000)

Each student is required to complete 65 hours community work, usually after 1st semester which would be a prerequisite for the award of degree. It will be assessed as satisfactory (S) / unsatisfactory (US). In case of unsatisfactory, it will be done from scratch.

■ CGPA Requirement

A student is required to earn a minimum 2.00/4.00 CGPA on the completion of his/her degree requirements.

■ 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 Computer Engineering degree is 07 years.

SCHEME OF STUDIES
BS Computer Engineering Program

☐ Semester-I (16 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
CPEG1012	Islamic Studies/Ethics	2
CPEG1113	Functional English	3
CPEG1513	Calculus and Analytical Geometry	3
CPEG1312	Applied Physics	2
CPEG1311	Applied Physics Lab	1
CPEG1612	Applications of Information and Communication Technologies	2
CPEG1611	Applications of Information and Communication Technologies Lab	1
CPE1021	Workshop Practice	1
HCPE1071	Occupational Health & Safety	1

☐ Semester-II (16 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
CPEG1412	Sociology	2
MCPE1032	Linear Algebra	2
MCPE1043	Applied Differential Equations	3
CCPE1122	Computer Programming	2
CCPE1121	Computer Programming Lab	1
CPE1213	Circuit Analysis	3
CPE1211	Circuit Analysis Lab	1
CPEG1022	Ideology and Constitution of Pakistan	2

☐ Semester-III (18 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
CPE2052	Discrete Structures	2
CPE2123	Object Oriented Programming	3

Course Code	Course Title	Cr. Hrs.
CPE2121	Object Oriented Programming Lab	1
CPE2233	Electronic Devices and Circuits	3
CPE2231	Electronic Devices and Circuits Lab	1
CPEG1212	Personal Grooming	2
MCPE2053	Complex Variables and Transforms	3
CPEG2812	Civics and Professional Ethics	2
CPE1011	Engineering Drawing	1

☐ Semester-IV (18 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
CPE2313	Digital Logic Design	3
CPE2311	Digital Logic Design Lab	1
CPEG1123	Expository Writing	3
CPEG2523	Probability and Statistics	3
CPE2133	Data Structures and Algorithms	3
CPE2131	Data Structures and Algorithms Lab	1
CPEG2712	Entrepreneurship	2
MCPE3072	Numerical Analysis	2

☐ Semester-V (18 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
CPE2323	Computer Architecture and Organization	3
CPE2321	Computer Architecture and Organization Lab	1
CPE3633	Artificial Intelligence	3
CPE3631	Artificial Intelligence Lab	1
CPE3333	Microprocessors and Interfacing	3
CPE3331	Microprocessors and Interfacing Lab	1
CPE2613	Signals & Systems	3
CPE2611	Signals & Systems Lab	1
HCPE4062	Project Management	2

☐ Semester-VI (16 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
CPE3623	Digital Signal Processing	3
CPE3621	Digital Signal Processing Lab	1
CPE3xx3	Depth Elective-I	3
CPE3xx1	Depth Elective-I Lab	1
CPE3413	Operating Systems	3
CPE3411	Operating Systems Lab	1
CPE4713	Computer Communications and Networks	3
CPE4711	Computer Communications and Networks Lab	1

☐ Semester-VII (18 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
CPE3343	Digital System Design	3
CPE3341	Digital System Design Lab	1
CPE4xx3	Depth Elective-II	3
CPE4xx1	Depth Elective-II Lab	1
CCPE3423	Computer Graphics	3
CPE4523	Software Engineering	3
CPE4912	Design Project (Part-I)	2

☐ Semester-VIII (15 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
CPE4513	Database Management System	3
CPE4511	Database Management System Lab	1
CPE4xx3	Depth Elective-III	3
CPE4xx1	Depth Elective-III Lab	1
CPE4xx3	Depth Elective-IV	3
CPE4924	Design Project (Part-II)	4

BS Cyber Security

■ **Program Educational Objectives (PEOs)**

The graduates of the BS Cyber Security will become the professionals who:

(i) Demonstrate excellence in the profession through in-depth knowledge and requisite skills in the emerging fields of cyber and information security.

(ii) Engage in continuous professional development and exhibit a quest for learning, innovation, and entrepreneurship.

(iii) Show professional integrity and commitment to social and ethical responsibilities.

■ **Program Learning Outcomes (PLOs)**

At the time of graduation the graduates of BS Cyber Security program will possess the following attributes:

(i) **Academic Education:** Equip graduates with a strong foundation in computing principles and in-depth knowledge of cyber and information security concepts to prepare them as cybersecurity professionals.

(ii) **Knowledge for Solving Computing Problems:** Apply knowledge of computing fundamentals, knowledge of cyber and information security, mathematics, science, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models that address cyber and information security problems and requirements.

(iii) **Problem Analysis:** Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and cyber and information security.

(iv) **Design/ Development of Solutions:** Design and evaluate solutions for complex computing problems, and design and evaluate cyber and information security systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

(v) **Modern Tool Usage:** Create, select, adapt, and apply appropriate techniques, resources, and modern computing tools to complex computing activities relating to cyber and information security, with an understanding of the limitations.

(vi) **Individual and Teamwork:** Function effectively as an individual and as a member or leader in diverse teams and multi-disciplinary settings, fostering effective collaboration to address complex cyber and information security challenges.

(vii) **Communication:** Communicate effectively with the computing community and with society at large about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

(viii) **Computing Professionalism and Society:** Understand and assess societal, health, safety, legal, and cultural issues pertaining to cyber and information security within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

(ix) **Ethics:** Understand and commit to professional ethics, responsibilities, and norms of professional

computing practices involving cyber and information security measures.

(x) **Life-long Learning:** Recognize the ongoing need for lifelong learning in the ever-evolving field of cyber and information security and have the ability, to engage in independent learning for continual development as a computing professional.

■ **Admission Requirements**

(i) Higher Secondary School Certificate or equivalent securing at least 50% marks in aggregate with Mathematics.

(ii) CUST Admission Test/HEC Approved Test

■ **Degree Requirements**

Each candidate for the BS Cyber Security degree is required to complete successfully 136 credit hours (Cr. Hrs.) as per the following details:

	Area	Cr. Hrs.
a)	General Education	30
b)	Disciplinary or Major Courses	82
c)	Interdisciplinary / Allied Courses	15
d)	Field Experience / Internship	03
e)	Capstone / Design Project	06
f)	Community Service	00
	Total	**136**

■ **General Education Courses (38 Cr. Hrs.)**

Course Title	Code	Cr. Hrs.
Functional English	CYG1113	3
Expository Writing	CYG1123	3
Islamic Studies/Ethics	CYG1012	2
Ideology and Constitution of Pakistan	CYG1022	2
Personal Grooming	CYG1212	2
Sociology	CYG1412	2
Applications of Information and Communication Technologies	CYG1612	2
Applications of Information and Communication Technologies Lab	CYG1611	1
Civics and Professional Ethics	CYG2812	2

Course Title	Code	Cr. Hrs.
Calculus and Analytical Geometry	CYG1513	3
Applied Physics	CYG1312	2
Applied Physics Lab	CYG1311	1
Entrepreneurship	CYG2712	2
Probability and Statistics	CYG2523	3

■ **Disciplinary Courses (82 Cr. Hrs.)**

a) Computing Courses (43 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Programming Fundamentals	CY1133	3
Programming Fundamentals Lab	CY1131	1
Object Oriented Programming	CY1123	3
Object Oriented Programming Lab	CY1121	1
Data Structures and Algorithms	CY2133	3
Data Structures and Algorithms Lab	CY2131	1
Digital Logic Design	CY2313	3
Digital Logic Design Lab	CY2311	1
Design and Analysis of Algorithms	CY4153	3
Computer Organization and Assembly Language	CY2322	2
Computer Organization and Assembly Language Lab	CY2321	1
Computer Communications and Networks	CY4713	3
Computer Communications and Networks Lab	CY4711	1
Information Security	CY2213	3
Database Systems	CY4513	3
Database Systems Lab	CY4511	1
Operating Systems	CY3413	3
Operating Systems Lab	CY3411	1
Artificial Intelligence	CY3632	2
Artificial Intelligence Lab	CY3631	1
Software Engineering	CY4523	3

b) Core Courses (18 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Fundamentals of Cyber Security	CY2203	3
Network Security	CY3222	2
Network Security Lab	CY3221	1
Secure Software Design and Development	CY3232	2
Secure Software Design and Development	CY3231	1
Information Assurance	CY3243	3
Parallel and Distributed Computing	CY4542	2
Parallel and Distributed Computing Lab	CY4541	1
Digital Forensics	CY4252	2
Digital Forensics Lab	CY4251	1

c) Depth Elective Courses (21 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Computer Architecture	CY4723	3
Malware Analysis	CY3643	3
Penetration Testing	CY4622	2
Penetration Testing Lab	CY4621	1
Theory of Automata	CSCY3613	3
Wireless and Mobile Security	CY4262	2
Wireless and Mobile Security Lab	CY4261	1
Embedded Systems	CY4353	3
Vulnerability Assessment & Reverse Engineering	CY4652	2
Vulnerability Assessment & Reverse Engineering Lab	CY4651	1

■ ***Depth Elective Courses**

Students are required to take 21 Cr. Hrs. as depth elective courses. A list of technical elective courses is given below:

Course Title	Code	Cr. Hrs.
Vulnerability Assessment & Reverse Engineering	CY4652	1
Vulnerability Assessment & Reverse Engineering Lab	CY4651	2
Hardware Security	CY4273	3
Malware Analysis	CY3643	3
Wireless and Mobile Security	CY4262	2
Wireless and Mobile Security Lab	CY4261	1
Theory of Automata	CSCY3613	3
HCI & Computer Graphics	CSCY3423	3
Embedded Systems	CY4353	3
Penetration Testing	CY4622	2
Penetration Testing Lab	CY4621	1
Computer Architecture	CY4723	3
Cyber Law & Cyber Crime (Cyber Warfare)	CY4663	3
Control System Security	CY4283	3

■ **Interdisciplinary / Allied Courses (IDC) - 15 Cr. Hrs.**

Course Title	Code	Cr. Hrs.
Complex Variables and Transforms	MTCY2063	3
Discrete Structures	CY2053	3
Linear Algebra	MTCY2033	3
Technical and Business Writing	HMCY4033	3
Introduction to Marketing	MKCY4013	3

■ **Capstone / Design Project (06 Cr. Hrs.)**

After the completion of 90 Cr. Hrs., the students are required to register for Design Project (Part-I) of 3 Cr. Hrs. in the 7th semester of their degree program. Design Project (Part-II) of 3 Cr. Hrs. can be taken in the next i.e. 8th semester provided Design Project (Part-I) is passed.

Course Title	Code	Cr. Hrs.
Design Project (Part-I)	CY4912	02
Design Project (Part-II)	CY4924	04

■ Field Experience /Internship (03 Cr. Hrs.)

Each student is required to complete 8 weeks industrial internship training usually after 6th semester or on the completion of 90 Cr. Hrs.

Course Title	Code	Cr. Hrs.
Field Experience/Internship	CY4003	03

■ Community Service (VIS4000)

Each student is required to complete 65 hours community work, usually after 1st semester which would be a prerequisite for the award of degree. It will be assessed as satisfactory (S) / unsatisfactory (US). In case of unsatisfactory, it will be done from scratch.

■ CGPA Requirement

A student is required to earn a minimum 2.00/4.00 CGPA on the completion of his/her degree requirements.

■ 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 Computer Engineering degree is 07 years.

SCHEME OF STUDIES
BS Cyber Security Program

☐ **Semester-I (18 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
CY1133	Programming Fundamentals	3
CY1131	Programming Fundamentals Lab	1
CYG1513	Calculus and Analytical Geometry	3
CYG1312	Applied Physics	2
CYG1311	Applied Physics Lab	1
CYG1612	Applications of Information and Communication Technologies	2
CYG1611	Applications of Information and Communication Technologies Lab	1
CYG1113	Functional English	3
CYG1022	Ideology and Constitution of Pakistan	2

☐ **Semester-II (17 Cr. Hrs)**

Course Code	Course Title	Cr. Hrs.
MTCY2063	Complex Variables and Transforms	3
CYG1123	Expository Writing	3
CY1123	Object Oriented Programming	3
CY1121	Object Oriented Programming Lab	1
CY2313	Digital Logic Design	3
CY2311	Digital Logic Design Lab	1
MTCY2033	Linear Algebra	3

☐ **Semester-III (17 Cr. Hrs)**

Course Code	Course Title	Cr. Hrs.
CYG2712	Entrepreneurship	2
CY2053	Discrete Structures	3
CY2133	Data Structures and Algorithms	3
CY2131	Data Structures and Algorithms Lab	1

Course Code	Course Title	Cr. Hrs.
CYG2523	Probability and Statistics	3
CYG2812	Civics and Professional Ethics	2
CY2203	Fundamentals of Cyber Security	3

☐ Semester-IV (17 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
CY4153	Design and Analysis of Algorithm	3
CY4713	Computer Communications and Networks	3
CY4711	Computer Communications and Networks Lab	1
CY2213	Information Security	3
CY2322	Computer Organization and Assembly Language	2
CY2321	Computer Organization and Assembly Language Lab	1
CYG1212	Personal Grooming	2
CYG1412	Sociology	2

☐ Semester-V (17 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
CY3643	Malware Analysis	3
CY3413	Operating Systems	3
CY3411	Operating Systems Lab	1
CY3222	Network Security	2
CY3221	Network Security Lab	1
CY4723	Computer Architecture	3
CY4513	Database Systems	3
CY4511	Database Systems Lab	1

☐ Semester-VI (15 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
CY3632	Artificial Intelligence	2
CY3631	Artificial Intelligence Lab	1
CSCY3613	Theory of Automata	3
CY3232	Secure Software Design and Development	2

Course Code	Course Title	Cr. Hrs.
CY3231	Secure Software Design and Development Lab	1
CY4523	Software Engineering	3
CY3243	Information Assurance	3

☐ Semester-VII (16 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
CY4252	Digital Forensics	2
CY4251	Digital Forensics Lab	1
CYG1012	Islamic Studies / Ethics	2
CY4622	Penetration Testing	2
CY4621	Penetration Testing Lab	1
HMCY4033	Technical and Business Writing	3
MKCY4013	Introduction to Marketing	3
CY4912	Design Project (Part-I)	2

☐ Semester-VIII (16 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
CY4353	Embedded Systems	3
CY4652	Vulnerability Assessment & Reverse Engineering	2
CY4651	Vulnerability Assessment & Reverse Engineering Lab	1
CY4542	Parallel and Distributed Computing	2
CY4541	Parallel and Distributed Computing Lab	1
CY4262	Wireless and Mobile Security	2
CY4261	Wireless and Mobile Security Lab	1
CY4924	Design Project (Part-II)	4

MS Electrical Engineering

■ Admission Requirements

(i) A minimum of 16 years of education leading to BS/BE/BSc in Electrical / Electronics / Telecommunications Engineering or equivalent

(ii) Minimum 2.00/4.00 CGPA or 50% marks

(iii) Admission Test/HEC Approved Test

■ Degree Requirements

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

(i) 24 Cr. Hrs. course work with 6 Cr. Hrs Thesis

(ii) 30 Cr. Hrs. course work only (10 Courses)

The students are required to register courses offered by the department from the list appended below:

Course Title	Code	Cr. Hrs.
Linear System Theory	EE5813	3
Nonlinear Control Systems	EE5823	3
Advanced Digital Control Systems	EE6833	3
Control Systems Design	EE5843	3
Robust Control Systems	EE6843	3
Sliding Mode Control	EE6893	3
Advanced Robotics	EE7843	3
Advanced Digital Signal Processing	EE5613	3
Advanced Digital Image Processing	EE5623	3
Adaptive Signal Processing	EE6633	3
Pattern Recognition	EE6643	3
Computer Vision	EE6653	3
Machine Learning	EE6683	3
Advanced Artificial Intelligence	EE6363	3
Neural Networks and Deep Learning	EE7633	3
Video Encoding and Processing	EE7643	3
Statistical Data Analysis & Hypothesis Testing	EE5453	3
Principles of Digital Communications	EE5703	3

Course Title	Code	Cr. Hrs.
Stochastic Processes	EE5413	3
Advanced Digital Communications	EE6703	3
Information and Coding Theory	EE5723	3
Advanced Computer Networks	EE6713	3
Cellular and Mobile Communications	EE6733	3
Mobile and Wireless Networks	EE6763	3
Multimedia Services Over IP Networks	EE6773	3
Networks Security	EE5733	3
Software Defined Radios	EE6723	3
Radar Signal Processing	EE6673	3
Analog Integrated Electronic Circuits	EE6213	3
Advanced Antenna Theory and Design	EE6523	3
Advanced Microwave Engineering	EE6533	3
Advanced Power Electronics	EE6263	3
Advanced ASIC Design and FPGA	EE6333	3
Advanced Semi-conductor Devices	EE6233	3
Advanced Computer Architecture	EE6313	3
Advanced Power System Analysis	EE5113	3
Power System Stability and Control	EE6143	3
Smart Grid	EE6153	3
Renewable Energy Systems	EE6163	3
Advanced Power System Protection	EE5123	3
Advanced Electric Drives	EE5173	3
Advanced Electric Vehicles	EE5183	3

■ Research Thesis

Course Title	Code	Cr. Hrs.
Research Thesis	EE6916	6

■ **CGPA Requirement**

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

■ **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

(i) MS degree in relevant discipline

(ii) Minimum CGPA 3.0/4.0 (Semester System) or 60% marks (Annual System)

(iii) Admission Test/GAT General/HEC Test

(iv) Interview

■ Degree Requirements

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

(i) 18 Cr. Hrs. Course Work with minimum CGPA 3.00/4.00

(ii) Comprehensive Examination

(iii) 30 Cr. Hrs. Research Work

(iv) Synopsis Defense

(v) Dissertation Foreign Reviews

(vi) Publication of at least one research paper in HEC approved journal.

(vii) Dissertation Final Defense

Note: PhD scholars are required to comply with the following timeline:

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	12 Semesters