# COMPUTER ENGINEERING
# CLASS OF 2025


# ACADEMIC DOSSIER

# OFFICE OF UNDERGRADUATE EDUCATION & ACCREDITATION

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# COMPUTER ENGINEERING

## PROGRAM DESCRIPTION:

The two disciplines of Electrical Engineering and Computer Engineering have reshaped the way we live and think about our lives today, be it in the form of electronic devices, computers, communication networks in use, or new technologies in transport, agriculture, medicine, manufacturing, or commerce. Ideas from Electrical and Computer Engineering are even enhancing our understanding of other disciplines, such as Biology, Finance, and Economics. In upcoming decades, Electrical and Computer Engineers will play a pivotal role in tackling key challenges faced by our present society, such as the need for affordable and clean sources of energy and transport, advancements in health, resilient infrastructure, or imagining future of industry, to name a few. Keeping this state in view, the vision of the Electrical and Computer Engineering program is to shape electrical engineers and computer engineers who will assume a leadership role in pursuit of tackling these key challenges faced by our society.

**Vision of Electrical and Computer Engineering program**

Be an agent of positive change in society through excellence in locally contextualized and globally competitive liberal-arts and discipline-specific education and research, and imparting an understanding of contemporary issues and challenges facing the society.

## PROGRAM EDUCATIONAL OBJECTIVES:

Electrical Engineering program at Habib University aims to produce competent electrical engineers who;

1. Exhibit broad-based technical excellence in their engineering practice and in other professional dealings.
2. Are aware of the impact of their work on society and environment.
3. Are capable of leading through a pluralistic approach.
4. Engage in the lifelong process of independent and reflective learning.

## PROGRAM LEARNING OUTCOMES:

Upon graduation, students will have the following abilities:

1. Engineering Knowledge: an ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems;
2. Problem Analysis: an ability to identify, formulate, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering;
3. Design 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;
4. 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;
5. Modern tool usage: an ability to create, select and apply appropriate techniques, resources, and modern engineering tools, including prediction and modelling, to complex engineering activities with an understanding of the limitations;

6. Contextual Awareness: 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;
7. 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;
8. Ethics: the ability to apply ethical principles and commit to professional ethics, responsibilities, and norms of engineering practice;
9. Collaboration: an ability to work effectively, as an individual or in a team, on multifaceted and/or multidisciplinary settings;
10. 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;
11. Project Management: an ability to demonstrate management skills as a member and/or leader in a team, to manage projects in a multidisciplinary environment;
12. Lifelong learning: an ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

# MAPPING OF PLOS TO UNIVERSITY LEARNING GOALS:

**PROGRAM LEARNING OUTCOMES - MAPPING**

| | | | University Learning Goals (ULG) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | *Know* | | | *Act* | | | *Value* | | |
| | | | ***Knowledge*** | ***Interdisciplinary &*** | ***Context*** | ***Creativity &*** | ***Critical Inquiry*** | ***Communication &*** | ***Social Impact*** | ***Thought*** | ***Ethical & Cultural*** |
| | | | *Breadth & Depth* | *Synthesis & Connections* | *Contextually Grounded* | *Imaginative & Interesting* | *Analysis & Critical Thought* | *Interaction & Teamwork* | *Service & Sustainability* | *Yohsin Values & Lifelong Learning* | *Personal & Professional Ethics* |
| | | | ULG 01 | ULG 02 | ULG 03 | ULG 04 | ULG 05 | ULG 06 | ULG 07 | ULG 08 | ULG 09 |
| **PLO** | **Title** | **Program Learning Outcomes** | Demonstrate both a genuine breadth of knowledge through the Habib Liberal Core and a capable depth of knowledge throught command and their chosen major | Synthesize knowledge, methods and viewpoints from different disciplines to both make meaningful connections among and transcend them | Demonstrate their knowledge in a firm understanding of the historical, social, political, economic, religious, regional and global contexts in which they are located | Imagine, develop, and produce creative, original ideas, interpretations and works | Analyse and formulate relevant critical questions, and answer those questions in a substantive way supported by quantitative and qualitative evidence | Listen actively to comprehend the meaning of others and successfully express cogent meaning through capable oral, written, and artistic modes of communication. Effectively interact and collaborate with others | Recognize the reciprocity of knowledge and service, and benefit their community, society and the environment through socially responsible and sustainable engagement | Cultivate lifelong curiosity by engaging in inquiry and reflection to acquire and apply new knowledge | Develop and nurture their own beliefs, values, and sense of responsibility to reach informed conclusions, while considering, appreciating, and respecting the perspectives of others |
| 1 | Engineering Knowledge | An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems | S | | | | | | | | |
| 2 | Problem Analysis | an ability to identify, formulate, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering | S | S | | | S | | | | |
| 3 | Design 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 | | W | W | S | | | W | | |
| 4 | 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 | | S | | | S | | | | |
| 5 | Modern Tool Usage | An ability to create, select and apply appropriate techniques, resources, and modern engineering tools, including prediction and modelling, to complex engineering activities with an understanding of the limitations | S | S | | | S | | | | |
| 6 | Contextual Awareness | 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 | | S | S | W | | | W | | |
| 7 | 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 | | | | | | | S | | |
| 8 | Ethics | The ability to apply ethical principles and commit to professional ethics, responsibilities, and norms of engineering practice | | | | | | | | | S |
| 9 | Collaboration | An ability to work effectively, as an individual or in a team, on multifaceted and/or multidisciplinary settings | | | | | | S | | | |
| 10 | 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 | | | | | | S | | | |
| 11 | Project Management | An ability to demonstrate management skills as a member and/or leader in a team, to manage projects in a multidisciplinary environment | | | | | | | | | |
| 12 | Lifelong Learning | An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments | | | | | | | | S | |

***Legend Competencies***

**S: Strongly - Program Learning Outcome strongly maps to the University Learning Goal**

**W: Weakly - Program Learning Outcome strongly maps to the University Learning Goal**

# REQUIRED COURSES:

## CE/EE 101: Introduction to Electrical & Computer Engineering

Credit Hours: 3+1
Fulfils: CE Foundation, EE Foundation, ECE Minor Foundation

Through a series of projects, this course aims to expose the students, having little or no prior exposure, to the fascinating world of electrical and computer engineering. The course will allow the students to gain an appreciation for the history and possible futures of various disciplines within electrical and computer engineering. Students will spend most of their time in the lab working on these projects with classroom instruction for support. The course will introduce basic electrical concepts including charge, voltage, current, energy, power, resistance, capacitance, inductance, and Kirchoff's laws. Practical digital and analog electronic systems will also be introduced to illustrate advanced topics that are treated completely in subsequent electrical engineering courses.

## CE/EE 111: Electric Circuit Analysis

Credit Hours: 3+1
Fulfils: CE Foundation, ECE Minor Foundation

This course introduces basic DC and AC steady-state analysis for linear circuits. Topics discussed in this course include circuit elements, Ohm's law and Kirchhoff's laws, node and mesh analysis, energy storage elements, Thevenin and Norton theorems, Phasors and sinusoidal steady state analysis. Computer applications in circuit simulation and numerical solution is also discussed.

## CS 101: Programming Fundamentals

Credit Hours: 2+1
Prerequisite: None
Fulfils: CE Foundation

Motivates computer programming as a means to solve problems; introduces the basic components of problem solving: repetition, decision making, data storage and manipulation, input/output, modularity, top-down design; develops expertise in the corresponding constructs – variables, data types, iteration, conditionals, functions, file and console I/O, and recursion – in a high-level programming language.

## CE 171: Data Structures and Algorithms

Credit Hours: 3+1
Prerequisite: CS 101
Fulfills: Engineering Sciences and Computing

Motivates the design of algorithms by exploring various algorithms for a single task: linear search and binary search, bubble sort, insertion sort, selection sort, merge sort, quick sort; introduces techniques to reason about and compare algorithms: asymptotic analysis and notation, Master theorem; introduces frequently used data structures: list, tree, graph, stack, queue; discusses and analyzes basic operations on the data structures: infix, postfix, and prefix traversal, breadth-first and depth-first search, computation of graph.

## CE/EE 211: Basic Electronics

Credit Hours: 3+1
Fulfils: CE Electronics, ECE Minor Foundation

The course aims to introduce students to semiconductor devices, with emphasis on application of these devices in realizing analog and digital electronic circuits. The course starts with an introduction to semiconductors, energy bands, valence bonds, doping, n-type and p-type semi-conductors. The electronic devices, such as PN junction diode, bipolar junction transistor (BJT) and Metal-oxide semiconductor field-effect transistor (MOSFET), along with their applications are discussed in detail. Biasing circuits, single transistor amplifiers and their frequency are also discussed. Circuit simulations using PSpice (OrCAD) forms an important bridge between the theory discussed in class and lab experiments.

## CE 222/EE 172/CS 130: Digital Logic and Design

Credit Hours: 3+1
Fulfils: CE Computing Systems, ECE Minor Foundation

Introduction to the design of digital hardware, realization of computation with logic gates; Boolean algebra, design of combinational logic circuits, and analysis and design of clocked sequential logic circuits, circuits for arithmetic operations; introduction to hardware description language and its application to logic design. (Cross-listed with CS 130.)

## CE 251/EE 252: Signals and Systems

Credit Hours: 3+1
Fulfils: CE Information Systems, ECE Minor Foundation

The topics covered in this course include types of signals; unit impulse and unit step functions; linear time invariant (LTI) systems and their properties; convolution sum and convolution integral; Fourier series, Fourier, Laplace and Z transforms; analysis and characterization of LTI systems using various transforms, Sampling.

## CE 362/EE 355/MATH 322: Statistics and Inferencing

Credit Hours: 3+0
Fulfils: CE Engineering Sciences and Computing

Introduces probabilistic modelling for problems of inference and machine learning from data, emphasizing analytical and computational aspects. Distributions, marginalization, conditioning, and structure, including graphical and neural network representations. Belief propagation, decision-making, classification, estimation, and prediction. Sampling methods and analysis. Introduces asymptotic analysis and information measures. Computer simulation-based computational component explores the concepts introduced in class in the context of contemporary applications. Students design inference algorithms, investigate their behavior on real data, and discuss experimental results.

## CE 272: Object Oriented Programming

**Credit Hours**: 3+1
**Fulfils**: CE Algorithms and Software

Introduces object oriented and related memory concepts; motivates C++ as the language of choice; topics include: pointers and structs, objects, heap allocation, data encapsulation, classes, namespaces, constructors and destructors, virtual functions and destructors, operator overloading and standard input/output, inheritance and polymorphism, templates, standard library containers, and software design using UML 2.0.

## CE/EE 301: Electrical & Computer Engineering Seminar

Credit Hours: 1+0
Fulfils: CE Core, EE Core

Through a series of weekly seminars by researchers and engineers working in the domain of Electrical Engineering, this course achieves the following objectives:

Exposure to various sub-disciplines in Electrical Engineering, their corresponding electives at HU, and that state of research in that sub-discipline; Strengthen the commitment to professional and ethical practice of engineering; Awareness of some theoretical ideas in Electrical Engineering, not covered in other courses.

## CE 321: Computer Architecture

Credit Hours: 3+1
Fulfils: CE Computing Systems, ECE Minor Elective

Studies the architecture of processors that enable general purpose computing and develops hands-on expertise in developing complex logical components. Topics include instruction set architecture, addressing modes, processor design and computer arithmetic, pipelining, memory systems, fetch execution cycle, processor implementation on FPGA using Verilog HDL.

## CE 324: Operating Systems

Credit Hours: 3+1
Fulfils: CE Computing Systems

The student will be taught principles of modern operating systems. In particular, the course will cover details of concurrent processes, multi-threads, CPU scheduling, memory management, file system, storage subsystem, and input/output management. This will be accomplished by integrating theory and practice through coordinated lecture and lab hours.

## CE 325: Digital Systems Design

Credit Hours: 3+0
Fulfils: CE Computing Systems

This course is currently under development.

## CE 331/EE 375: Microcontrollers and Interfacing

Credit Hours: 3+1
Fulfils: CE Core, ECE Minor Elective

Microcontrollers play a central role in modern life, controlling everything from the engine of a car, to domestic and office machinery. Microcontroller fundamentals including architecture, assembly language programming, and interfacing. Applications of industry-standard microcontrollers in embedded systems. Employs software design tools, simulators, and hardware trainers. Will focus on interfacing the ARM RISC processor to motors, actuators and sensors.

## CE 341: Data Communication & Networking

Credit Hours: 3+1
Fulfils: CE Networking and Security, ECE Minor Elective

It is the first course on networking therefore no prior background is expected. This course will not only introduce students to the basics of the communication of data in the networks of computer but will also enable to develop some insight towards the core issues related to the communication models and different network devices.

## CE 352: Digital Signal Processing

Credit Hours: 3+1
Fulfils: CE Information Systems, ECE Minor Elective

Introduction to digital signal representations in time and frequency domains; signal manipulations via filters and resampling; signal creation and capture and processing with real-time computing machinery.

## CE 361/EE 354/MATH 310: Introduction to Probability and Statistics

Credit Hours: 3+0
Fulfils: CE Engineering Sciences and Computing

Set theory and counting principles, axiomatic definition of probability, independence and conditional probability, Bayes' theorem; random variables (RVs) and their cumulative distribution function, probability mass functions, probability density functions and moments; joint RVs; limits theorems; statistics; applications.

## CE 374: Software Engineering

Credit Hours: 3+0
Fulfils: CE Algorithms and Software

Approaches software engineering as the study and practice of a collection of concepts, techniques and tools which enable programmers to design, build, and maintain large software systems in a reliable and cost effective way; develops skills and understanding that function as the basis for many of the more advanced

analysis and design practices encountered in the industry; topics include: systems development process, stakeholders and their roles, systems development project needs, software process methodologies, spiral and RUP, software analysis and requirement discovery, data modelling, SAD and OOAD, UML, use case diagrams, software project management, project scope, network diagrams and CPM, agile methodologies, XP, Scrum and FDD, class diagrams, realization of use cases, object-oriented design, sequence diagrams, activity diagrams, state transition diagrams, user interface design, software testing, software construction and maintenance.

## CE/EE 391: Engineering Design and Innovation

Credit Hours: 0+2
Fulfils: CE Design

This course aims to cultivate skills needed to produce great designs, be a more effective engineer, and communicate with high emotional and intellectual impact. This is accomplished by working on projects centered around a locally contextualized wicked problem and students are expected to develop a solution to their identified problem by the end of semester. During the course of the semester, students will study and apply techniques suited for various steps of the design process. Students will come to appreciate that a design problem involves multiple stakeholders, come to terms with the ambiguity that shows up in design problems, make decisions in presence of multiple conflicting objectives and constraints, handle uncertainty, think as part of a team, learn how to manage the progress of their project, and communicate their design effectively.

## CE/EE 491: Capstone Project I

Credit Hours: 3
Fulfils: Design in Engineering, Design Project

By the senior year, students have acquired sufficient breadth in Electrical Engineering (EE) and are on their way to acquire depth in one or more areas of specialization through technical electives. Intellectual maturity also requires that students understand their education in the broader context of the world and are prepared to make committed choices as participants of this complex world. The capstone design project, offered as a two semesters sequence, provides students with an opportunity to reflect on their entire educational experience, integrate the knowledge and skills acquired in earlier years, form connections within and across disciplines, and synthesize a solution to a problem connecting them to the broader issues of their discipline as well as the world they're about to enter.

## CE/EE 492: Capstone Project II

Credit Hours: 3
Fulfils: Design in Engineering, Design Project

This year-long sequence represents the culmination of study towards the BS degree. Students work individually or in small teams on a project in which they utilize the knowledge acquired during the first three years of education. Each project is closely supervised by a faculty member and each team produces a comprehensive report at the end of the project.

## CS 113: Discrete Mathematics

Credit Hours: 3+0
Prerequisite: None
Fulfils: CS Foundation; Formal Reasoning

Equips students with essential mathematical tools that will be encountered in future Computer Science courses; develops a capacity for formal mathematical manipulation and abstract thought; topics include: propositional logic, predicate and quantifiers, sets, functions, sequences, summations, relations, partial orderings, proofs, mathematical induction, pigeonhole principle, permutations and combinations, graphs, graph isomorphism, Euler and Hamiltonian paths, and trees.

## MATH 101: Calculus I

Credit Hours: 4
Fulfils: CE Engineering Sciences and Computing.
Prerequisite: None

The course covers important pre-requisite content related to functions, their behavior, and multiple contexts for which they serve as an important modelling tool. This course fulfills a foundational mathematics course requirement for the Electrical Engineering, Computer Engineering and Computer Science majors. It is also a mandatory requirement for all non-DSSE students wishing to pursue a Mathematics Minor.

### MATH 102: Calculus II

Credit Hours: 3
Fulfils: CE Engineering Sciences and Computing.
Prerequisite: MATH 101

Calculus is a very important part of Applied Mathematics which in turn serves as an important tool in Science and Engineering. In Calculus I you studied the fundamental concepts of function and the techniques of differentiation and integration. Calculus II builds upon the concepts of calculus learned in the previous course and extends them to other areas of Applied Mathematics such as multivariable functions and vectors.

### MATH 205: Linear Algebra

Credit Hours: 3
Fulfils: CE Engineering Sciences and Computing
Prerequisite: MATH 202

Topics covered: A brief revision of vector algebra including lines and planes in 3D and matrices, Determinants, Symmetric matrices, and quadratic forms; Elementary row and column operations of a matrix; Systems of linear equations and their solutions, existence, and uniqueness of solutions; Vector spaces; Inner products and ortho-normalization; Orthogonal transformations and rotations; Linear transformations, orthogonality, QR factorization, Hermitian and Unitary transformations; Least squares analysis and approximations; Singular value decomposition; Direct sum decomposition; and Caley-Hamilton Theorem.

### Natural Science Elective

Students pursuing a CE major are required to complete 01 Natural Science course, with or without lab component.

## Professional Practices Category Courses:

The students are required to enroll in either one of the following courses falling under the Professional Practices category:

### MGMT 301: Technology Management and Entrepreneurship

Course Prerequisites: None
Credit hours: 2+0

Topics include: managing technological transitions, intellectual property, creating and managing an innovative organization, managing research and development, organizational learning, economist and sociologist views of entrepreneurship, the process and management of entrepreneurship, the importance of innovation, teamwork, financial and marketing aspects, product quality; study will be supplemented with case studies.

### MGMT 304: Fundamentals of Intellectual Property

Course Prerequisites: None
Credit hours: 3+0

A primary purpose of this course is to raise awareness of Intellectual Property (IP) amongst students and to introduce the topic of IP, associated law, and some of its primary branches, to a non-legal (e.g. STEM, social sciences, design, liberal arts) audience so that they may effectively navigate through the landscape of various intellectual property regimes and related family of (legal) rights (IPR). Whilst these rights are rooted in law, intellectual property education has branches which touch many areas of academic research and commercial activity, including: economics, finance, taxation, human rights, ethics, education, governance and management. Studying intellectual property in a non-law curriculum can be seen as an 'opportunity' to engage with a vital topic that links commercial, legal and technical disciplines. Another important purpose of this course is to introduce students to the increasingly important area of IP management (and IP strategy). IP and intangible assets are driven by investments in R&D, advertising and marketing, education and training, management information systems, organizational structure, and so on. The development of such assets can involve invention or some other creative step, as well as innovation. The investments and the activities involved are all inherently risky. Thus, understanding the management of IP and intangible assets requires inputs from a variety of disciplines, including economics, law, accounting and finance, management, and so on. An exposure to some key tactics on the strategic management of IP supplemented with relevant IP management case studies can be of immense value in todays and tomorrow's expanding ecosystem.

### MGMT 320: Principles of Management

Course Prerequisites: None
Credit Hours: 3+0

The course on Principles of Management for Tech Professionals introduces management as a discipline and process to tech professionals. This course includes evolution and scope of management, decision-making, planning, strategy, organizing, staffing, leading, control, change, and the importance of management in the global environment and ethical considerations of management decisions. Hence, the course provides a framework that will enhance a person's effectiveness in the business.

### MGMT 321: Engineering Project Management

Course Prerequisites: None
Credit Hours: 3+0

Through using textbook, discussions, assignments and real-world examples, the engineering professionals will learn how to identify, define, plan, execute, monitor, control, and close projects. They will build project components, organize work efficiently, effectively and help them to control changes. The students will use tools to build works schedules, allocate resources and manage cost of any project. This will help them to get a hands-on training of using project management tools for the smooth flow of various stages of project that is the need of time and most demanded skill by the employers all around the world.

### MGMT 322: Operations Management

Course Prerequisites: None
Credit Hours: 3+0

The course aims to provide an understanding to identify, define, plan, execute, monitor, control, optimize and improve operations and processes in both manufacturing and service industries. For many different types of operations either in the tangible goods industry or the intangible service industry, this course aims to familiarize students with the major operational issues that challenge entrepreneurs and managers and provide them with the basic language, concepts, insights, and analytical tools to deal with these issues.

### MGMT 323: Supply Chain Management

Course Prerequisites: None
Credit Hours: 3+0

The course aims to provide an understanding of fundamental concepts of supply chain management. All functional areas of supply chain management are explored in an integrated view of procurement, manufacturing and operations management, transportation and logistics, inventory and warehousing, demand planning, scheduling, network design, collaboration, and performance measurement. Topics may also cover supply chain financial metrics, strategy, and risk management for demand-driven value networks.

**ECON 302: Engineering Economics**
Credit Hours: 3+0
Fulfils: Professional Practice

Topics include: Application of economic principles to engineering solutions, time value of money, cash flow analysis, quantization of profitability, methods of evaluating investments, comparison of alternative investments, inflation, depreciation, resource depletion, economic analysis of projects, economic management of engineering projects.

# LIST OF ELECTIVES:

Below is the proposed list of elective courses offered by the EE Major. These elective courses may be subject to change.

## Fall 2021

EE 424 – Data Communication and Networking

EE 424L – Data Communication and Networking Lab

EE 433 – Power Electronics System Design

EE 451 – Digital Image Processing

EE 451L – Digital Image Processing Lab

EE 468 – Mobile Robotics

ME 291 – Computer Aided Engineering

MGMT 322 – Operations Management

MGMT 323 – Supply Chain Management

## Spring 2022

EE 365 – Instrumentation & Measurements

EE 365L – Instrumentation & Measurements Lab

EE 366/CS 380 – Introduction to Robotics

EE 366L – Introduction to Robotics Lab

EE 422 – Wireless and Mobile Communication

EE 432 – Power Electronics

EE 432L – Power Electronics Lab

EE 452 – Computer Vision

EE 366/CS 380 – Introduction to Robotics

EE 371/CS 330 – Computer Architecture

EE 371L/CS 330L – Computer Architecture Lab

ME 432 – Introduction to Nanotechnology

MGMT 301 – Technology Management & Entrepreneurship

MGMT 321 – Engineering Project Management

MGMT 304 - Fundamentals of Intellectual Property

MGMT 320 – Principles of Management

MGMT 322 – Operations Management

## Fall 2022

EE 355/CE 362/MATH 322 – Statistics and Inferencing

EE 424 – Data Communication and Networking

EE 424L – Data Communication and Networking Lab

EE 433 – Power Electronics System Design

EE 451 – Digital Image Processing

EE 451L – Digital Image Processing Lab

EE 468 – Mobile Robotics

MGMT 320 – Principles of Management

MGMT 323 – Supply Chain Management

# GRADUATING REQUIREMENTS:

1. Minimum credit hours: 130.
2. 33 required courses as specified in the grid for class of 2025.
3. One Natural Science course of at least 3 credit hours.
4. Two Professional Practice courses, totaling to at least 5 credit hours.
5. Two Multidisciplinary Engineering electives of at least 3 credit hours, each.
6. One Philosophy elective of at least 3 credit hours.
7. Four CE elective courses of 3 or 4 credit hours each. All electives are to be taken with their accompanying labs

Elective courses in any category are to be taken from the list approved by the ECE program

# 4-YEAR GRIDS:

**CE Curriculum for Batch of 2025 (Fall 21 - Spring 25) - v3.0**

**Graduation requirement: 43 courses and a minimum of 137 credit hours**

| Year | Semester and CH | C | University Core: Code | Course Title | Th | Lb | C | Natural Science and Math: Code | Course Title | Th | Lb | C | Computing: Code | Course Title | Th | Lb | C | Electrical Engineering: Code | Course Title | Th | Lb |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year 1 : 35 CH | **SEMESTER-1** Fall 21 Credit Hours: 18 | 1 | CORE 101 | Rhetoric and Communication | 3 | 0 | 3 | MATH 101 | Calculus I | 4 | 0 | 4 | CS 101 | Programming Fundamentals | 2 | 1 | 5 | CE 101 | Introduction to Electrical and Computer Engineering | 2 | 2 |
| | | | *1. Language & Expression -1 of 2* | | | | | | | | | | *3. Formal Reasoning - 1of1* | | | | 6 | ENGR 291 | Engineering Workshop and Design | 0 | 1 |
| | | 2 | CORE 121 | Jehan-e-Urdu | 3 | 0 | | | | | | | | | | | | | | | |
| | | | *2. Language & Expression - 2 of 2* | | | | | | | | | | | | | | | | | | |
| | **SEMESTER-2** Spring 22 Credit Hours: 17 | 1 | CORE 102 | What is modernity? | 3 | 0 | 2 | MATH 102 | Calculus II | 3 | 0 | 3 | CE 171 | Data Structures and Algorithms | 3 | 1 | 5 | CE 111 | Electric Circuit Analysis | 3 | 1 |
| | | | *4. Historical & Social Thought - 1of2* | | | | | | | | | 4 | CS 113 | Discrete Math | 3 | 0 | | | | | |
| Year 2 : 35-36 CH | **SEMESTER-3** Fall 22 Credit Hours: 18 | 1 | CORE 201 | Pakistan and Modern South Asia | 3 | 0 | 2 | CE 361 | Probability and Statistics | 3 | 0 | 3 | CE 272 | Object Oriented Programming | 3 | 1 | 4 | CE 222 | Digital Logic and Design | 3 | 1 |
| | | | *5. Historical & Social Thought - 2of2* | | | | | *6. Quantitative Reasoning - 1 of 1* | | | | | | | | | 5 | CE 211 | Basic Electronics | 3 | 1 |
| | **SEMESTER-4** Spring 23 Credit Hours: 17-18 | 1 | CORE 202 | Hikmah I | 3 | 0 | 2 | XX XXX | Natural Science Elective | 3 | 0-1 | | | | | | 4 | CE 251 | Signals and Systems | 3 | 1 |
| | | | *7. Philosophical Thought - 1 of 2* | | | | 3 | MATH 205 | Linear Algebra | 3 | 0 | | | | | | 5 | CE 321 | Computer Architecture | 3 | 1 |
| Year 3 : 37-38 CH | **SEMESTER-5** Fall 23 Credit Hours: 18 | 1 | xx xxx | Philosophy Elective | 3 | 0 | 2 | MATH 362 | Statistics and Inferencing | 3 | 0 | 3 | CE 324 | Operating Systems | 3 | 1 | 4 | CE 331 | Microcontrollers and Interfacing | 3 | 1 |
| | | | *8. Philosophical Thought - 2 of 2* | | | | | | | | | | | | | | 5 | CE 341 | Data Communication and Networking | 3 | 1 |
| | **SEMESTER-6** Spring 24 Credit Hours: 19-20 | 1 | CORE 200 | Scientific Method | 3 | 0 | | | | | | 2 | CE 374 | Software Engineering | 3 | 0 | 3 | CE 352 | Digital Signal Processing | 3 | 1 |
| | | | *9. NS Method & Analysis - 1of1* | | | | | | | | | | | | | | 4 | CE 325 | Digital Systems Design | 3 | 0 |
| | | | | | | | | | | | | | | | | | 5 | CE 391 | Engineering Innovation and Design | 0 | 2 |
| | | | | | | | | | | | | | | | | | 6 | CE 301 | CE Seminar | 1 | 0 |
| | | | | | | | | | | | | | | | | | 7 | CE XXX | CE Elective I* | 3 | 0-1 |
| Year 4 : 30-36 CH | **SEMESTER-7** Fall 24 Credit Hours: 16-18 | | | | | | | | | | | | **Professional Practice** | | | | 3 | CE XXX | CE Elective II* | 3 | 0-1 |
| | | | | | | | | | | | | 1 | XX xxx | Elective I | 3 | 0 | 4 | XX XXX | Multidisciplinary Engineering Elective I* | 3 | 0-1 |
| | | | | | | | | | | | | 2 | CE 373 | Databases | 3 | 1 | 5 | CE 491 | Capstone Design Project | 0 | 3 |
| | **SEMESTER-8** Spring 25 Credit Hours: 14-18 | | | | | | | | | | | | **Professional Practice** | | | | 2 | XX XXX | Multidisciplinary Engineering Elective II* | 3 | 0-1 |
| | | | | | | | | | | | | 1 | XX xxx | Elective II | 2-3 | 0 | 3 | CE XXX | CE Elective III* | 3 | 0-1 |
| | | | | | | | | | | | | | | | | | 4 | CE XXX | CE Elective IV* | 3 | 0-1 |
| | | | | | | | | | | | | | | | | | 5 | CE 492 | Capstone Design Project | 0 | 3 |

**Non-Engineering Courses**

| Knowledge Area | CC | CH |
|---|---|---|
| HSS | 6 | 18 |
| Management | 2 | 5-6 |
| NS-Math | 4 | 13 |
| NS Elective | 1 | 3-4 |
| Sci Methods | 1 | 3 |
| **Total** | **14** | **42-44** |

**Engineering Courses**

| Knowledge Area | CC | CH |
|---|---|---|
| Computing | 2 | 6 |
| CE Foundation | 7 | 27 |
| CE Core | 9 | 32 |
| CE Depth | 5 | 15-19 |
| MDEE | 2 | 6-8 |
| Design + Capstone | 4 | 9 |
| **Total** | **29** | **95-101** |

**Legend**

| | |
|---|---|
| CS | Computer Science |
| CE | Computer Engineering |
| EE | Electrical Engineering |
| MDEE | Multidisciplinary Engineering Elective |
| SEM | Semester |
| CH | Credit Hours |
| Th | Theory |
| Lb | Lab |
| C | Course Count |

* Electives can be with or without labs - however, if the elective is offered with labs than those labs would be mandatory for graduation.