

**COMPUTER ENGINEERING
CLASS OF 2023**



ACADEMIC DOSSIER

**OFFICE OF UNDERGRADUATE EDUCATION &
ACCREDITATION**



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1.0	New document	N/A	BoF	24/06/22



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

PLO	Title	Program Learning Outcomes	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	
		Demonstrate both a genuine breadth of knowledge through the Habib Liberal Core and a capable depth of knowledge through 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 weakly maps to the University Learning Goal

REQUIRED COURSES:

CE/EE 101: Introduction to Electrical & Computer Engineering

Credit Hours: 3+1

Fulfills: 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

Fulfills: 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 Kirchoff'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

Fulfills: 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 I

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

Fulfills: 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 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

Fulfil: CE Computing Systems

This course is currently under development.

CE 331/EE 375: Microcontrollers and Interfacing

Credit Hours: 3+1

Fulfil: 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

Fulfil: 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

Fulfil: 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

Fulfil: 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

Fulfil: 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

Fulfil: 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

Fulfil: 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

Fulfil: 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

Fulfil: 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.

CS 201: Data Structures & Algorithms II

Credit Hours: 3+0

Prerequisite: CS 102 and CS 113

Fulfil: CE Core

Imparts proficiency in the use of commonly used data structures; introduces a few higher level data structures; develops critical judgment regarding the choice of data structures for a given situation; topics include: abstract data type, complexity, stack, queue, list, amortized analysis, array-list, linked list and skip list, hashing, binary tree, binary search tree (BST), randomized BST and treap, self-balancing in trees, AVL tree, B-tree, red-black tree, binary heap and meldable heap, Fibonacci heap, graphs and their representations, graph algorithms, trie, inverted index.

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 202: Engineering Mathematics

Credit Hours: 3+0

Fulfils: Mandatory Math requirement for all DSSE students

Prerequisite: MATH 102

Topics include: Vector Calculus (vector functions, line and surface integrals). Elementary methods for solving first order ODEs (direct integration and substitution) with geometric interpretation and classification, separable ODEs, method of integrating factors. Vector algebra (including matrix algebra, eigenvalues and eigenvectors, quadric surfaces). Dynamical systems (linear systems of ODEs, stability and phase portraits of dynamical systems). Second, order ODEs – elementary methods including their classification, reduction of order techniques, linear second order ODEs with constant coefficients, and finding particular solutions. Orthogonal functions and Fourier series solutions (generalized and trigonometric methods), convergence in the mean and pointwise convergence, odd and even expansions, half-range expansions. Partial differential equations (PDEs) (wave, heat and Laplace equations), solutions using Fourier series and Laplace transforms, and Schrodinger equation.

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.

PHY 101: Mechanics and Thermodynamics

Credit Hours: 3+0

Fulfils: Natural Science requirement; mandatory for CE 2023 and CE 2024 batches

Prerequisite Mechanics and Thermodynamics Topics include: Units and physical quantities, vectors, motion in 1-dimension, motion in more than 1-dimension, Newton's laws of motion and their applications,

work and energy, potential energy and conservation law of energy, momentum and impulse, rotation of rigid bodies, dynamics of rigid bodies, gravitation, thermal properties of matter, laws of thermodynamics.

PHY 101L: Mechanics and Thermodynamics Lab

Credit Hours: 1+0

Fulfills: Natural Science requirement; mandatory for CE 2023 and CE 2024 batches

Prerequisite: PHY 101

Experiments include: simple harmonic motion observed through webcam, waves and oscillations, standing waves, resonance, moment of inertia of a tennis ball, rotational mechanics, rotational inertia, rotational friction, conservation of energy, latent heat of liquid nitrogen, heat capacity of solids, determined from boil-off of liquid nitrogen, conservation of momentum - elastic and inelastic collision, rotational motion, mass on a spring, basics of uncertainty analysis, Maxwell's wheel, light polarization, heat transfer, conduction, convection, Newton's law of cooling, temperature oscillations, Fourier analysis.

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 today's 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 2019

EE 424 – Data Communication and Networking

EE 424L – Data Communication and Networking Lab

ME 432 – Introduction to Nanotechnology

EE 433 - Power Electronics System Design v2

EE 451 - Digital Image Processing

EE 451L - Digital Image Processing Lab

EE 468 - Mobile Robotics

ME 431 - Introduction to Engineering Materials



MGMT 304 - Fundamentals of Intellectual Property

Spring 2020

ECON 302 – Engineering Economics
EE 427 – Cellular Internet of Things 5G
EE 427L – Cellular Internet of Things 5G Lab
EE 432 – Power Electronics
EE 432L – Power Electronics Lab
EE 371/CS 330 – Computer Architecture
EE 371L/CS 330L – Computer Architecture Lab
MGMT 301 – Technology Management & Entrepreneurship
MGMT 321 – Engineering Project Management
EE 365 - Industrial Instrumentation & Measurements
EE 366 - Introduction to Robotics
EE 422 - Wireless and Mobile Communications
EE 452 - Computer Vision
ME 302 - Engineering Thermodynamics

Fall 2020

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/PHY 441 – Antennas and Wave Propagation
ME 291 – Computer Aided Engineering
MGMT 304 – Fundamentals of Intellectual Property
MGMT 322 – Operations Management
EE 468 – Mobile Robotics

Spring 2021

EE 365 – Instrumentation & Measurements
EE 365L – Instrumentation & Measurements Lab

EE 366 – Introduction to Robotics
EE 427 – Cellular Internet of Things 5G
EE 427L – Cellular Internet of Things 5G Lab
EE 432 – Power Electronics
EE 432L – Power Electronics Lab
EE 452 – Computer Vision
EE 371/CS 330 – Computer Architecture
EE 371L/CS 330L – Computer Architecture Lab
ME 302 – Engineering Thermodynamics
MGMT 301 – Technology Management & Entrepreneurship
MGMT 321 – Engineering Project Management

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. 35 required courses as specified in the grid for class of 2023.
3. Two Professional Practice courses, totaling to at least 5 credit hours.
4. One Multidisciplinary Engineering elective of at least 3 credit hours.
5. One Philosophy elective of at least 3 credit hours.
6. 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 2023 (Fall 19 - Spring 23) - v2.0																																				
Graduation requirement: 42 courses and a minimum of 133 credit hours																																				
Semester	University Core					Sci & Math					Computing					Engineering & Foundation																				
	CN	Code	Title	T-hrs	L-hrs	CN	Code	Title	T-hrs	L-hrs	CN	Code	Title	T-hrs	L-hrs	CN	Code	Title	T-hrs	L-hrs																
Year 1: 31 hours	Sem-1 Fall-19 Cr Hrs = 14	1	CORE-101	Rhetoric and Communication	3	0	2	MATH-101	Calculus-I	3	0	3	CS-101	Programming Fundamentals	2	1	4	CE-101	Introduction to Electrical & Computer Engineering	2	2	5	ENGR-291	Engineering Workshop	0	1										
		1. Language & Expression - 1 of 2										2. Formal Reasoning - 1 of 1																								
Year 2: 35 hours	Sem-2 Spr-20 Cr Hrs = 17	1	CORE-102	What is Modernity	3	0	2	MATH-102	Calculus-II	3	0	4	CE-171	Data Structures & Algorithms I	3	1	5	CE-111	Electric Circuit Analysis	3	1															
		3. Historical & Social Thought - 1 of 2					3. PHY-101 Mechanics 3 0																													
Year 3: 36-37 hours	Sem-3 Fall-20 Cr Hrs = 18	1	CORE-201	Pakistan and Modern South Asia	3	0	3	MATH-201	Engineering Math	3	0						4	CE-222	Digital Logic Design	3	1	5	CE-211	Basic Electronics	3	1										
		4. Historical & Social Thought 2 of 2					PHY-101 L Mechanics Lab 0 1																													
Year 4: 31-35 hours	Sem-4 Spr-21 Cr Hrs = 17	2	CORE-201	Scientific Methods	3	0																														
		5. NS Method & Analysis - 1 of 1					1 MATH-205 Linear Algebra 3 0					2 CS-113 Discrete Mathematics 3 0					5 CE-251 Signals & Systems 3 1																			
Year 3: 36-37 hours	Sem-5 Fall-21 Cr Hrs = 18											Management Sciences					2	CE-331	Microcontrollers & Interfacing	3	1	3	CE-341	Data Comm. & Networking	3	1	4	CE-352	Digital Signal Processing	3	1	5	CE-361	Intro to Probability & Stats	3	0
												1 MGMT xxx Elective I 3 0					6. Quantitative Reasoning - 1 of 1																			
Year 3: 36-37 hours	Sem-6 Spr-22 Cr Hrs = 18 - 19	1	CORE-202	Hikma I	3	0						Management Sciences					4	CE-321	Computer Architecture	3	1	5	CE xxx	CE Elective I	3	0-1	6	CE-301	CE Seminar	1	0	7	CE-391	Engineering Innovation & Design	0	2
		7. Philosophical Thought - 1 of 2										2 XX xxx Elective II 2 0					4 CE-374 Software Engineering 3 0					7 CE-391 Engineering Innovation & Design 0 2														
Year 4: 31-35 hours	Sem-7 Fall-22 Cr Hrs = 16 - 18	1	CORE-301	Hikma II	3	0						3 CE-324 Operating Systems 3 1					3 CE xxx CE Elective II*** 3 0-1																			
		9. Philosophical Thought - 2 of 2															4 CE xxx CE Elective III*** 3 0-1					5 CE 491 Capstone Design Project-I 0 3														
Year 4: 31-35 hours	Sem-8 Spr-23 Cr Hrs = 15 - 17	1	CORE-121	Jehan-e-urdu	3	0											2 XX xxx MDEE 3 0-1																			
		10. Language & Expression - 2 of 2															3 CE 325 Digital System Design 3 0					4 CE xxx CE Elective IV*** 3 0-1					5 CE 492 Capstone Design Project-II 0 3									

Non-Engineering Courses				Engineering Courses			
Knowledge Area	CC	CR-H		Knowledge Area	CC	CR-H	
H&S	6	18	Computing	7	24		
Mgmt Sci	2	5	CE Foundation (F)	7	24		
NS-Math	4	12	CE Breadth (B)	7	22		
NS-Physics	1	4	CE Depth (D)	4	12-16		
NS-Sci Methods	1	3	IDEE	1	3-4		
			Capstone Project	2	6		
Total	14	42		Total	28	91-96	

Legend - B - Breadth, Cr Hrs - Credit Hours, CC - Course Count, CS - Computer Science,
D - Depth, EE - Electrical Engineering, F - Foundation, Lb - Lab,
Mgmt - Management, NS - Natural Science, PHY - Physics, SEM - Semester,
Sci. - Science, Th - Theory,
MDEE - Multidisciplinary Engineering Elective

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