

KARABUK UNIVERSITY FACULTY OF COMPUTING AND INFORMATICS SCIENCE
COMPUTER ENGINEERING DEPARTMENT
%100 ENGLISH (MUDEK)
CURRICULUM COURSE CONTENTS

1st. Semester Courses

COURSE CODE	DESCRIPTION
PHY 195 General Physics I (3-2) 4-5	Physical quantities, units and measurements, vectors, Moment Equilibrium and Center of Gravity, Motion in one dimension, Acceleration, motion diagrams, two-dimensional motion, Newton's laws of motion, force, friction force, circular motion, non-uniform circular motion, Acceleration systems, motion, motion resistant environments, Work and kinetic energy, kinetic energy theorem, business and power, potential energy and conservation laws, Conservative and nonconservative forces.
CHE189 General Chemistry (3-2) 4-4	Matter knowledge, structure of atom, electron sequence, periodic system, chemical bonds and interactions, naming and finding valence, concepts of mole and equivalence, chemical laws, reactions and calculations, gases, solutions and concentration.
CAL 181 Mathematics I (4-0) 4-5	Numbers, absolute value, inequalities involving absolute value function, induction, and the coordinates, complex numbers. Functions. Junction function. Trigonometric functions. Limits of functions. Continuity. Properties of continuous functions. Derivatives. Exchange rate, mean value theorem and applications. Maximum and minimum detection and its applications, hyperbolic functions and their derivatives, closed and Inverse Function Derivatives, Curves and Parametric Equations, and their derivatives.
CPE 101 Programming Languages I (2-2) 3-6	Problem solving and algorithm development. Computer hardware and software. Introduction to computer programming: machine language, assembly and high-level programming languages. Programming with C programming language: arithmetic and logical expressions, data types, input/output operations, basic control structures, Loops, Function definition and the passing parameters, Prepared functions, Arrays and Matrices, Using of Struct, String operations and functions.
CPE 103 Introduction to Computer Engineering (2-0) 2-6	Definition of Computer Engineering and Working Area of Computer Engineers, Computer Terms, Working Principle of Computer, Binary Numbers, Software and Hardware Concepts, General Computer Architecture, Operating System Concepts, Computer Security, Office Programs and Applications, Database Concepts, Internet and Computer Networks.
FOL 183 Foreign Language I (2-0) 2-2	Tenses, verbs, name phrases, compound adjectives, plural phrases, compound nouns, noun phrases, sentences established with verbal adjective, Tenses used in narration, past simple, past progressive, past perfect simple, past continuous, reflexive pronouns, irregular verbs, comparison structures, modal structures, possibility, necessity, permission, capability, models indicating request, future tense, simple present tense, past tense auxiliary verbs, idioms, simultaneous words, structures which strengthens the expression, passive voice, tenses, adverbs.
TRK181 Turkish Language I (2-0) 2-2	Definition of language and culture, language-culture relationship, point of language as a social institution in people's life, status of Turkish language among world languages, Turkish language development and historical process, Turkish language recent status and expanding field, register, dialect and accent knowledge, Turkish sound facilities and rules about phonetic, derivational and inflectional affixes, application of spelling and punctuation rules.

2nd. Semester Courses

COURSE CODE	DESCRIPTION
PHY 196 General Physics II (3-2) 4-5	Coulomb's Law, Electric Field, Gauss Law, Electric potential, Capacitance and Dielectrics, Current and Resistance, Magnetic Fields, Magnetic Field Sources, Faraday's Law, Electromagnetic Waves.
CAL 194 Linear Algebra (3-0) 3-4	Matrices and System of Equations, Systems of Linear Equations, Row Echelon Form, Matrix Algebra, Elementary Matrices, Determinants, The Determinant of a Matrix, Properties of Determinants, Cramer's Rule, Vector Spaces, Definition of Vector Space, Subspaces, Linear Independence, Basis and Dimension, Change of Basis, Row Space and Column Space, Linear transformations, Matrix Representations of Linear Transformations, Orthonormality, The Scalar Product, Orthogonal Subspaces, Inner Product Spaces, Orthonormal Sets, The Gram-Schmidt Orthogonalization Process, Eigenvalues and Eigenvectors, Diagonalization.
CAL 182 Mathematics II (4-0) 4-5	Concept of integral, Definite and indefinite integral, Integral of various functions, Definition of differential, Mean value theorem, Multiple integral, Line integral, Sequels, Series.

COURSE CODE	DESCRIPTION
CPE 102 Programming Languages II (2-2) 3-7	Bitwise Operations, Pointers, Sorting and Search Algorithms, File operations, Lists, Introduction to Visual Programming, Components, Class and object concepts, Event handling, Basic graphic operation in visual programming languages.
CEC 106 Probability and Statistics (3-0) 3-5	Introduction to statistics. Data type, Sampling and collecting data, Frequency tables, Visualizing data, Central tendency measures (mean, mod, median), Dispersion measures (variance and standard deviation), Introduction to probability, Conditional probability and independence, Probability density function, Random variables, expectation, moment generating functions. Distributions (Normal, Binom, Bernoulli, uniform, Gaussian, exponential, poisson, gamma), Hypothesis testing.
FOL 184 Foreign Language II (2-0) 2-2	Comparisons: as...as, -er than, more than; superlatives: the...-est, the most, Affirmative-Negative-Question Forms of the Present Continuous Tense, Modals: Should for suggestion and Must/Have to for necessity, Requests/Permission: Can/Could/May, Hobbies, Likes/Dislikes, Connectors: But, and, because; Too and Enough, Imperatives, Simple Past Tense, The simple future: Will; Going to, If clause Type I and II, Present Perfect Tense, Present Perfect Continuous Tense, Subordinators/Linkers.
TRK 182 Turkish Language II (2-0) 2-2	Turkish derivational affixes, general composition information, plan to be used in written composition, Using verb and noun in Turkish, The written and spoken expression types and samples of composition, Using of proposition and adverb in Turkish.

3rd. Semester Courses

COURSE CODE	DESCRIPTION
FOL 281 Technical Foreign Language I (2-0) 2-2	Basic technical terms of Computer Engineering and Computer Science.
CPE 203 Logic Circuits (3-1) 3-5	Introduction to computer architecture. Number systems. Boolean algebra. Logic gates and flip flops. Combinational and sequential circuit design. Registers, counters. Bus transfer. RAM, ROM units. Instruction execution and hardwired control.
CPE 205 Circuit Analysis (3-1) 3-5	Introduction and definitions, resistances and their color code. Current, voltage, power, energy. Circuit elements: Voltage and current sources, resistance and Ohm's law. Kirchoff's laws. Simple resistive circuits: serial-parallel combinations. Delta-to-Wye transformation. Techniques of Circuit Analysis: Node-voltage method, mesh-current method, source transformations, Thevenin and Norton equivalents, maximum power transfer, superposition. Operational Amplifier circuits. Inductance, capacitance, and mutual inductance. Response of first-order RL and RC Circuits. Natural and step responses of RLC Circuits.

COURSE CODE	DESCRIPTION
CPE 207 Object Oriented Programming (2-2) 3-6	Introduction to C++ programming, Introduction to Object Oriented Programming, Objects and classes, Constructors and destructors, Operator overloading, Inheritance, Pointers to Objects, Polymorphism, The Unified Modeling Language (UML), Exceptions, Templates, The Standard Template Library - STL.
CPE 209 Data Structures (3-1) 3-6	Basic data structures, Stack, Queues, Trees, Lists. Sorting and search algorithms and applications. Recursion.
CAL 289 Differential Equations (4-0) 4-4	First-order differential equations. Nonlinear equations reducible to linear equations. Equations with constant coefficients. Systems of linear equations. Differential equations with variable coefficients. Partial differential equations. Solution with separation of variables. Fourier series and Fourier integrals. Orthogonal functions.
HST 181 Ataturk's Principles and History of Revolutions I (2-0) 2-2	Definition of revolution and Turkish revolution, notions, History of revolutions in Turkey, Movements appeared to save the Ottoman Empire, I. World War, Treaty of Sevr, Demolition of the Ottoman Empire, Period of Turkish National Struggle, Congresses, The wars made in the period of Turkish National Struggle, relationships with Western World and treaties, Lausanne Peace Treaty.

4th. Semester Courses

COURSE CODE	DESCRIPTION
FOL 282 Technical Foreign Language II (2-0) 2-2	Basic technical terms of Computer Engineering and Computer Science.

COURSE CODE	DESCRIPTION
CPE204 Discrete Mathematics (3-0) 3-5	Introduction to discrete mathematics, proposition logic and proofs. Mathematical proof methods, Set theory. Sets algebra. Relations and operations. Functions, Algebra Structures. Groups and Semi-Groups. Lattice Structures, Bool Algebra, Trees, Basic Graph Concepts, Simple Graph, Multi Graph, Planar Graph, 3D Graph, Weighted Graph, Directional Graph, Uncompleted Graph, Shortest path algorithm, Graph terminologies, Storing graphs in memory, Coloring graph, Navigation on graphs and related algorithms (BFS, DFS), Dijkstra Alg., Floyd Alg., Bellman-Ford Alg.
CPE206 Algorithms (3-1) 3-6	Introduction to algorithms. Analyzes concepts in algorithm design, problem solving strategies, complexity analysis. Dynamic programming (matrix-chain multiplication, longest common subsequence). Basic graph algorithms (BFS, DFS, Topological sort). Greedy algorithms, minimum spanning trees (kruskal algorithm, prim algorithm), shortest path (bellman-ford algorithm, dijkstra algorithm). Compression algorithm (Huffman algorithm).
CPE208 Electronic Circuits (3-1) 3-5	Structure and characteristics of diode. Circuits with diode. Structure and characteristics of the transistor. DC analysis of simple transistor amplifiers. Small signal analysis and design. Structure and characteristics of field effect transistor. DC analysis and small signal analysis of simple amplifiers with field effect transistor and design. Investigating the stability of amplifiers. Classification of cascade amplifiers and coupling types. Analysis and design of cascade amplifiers, investigating the frequency characteristics of amplifiers. Feedback amplifiers. Amplifier classes. Power amplifiers. Large signal analysis and distortion. Cooling of the power transistor. Differential amplifiers. Introduction to operational amplifiers. Basic power supply circuits and regulation circuits.
CPE210 Database Systems (3-1) 3-5	Information about Data. Introduction to database. Study on an example database architecture. Relational Algebra, Entity Relation Diagrams. Normalization. DDL and DLL Queries, SQL, Transaction Management. Synchronization control, database recovery, database security, database management. General knowledge of the administration to create a database, tables, indexes, views, constraints, and triggers. Project presentations.

COURSE CODE	DESCRIPTION
CPE212 Internet Based Programming (2-1) 2-5	The basics of Web Design, HTML, Text Editors, Web Design Editors (Frontpage, Macromedia Dreamweaver), Tables, Frames, Styles, CSS, Server-Client Concept, Uploading web sites to server, Publishing web sites on internet, Script Languages, ASP, PHP, variables, operators, conditional expression, loops, arrays, Web Forms, Data transferring between pages, Sessions, Database connection and operations, XML and Web Services.
HST 182 Ataturk's Principles and History of Revolutions II (2-0) 2-2	Definition of revolution and Turkish revolution, notions, State of Turkey after Lausanne Peace Treaty, Declarations of Independence, abolition of the Caliphate, Trials of Transition to multi-party System, Sheikh Said rebellion, Examination Turkish foreign policy, Teaching Ataturk's Elements and Revolutions.

5th. Semester Courses

COURSE CODE	DESCRIPTION
CPE301 Industrial Practice I (0-0) 0-4	Giving utmost importance to practice of computer systems which are used in industrial and private institutions.
CPE303 Microprocessors (3-1) 3-4	8 bit microprocessor architecture, 8 bit microcontroller architecture, Microcontroller addressing mode, Instruction set, machine language and programming, sample applications, Intel x86 microprocessor architecture, addressing mode, Introduction to x86 assembly language, Writing programme and compiling, Using debug, Instruction set, Data transfer instruction, Arithmetic and logic instruction, program control instruction, Calling subroutines, Using stack, Interrupts and its usage, Input-Output processes, Keyboard and display processes.
CEC301 Numerical Analysis (2-1) 2-4	The representation of number in computer system. Error concept, Taylor and Mclaren Series, Convergence methods to nonlinear equation system, Linear equation systems, Divided difference, interpolation, Backward interpolation, Numerical derivative, Numerical integration, Euler, Taylor and Runge-Kutta methods.
CPE307 Operating Systems (3-1) 3-5	Operating System Concept, History of operating systems, Operating Systems-Hardware Relations, Process Management, Processes, Threads, Scheduling, Deadlocks, Memory Management, Swapping, Paging, Virtual Memory, Input-Output Management, File Systems, Multi-processor systems, Multimedia Operating System, Security and Protection.
CPE309 Data Communications (3-1) 3-5	Information about data and communication. Introduction to data communication. Protocol architecture. Data transmission, signal encoding techniques, digital communication techniques, data link control, multiplexing, spread spectrum. Wide area networks, circuit switching, packet switching, routing, ATM.

COURSE CODE	DESCRIPTION
CEC305 Occupational Health and Safety I (2-0) 2-2	Basic concepts of occupational safety and health. Basic working areas of ergonomics. Reasons of work accidents. Avoidance models. Calculation of costs. Investigation and reporting. Occupational illness, its types and avoidance methods. Occupational safety methods at workshop and laboratories. Personal and machine protective equipments. Fire and explosion prevention methods. Principals and objectives of first aid. ISG legislation.
CPE311 Computer Graphics (3-1) 3-4	Introduction to graphic system, Matrix representation and homogeneous coordinates, Two-dimensional and three-dimensional transformations, Graphic techniques, Deformation, Shading, Surface mapping, Hatching, Color, Animation, Representation of curves and surfaces, Solid modeling, Graphic station. User graphic design.
CPE313 Robot Technologies (3-1) 3-4	Robot types, robot components and application area of robot technologies. Mechanical structure of robots, Sensors and application area of robots. Coordinate systems and conversion matrices. Control architecture of mobile robots, defining location, mapping, route planning, learning and image processing algorithms, Multi robot systems.
CPE315 System Programming (3-1) 3-4	Representing Data in a Computer, Parts of a Computer System, Elements of Machine Language, Basic Instructions, Branching and Looping, Procedures, Bit Manipulation, String Operations, Floating Point Operations, Kernel of operating systems and system calls, Interrupts, Device Drivers, Compilers, Linkers and Loaders.

COURSE CODE	DESCRIPTION
CPE317 Visual Programming (3-1) 3-4	Introduction to Visual Programming environments, event-driven programming concepts, GUI design principles and components, Windows Forms or WPF application development, controls and containers, event handling, dialog boxes, menus and toolbars, graphics and drawing operations, file I/O in visual environments, database connectivity, MDI applications, drag-and-drop operations, deployment of visual applications, sample projects and applications.
ESC305 Entrepreneurship (2-0) 2-2	Introduction, course information. Entrepreneurship in Turkey, Development of Entrepreneurship, Fundamentals of Entrepreneurship, Entrepreneurship Process, Functions of the entrepreneur. Basic concepts of business: What is the business, internal environment, external environment, production process, factors of production; Managerial functions: planning, organizing, leading (communication, motivation, leadership), control; Basic Business Functions, Business Types: according to size, according to their functions, according to the capital ownership; Legal Structure of enterprises. Venture Types: Business building, acquisition, mergers, franchising, agency, dealership. Feasibility Study. Creativity Techniques, Creativity Exercises. Innovation; Sources of Innovation, Innovation Policy, Innovation Processes, Types of Innovation. Intellectual Property, Patent, Trademark, Copyright. Business Plan; definition and preparation, main chapters. Finance; finding and development of capital: Loans, external resources, funds, leasing, venture capital.
CPE321 Project Management (2-0) 2-2	Project planning, control principles and methods. Implementation project plan. Resource planning and tabulation (PERT/CPM). Project following and conclusion. Leadership for effective team study. Effectual project management ability. Special problems of firms that using this technology.
DEG305 Values Education (2-0) 2-2	Değer kavramı ve önemi, bireysel ve toplumsal değerler, ahlaki değerlerin gelişimi, evrensel değerler, mesleki değerler ve etik, dürüstlük ve sorumluluk, saygı ve hoşgörü, adalet ve eşitlik, çevre ve sürdürülebilirlik değerleri, kültürel değerler ve çokkültürlülük, değer çatışmaları ve çözüm yolları, değer eğitiminin önemi, toplumsal dayanışma, vatandaşlık değerleri, günümüzde değerlerin yeri.

6th. Semester Courses

COURSE CODE	DESCRIPTION
CPE302 Automata Theory (3-1) 3-5	Automata and regular languages, finite state machine. Regular languages and push down automata. Context-free language and grammars. Normal structural grammar. Indecision and insolvability. Turing machines and use of problem solutions.
CPE304 Computer Architecture (3-1) 3-5	Digital Logic Circuits, Digital Components, Data Representation, Register Transfer and Micro operations, Basic Computer Organization and Design, Programming The Basic Computer, Micro programmed Control, Central Processing Unit, Pipeline and Vector Processing, Computer Arithmetic, Input-Output Organization, Memory Organization, Multiprocessors.
CPE306 Computer Network (3-1) 3-5	Connecting to Network, Connecting to Service Through ISP, Planning Addressing Structure, Network Services, DHCP, DNS, Classful and Classless Inter Domain Routing, Variable Length Subnet Masking, Virtual LAN, Routing, Switching in a Enterprise Network, Wireless Technologies, Finding Solutions to Network Problems.

COURSE CODE	DESCRIPTION
CPE308 Signals and Systems (2-1) 2-4	Memory, cause, stability, invertibility, linearity and independent from time, linear independent systems from time, pulse response, functions of a complex variable, complex series and its integrals. Transform methods, Fourier series continuous time Fourier transforms, frequency response. Sampling theory. Laplace and Z transform Systems functions.
CEC 306 Occupational Health and Safety II (2-0) 2-2	Basic concepts of occupational safety and health. Basic working areas of ergonomics. Reasons of work accidents. Avoidance models. Calculation of costs. Investigation and reporting. Occupational illness, its types and avoidance methods. Occupational safety methods at workshop and laboratories. Personal and machine protective equipments. Fire and explosion prevention methods. Principals and objectives of first aid. ISG legislation.
COURSE CODE	DESCRIPTION
CEC308 Engineering Economy (2-0) 2-3	Introduction to economy, economical ideas, definition of economy and interest in other sciences, economical systems, issues of population and economic growth, Functioning of price mechanism, the laws of supply and demand and economic decision units, production, production costs and factors of production, nature, labor, capital and types of undertakings, labor and unemployment problems, international labor flows, banks and money, inflation, deflation and devaluation, foreign investment, multinational corporations, trade exchanges, electronic trading.
CPE310 Software Engineering (3-1) 3-4	Definition of software engineering and the importance, Software processes and Product types, Software Project Management: Metrics, Estimation, Planning and Risk analysis, Software requirement analysis, Software design techniques, Software implementation, Software quality assurance, Software testing, Software maintenance, User interface design, User system interaction, Help system, User documentation, Software reliability.
CPE312 File Organizations (3-1) 3-4	Introduction to file organization and storage structures, sequential file organization, direct access file organization, indexed sequential file organization, B-tree and B+ tree structures, hashing techniques, external sorting algorithms, buffer management, file system implementation, record formats and storage allocation, file access methods and optimization, database storage structures, multi-dimensional file organization, case studies and applications.
CPE314 Remote Sensing Technologies (3-1) 3-4	Fundamental terms and definitions and historical development of remote sensing, Photogrammetric and application area, Electromagnetic spectrum, visible, infrared, thermal and radar images, Band image and pixel concept in remote sensing, Light and light sources for remote sensing, Spatial, Spectral, Radiometric and Temporal Resolutions, Working principles of active and passive sensors, Representation of satellite image in computer, pseudo color coloring, Introduction to digital image processing, Radiometric and geometric rectification/restoration, image enhancement techniques, Vegetation indices, Classification of satellite images, Thematic maps and their characteristics.
CPE316 Embedded Systems (3-1) 3-4	Introduction to embedded systems and their applications, microcontroller architecture and programming, hardware-software interface, interrupt-driven programming, real-time operating systems for embedded platforms, memory management in embedded systems, peripheral interfacing (GPIO, UART, SPI, I2C, ADC/DAC), power management, embedded C programming techniques, debugging and testing of embedded systems, development boards and toolchains, case studies and project applications.
ESC302 Research and Presentation Skills (2-0) 2-2	Science and basic concepts (facts, information, absolute, true, false, universal knowledge, etc.), basic information about the history of science, the scientific nature of the research, scientific methods and different opinions on these methods, problem, research model, the universe and the sampling, data collection and data collection methods (quantitative and qualitative data collection techniques), data recording, analysis, interpretation and reporting.
ESC 304 Human Resources Management (2-0) 2-2	Personnel management, definitions and scope. Relationship with other sciences. Personnel problems and solutions. Personnel control. Human resources (internal resourcing and outsourcing). Work load analysis. Workforce analysis. Personnel evaluation methods. Personnel education and development. Work evaluation techniques. Wage systems. Motivation. Leadership. Complaint mechanism. Communication. Discipline. Health and protection.
ESC 306 Management Systems (2-0) 2-2	As about management and organizational; basic concepts, the concept of administrative, organization and functioning of organizations, organizational forms, management functions and the development of management in historical process.

7th. Semester Courses

COURSE CODE	DESCRIPTION
CPE401 Industrial Practice II (0-0) 0-4	Giving utmost importance to practice of computer systems which are used in industrial and private institutions.
COURSE CODE	DESCRIPTION
CEC401 Ethics in Engineering (2-0) 2-2	Introduction to ethical concepts. Professionalism and professional ethics codes. Ethics in design. Rights and responsibilities in business. Technical and ethical problems. Risk, safety and accident. Responsibility for scientific research. Experimental study responsibility. Printing and publication of research results in the powers and responsibilities.
CPE423 Senior Project I (0-2) 1-9	Students will undertake a small-scale project under supervision of a staff member.
CPE407 Mobile Programming (3-0) 3-5	Programmable mobile systems and architectures, Mobile operating systems, Fundamentals of mobile systems, Read/Write to file, using XML files, using XML Web services, using mobile equipments and emulator, debugging and test, Mobile GUI applications, I/O process, sending SMS and e-mail.
CPE409 Image Processing (3-0) 3-5	Digital image processing fundamentals, Image enhancement in Spatial and frequency domain, Image restoration, Color image processing, Wavelet transform, Image compression, Morphological image processing, segmentation, Image representation and description, Object recognition.
CPE411 Artificial Intelligence (3-0) 3-5	Introduction to artificial neural networks, Artificial neural network building, Artificial neural network structures and applications, Learning: Supervised and unsupervised learning, Fuzzy logic, Neural fuzzy logic controller and applications, Classical and fuzzy clusters, Expert systems, Evolutionary algorithms, Genetic algorithms and applications.
CPE413 Wireless Network (3-0) 3-5	Introduction to transmission and networks, Fundamentals of wireless communication, Architectures and topologies of wireless networks, Antennas, Multipath propagation, Satellite communication, Cellular systems (GPS/GPRS), Wireless LANs, Security of Wireless Network, Mobile IP, Ad Hoc networks, The Bluetooth technology and the IEEE802.11 standard.
CPE415 Compiler Design (3-0) 3-5	Introduction to compilation, Formal languages, A simple level compilation, Lexical analysis-allocation tokens, Regular expression, finite state machines, Lexical analysis generator design, Deterministic and non-deterministic finite automata, Preparation of symbol table and recognition of expressions, Grammatical and Semantic analysis, Parsing techniques, Type checking, Code generation, Code optimization.
CPE417 Data Mining (3-0) 3-5	Introduction to data mining, background of data mining, data preparation techniques, data warehouse and OLAP, data analyzing techniques, clustering techniques, classification techniques, estimation techniques, decision trees, data mining problems, text mining, web mining, sample implementations.
CPE419 Server Side Programming (3-0) 3-5	Introduction to server-side programming concepts, web server architecture, HTTP protocol and request-response cycle, server-side scripting with Node.js/PHP/Python, RESTful API design and implementation, server-side frameworks (Express.js, Django, Laravel), session management and authentication, database integration and ORM, middleware concepts, security in server-side applications, caching strategies, microservices architecture, containerization basics with Docker, deployment and hosting, performance optimization, project development.
CPE421 Cloud Computing (3-0) 3-5	Introduction to cloud computing concepts and history, cloud service models (IaaS, PaaS, SaaS), cloud deployment models (public, private, hybrid, community), virtualization technologies, major cloud platforms (AWS, Azure, Google Cloud), cloud storage and databases, serverless computing, container orchestration with Kubernetes, cloud security and compliance, identity and access management, scalability and load balancing, cost management and optimization, migration strategies to cloud, cloud networking, monitoring and logging, case studies and practical applications.

8th. Semester Courses

COURSE CODE	DESCRIPTION
CPE402 Applied Engineering Education (0-22) 11-20	Giving utmost importance to practice of computer systems which are used in industrial and private institutions. Students will work on real-world engineering problems under professional supervision in a company or institution environment.
COURSE CODE	DESCRIPTION
CPE424 Senior Project II (0-2) 1-10	Students will undertake a big-scale project under supervision of a staff member.

COURSE CODE	DESCRIPTION
CPE404 Parallel Programming (3-0) 3-5	Introduction to Parallel Programming. Parallel architecture and scalability, system conjunction and communications. Shared and Distributed memory models, Distributed data processing, algorithm design, communication in parallel and distributed platform, synchronization, Complexity of parallel algorithm and comparing parallel algorithms.
CPE406 Game Programming (3-0) 3-5	Stages of game programming, Game Theory, The platforms of game developing: PC, Xbox and mobile devices, 2D Games, 3D Games, Multiplayer Games, sample applications and relevant developments and research.
CPE408 Digital Signal Processing (3-0) 3-5	Introduction to signal processing, discrete-time systems and signals. Analyzing signal and system frequency space, Discrete time Fourier transformation: Transformation of time-invariant system analysis, Sampling, Analyzing Z Transformation of systems and signals. Digital filter design.
CPE410 Geographic Information Systems (3-0) 3-5	The basic map information, Its historical development of GIS, Information systems, Non spatial and spatial information systems. What is GIS?, Geographic assets, Data models and DBMS of GIS, Data acquisition types, Examining data quality, Data control operations, Spatial analyzing in GIS, network analysis, geometric operations, Grid analysis, Organization of GIS software and hardware, System design in GIS, GIS applications.
CPE412 Pattern Recognition (3-0) 3-5	Data and pattern, recognition, intuition, measuring, classification, learning in daily life. Bayes Decision theorem, possibility of error, maximum possibility estimation, dimensional factors, Markov models, non-parametric techniques, closest neighbor inference, linear discriminate functions, unsupervised learning, grouping.
CPE 414 GPS Based Systems (3-0) 3-5	Introduction to GPS, Coordinate and Time System, Satellite Orbits, Orbit parameters and estimation of satellite coordinates, GPS signal structure, definition of pseudo-range observations, RINEX data structure, GPS based positioning and Navigation systems, Vehicle tracking system, Mobile Device Applications, Algorithms used in navigation solutions and positioning.
CPE416 Bioinformatics (3-0) 3-5	Description of bioinformatics, content and history; biologic database and access to information I and II; Collection and storage of array: Presentation arrays to databases; Array formats. Investigating important bioinformatics centers: NCBI, EBI, SIB, SRS. Comparison array methods: Algorithms (Dot Matrix; Dynamic Programming). Dual Alignment Applications: BLAST, FASTA. Multiple Alignment: Methods, creating Phylogenetic tree and applications: CLUSTAL W; T-Coffee. Classification protein and scanning secondary databases. Protein Analysis. Viewing structure three dimensions of proteins: RasMol, Swiss-PdbViewer. Primer designing (PCR principles; FASTPCR). Restriction Analysis.
CPE418 Optimization Theory (3-0) 3-5	Introduction to optimization, one-variable optimization, multi-variable optimization, modeling of optimization problems, multi-purpose optimization, constricted optimization, unconstrained optimization, equality and inequality limited optimization, convex and concave functions, Lagrange multipliers and comment, the Kuhn-Tucker, Duality, graphics solution, the search techniques, Fibonacci, gold rate, gradient calls, Newton search, direct search techniques, Hooke-Jeves call, Powell Search, quadratic programming, portfolio and quadratic programming applications, portfolio analysis.
CPE420 Computer and Network Security (3-0) 3-5	Network Security Introduction and Basic Concepts, Risk Assessment, Security Policy, Threat Classification, passwords, access permissions. Cryptographic Techniques, Traditional Methods, Open Key Methods, Digital Signature, protocols, encryption software. TCP/IP Protocols and Services Safety, Firewalls, Virtual Private Networks, Attack Detection Systems.
CPE422 Computer Vision and Imaging Techniques (3-0) 3-5	Introduction to computer vision and its applications, image formation and camera models, feature detection and description (SIFT, SURF, ORB), image segmentation techniques, object detection and recognition, deep learning for computer vision (CNN architectures), optical flow and motion analysis, stereo vision and 3D reconstruction, image registration, face detection and recognition, scene understanding, medical image analysis, real-time vision systems, practical implementations using OpenCV and deep learning frameworks.