DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING AND COMPUTER SCIENCE

Dr. Jacqueline M. Jackson
Interim Chair
mahmoud.a.manzoul@jsums.edu
(601) 979-2105
Engineering, Room 236

Faculty of Department

K. Abed, K. Ali, S. Aliabadi, A. Abu-El Humos, M. Manzoul, N. Meghanathan, L. Moore, T. Pei, S. Tu, S. Hong, J. Jackson, A. Tanner, L. Gong, V. Melapu, F. Dancer, G. Offiah, Q. Pang

Introduction/Mission

The mission of the Electrical and Computer Engineering and Computer Science department is to build and sustain high-quality and broad-based teaching and research programs in Electrical Engineering, Computer Engineering, Biomedical Engineering, and Computer Science, to prepare graduates for successful professional careers, and to provide service to the community. The Department offers four undergraduate degrees:

- Bachelor of Science in Electrical Engineering
- Bachelor of Science in Computer Engineering
- Bachelor of Science in Biomedical Engineering, and
- Bachelor of Science in Computer Science.

Bachelor

- Biomedical Engineering (B.S.) (https://jsums-public.courseleaf.com/undergraduate/college-science-engineering-technology/department-electrical-computer-engineering-computer-science+/biomedical-engineering-bs/)
- Computer Engineering (B.S.) (https://jsums-public.courseleaf.com/undergraduate/college-science-engineering-technology/department-electrical-computer-engineering-computer-science+/computer-engineering-bs/)
- Computer Science (B.S.) (https://jsums-public.courseleaf.com/undergraduate/college-science-engineering-technology/department-electrical-computer-engineering-computer-science+/computer-science-bs/)
- Electrical Engineering (B.S.) (https://jsums-public.courseleaf.com/undergraduate/college-science-engineering-technology/department-electrical-computer-engineering-computer-science+/electrical-engineering-bs/)

Course Descriptions

CPE 431 DIGSYSTEM TESTING AND DESIGN (3 Hours)
Prerequisite: CPE 330 and EN 212.
This course introduces fundamental techniques for detecting defects in VLSI circuits. Topics include fault models, fault detection, and schemes for designing systems to be easily testable and with self-test capability.

CPE 471 BIOMEDICAL SIGNAL PROCESSING (3 Hours)
This course introduces two fundamental concepts of signal processing: linear systems and stochastic processes. Various estimation, detection and filtering methods are developed and demonstrated on biomedical signals. The methods include harmonic analysis, autoregressive model, Wiener and Matched filters, linear discriminants, and independent components.

CPE 472 BIOMEDICAL MATERIALS (3 Hours)
An overview of biomaterials in three basic classes: metals, ceramics, and polymers. Topics include biomaterials used in special medical applications such as tissue replacement, absorbable and non-absorbable sutures, soft tissue replacements. Tissue, body and blood responce to implants will be investigated.

CSC 115 DIGITAL COMPUTER PRINCIPLES (3 Hours)
An introduction to the study of computer science. Subject matter consists of word processing, spreadsheet, database, graphics, computing, data processing, the organization of a computer, input and output devices, number systems, internal data representation and an introduction to a high-level programming language. (F, S, Sum)

CSC 118 COMPUTER SCIENCE I (3 Hours)
Prerequisite: MATH 118 or equivalent, CSC 115 or equivalent.
This is the first course in the computer science programming sequence and is required of all computer science majors. Course objectives include: introduction to problem-solving methods and algorithm development; definition of language syntax and semantics of a high-level programming language; and developing the ability to design, code, debug, document, and successfully execute programs. Topics include objects and classes, data types, applets and graphics, decision statements, iteration, methods, testing and debugging, arrays, sorting and searching, inheritance, interfaces, and polymorphism.

CSC 119 COMPUTER SCIENCE II (3 Hours)
Prerequisite: CSC 118.
This course is the follow-up of CSC 118. Additional topics in Object Oriented Programming covered in this course. Then the emphasis shifts to object oriented analysis and design. This course covers I/O streams, exception handling, threads, reflection, UML, object-oriented analysis and design, object-oriented graphical interfaces, design patterns, and refactoring. The course consists of two lecture hours and one laboratory hour. The course consists of two lecture hours and one laboratory hour. (F,S).

CSC 214 PROGRAMMING FOR THE WEB (3 Hours)
Prerequisite: CSC 119, CSCL 119.
This course is designed for students who have computer programming experience and who want to write Web applications. Students will learn the basic programming skills and languages that are needed to implement distributed Web applications. Topics include client-side programming techniques including HTML, Dynamic HTML and JavaScript; server-side programming techniques including CGI programming using Perl; and Web architectures and servers. (S)

CSC 215 DATA ANALYTICS (3 Hours)
This course introduces students to data analytics -- the science of examining raw data and deriving conclusions from it. Data analytics is used in business and industry to make better business decisions and in science to verify existing theories. It involves extracting useful properties of data using concepts from statistics, mathematics and computer science. Students will use statistical methods, machine learning algorithms and software tools for analyzing data from science, business and industry. The course is designed for students in a variety of fields including statistics, artifical intelligence, engineering, marketing, finance, etc. The course consists of two lecture hours and one laboratory hour. (F, S)

CSC 216 COMPUTER ARCHITECTURE & ORGNZA (3 Hours)
Prerequisite: CSC 119, 225, CSCL 119, EN 212, ENL 212; co-requisite: CSCL 216.
Students will learn functional behaviors and structural organizations of a computer. Topics include machine level representations of data, computer arithmetic, instruction set architecture and assembly language, datapath and control, memory system and bus architectures and I/O devices. Also, the compilation and the assembly processes, and linking and loading are covered. (F, S)

CSC 225 DISCRETE STRUCTURES (3 Hours)
Prerequisite: CSC 118, CSCL 118, MATH 118 or Higher.
Introduces the foundations of discrete mathematics as they apply to computer science, focusing on providing a solid theoretical foundation for further work. Topics include basic logic, proof techniques, sets, bags, ordered structures, graphs, trees, facts and properties of functions, and construction techniques. (F, S)

CSC 228 DATA STRUCTURES & ALGORITHMS (3 Hours)
Prerequisities: CSC 119. The main objective this course is to study data structures (e.g. arrays, lists, binary tree, heaps, etc.), their properties and purposes, and algorithms (e.g. graph and tree algorithms, minimal paths, greedy algorithms, divide and conquer, dynamics programming) to manipulate these structures. A participate emphasis will be placed on understanding the theoretical foundations of data structures and associated algorithms, but also on their practical development from a software engineering perspective, and their associated algorithmic analysis. The course consists of two lecture hours and one laboratory hour. (F,S).

CSC 235 SECURITY AWARENESS (3 Hours)
Prerequisite: CSC 115 or equivalent.
This course will increase students' understanding of cyber security issues and practices. It will teach them need-to-know information about staying secure and how to avoid security attacks through hands-on-projects. Topics covered will include: personal security, mobile security, Internet security, computer security, and workplace security. The course consists of two lecture hours and one laboratory hours. (F,S)

CSC 245 INTRODUCTION TO BIOINFORMATICS (3 Hours)
Introduces the foundations of Bioinformatics as they apply to computer science, focusing on providing a solid theoretical foundation in Biology for further work. Topics include sequence Alignments, Evolutionary processed, Genome characteristics, secondary structures & tertiary structures of proteins, Cells and organisms. The course consists of two lectures hours and one laboratory hours. (F,S).

CSC 323 ALGORITHM DESIGN AND ANALYSIS (3 Hours)
Prerequisite: CSC 228, CSCL 228.
Introduces students to various techniques to design and analyze algorithms. Topics include examples of computational problems, basic issues related to algorithms, efficiency comparison, and the design and analysis of brute force, divide-and-conquer, decrease-and-conquer, and transform-and-conquer algorithm design strategies. (F, S)

CSC 325 OPERATING SYSTEMS (3 Hours)
This course introduces the major concepts of process communication and synchronization, protection, performance measurement, and causes and evaluations of the problems associated with mutual exclusions and process synchronization among the concurrent processes. This course introduces and analyzes various operating systems in terms of professor management, memory management, device management, information management, and distributed systems management. The course consists of two lecture hours and one laboratory hour. (F,S)

CSC 330 DATABASE SYSTEMS (3 Hours)
Prerequisite: CSC 228.
This course is designed to introduce students to the concepts and theories of database systems. Topics include: information models and systems; the database environment; data modeling; conceptual modeling using the entity-relationship approach and mapping to relational tables; the relational model including the relational data structure, integrity rules, relational algebra and relational calculus; normalization; data definition and data manipulation in SQL; conceptual, logical, and physical database design; security; transaction management; query processing; and advanced topics in database systems. The course consists of two lecture hours and one laboratory hour. (F, S)

CSC 335 COMPUTER FORENSICS (3 Hours)
Prerequisite: CSC 325.
This course introduces students to topics in computer crimes and computer forensics. Students are required to learn ways to uncover, protect, and exploit digital evidence. Topics covered will include: e-mail investigation, data hiding, live acquisitions, processing a crime scene, data acquisition, analysis and validation, computer crimes, and cell phone and mobile device forensics. The course consists of two lecture hours and one laboratory hour. (F,S)

CSC 350 ORGANIZATION OF PROGRAM LANGUA (3 Hours)
Prerequisite: CSC 216, 228, CSCL 216, 228.
Study of the organization and specification of programming languages. Topics include an overview of programming languages; issues in language design, including typing regimens, data structure models, control structure models, and abstraction; virtual machines; language translation; interpreters; compiler design; lexical analysis; parsing; symbol tables; declaration and storage management; code generation; and optimization techniques. (F, S)

CSC 390 COMPUTER SCIENCE SEMINAR (1-3 Hours)
Discussion on trends in computer science. Students are required to prepare a paper and present it to their peers. Students who have participated in a Co-op Program will conduct a seminar discussing their work assignments.

CSC 435 COMPUTER NETWORKS (3 Hours)
Prerequisite: CSC 323,325.
The CSC 435 course will primarily focus on the following five layers of the TCP/IP protocol stack: Physical, Link, Network, Transport and Application layers. Topics to be covered include: Physical Layer -- encoding and decoding data for short-distance and long-distance communications; Link Layer -- local area network technologies and their extension using interconnection devices; Network Layer -- routing protocols, IP addressing, subnets, datagram forwarding, fragmentation and other auxiliary network-level communication protocols; Transport Layer -- UDP and TCP and Application Layer -- Socket programming. The course will also cover appropriate security aspects for each of the above layers. The course consists of two lecture hours and one laboratory hour. (F,S)

CSC 437 COMPUTER SECURITY (3 Hours)
Prerequisite: CSC 325.
This course will examine the risks of security in computing, consider available countermeasures, controls, and examine some of the uncovered vulnerabilities. Topics covered will include: Cryptography, Program Security, Operating System Security, and Network Security. The course consists of two lecture hours and one laboratory hour. (F,S)

CSC 441 COMPUTERS AND SOCIETY (3 Hours)
Prerequisite: CSC 325 and 330.
This course presents concepts of computer moral and legal issues, describes the impact of computers on society and presents techniques which are applicable in addressing problems posed by the social impact of computers. As a Service Learning Course, students will be able to help agencies and businesses in educating them on the most recent Anti-virus software available, viruses, e-mail scams, privacy issues, intellectual property rights, and computer crimes. (F, S)

CSC 450 SENIOR PROJECT (3 Hours)
Prerequisite: CSC 325 and CSC 475.
Students will design, code, test, implement and document a large and complex application program. (F, S)

CSC 456 AUTOMATA,COMPTBLTY & FORMAL LA (3 Hours)
Prerequisite: CSC 350 and a knowledge of discrete structures.
An introduction to formal models of computation. Assignments will develop students skills in understanding vigorous definitions in computing environments and in determining their logical consequences.

CSC 460 ARTIFICIAL INTELLIGENCE (3 Hours)
Prerequisite: CSC 323.
An introduction to the theory, research paradigms, implementation techniques, and philosophies of artificial intelligence. Introduction to Prolog, Lisp and expert system-shell programming.

CSC 475 SOFTWARE ENGINEERING (3 Hours)
Prerequisite: CSC 330.
Introduction to software engineering, software design, APIs, software tools and environments, software development processes, software requirements and specifications, software verification and validation, software implementation, software evolution, and software project management. (F)

CSC 499 SPECIAL TOPICS - WEB PROGRAMMI (3 Hours)
Prerequisite: Approval of instructor.
Advanced, specialized topics selected on the basis of mutual interest of the student and the instructor.

ECE 101 Introduction to Electrical and Computer Engineering (2 Hours)
This course gives first year students a survey of the field of the electrical and computer engineering. It describes the different subareas within the electrical and computer engineering field and the analytical tools that will be utilized throughout the curriculum. The course discusses the curriculum, the available technical electives, and professional careers for ECE students.

ECE 212 DIGITAL LOGIC (3 Hours)
Prerequisite: MATH 111 or equivalent.
This is an introductory course to digital design. Topics include Digital Systems and Binary numbers. Boolean Algebra and Logic Gates, Gate-Level Minimization, Combinational Logic circuits and Synchronous Sequential Logic circuits.

ECE 220 CIRCUIT THEORY (3 Hours)
Prerequisite: PHY 211, Co-requisite: MATH 242.
This course introduces introduction to theory, analysis and design of electric circuits. Voltage, current, power, energy, resistance, capacitance, inductance. Ohm's law, Kirchhoff's laws, nodal and mesh analysis. The venin's and Northon's theorem, Superposition, operational amplifier, steady state in RCL circuits and transient analysis in RL and RC circuits.

ECE 252 ENGINEERING ANALYSIS (3 Hours)
Prerequisite: MATH 241.
This course introduces the principles and applications of engineering mathematics, differentiation of functions with multiple variables, coordinate systems, vectors and linear algebra, matrix inversion, complex variable theory, differenital equations.

ECE 312 COMPUTER ORGANIZATION & DESIGN (3 Hours)
Prerequisite: ECE 212, ECEL 212 and CSC 118.
This course provides an overview of digital logic design. It covers modeling and simulation of basic digital systems using a hardware desciprtive language. Topics include behavioral, data flow, and structural modeling.

ECE 315 SYNTHESIS WITH HARDWARE DL (3 Hours)
Prerequisite: ECE 212, ECEL 212, CSC 119 and CSCL 119.
This course provides an overview of digital logic design. It covers modeling and stimulation of basic digital systems using a hardware descriptive language. Topics include behavioral behavioral, data flow, and structural modeling.

ECE 320 CIRCUIT THEORY II (3 Hours)
Prerequisite: ECE 220, ECE 252 and MATH 368.
This course is a continuation of ECE 220 Circuit Theory I, covering phasor analysis, steady state power, complex network functionsk frequency response, and transformers.

ECE 330 ELECTRONICS (3 Hours)
Prerequisite: ECE 220 and ECE 252.
This course introduces fundamental concepts to electronics. Topiccs include diode, BJT, and FET circuits. It covers frequency response, biasing, current sources and mirrors, small-signed analysis, and design of operational amplifiers.

ECE 331 ELECTRONICS II (3 Hours)
Prerequisite: ECE, 330, ECEL 330 and ECE 320.
This course is a continuation of ECE 330 whihc focusing on characteristics and applications of both linear and digital integrated circuits; amplifiers, feedback analysis, frequency response, oscillators, amplifier stabilization, microprocessors, memory systems, and emphasis is on design.

ECE 335 SEMICONDUCTOR DEVICES (3 Hours)
Pre-requisites: PHY 212, PHYL 212 and MATH 368. This course applies the fundamentals of semiconductor physics to the understanding of electronic devices. Energy band models, electron and hole concentrations and transplat, p-n junctions, bipolar junction transistors, field effect devices, technology, scaling, and nanotechnology.

ECE 345 ELECTROMAGNETIC FIELDS (3 Hours)
Pre-requisites: ECE 220, PHY 212, MATH 368 and MATH 244. This course introduces fundamental cconcepts to electromagnetics. Concepts include Waves and phasors, Transmission lines, vector analysis, electrostatics and magnetostatics. Topics cover gradient, divergence, curl, laplacian, field intensity, charge and current distribution, Coulomb's law, Guess's law, electric and magnetic potential, conductors, dielectrics, capacitors, magnetic force and torques, Biot Savart law, and electric and magnetic boundary conditions.

ECE 351 SIGNALS AND SYSTEMS (3 Hours)
Pre-requisites: ECE 220, ECE 252 and MATH 368. This course introduces theoretical analysis of continuous-time signals and systems. Topics include time domain analysis using convolution integral, S-domain analysis using Laplace transform, real frequency domain analysis using Fourier series and Fourier transform, and relationship between time domain and frequency domain description. Topics also include brief introduction of the application of signals and systems in filter design, communications and control systems.

ECE 355 CONTROL SYSTEMS (3 Hours)
Pre-requisite: ECE 351. This course introduces fundamental principles of classical feedback control. Topics include using Laplace transform and partial fraction to solve linear ordinary differential equations, impulse response, transfer function, block diagram, signal flow graph and grain formula, state diagram and state variable analysis of linear systems, modeling of physical systems, analysis of stability of linear control systems, time-domain analysis of control systems and root-locus technique.

ECE 360 EMBEDDED MICROPROCESSOR SYSTEM (3 Hours)
Prerequisite: ECE 312.
This course covers the architecture, operation, and applications of microprocessors. Topics include microprocessor programming, address decoding, interface to memory, interfacing to parallel and serial input/output, interrupts, and direct memory access. Course project is to design, build, and program a simple microprocessor-based system.

ECE 412 COMPUTER ARCHITECTURE (3 Hours)
Prerequisite: ECE 312.
This course covers computer architecture design issues. Topics include organization of CPU, processor systems design, computer arithmetic, memory system organization and architecture, interfacing and communication, performance, and multiprocessing.

ECE 430 DIGITAL VLSI DESIGN (3 Hours)
Prerequisite: . ECE 212, ECEL 212, ECE 330 and ECEL 330. This course introduces principles of the design and layout of Very Large Scale Integrated (VLSI) circuits with concentrations on the Complementary Metal-Oxide-Semiconductor (CMOS) technology. Topics include MOS transistor theory and CMOS technology, characterization and performance estimation of CMOS gates. Course projects involve layout designs and simulations using computer-aided design tools.

ECE 431 Digital System Testing and Design for Testability (3 Hours)
Prerequisite: ECE 330 and ECE 212
This course introduces fundamental techniques for detecting defects in VLSI circuits. Topics include fault models, fault detection, and schemes for designing systems to be easily testable and with self-test capability.

ECE 435 POWER ELECTRONICS (3 Hours)
Prerequisite: ECE 331.
This course introduces students to Switch-mode power electronics. Topics include Switch-mode DC power supplies and Switch-mode converters for DC and AC motor drives, wind/photovoltaic inverters, and interfacing power electronics equipment with utility system, power semiconductor devices, magnetic design, and electro-magnetic interference.

ECE 440 COMMUNICATION SYSTEMS (3 Hours)
Prerequisite: MATH 243 and MATH 307.
This course introduces students to analog and digital modulation techniques. Topics include random processes, power special density, effects of nosie on, and bandwidth requirements of, different modulation schemes.

ECE 441 COMPUTER NETWORKS (3 Hours)
Prerequisite: ECE 312 and ECE 351.
This course introduces students to network protocols and network architectures. Topics include characteristics and principles related to Wide Area Network(WAN), and network devices and their relationship with network protocols and architectures. It also provides methods for characterizing and analyzing communications systems performance.

ECE 451 DIGITAL SIGNAL PROCESSING (3 Hours)
Pre-requisite: ECE 351. This course introduces theoretical analysis of discrete-time signals and systems. Topics include sampling continuous-time signals and reconstructions of continuous-time signals from samples: z-transforms; signal flow graphs; spectral analysis of signals and systems using Fourier series and Fourier transform: the discrete Fourier transform; the fast Fourier transform algorithm; finite and infinite impulse response (FIR/IIR) filter design techniques, and applications in digital control systems and digital communications.

ECE 480 POWER SYSTEM ANALYSIS (3 Hours)
Pre-requisite: ECE 320. This course introduces students to AC power systems. Topics include large power system networks, mathematics and techniques of power flow analysis, transient stability analysis, and use of power system simulation program.

ECE 481 ELECTRIC MACHINES (3 Hours)
Pre-requsities: ECE 320. This course introduces students to the principles and applications of electric machines. Topics include integrated discussion of DC motors, transformers, and AC machines. Application include electric transportation, process control, and energy conservation.

ECE 490 SENIOR DESIGN PROJECTS I (3 Hours)
Prerequisities: ECE 330 and ECE 360. This course is based on group design projects. Students work in teams to develop proposals for their selected projects. Topics include engineering professionalism, ethics, design methodology, project management, development of specifications, and evaluation of alternatives. Students make oral presentation and submit written reports on their proposed projects.

ECE 491 SENIOR DESIGN PROJECTS II (3 Hours)
Prerequisite: ECE 490.
In this course students complete the design projects proposed in ECE 490-Senior Design Projects I. Students perform the design synthesis, analysis, construction, testing, and evaluation of their team projects. Topics include engineering professionalism, ethics, and safety. Students make oral presentation and submit final reports documenting their results.

ECE 492 SPCL STDS N ELEC & COMPU ENGIN (1-4 Hours)
Prerequisite: Junior/Senior standing in Electrical and Computer Engineering and consent of Chair.
Special Studies in Electrical and Computer Engineering. This course is based on individual projects and problems selected by instructors and individual students. It is open to junior/seniors in Electrical and Computer Engineering only. No more than four credit hours of ECE 492 can be applied toward the degree.

ECE 493 SPCL TPCS N ELECTRL & COMPU EN (1-4 Hours)
Prerequisite: Junior/Senior standing in Electrical and Computer Engineering and consent of Chair.
Special Topics in Electrical and Computer Engineering. This course includes lectures on recent topics of special interests to students in various areas of Electrical and Computer Engineering. It is designed to test new experimental courses in Electrical and Computer Engineering. No more than four credits of ECE 439 can be applied toward the degree.

ECEL 212 DIGITAL LOGIC LABORATORY (1 Hour)
Co-requisite: ECE 212. This laboratory course enables students to validate the major concepts covered in ECE 212, digital Logic.

ECEL 220 CIRCUITS LABORATORY (1 Hour)
Co-requisite: ECE 220. This laboratory enables students to validate the major concepts covered in ECE 220, Circuit Theory. Experiments include OHM's law, node voltage analysis, RC circuits, and RL circuits.

ECEL 330 ELECTRONICS LABORATORY (1 Hour)
Co-requisite: ECE 330. This laboratory course includes experiments that validate the concepts covered in ECE 330--Electronics.

ECEL 331 ELECTRONICS II LABORATORY (1 Hour)
Co-requisite: ECE 331. This laboratory course includes experiments that validate the concepts covered in ECE 331, Electronics II. Experiments include amplifiers, feedback analysis, and oscillators.

ECEL 360 MICROPROCESSOR LABORATORY (1 Hour)
Co-requisite: ECE 360. This laboratory courses enables students to validate the major concepts covered in ECE 360-Embedded Microprocessor Systems. Experiments include building and/or interfacing a microprocessor system.