



Courses Description Communication and Software Engineering

BSE0205	Engineering Drawing	2(0-6)
Drawing instruments and their use, lettering, geometric construction, dimensioning, free-hand sketching, Orthographies, isometric projections, sketching and sectioning. Computer drawing using autocad (AutoCAD), engineering applications. Prerequisite: CS101		
BSE0102	Engineering Workshop	1(0-3)
Occupational safety and health in engineering workshops, mechanical forming of metals, machining operations, welding processes, carpentry works, electrical installation. Prerequisite: -		
BSC0401	Engineering Economy	3(3-0)
Engineering Economy: engineering economic concepts; interest formulas; decision making using present worth, future worth, annual worth, internal rate of return and benefit- cost ratio methods; payback analysis; depreciation. Prerequisite: 80 credit hours		
BSE 0201	Programming for Engineers	3(2-3)
This is a fast-paced introductory course to the C++ programming language. It is customized for the engineers with a little programming background. It covers C++ programming concepts, variables and basic data types, control structures and loops, functions; call by value and reference, arrays, structures, classes and objects, pointers and references to objects, files and streams. Weekly laboratory experiments will provide hands-on experience in topics covered in this course. Pre-requisite: CS101		
BSE 0306	Numerical Methods	BSE 0306
Errors analysis, roots of equations: bracketing and open methods, solutions of linear equations: gauss elimination, LU decomposition, matrix inverse, gauss-Seidel, curve representation and fitting, numerical differentiation and integration, solutions of differential equations: runge-kutta method, boundary-value and eigen-value problems. Prerequisite: 30202102		
BSE0203	Technical Writing & Professional Ethics	3(3-0)
This course deals with the definition of technical writing, its standards and how they differ from other types of writing. The basics of writing official reports, laboratory reports, projects and scientific papers. The common mistakes in writing and the process of writing citations and references. The concept of professional work and the definition of professional ethics and the acceptable and unacceptable professional practices. The sources of professional ethics and reasons for non-compliance with professional ethics. Identifying different forms of professions and explaining the importance of their relationship to ethics, standards of ethical behavior in science. Professional ethics in Jordanian laws and regulations. Prerequisite: AEL102		
BSE 0202	Statistics and Probabilities for Engineers	3(3-0)



Descriptive mathematical and analytical statistics, probability, discrete and continuous random variables, probability density & distribution functions, statistics of random variables, random process, ergodicity & stationarity, autocorrelation function, power spectral density, estimating the autocorrelation function, power spectral density for raw data, input–output relation of linear systems and statistical hypothesis testing.

Prerequisite: 30202102

ELE 0211	Electrical Circuits (1)	3(3-0)
Units; Definitions: charge, current, voltage, power, energy, components of electrical circuits (independent and dependent sources, resistors, capacitors, inductors), Ohm's law, Kirchhoff's voltage and current laws, series, parallel, delta and star connections of the passive elements in electrical circuits, nodal and mesh analysis of electrical circuits, Thevenin and Norton Theorems, source transformation theorem, RL, RC and RLC circuits without source and with unit step forcing source.		
Prerequisite: 30201102		
ELE 0212	Electrical Circuits (2)	3(3-0)
Introduction to AC waveforms, AC RL, RC and RLC circuits, phasor diagram, impedance, resonant circuits, single phase and three phase circuits, magnetically coupled circuits and transformers, two-port networks, low pass, band pass and high pass filters.		
Prerequisite: ELE 0211		
ELE 0214	Electrical Circuits Lab	1(0-3)
DC circuits, Ohm's law, Kirchhoff's voltage and current laws, network theorems; transient analysis of RL, RC, and RLC circuits, impedance concept, power and P.F, series and parallel resonance, three phase circuits, magnetically coupled circuits, filters.		
Prerequisite: ELE0212*		
ELE 0213	Digital Logic Design	3(3-0)
Number Systems and digital waveforms. Basic gates and logic functions. Boolean algebra, Boolean expressions. Logic minimization techniques. VHDL basics. Design simulation and synthesis tools for programmable logic devices. Combination logic building blocks including decoders, encoders, multiplexers, demultiplexers and magnitude comparators. VHDL for combinational circuits. Digital arithmetic, adders and subtractors. VHDL for arithmetic circuits. Basics of sequential circuits. Basic latches and flip-flops. Timing parameters and diagrams. Counter, shift registers, basic PLDs, CPLDs and FPGAs architectures. VHDL for binary counters and shift registers. State machines. System Design with state machines using VHDL. Memory devices and systems including RAM, ROM, FIFO, LIFO and dynamic RAM.		
Prerequisite: BSE 0201		
ELE 0216	Electronics (1)	3(3-0)
Semiconductor diode, diode applications, BJT transistor, biasing circuits for BJT transistor, FET transistor, biasing circuits for FET transistor, transistor circuits models, small signal amplifiers.		
Prerequisite: ELE 0211		
ELE 0216	Electronics Lab (1)	1(0-3)



Diode characteristics, rectification, regulation, limiting and clamping, BJT transistor characteristics and applications, FET transistor characteristics and applications. Prerequisite: ELE 0216		
ELE 0321	Signals and Systems	3(3-0)
Representation and classification of signals and systems, continuous-time signals and systems, Fourier series representation, Fourier transform and its applications, Laplace transform, analog filters: LPF, BPF and HPF, sampling theorem, discrete-time signals and systems, introduction to Z-transform. Prerequisite: ELE 0211		
ELE 0322	Communications and Data Transmission	3(3-0)
Analog and Digital signals, Analogue Modulation Techniques, Principles of Data Communications, Pulse Modulation Techniques, Error detection and correction, data compression, Line Coding Techniques, Frequency Division Multiplexing and Time Division Multiplexing. Prerequisite: ELE 0321+ ELE 0213+ ELE 0205		
ELE 0334	Control Systems	3(3-0)
Introduction to Control Systems, Mathematical Models of Systems, State Variable Models, Feedback Control System Characteristics, The Performance of Feedback Control Systems, The Stability of Linear Feedback Systems, The Root Locus Method, Frequency Response Methods, Stability in the Frequency Domain, The Design of Feedback Control Systems, The Design of State Variable Feedback Systems, Robust Control Systems. Prerequisite: ELE 0321		
ELE 0431	Control Systems Lab	1(0-3)
Time Response of first and Second order system, Study of characteristics, Transfer function of DC and AC motors, Characteristics of AC servo motor, Effect of feedback on DC servo motor, Effect of P, PD, PI, PID controller on a second order systems, State space model for classical transfer function using MATLAB – Verification, system identification, Lag and lead compensation – Magnitude and phase plot, verification of Routh Horvitz criteria, Root locus plotting. Prerequisite: ELE 0334		
ELE 0335	Electrical Machines (1)	3(3-0)
Magnetic circuits; single-phase transformers: types; construction; ideal and practical transformers; equivalent circuit; testing; voltage regulation and efficiency; three-phase transformers: construction; connections and groups; in-rush currents and harmonics; preventive maintenance and testing; direct current machines: construction and classification; elementary DC machine; excitation; windings; EMF; torques and power relations; armature reaction and commutation; DC generators: performance characteristics and applications; DC motors: performance characteristics; starting; speed control and applications preventive maintenance. Prerequisite: ELE 0212		
ELE 0228	Microprocessors Systems	3(3-0)



Introduction to microprocessors and microcomputers. Microprocessors' evolution, architecture, programming model, buses and control signals. Introduction to Real-mode and protected-mode memory addressing. Introduction to Assembly programming (one of the latest 16-bit or 32-bit microprocessors can be chosen, e.g., Intel, Zilog, Motorola). Data movement instructions (different addressing modes), Arithmetic instructions: addition, subtraction, comparison, multiplication and division. Logical, shifts and rotate instructions. Stack, load-effective address, software interrupts and calling subroutine and macro. Jump instructions. Counters and time delays. String instructions. String comparisons. Code conversion. Program and machine control instructions. Direct Memory Access .Program development. Introduction to memory and I/O interface.

Prerequisite: ELE 0213

ELE 0328	Microprocessors Systems Lab	1(0-3)
Writing, implementing and debugging assembly programs on Intel x-86 microprocessors. The lab also provides the facility to interface the microprocessor with different circuits such as A/D converters, stepper motors, multi-digit displays, sensors etc.		
Prerequisite: ELE 0228		

ELE 0205	Linear Algebra	3(3-0)
Simultaneous linear equation systems and matrices. Gaussian elimination, orthogonal projection, Determinants, vector and matrix spaces, Inner product spaces, linear transformation. Eigenvalues and eigenvectors. Diagonalization and quadratic forms. Singular value decomposition. Modeling and applications in electrical engineering.		
Prerequisite: 30202102		

ELE 0541	Graduation Project (1)	1(0-1)
Project under the supervision of one of an academic staff in the department, on an assigned specification topic in the related specialization. This is the first part of the project; it will normally involve literature review, theoretical work and some laboratory or fieldwork.		
Prerequisite: pass 120 Cr. Hrs.		

ELE 0542	Graduation Project (2)	3(0-3)
Project 2 is the second part of the project and will normally involve design, analysis and conclusions of the study and the submission of a final report and discussion by a committee in the department.		
Prerequisite: ELE 0541		

ELE 0442	Field Training	3(0-3)
Training for 8 weeks in the field of the related specification in an approved public or private sector.		
Prerequisite: pass 115 Cr. Hrs.		

ELE 3272	Data Structure	3(3-0)
Data types: records, files, and sets. Dynamic data structure. Single, double, and circular linked lists and queues. Stacks and binary trees. Shell sort, quick sort, binary search, and		



hashing. Data compression. Definitions of algorithms. Design & analysis Algorithms: Divide and conquer, Greedy algorithm. Dynamics programming. Backtracking. Branch and bound technique. NP-hard and NP-complete problems.

Pre. Request: ELE 5251

ELE 3314	General Electromagnetics	3(3-0)
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Vectors, vector calculations for the static electric field (Coulomb's law and Gauss's law) and the static magnetic field (Biot-Savart law and Amper's law), Maxwell's equations time invariant fields (constant). Boundary conditions. Time varying field Maxwell's equations; Wave propagation in lossy and lossless dielectrics, wave reflection. Transmitter lines; parameters, equations, impedance and power, Smith chart and applications, Waveguides; Modes, wave propagation, power and attenuation, Introduction to antennas.

Pre. Request: ELE 0205+ELE 0211

ELE 3427	Communication and Data Transmission Lab.	1(0-3)
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Tuned amplifier. Application and analysis of analogue modulation and demodulation techniques: AM, FM, PM, and Pulse modulation. Detection and correction of errors, time and frequency multiplexing.

Pre. Request: ELE 0322

ELE 3551	Communication Transmission Systems and Optical Communication	3(3-0)
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Line communication. Telephone and data transmission systems. Radio propagation system at HF, VHF, and UHF. Microwave transmission. Satellite systems. Earth station. Satellite link, VSAT, DBSAT, and other modern trends. Optical communication principles, optical transmitters (LED, LASER), medium (MM, SM), optical receivers (pin, APD), and principles of optical fiber communication systems.

Pre. Request: ELE 3314+ ELE

0322

ELE 3470	Software Engineering	3(3-0)
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software engineering concepts and methodologies, system concepts and systems life cycle, introduction to Unified Modeling Language (UML), software process and its difficulties; software life-cycle models, project planning including structured design, data structure-oriented design, and software testing. A brief review of data structures is included.

Pre. Request: ELE 3272

ELE 3471	Programming in Electrical Engineering	3(1-6)
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The Matlab interactive environment. The programming elements of Matlab and its applications in electrical engineering (such as, in signal and system analysis and in automatic control). Introduction to Simulink. Introduction to Multisim and other electrical engineering applications software.

Pre. Request: ELE 0321

ELE 3476	Microcontrollers and Embedded Systems	3(3-0)
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Introduction to microcontroller-based Embedded Systems, examples, and characteristics. Systems' architecture, hardware fundamentals: Processors, Memory, And Bus, etc. software: OS, Application Software. Software Development. Interrupts; Handlers and Interrupt



Service Routines. Software Architectures. Real Time Operating Systems. Embedded Software Engineering. Testing and Debugging Embedded Systems.

Pre. Request: ELE 5361+ ELE 5362

ELE 3559	Special Topics in Communication and Software Engineering	3(3-0)
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Department Up-to date subjects in communications and software.

Pre. Request: pass 90 Cr. Hrs.

ELE4201	Intermediate Analysis	3(3-0)
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Vectors in plane, vectors in space, dot product, cross product, curves and planes in space, vector functions, motion on a curve, curvature and components of acceleration, partial derivatives, directional derivative, tangent planes and normal lines, curl and divergence, line integrals, double integrals, triple integrals in cartesian, cylindrical and spherical coordinates, Green's theorem, Stokes' theorem, divergence theorem, change of variables in multiple integrals.

Prerequisite: 30202102

ELE4311	Electronics (2)	3(3-0)
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BJT, JFET and MOSFET frequency response, small and large signal models of transistors, amplifiers and their types, differential amplifier, operational amplifier and its applications, positive and negative feedbacks, oscillators, power amplifiers.

Prerequisite: ELE0216

ELE4312	Electronics Lab. (2)	1(0-3)
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Frequency response of amplifiers, OP-AMP and its applications, DC regulated power supply, oscillators, and power amplifiers.

Prerequisite: ELE4311

ELE4252	Electromagnetics (1)	3(3-0)
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Coulomb's law, static electric field, electric potential, electric flux, Gauss's law, divergence theorem, electric conductor, dielectric media, permittivity, boundary conditions of electric field, capacitance, electrostatic force and energy, static magnetic field, Amper's law, Biot-Savart law, curl of the magnetic field, Stokes' theorem, vector magnetic potential, magnetic flux, magnetic fields in media, permeability, boundary conditions of magnetic field, magnetic force, time varying electric and magnetic fields, Faraday's law, energy in magnetic field, displacement current, Maxwell's equations.

Prerequisite: ELE4201

ELE4326	Analog Communications	3(3-0)
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Signal analysis: equivalent low-pass and band-pass models, power spectral density, amplitude modulation and demodulation: large carrier and suppressed carrier, single side band modulation, vestigial side band modulation, coherent and non-coherent detection, angle modulation, frequency modulation (FM) and demodulation, wideband and narrowband FM, transmission bandwidth, generation and demodulation of FM signal, noise representation and analysis: SNR analysis of AM and FM.

Prerequisite: ELE0321 +

0202



ELE4423	Analog Communications Lab	1(0-3)
Analog filters (LPF, BPF and HPF), amplitude modulation (AM), single-sideband (SSB) modulation, AM receiver with automatic gain control, frequency modulation (FM), FM demodulator using phase-locked loop, FM demodulator using frequency discriminator. Prerequisite: ELE4326		

ELE4467	Digital Signal Processing	3(3-0)
Discrete-time signals and systems, Fourier transform and its properties, Z-Transform and its properties, sampling of continuous-time signals, interpolation and decimation, structures and design of discrete-time systems, filters design techniques, discrete Fourier transform, introduction to fast Fourier transform. For communication engineering: Prerequisite: ELE0321 For communication and software engineering Prerequisite: ELE 4461*		

ELE4468	Digital Signal Processing Lab	1(0-3)
Introduction to Matlab or Labview programming, sampling theorem, discrete-time signals, discrete Fourier transform applications, digital filters: LPF, BPF and HPF, FIR and IIR systems, interpolation and decimation, time division multiplexing, Fourier series simulation of discrete-time signals. Prerequisite: ELE4467		

ELE4461	Digital Communications	3(3-0)
Base band digital systems: PAM, PPM, PWM, sampling theorem, quantization and pulse code modulation (PCM), delta modulation (DM), noise analysis in PCM and DM, TDM, error probability analysis of base band systems, pass band digital systems: ASK, PSK, FSK, QAM, signal space representation and receiver model, error probability analysis of pass band systems for coherent and non-coherent detection, power spectra of digital signals, synchronization. For communication engineering: Prerequisite: ELE4326 For communication and software engineering: Prerequisite: ELE 0322		

ELE4450	Antennas and wave propagation	3(3-0)
Electromagnetic spectrum, reflection, refraction and scattering of waves, ground waves, physical properties of ionosphere and troposphere, waves propagation in the ionosphere and troposphere, line of sight, physical principles of radiation, antenna parameters, monopole antennas, dipole antennas, antenna arrays, loop antennas, aperture antennas, reflector antenna, antennas synthesis. Prerequisite: ELE4353		

ELE4567	Communication Circuits	3(3-0)
General review of electronics fundamentals and circuits techniques used in communications, intermodulation noise and distortion in communication systems, radio frequency amplifiers, AM and FM transmitters and receivers, phase-locked loops, frequency mixer, oscillators, frequency synthesizers.		



For communication engineering: Prerequisite: ELE4311 + ELE4326		
For communication and software engineering: Prerequisite: ELE4311, ELE 0322		
ELE4552	Radar Engineering	3(3-0)
Nature of Radar, Radar frequencies, Radar antennas, Radar target, RCS of target, Radar equations, continuous and frequency modulated Radar, MTI Radar, pulse Doppler Radar, tracking Radar, Radar indicators and displays, target noise, ground and sea echoes and clutter, weather effect on Radar.		
For communication engineering: Prerequisite: ELE4353		
For communication and software engineering: Prerequisite: ELE3314, ELE0322		

ELE 5216	Digital Logic Design Lab	1(0-3)
This lab introduces students to the fundamentals of designing and building digital circuits using hardware ICs as well as HDL. The lab includes an introduction HDL, and focuses on building combinational circuits such as parallel adder, multiplexers and decoders using HDL and hardware components. While the second part of the lab deals with building sequential circuits in hardware and describing them in HDL using behavioral modeling.		
Pre. Request: ELE 0213		
ELE 5361	Computer Architecture and Organization	3(3-0)
This course covers basic topics about computer architecture and organization; central processing unit, micro-program control and control unit, arithmetic processor, memory units, bus structures, interrupt structures. Taxonomies of computer architectures; addressing methods, programs control, processing units, I-O organization, arithmetic, main-memory organization, peripherals, microprocessor families, RISC/CISC architectures, pipelining, multi-cores, synchronous and asynchronous models. Von Neumann/Harvard architectures; memory and cache organization; virtual memory; parallel computing and multithreading; a basic background on the computer performance evaluation; Amdahl's law. Operating system principles are also briefly touched.		
Pre. Request: ELE 0228		

ELE 5461	Embedded Systems	3(3-0)
Basic introduction to microcontroller-based embedded systems design, development and implementation. Embedded System types; Introducing PIC 16 Series: Architecture Overview of PIC16F84A, The 16F84A Memory, Power Up and Reset; Building Assembly Programs: 16 Series Instruction Set; Parallel Ports (I/O interfacing); PIC 16F87XA: Architecture Overview, Special Memory Operations; The physical interface; Interrupts, Counters and Timers: Working with Interrupts, Counters and Timers, Watchdog Timer, Sleep Mode, Capture Mode, Compare Mode, PWM Module, ADC; Serial Communication; Data Acquisition and other related topics.		
Pre. Request: ELE 5362+ELE 5361		
ELE 5251	Object Oriented Programming	3(2-3)
To learn the fundamental concepts and techniques behind object-oriented programming in C++. Review of control structures, data types and functions. Data Abstraction ADT. Encapsulation and information hiding. Classes, attributes and methods (operations). Objects,		



instantiation, and constructors. Software reuse and reengineering. Inheritance. Overloading. Polymorphism. Templates. In addition, graphical user interface will also be discussed.

Request: BSE 0201

ELE 5252	Data Structure and Algorithms	3(3-0)
Data types: records, files, and sets. Dynamic data structure. Single, double, and circular linked lists and queues. Stacks and binary trees. Shell sort, quick sort, binary search, and hashing. Data compression. Definitions of algorithms. Design & analysis Algorithms: Divide and conquer, Greedy algorithm. Dynamics programming. Backtracking. Branch and bound technique. NP-hard and NP-complete problems. Asymptotic notations. Performance measurement. Sorting and searching: algorithms and lower bound Abstract data types and classes. Data structures: stacks, queues, lists, trees, heaps, and search tree, tries, a hashing. Graphs: representation, depth-first-search, and breadth-first-search.		
Pre. Request: ELE 5251		

ELE 5362	Operating systems	3(3-0)
This course enables students to understand and implement operating systems functions in managing computer systems component. It includes the following major topics: Introduction to Hardware and Software Concepts; Process and CPU Scheduling, Threads, Synchronous and Concurrent Execution, Deadlock and Indefinite Postponement; Memory Management: Physical and Virtual Memory; Management of External Storage and I/O Devices: Files Management; Performance and Optimization; Security and Protection; and Distributed Systems.		

Pre. Request: ELE 5252

For Communication and Software Engineering [ELE 3272, Pre-req.]

ELE 5354	Data Base Systems	3(3-0)
Basic concepts of databases. DBMS components. Transaction managements. Data modeling. Entity relationships diagrams. Relational databases. Database integrity constraints. Relational Algebra. Dependencies, schema designs normalization and redundancy elimination. By the end of the course, students are expected to be familiar with many of the principles and concepts related to databases and how these are applied in real database systems by presenting small individual/group projects.		

Pre. Request: ELE 5252

For Communication and Software Engineering [ELE 3272, Pre-req.]

ELE 5455	Data Base Systems Lab	1(0-3)
Experiments in designing databases using the DBMS system, such as Oracle/SQL, The students are expected to implement individual projects to refine their database development skills using the latest tools, programs and concepts covered in ELE 5354 Course.		

Pre. Request: ELE 5354

ELE 5453	Artificial Intelligence and Machine Learning	3(3-0)
Fundamentals of machine learning and artificial intelligence. Concept of learning. Evaluating hypotheses. Supervised learning, unsupervised learning, regression and reinforcement learning. Bayesian learning. Ensemble Methods such as Genetic Algorithm,		



Decision Tree, Naïve Bayes, k-Nearest Neighbors, Back Propagation neural networks and their applications in computer engineering.

Pre. Request: ELE 5251+BSE 0202

ELE 6461	Fundamentals of Computer Networks	3(3-0)
Introduction to the fundamental principles underlying telecommunication and computer networks. The course introduces the concepts of network architecture, protocols, layers, and the TCP/IP and OSI reference models. Covers topics in the application layer, transport, network, data link, and physical layers of the protocol stack with concentration on the link layers. Data link layer services: Error detection and correction, multiple access Control. Principles of Wireless Networks, Principles of Network Security.		
[Pre-req. ELE 0322]		
For Communication and software engineering Pre. Request: ELE 4461 (synchronous)		
ELE 6464	Computer Networks Lab	1(0-3)
The Computer Networks Lab consists of a set of experiments: setting up the PC and configuring the NIC, establishing a LAN, Router and network tools, router configuration and router protocols. Securing networks using routers. Configuring switches. Network address conversion, Introduction to wireless network s and configuration.		
[Pre-req. ELE 6461]		
For Communication and software engineering Pre. Request: ELE 6461 (synchronous)		

ELE 6468	Network Programming	3(2-3)
Overview of network programming and OSI reference model. Data Links and Transport Layers, Ethernet, TCP/IP protocol suite. Python Scripting, strings, lists, tuples, sets, dictionary, arrays, loops function and classes definition, exceptions, inheritance, and libraries overview. Files, TCP/IP and UDP sockets programming Client/Server, threaded servers programming, multicast. Mail and handling packages, encoders, iterators, headers, SMPT, and ftp servers etc. Python CGI module, XHTML, Flask, request, response objects, SQL, and web forms handling, cookies, ecommerce.		
[Pre-req. ELE 6466]		
ELE 6466	Networks Protocols	3(3-0)
Consolidate knowledge learned in ELE 647 through hands-on measurement and implementation of network protocols (link layer, IP layer, transport layer) and further experiment with state-of-the-art network architectures and applications. The course lectures will cover the following topics: network programming over TCP/UDP sockets; application-layer protocols (DNS, HTTP, P2P); multimedia protocols (video streaming, VoIP, video telephony, virtual reality); data center networking and cloud computing; software-defined networking; wireless and mobile networks architecture and core protocols (LTE, WiFi, 5G, IoT); Security in computer networks.		
[Pre-req. ELE 6461]		