

الوصف المختصر للمواد الدراسية - إجراءات إعداد الخطة الدراسية وتحديثها/ قسم الهندسة الكهربائية/ الأنظمة الذكية و الاتصالات	QF09/0409-3.0
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Department	Electrical Engineering/Smart Systems and Communications	القسم
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49	عدد المواد الدراسية Number of Courses	تاريخ الاعتماد Approval Date	الخطة الدراسية رقم Course Plan No.
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المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0150111	3	Principles of Electrical Circuits	0905111

Basic passive circuit elements (resistors, capacitors, inductors). Voltage and current sources. DC and sinusoidal steady state (AC) analysis. Kirchoff laws. Loop and nodal analysis. Circuit theorems: Superposition, Maximum power transfer, Thevenin, Norton. Sinusoidal signals, complex numbers, phasors and impedance concepts. Average and RMS quantities. Steady state time-domain behavior of inductors and capacitors, and energy storage. Complex, average and apparent power. Resonant circuits. Introduction to the use of electrical measurement equipment, and circuit simulation using SPICE.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912221	3	Mathematical Analysis and Optimization	0912141

This course provides an introduction to vector geometry (normal vectors, separating planes, distance to planes), multivariable calculus (gradient, Jacobian, partial differentiation), linear least squares (pseudo-inverse) regression, steepest descent, optimization constrained and unconstrained (Lagrangian),

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0120001	3	Computer Engineering Applications	0909101

This course provides the necessary information for students to understand vectors, matrices, data types, and Python basic units of operations, use simpler programming techniques like decision making structures (if and switch statements) and repetition structures (for and while), understanding functions, function calls and scripting, building user defined functions and applications. Finally, display results using 2 and 3 dimensional figures.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0101101	3	Digital Logic Design	0912242

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. Combinational logic building blocks including decoders, encoders, multiplexers, demultiplexers, magnitude comparators. VHDL for combinational circuits. Digital arithmetic, adders, subtractors. VHDL for arithmetic circuits. Basics of sequential circuits. Basic latches and flip-flops. Timing parameters and diagrams. Counters, shift registers. Basic PLDs, CPLDs and FPGAs architectures. VHDL for binary counters and shift registers. State machines.

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System design with state machines using VHDL.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0101104	3	Introduction to Linear Systems	0912221
The fundamental theorem of algebra. Review of vector and scalar products, projections. Introduction to vector spaces, linear independence, bases, matrix spaces. Solution of linear systems, matrix algebra, determinants, Eigenvalues and Eigenvectors and singular value decomposition. Gram Schmidt, orthogonal projections. Linear transformations, kernel and image, their standard matrices. Applications (e.g. geometry, networks, differential equations).			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0101101	3	Signal and System Analysis	0912223
Continuous-time and discrete-time signals. Mathematical description of systems. Properties of systems. Convolution and impulse response of continuous and discrete time LTI systems. Fourier series of periodic continuous and discrete time signals. Decomposition and approximation of signals by orthogonal functions. The Fourier transform of continuous and discrete time signals. Frequency response of systems. Frequency selective filtering. An introduction to z-transform. First and second order systems. Sampling and reconstruction of continuous-time signals. LTI system analysis with Laplace transforms.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0101104	3	Numerical Analysis	0911363
Roots of nonlinear equations (fixed point, Newton, secant, bisection). Condition number of linear systems. Iterative methods for linear and non-linear systems (Gauss-Seidel, Gauss-Jacobi, SOR; fixed point, Newton). Interpolation and polynomial approximation. Eigenvalue methods. Spline interpolation, numerical differentiation and integration. Numerical methods for differential equations. Random number generators. Error analysis.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0150111	3	Applied Physics and Electromagnetics	0912116
Electric Field, Gauss's Law; Electric Potential; Capacitance and Dielectrics; Current and Resistance; Direct Current Circuits, Magnetic Field, Sources of the Magnetic Field, Faraday's Laws of Induction. Vectors; coulomb's law, electric flux density; Gauss law and divergence theorem, potential, boundary conditions: Poisson and Laplace equations, Biota-Savant law, Ampere law, the magnetic properties of materials, inductance, magnetic circuits, Faraday's law, displacement current.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912341	3	Cloud Computing and Database Systems	0912546
Introduction of cloud computing and its services' models; infrastructure as a service (IaaS), platform as a service (PaaS), software as a service (SaaS), business process as a service (BPaaS) and machine learning as a service (MLaaS). The course gives insights of the virtualization technology and its usage			

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to construct and build the cloud models. Different cloud vendors' examples will be overviewed. In addition, fog, edge and cloudlet architectures and services are introduced. MLaaS will be covered in details to show its relation to the IoT era. IoT applications and their connection to the cloud computing for analysis, analytics and storage will be introduced.

Database models. Database design and programming. It defines the underlying data structures needed for database processing and management, as well as the problems entailed in file-based information systems design and that motivates the use of a database system. Designing of Database Management Systems (DBMS) will be discussed. SQL for analysis and machine learning for analytics are covered in this course.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	
0912242	3	High Performance Microprocessor	0912248

Examines hardware and software model of microprocessors; Introduction to microprocessor interfacing. Bus functions, bus interconnections, synchronous and asynchronous bus. Signal flow and data transfer, decoding for I/O and memory, memory organization and structures. Interfacing examples; parallel interfacing, serial interfacing, the interrupt system; bus arbitration and DMA. Analog-to-digital and digital-to-analog structures and interfacing. bus standards; local area networks. Benchmarking and comparative study of recent microprocessors. Practical understanding to the design of computing systems that are embedded in a larger system such as communication and control systems; design aspects of embedded systems; architectures, microcontrollers, memory hierarchy, I/O, timers and exceptions, interfacing, and data acquisition; Real time operating system features. Concurrent processes and priority. Synchronizing processes. Hardware and operating system constraints. Deadlines and real time scheduling. Inter-task communication, message passing and threads, Hardware for real time. Safety critical systems. modern computer architecture, including branch prediction, out-of-order instruction execution, cache optimizations, multi-level caches, memory and storage, cache coherence and consistency, and multi- and many-core processors.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0909101	1	Object-Oriented Programming Lab	0912256

In this course, programming projects will be implemented in Python programming language, The UML concepts and diagrams, a set of laboratory experiments will provide hands-on experience in related topics. The lab emphasizes on the OOP model programming using Python for algorithmic and computational problems.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912116	3	Electromagnetics and Wave Propagation	0912219

Maxwell's equation. Wave equation. Plane wave (PW) in general medium. Wavelength, wave number, direction of wave propagation, phase velocity, group velocity, phase and attenuation constants and wave impedance. Skin effect and the surface impedance in lossy and good conducting media. Generalized form of the PW. Poynting vector. Normal and oblique incidence of the UPW. Wave polarization. Transmission lines (TL). Matching using single stub, double stubs and quarter wavelength TL. Antenna Types. Antenna Parameters. Free Space Path loss. Wire antennas: Short dipole, long and half wavelength dipoles, standing and traveling wave antennas. Wave equation.

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Plane, cylindrical, and spherical waves. Wave components and wave polarization. Reflection, refraction and transmission of wave. Huygence's principal. Physics of the atmosphere. Wave propagation in the troposphere. Space wave. Surface wave. Physics of the ionosphere. Wave propagation in the ionosphere. Sky wave.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0905111	3	Electronics	0912218

Physics of semiconductors. Diodes: operation, models and application circuits. Bipolar Junction Transistors - operation and characteristics. DC and AC circuit models. Basic single-stage BJT amplifier configurations. Field-Effect Transistors: Structure and physical operation, bias circuits, small-signal equivalent circuits and basic amplifiers. Basic concepts of digital logic circuits. The BJT inverter. The CMOS Inverter. Propagation delay of the CMOS inverter. CMOS gates and other digital circuits. Darlington pair amplifiers. Differential Amplifiers: BJT, MOS, BiCMOS, GaAs. Multistage Amplifiers: Frequency Response: s-Domain analysis, amplifier transfer function, frequency response of CS, CE, CB, cascade, CC and cascaded amplifiers. Feedback: general feedback structure and basic feedback topologies. Operational amplifier theory and applications: summation, subtraction, integration and differentiation. Filters. Oscillators. Output Stages and Power Amplifiers: Class A, B and AB output stages. IC and MOS power amplifiers. Bipolar and Advanced Technology Digital Circuits: TTL, ECL, BiCMOS Digital Circuits, GaAs Digital Circuits.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912223	3	Probability and Random Signal Analysis	0912224

Probabilistic models, conditional probability and Bayes' rule, distributions and density functions, function of random variables, expectations, variance, covariance and characteristic functions. Independence, law of large numbers and Central-Limit Theorem. Random processes, wide sense stationary, correlation, auto-correlation and cross-correlation. power spectral density. Response of linear time-invariant systems to random inputs. Applications drawn from Computer and communications system.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912248	3	Smart Embedded Systems	0912350

This course will introduce the architecture of microprocessors and microcontrollers and their usage in constructing different embedded systems. Subsequently, sensors and their interfaces to the embedded systems will be covered. Finally, the communication modules and their interfacing to the embedded is overviewed to construct the IoT devices and connect them to the world.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912350	1	Smart Embedded Systems Lab	0912451

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Introduction to embedded systems design, software design basics, C as implemented in assembly language, interrupts and low power operating modes, general purpose I/O, analog interfacing, timer peripherals, serial communication, programming for power-efficient computing

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912224	3	Communications Systems and Optical Fibers	0912326

Equivalent low-pass models. Amplitude modulation and demodulation. coherent and non-coherent detection. Angle modulation and demodulation. Noise representation and analysis: SNR analysis of AM and FM systems. Sampling, quantization and pulse code modulation. TDM and Pulse modulation techniques: PAM, PPM, PWM. Quantization. Delta modulation. Noise analysis in PCM and DM systems, introduction to fiber communication systems, dielectric slab wave-guide, step index fiber, graded index fiber, pulse attenuation and dispersion, light sources, optical modulation, photodetectors, optical detection, noise in the optical receiver, heterodyne detection, bit error rate analysis of direct detection and heterodyne detection systems.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912223	3	Control Systems	0905342

Transfer functions. Block diagrams. Signal flow graphs. Servomotors control analysis. Control system stability analysis. State-space description. Mathematical modeling of physical systems. Time-domain analysis. Root locus techniques. Frequency-domain analysis and design.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912326	3	Digital Communications	0912327

Line coding and power spectra of digital signals, digital signaling over additive Gaussian noise channels, inter-symbol interference. Channel equalization, adaptive equalization. Error probability analysis. Passband digital systems: signal and system models of ASK, PSK, DPSK, FSK and QAM. Signal space representation and receiver model. Error probability analysis of digital modulation techniques for coherent and non-coherent detection. Introduction to Information Theory. Introduction to Error control coding.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912327	1	Communication Systems Lab	0912441

This lab practically explores digital wired and wireless communications. Starting wired communication, the lab begins with the sampling theorem and line coding, such as nonreturn-to-zero (NRZ) pulse, return-to-zero (RZ) pulse, unipolar, polar, bipolar and Manchester pulse, differential encoding and decoding. Pulse amplitude modulation (PAM) and time division multiplexing (TDM). For the wireless communication part, the software defined radio is firstly introduced. Then amplitude modulation (AM) transmission and reception. Frequency modulation (FM) transmission and reception. Followed by pulse shaping, Nyquist criteria, matched filtering, carrier and frequency synchronization, phased locked-loop (PLL), quadrature phase shift keying (QPSK) transmission and reception.

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Prerequisite	Credit Hours	Course Name	Course No.
0912223	3	Digital Signal Processing	0912325
Introduction to discrete time signals and systems, elementary discrete time signals and basic operational. Signals and systems classifications, difference equations, linear time invariant (LTI) systems, convolution and impulse response. Z transform and properties. One-side Z transform, poles and zeroes of rational transfer function. Inverse Z-transform, Discrete-time Fourier transform (DTFT) and frequency response. Properties of DTFT. Inverse DTFT, discrete Fourier transform (DFT). Linear and circular convolution. Structure of FIR systems. Design of FIR filters by windowing. Design of discrete time IIR filters from continuous time filters. Impulse invariance and bilinear transformation design methods. Related MATLAB functions for the topics above.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912256	3	Networks Protocols Programming	0912362
Overview of A review of basic networking principles: Protocol Stacks; The Transport Layer, TCP and UDP; The Network Layer, IP; The Link Layer, LANs; Application Protocols, HTTP, ftp; The Sockets interface, primarily on Unix/Linux; Advanced Sockets, select, socket options; Other socket types, Unix, Raw; Network programming methodologies and protocols, primarily for the World Wide Web: Name servers, DNS; IPv6; Server design, daemons, inetd; CGI; XML; Sockets in Java; Cookies, Javascript; Servlets, JSP; JDBC; Java RMI; Remote Procedure Calls; Network Security, firewalls, ssl, ssh; Grid computing, web spiders; Bluetooth; VoIP.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912218	1	Electronics Lab.	0912315
Study diode characteristics and applications such as rectification and regulation. Study of BJT characteristics, DC biasing, amplification, and switching. Learn FET characteristics, DC biasing, and amplification. Investigate operational amplifiers and their applications. Explore general electronic circuits such as 555 timers, comparators, Schmitt triggers, analog-to-digital converters, and digital-to-analog converters.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
Passing 115 credit hours	3	Engineering Training	0912401
The student has to spend at least 280 hours of electrical engineering training at recognized companies and establishments during the summer semester.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912327	3	Wireless Communications	0912444
Identify the challenges posed by using wireless channels for communication, such as channel noise and different kinds of fading. Knowledge of the wireless communications channel models, such as empirical path-loss models, large -scale and small-scale fading models, in addition to wideband channel models. Basic understanding of techniques used to mitigate multipath fading effect, such as channel coding, diversity, equalization and space-time coding, spread spectrum communication: direct spread sequence spectrum, frequency hopping spread spectrum, discrete multitone communication and orthogonal			

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frequency division multiplexing. Multiple input multiple output (MIMO) systems.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0905213	3	Electrical Machines and Power	0905334

This course taught the theory of AC Synchronous Generators and Motors, which is then demonstrated with practical labs. Vector analysis of the synchronous machine and its effect on the grid system as well as the concept of infinite buss is covered in depth. Attention is given to the different types of construction methods of Synchronous machines and as well as the effect of these Construction methods on the Harmonic distortion. Power factor correction using synchronous machines in "Real World" situations are covered in depth.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0905111	3	Advanced Electrical Circuits	0905213

This course covers the following topics: AC power calculations. Three-phase circuits. Magnetically coupled circuits. Laplace transform technique. Complex frequency theory. Frequency response applications. Two-port networks.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912444	3	Wireless Networks Communications	0912432

Introduction to fixed, mobile and cellular wireless systems and their standards with an emphasis of IoT wireless technologies. Link budget calculations. Cellular communication standards will be covered such as 2G, 3G and 4G. Fixed personal wireless standards such as IEEE802.11 and Bluetooth.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912116	1	Applied Physics and Electromagnetics Lab.	0912217

Field lines, Ohm's law, Wheatstone bridge, The Galvanometer Ammeter and Voltmeter, Kirchoff's rules, Voltage division with potentiometer, Electrical Power, measurement of a capacitance, RC circuits and Faraday's Laws.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912325	3	Computer Vision	0912555

Introduction to image processing system. Image Enhancements in spatial domain. Image Enhancements in frequency domain. Image Restoration. Color Image processing. Image representations: block transforms and sub band/wavelet representations. Object Recognition concept. Applications in Image interpretation. Image Segmentation algorithms. Introduction to video and

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motion detection. Related MATLAB functions and some practical experiments. Project including image acquisition and some applications.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912341	3	Fundamentals of Cyber Security	0912521

Security policies. Security mechanisms. Physical security. Security awareness. User authentication. Application security mechanisms. Encryption. External and internal firewalls. Security of operating systems and software. Security of e-commerce applications. Design of security system and components. Devices for security analysis; sniffers, attack detectors. Information warfare. Ethical issues in computer security.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912141	3	Artificial Intelligence and Machine Learning	0912358

Introduction to artificial intelligence (AI) and machine learning, AI taxonomy (supervised, unsupervised and reinforced learning). Introduction to regression learning, linear regression, regularized regression, logistic regression, generalization, overfitting and cross-validation. Introduction to classification, the perceptron classifier, various loss functions, support vector machine (SVM) classifier and variations, softmax, the kernel trick, linear and non-linear kernels. Performance metric such as receiver operating characteristic (ROC) curve and confusion matrix. Principle component analysis (PCA), latent variables and missing values.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
Passing Engineering Training	1	Graduation Project I	0912501

Lectures and tutorials on product design and development methodology, and the role of the professional engineer in this regards election of a project that will build design, teamwork and entrepreneurial skills. Formation of teams. Documentation and presentation of first iteration of design project.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912501	2	Graduation Project II	0912502

Lectures and tutorials on product design and development methodology, and the role of the professional engineer in this regard. Completion of work started in 0912501. Deliverables include written documentation and presentations in class.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
5 th year	3	Special Topics in Communications Engineering	0912504

Content related to modern communications engineering has to be approved by the Electrical Engineering Department Council.

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Prerequisite	Credit Hours	Course Name	Course No.
0912442	3	IoT Programming	0912460
This course provides fundamental concepts of the Internet of Things (IoT), such as embedded systems, connectivity, cloud computing, and security. Provide them with practical experience in creating smartphone apps and controlling a wearable device using the Arm Mbed platform and Android SDK. This kit focuses on the transformative intersection between the internet, mobile and sensor technology and providing the skill set to get involved in IoT development.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0905111	1	Electrical Circuits Lab	0905212
Resistors and resistive circuits. Potentiometers. Superposition principle. Thevenin's theorem and maximum power transfer. RLC current and voltage characteristics. Frequency response of RL, RC and RLC circuits. Series and parallel resonant circuits. Lab project.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912242	1	Digital Logic Design Lab	0912243
This laboratory consists of four parts. Part one involves the design of logic circuits using discrete components. The second part involves the design of logic circuits using VHDL and testing its operation on an FPGA board. The third part of this laboratory course involves experiments of computer architecture.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912341	1	Computer Networks Lab	0912463
This laboratory course covers the technologies and protocols of the internet. The experiments cover the internet protocol (IP), address resolution protocol (ARP), internet control message protocol (ICMP), user datagram protocol (UDP) and transmission control protocol (TCP), the domain name system (DNS), routing protocols (RIP, OSPF, BGP), network address translation (NAT), dynamic host configuration (DHCP), network management protocols (SNMP), and IP multicast.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912350	3	IoT and Wireless Sensors	0912442
This course introduces wireless sensor networks (WSNs) applications, challenges and architecture of WSNs. General background of WSN physical layer, related medium access protocols such as S-MAC and T-MAC. WSN related routing, such as flooding, diffusion and geographical routing, LEACH and clustering. Zigbee and 802.15.4 protocol, low power wireless access network (LPWAN) such as LoRA and Sigfox. Transport protocols for WSN and IoT such as MQTT, XMP, AMPQ and REST.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
4 th year	3	Engineering Economy	0909404

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Engineering economic analysis. Cash flows, simple interest, equivalence, single payment compound interest, uniform series compound interest formulas. Present worth techniques. Annual cash. Rate of return analysis. Incremental rate of return analysis. Future worth analysis. Cost ratio analysis, payback period. Depreciation.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
5 th year	3	Special Topics in Smart Systems	0912505

Content related to modern smart systems has to be approved by the Electrical Engineering Department Council.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912444	3	5G Future Networks and Beyond	0912524

This course provides an insight into 5G enabling technologies such as small cells, mmWave full-duplex and massive MIMO. Then it introduces 5G network architecture and design principles, control and user plane separation, network slicing, core network. Then the New Radio (NR) access layer 2 and 3 considerations and functions, random access procedures and carrier aggregation. NR access physical layer aspects, wireless channel characteristics, OFDM waveforms, multiple access schemes, duplex schemes, time frequency resources. Downlink physical layer procedures and functions, reference signal and control channels, channel coding and modulation, downlink MIMO schemes. Uplink physical layer procedures and functions, demodulation and control channels, physical random access and MIMO schemes. NR access RF and transceiver design consideration, radio resource management mmWave band operation. Finally, IoT use in 5G networks, NB-IoT and massive MTC.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912450	3	Natural Language Processing	0912551

Introduction to Natural Language Processing, Markov chain and processes, speech segmentation, tokenization, back of words approach, sentiment analysis and text classification, deep neural network models and applications.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912256	3	Mobile Application Programing	0912552

In this course development of applications for mobile devices is introduced, including smartphones and tablets. Students are introduced to the survey of current mobile platforms, mobile application development environments, mobile device input methods, as well as developing applications for two popular mobile platforms. Students will design and build a variety of Apps throughout the course to reinforce learning and to develop real competency.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.

الوصف المختصر للمواد الدراسية - إجراءات إعداد الخطة الدراسية وتحديثها/ قسم الهندسة الكهربائية/ الأنظمة الذكية و الاتصالات	QF09/0409-3.0
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0912358	3	Unsupervised and Deep Learning	0912450
This course firstly provides an introduction to unsupervised learning, then clustering, k-means and variations such as k- median and k-medoids. Then generative models are introduced such as Gaussian mixture models, expectation maximization, collaborative filtering, low rank matrix algorithms. Followed by an introduction to neural networks, neuron activation function, forward and backward propagation algorithm, recurrent neural networks, convolutional neural networks (CNN), average and max pooling, and CNN applications.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912248	3	Computer Networks	0912341
Overview of Computer networking, OSI model, communication and transmission systems; physical layer issues: data transmission, channel capacity, signal encoding. Data link layer issues: framing, error control, flow control, line configurations, bridging. Network layer issues: Packet switching. Introduction to queuing theory. Flow/congestion control and their algorithms. Routing algorithms and protocols, architecture of Internet, Internet Protocols. Introduction to LANs.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912242	3	Very Large Scale Integrated (VLSI) Circuit Design	0912545
Integrated circuit chip design in silicon CMOS technology. Computer aided physical layout design and simulation of Digital Integrated Circuits-Combinational logic in Sequential logic circuits. Static and dynamic operation of logic circuits. Timing issues in digital circuits. The influence of parasitic capacitance, inductances, and resistances on the design performance. Chip input and output circuits. Optimizing speed, area and power.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0912444	3	Satellite Communications	0912522
Overview of satellite communication. Orbital aspect of satellite communications. Earth station technology. Earth-orbiting and geostationary satellites. Global Positioning Systems (GPS). Channel characterization and link budget calculations. Transponders and transponder model. Channelization. Frequency plans. Propagation and interference considerations. Satellite access techniques. Introduction to satellite networks.			

Approved by	(التوقيع والخاتم الرسمي)	اعتمدت من قبل مجلس القسم
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