

Network & Information Security Engineering Plan change Log

Date	Name of the personnel who did the change	The change	Page No.
28/2/2016	Dr. Amjed Almousa	Changing Prerequisite for Engineering Economics (99 Cr. Hrs.)	2
28/2/2016	Dr. Amjed Almousa	Changing prerequisite for Senior Project (1) 120 Cr. Hrs. (112Cr. Hrs. If an approved by Dep.)	2
20/3/2016	Dr. Amjed Almousa	Multiple Corrections to NIS Plan, adding Courses Description	

Bachelor in Networks & Information Security Engineering Curriculum

Curriculum Composition

University Requirements	27	16.9 %
College Requirements	30	18.8 %
Department Requirements	103	64.4 %
Total	160	100 %

Course Numbering System

D5	D4	D3	D2	D1
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Where:

Digit	Description	Details
D1	Serial Number	Within the area
D2	Area	<ol style="list-style-type: none"> 1. General Engineering 2. General Electrical Engineering 3. Electronics 4. Computers 5. Communication 6. Power & Machines 7. Control & Specialized Topics 8. Technical Electives 9. Senior Project and Training
D3	Level (Year)	
D4	Academic Program	<ol style="list-style-type: none"> 1. Electronics Engineering 2. Computer Engineering 3. Communications Engineering 4. Electrical Power & Energy 5. Network & Information Security
D5	College	<ol style="list-style-type: none"> 1. King Hussein Faculty of Computing Sciences 2. King Abdullah II Faculty of Engineering 3. King Talal Faculty of Business & Technology

1. University Requirements (27 Credit Hours):

a. Mandatory courses (12 credit hours):

Course No.	Course Title	Credit Hours	Prerequisite
11000	Computer Skills Placement Test	0	–
11100	Computer Skills (Remedial) ⁽¹⁾	0	–
31010	Arabic Language Placement Test	0	–
31019	Arabic Language (Remedial) ⁽²⁾	0	–
31020	English Language Placement Test	0	–
31029	English Language (Remedial) ⁽²⁾	0	–
31111	Communication Skills/Arabic Language	3	31019
31121	Communication Skills/English Language	3	31029
31151	National Education (Jordanian Students) ⁽³⁾	3	–
31153	Introduction to Society , Technology and Environment Protection	3	-
31251	Military Science (Jordanian Students Only) ⁽⁴⁾	3	–

⁽¹⁾ Students who pass the placement test successfully or obtain the ICDL certification are exempted from this remedial course.

⁽²⁾ Students who pass the placement test successfully are exempted from taking this remedial course.

⁽³⁾ Non Jordanian students may choose to take it or any other University Elective course instead.

⁽⁴⁾ Non Jordanian students may choose to take, in lieu of this course, any other University Elective course.

b. Elective Courses (15 credit hours):

1. Scientific & Practical Skills (9 credit hours)

Course No.	Course Title	Credit Hours	Prerequisite
31255	Entrepreneurship for Business	3	-
31311	Scientific Research Method	3	-
31372	Business Skills	3	-
31130	Foreign Language	3	-

2. General (6 credit hours)

Course No.	Course Title	Credit Hours	Prerequisite
31161	Introductions to Library Science	3	-
31261	Introductions to Politics and Economics	3	-
31262	Introductions to Educational Science	3	-
31361	Introductions to Philosophy	3	-
11201	Geographical Information Systems	3	-
20251	History of Science	3	-
31271	Environmental Science	3	-
31371	Health Education	3	-
31152	Islamic Arabic Civilization	3	-
31211	Arabic Literature	3	31111
31351	Current Issues in the Arab World	3	-
31352	Jerusalem: History and facts	3	-

2. College Requirements (30 credit hours):

Course No.	Course Title	Credit Hours	Prerequisite (* Co-requisite)
11103	Structured Programming	3	11100
11151	Structured Programming Lab	1	11103*
20132	Calculus (1)	3	–
20133	Calculus (2)	3	20132
20141	Physics (1)	3	–
20142	Physics (2)	3	20141
20148	Physics (1) Lab	1	20141*
20149	Physics (2) Lab	1	20142*
20231	Calculus (3)	3	20133
24218	Engineering Drawing Using Computers	1	–
24219	Engineering Workshop	1	–
24411	Engineering Ethics	1	99 Cr. Hrs.
20200	Technical Writing & Communication Skills	3	31111, 31121
32431	Engineering Economics	3	99 Cr. Hrs.

3. Department Requirements (103 credit hours):

a. Mandatory Courses (97 credit hours):

Course No.	Course Title	Credit Hours	Prerequisite (* Co-requisite)
11206	Object Oriented Programming	3	11103
11212	Data Structures & Introduction to Algorithms	3	11206, 20134
11240	Website Programming	3	11103
11253	Object Oriented Programming Lab	1	11206*
11323	Database Systems	3	11212
11335	Operating Systems	3	11212
11355	Operating Systems Lab	1	11335*
11437	Network Programming	3	25341, 11335
11465	Operating System Security	3	11335
11466	Secure Software Development	3	11335
11469	Secure Software Development Lab	1	11466*
20134	Discrete Mathematics	3	–
20232	Engineering Mathematics (1)	3	20133
20234	Linear Algebra	3	-
20331	Engineering Mathematics (2)	3	20231, 20232
20334	Applied Probability	3	20231
21232	Digital Electronics Fundamentals	3	22241, 24223
22241	Digital Logic Design	3	–
22340	Microprocessors & Embedded Systems	3	21232, 22241
22348	Digital Logic Lab	1	22241
22444	Computer Architecture & Organization (1)	3	22241
22448	Embedded Systems Lab	1	22340
23354	Data Communications	3	20232
24223	Electric Circuits	3	20142
25341	Telecommunications and Computer Networks	3	23354
25347	Cryptography	3	23354
25441	Wireless Networks	3	25341
25443	Information and Networks Security Fundamentals	3	25341
25444	Wireless Networks Security	3	25441, 25347
25445	Wireless Networks Lab	1	25441
25446	Network Protocols	3	25347, 11335
25447	Telecommunications and Computer Networks Lab	1	25341

Course No.	Course Title	Credit Hours	Prerequisite (* Co-requisite)
25490	Engineering Training	3	99 Cr. Hrs.
25542	Cyber Laws	3	24411
25543	Intrusion Detection & Network Forensics	3	25444
25545	Network Security Lab	1	25444
25549	Ethical Hacking Techniques Lab	1	25543*
25581	Information Systems Security Assessment	1	25347, 25444
25591	Senior Project (1)	1	120 Cr. Hrs. (112Cr. Hrs. If a approved by Dep.)
25592	Senior Project (2)	2	25591

b. Elective Courses (6 credit hours):

Course No.	Course Title	Credit Hours	Prerequisite (* Co-requisite)
11467	Database Security	3	11323
11468	Secure Code Analysis	3	11466
23575	Coding Algorithms	3	23354
25541	Cloud Computing & Security	3	25446
25576	Network Performance Analysis	3	25441
25582	Operation & Administration of Security Centers	3	25446
25583	IT Audit	3	25446
25584	Risk Management	3	25446
25585	Multimedia Networks	3	25341
25586	Hardware Security	3	22444
25587	Secure System Architecture	3	22444
25593	Special Topics in Network Security Engineering (1)	3	To be set by Dept.
25594	Special Topics in Network Security Engineering (2)	3	To be set by Dept.
25595	Special Topics in Information Security (1)	3	To be set by Dept.
25596	Special Topics in Information Security (2)	3	To be set by Dept.

Course Description

11000 **Computer Skills Placement Test**
Prerequisite: None
Credit Hours: 0

This test covers all topics taught in 2100 Computer skills (Remedial).

11100 **Computer Skills (Remedial)**
Prerequisite: None
Credit Hours: 0

Introduction to computers: historical, components, functionality. Introduction to computer hardware and software. Programming languages. Introduction to operating systems. Introduction to word processing with practical applications in preparing homework and reports. Spreadsheets. Computer graphics. Presentation design. Using the Internet and emails.

11103 **Structured Programming**
Prerequisite: 11100
Credit Hours: 3

Concepts of structured programming. Structured programming languages. Program design, development, running, and testing, and debugging programs. Syntax and semantics of the programming language C++. Basic elements of the language: variables, constants, and data types. Basic input/output functions. Conditional and iterative control structures. Concept of procedural programming, Top/down design. Structured decomposition. Functions and parameter passing. Recursive functions. Pointers and dynamic variables. Basic data structures: one and two-dimensional arrays, string manipulation, structures. Input / Output files, Concepts of OOP and Classes.

11151 **Structured Programming Lab**
Co-requisite: 11103
Credit Hours: 1

Laboratory sessions on applications of structured programming. It includes training on the different aspects and topics of the structured programming using C.

11201 **Geographical Information Systems**
Prerequisite: None
Credit Hours: 3

The goal of this course is to introduce the students to the basics of GIS. Specific features of the course include: coverage of basic geographic, cartographic, and GIS concepts. Topics include: computer representation of physical, political, statistical, and social aspects of space using vector-based maps, graphic design principles for using shape, hue, size, and patterns in mapping, attribute-based and graphic feature-based queries for spatial analysis. Geographic Information Systems (GIS) allow individuals and organizations to pose, explore and answer a variety of public- and private-sector questions using spatial data.

11206 **Object Oriented Programming**

Prerequisite: 11103

Credit Hours: 3

Object oriented programming concepts and paradigms. Review of control structures, data types and functions. Data abstraction and ADT. Encapsulation and information hiding. Classes, attributes and methods (operations). Objects, instantiation, and constructors. Software reuse and reengineering. Inheritance. Overloading. Polymorphism. Templates. Graphical User Interface.

11212 **Data Structures & Introduction to Algorithms**

Prerequisite: 11206 & 20134

Credit Hours: 3

Basics of algorithm design and analysis. Asymptotic analysis of upper and average complexity bounds: best, average, and worst case behaviors. Big "O" notation. Searching and sorting algorithms. Recursion. Data abstraction and review of object oriented concepts. Basic data structures. Sequential and linked representation of data structures. Lists, ordered lists, sets, stacks, queues, trees, binary trees, graphs and networks.

11240 **Website Programming**

Prerequisite: 11103

Credit Hours: 3

This course focuses on how to design and maintain interactive and dynamic web sites using HTML, Cascading Style Sheets (CSS) and client-side scripting with JavaScript. The students will also learn basic Web Page design principles. The goal is to develop effective, pleasing and useful Web sites. In the JavaScript part of the course students will develop real-world projects to learn JavaScript programming, the JavaScript Object Model, JavaScript event handlers, and how to integrate JavaScript programs in a HTML document. Other client-side technologies (Ajax and XML) will be introduced.

11253 **Object Oriented Programming Lab**

Co-requisite: 11206

Credit Hours: 1

Laboratory sessions on the different aspects and topics of object oriented programming.

11323 **Database Systems**

Prerequisite: 11212

Credit Hours: 3

Basic concepts of databases. DBMS components. Transaction managements. Data modeling. Entity relationships diagrams. Relational databases. Database integrity constraints. Relational Algebra. Query languages. Dependencies, schema designs normalization and redundancy elimination.

11335 **Operating Systems**
Prerequisite: 11212
Credit Hours: 3

Introduction to operating systems. Processes. Threads. CPU scheduling. Process synchronization. Dead-locks. Memory management. Virtual memory. File system. Mass storage management. Case study: UNIX.

11356 **Introduction to Linux Lab**
Co-requisite: 11335
Credit Hours: 1

Basic concepts of Linux, such as processes, files and directories, pipes, input/output redirection, shells, etc., the X window system (Linux's GUI) and one or more of its associated window managers, basic Linux commands and programs, standard program development tools, such as Emacs, compilers, debuggers, the "make" facility, automated common system tasks using shell scripts, basic system administration.

1143v **Network Programming**
Prerequisite: 11335, 25341
Credit Hours: 3

Introduction to Network Programming, Transport Layer Protocols, TCP, UDP, and SCTP, Client-Server Model, TCP Sockets, UDP Sockets, SCTP Sockets, I/O Multiplexing, DNS and Address Conversion, Threads Programming, RPC, Raw Sockets and Data link Access. One or more of the following Internet Application Protocols and Case Studies: TELNET, HTTP, SMTP, POP, IMAP, FTP, and Web Programming (CGI, Servlets, and XML).

11465 **Operating System Security**
Prerequisite: 11335
Credit Hours: 3

This course covers both fundamentals and advanced topics in operating system (OS) security. It will study OS level mechanisms and policies in investigating and defending against real-world attacks on computer systems, such as self-propagating worms, stealthy rootkits and large-scale botnets. Basic OS security techniques such as authentication, system call monitoring, as well as memory protection will covered. Recent advanced techniques such as system-level randomization, hardware/software virtualization, and other hardware features will also introduced.

11466 **Secure Software Development**

Prerequisite: 11335

Credit Hours: 3

The course focus on the development of high-assurance software systems is a growing challenge in emerging complex systems. Secure by design is emerging as a basic principle for trustworthy computing and as a preferred way to ensure the security of networked information systems and infrastructures. This course will focus on this issue and fosters the design, implementation as well as verification/validation of secure software systems and architectures. A key coverage will include principles and practices of secure and high assurance software development process, including security development lifecycle models, and design/verification/validation using languages and tools such as UML. Tools and techniques for code analysis and testing, and evaluation and certification of software will also be emphasized. The course will also cover secure programming principles using different languages, with particular focus in secure software development.

11467 **Database Security**

Prerequisite: 11323

Credit Hours: 3

This course introduce the security challenges and threats in database systems and provide an understanding of the state-of-the art security technologies. In addition to the security issues, the course addresses issues related to distributed databases and current technologies, such as service-oriented architecture. Access control in relational databases; grant/revoke model; cascading and non-cascading revoke; timestamp-based revoke; security by views; query modification; Oracle VPD; Truman and non-Truman models; auditing in databases; information warfare in databases; multi-level database security.

11468 **Secure Code Analysis**

Co-requisite: 11466

Credit Hours: 3

This course focus on the low-level system details of code security by investigating the current limitations of compiler, linker and loader on providing automatic detection and elimination of security flawed. This course also discuss the concepts of OS kernel and computer architectures, Memory exploit, Kernel-level Defense, Binary code reverse engineering and study the state-of-the-art offenses and defenses.

11469 **Secure Software Development Lab**

Prerequisite: 11466

Credit Hours: 1

This laboratory provides hands-on experience on (i). Code Review with Tools: code review with RATS and flawfinder, and code review with Fortify. (ii).Web Application Vulnerability Assessment : information gathering with WebScarab, exploiting hidden value, vulnerability assessment of TuneStore and BOG, and fuzz testing with SWebScarab. (iii). Threat Analysis and Modeling : threat analysis with Microsoft Threat Analysis and Modeling (TAM) tool, and threat modeling with Microsoft SDL Threat Modeling tool.

- 20132 **Calculus (1)**
 Prerequisite: None
 Credit Hours: 3
- Functions, limits and continuity. Derivatives. Differentiation. Inverse functions. Trigonometric functions. Logarithmic and exponential functions. Hyperbolic functions. Integrals.
- 20133 **Calculus (2)**
 Prerequisite: 20132
 Credit Hours: 3
- Methods of integration. Applications of integration. Plane analytic geometry including polar coordinates. Sequences and series, including power series.
- 20134 **Discrete Math**
 Prerequisite: None
 Credit Hours: 3
- Mathematical models. Proof methods. Program correction methods. Sets and operations. Relations and types. Charts and branches. Searching methods. Dividing. Functions and types. Algorithms. Counting methods.
- 20141 **Physics (1)**
 Prerequisite: None
 Credit Hours: 3
- Units and measurements. Vector algebra. Kinematics. Projectile and circular motions. Newton's laws of motion. Forces of nature. Applications of Newton's laws on rectilinear and circular motions. Work and energy. Law of conservation of mechanical energy. Laws of conservation of linear and angular momenta.
- 20142 **Physics (2)**
 Prerequisite: 20141
 Credit Hours: 3
- Electric fields. Gauss' law. Electric potential. Capacitance and dielectrics. Current and resistance. Direct current circuits. Magnetic fields. Source of the magnetic field. Faraday's law. Inductance. Alternating current circuits. Electromagnetic waves.
- 20148 **Physics (1) Lab**
 Co-requisite: 20141
 Credit Hours: 1
- Basic measurements. Static equilibrium. Newton's second law on the air track. Moment of inertia. The simple harmonic motion of a spring. Young's modulus of elasticity. Resonance in air columns. Linear expansion of a solid.

20149 **Physics (2) Lab**
Co-requisite: 20142
Credit Hours: 1

Electric fields. Slide-wire Wheatstone bridge. Damped electrical oscillations. Index of refraction. Interference and diffraction. Photoelectric effect.

20200 **Technical Writing & Communication Skills**
Prerequisite: 31111 and 31121
Credit Hours: 3

Organization of the technical report. Layout and organization of the front page. Arrangement of information. Organization and layout of headings and sub-headings. Numbering systems. Order of arrangements of results and recommendations. How to prepare an undetailed proposal on any technical and scientific work.

20231 **Calculus (3)**
Prerequisite: 20133
Credit Hours: 3

Vectors in a plane. Vectors in space. Plane and space curves. Functions of several variables. Partial differentiation and derivatives. Gradient. Extremal values. Lagrange multipliers. Double integrals in Cartesian and polar coordinates. Triple integrals in Cartesian, cylindrical and spherical coordinates.

20232 **Engineering Mathematics (1)**
Prerequisite: 20133
Credit Hours: 3

First order ordinary differential equations. Second and higher order linear ordinary differential equations. Systems of first order linear and nonlinear ordinary differential equations and stability. Laplace transforms.

20234 **Linear Algebra**
Prerequisite: ---
Credit Hours: 3

System of Linear Equations: row-echelon form, reduced row-echelon form, Gaussian elimination, Gauss-Jordan method, etc. Matrices: arithmetic's, operations, multiplications, properties of matrix arithmetic's matrix transpose, inverse, special matrices, etc. Determinants: the determinant function, properties of determinants, the method of cofactors, adjoint matrix, using row reduction to compute determinants, Cramer's rule. Euclidean n-space: introduction, vectors, dot product, cross product, Euclidean n-space, linear transformations. Vector spaces: vector spaces, subspaces, span, linear independence/dependence, basis and dimensions, change of basis, fundamental subspaces, inner product spaces, orthonormal basis, least squares, QR-decomposition, orthogonal matrices. Eigenvalues and Eigenvectors: review of determinants, Eigenvalues and Eigenvectors, diagonalization.

20331 **Engineering Mathematics (2)**
Prerequisite: 20231 and 20232
Credit Hours: 3

Vector calculus. Line and surface integrals. The three main theorems: Green theorem, Stokes theorem and divergence theorem. Fourier series, integrals and transforms. Partial differential equations solutions using Fourier series and Transforms.

20334 **Applied Probability**
Prerequisite: 20231
Credit Hours: 3

Probability principles and set theory. Random variables. Operations on random variables. Various distribution functions. Introduction to random processes. Weak stationary. Correlation functions, linear processing, and estimation. Poisson processes and Markov chains. Queuing analysis.

21232 **Digital Electronics Fundamentals**
Prerequisite: 22241 and 24223
Credit Hours: 3

Basic semiconductor concepts. Diodes. Theory of Bipolar Junction Transistors (BJT): biasing, the BJT switch. The standard TTL circuit. CMOS logic circuits. Logic gate based multi-vibrator circuits. BiCMOS and GaAs logic circuits. Interface of various logic gates. Sampling circuit, D/A and A/D conversion techniques.

22241 **Digital Logic Design**
Prerequisite: None
Credit Hours: 3

Number systems. Basic gates and logic functions. Boolean algebra, Boolean expressions. Logic minimization techniques. Combinational logic building blocks: decoders, encoders, multiplexers, demultiplexers and magnitude comparators. Digital arithmetic: adders and subtractors. Basics of sequential circuits: latches and flip-flops. Timing diagrams. Counters and shift registers. Basic PLDs, CPLDs and FPGAs. State machines. System design with state machines using VHDL. Memory devices and systems: RAM, ROM, FIFO, LIFO and DRAM.

22340 **Microprocessors and Embedded Systems**
Prerequisite: 21232 and 22241
Credit Hours: 3

Microprocessor basic system: CPU, memory, I/O and buses. Computer basic operation: the fetch and execute cycle. Bus timing. Microprocessors and microcontrollers. Microcontroller architecture and instruction set. On-chip peripheral devices. Interrupt system. Internal and external interrupts. I/O interfacing: keypad, seven-segment LED display, LCD display, ADC and DAC and I/O port expansion. System development tools.

22348 **Digital Logic Lab**
 Prerequisite: 22241
 Credit Hours: 1

Building combinational circuits using gates. Parallel adder. Decoders and Multiplexers. ROM and RAM. Register and counters. A simple computer design Project.

22444 **Computer Architecture and Organization (1)**
 Prerequisite: 22241
 Credit Hours: 3

Register transfer & microoperations. Design of arithmetic logic unit. Computer Instructions. Number representations and computer arithmetic. Computer organization and components. Processor design: datapath and control units. Instruction cycle. Pipelining.

22448 **Embedded Systems Lab**
 Co-requisite: 22340
 Credit Hours: 1

Introduction to PIC MPLAB IDE. Interfacing switches and LED displays. Use of mechanical and solid-state relays. Interrupts and counters. A/D conversion. Temperature measurement. Waveform generation. PWM techniques.

23354 **Data Communications**
 Prerequisite: 20232
 Credit Hours: 3

Analog and digital transmission concepts, modulation and demodulation, transmission media, signal encoding techniques, synchronous and asynchronous transmission, error control, multiplexing, spread spectrum and circuit and packet switching.

23575 **Coding Algorithms**
 Prerequisite: 23354
 Credit Hours: 3

Shannon limit theorem. Punctured codes. Turbo code-decode process (iterative decoding). Iterative decoding error performance for block and convolutional codes.

24218 **Engineering Drawing Using Computers**
 Prerequisite: None
 Credit Hours: 1

Introduction to engineering drawing and AutoCAD software. Setting up drawing parameters. Coordinates entry. Object snap. Basic editing techniques. Blocks. Multi-lines. Polylines. Spline. Layers. Dimensions. Orthographic projection. Auxiliary views. Sections. Three-dimensional pictorials. Editing solids and 3-D operations. Boolean Operations.

24219 **Engineering Workshop**

Prerequisite: None

Credit Hours: 1

Development of basic skills in fields of hand filing, turning, welding, piping and plumbing, carpentry, sand casting, glass works, sheet metal fabrication, and household electric circuits. Theories related to metal machining, measurements, metal forming, sand casting, and welding. Industrial Safety. Engineering Materials and Their Properties. Electrical wiring. Casting Processes. Metal Forming (Working) Processes. Metal Machining Processes. Metal Joining. Carpentering.

24223 **Electric Circuits**

Prerequisite: 20142

Credit Hours: 3

Types of circuits and circuit elements. Revision of Ohm's and Kirchhoff's Laws. Circuit analysis techniques: voltage and current division, nodal and mesh analysis, source transformation, superposition, Thevenin's and Norton's theorems. Inductance and capacitance. Source-free RL and RC circuits. Applications of the unit-step forcing function. The RLC circuit: source-free parallel and series RLC and complete response. Sinusoidal forcing function. Phasor concept.

24411 **Engineering Ethics**

Prerequisite: Finish 99 Credit Hours

Credit Hours: 1

Safety and responsibility. Professional responsibility toward customers and to employers. Blowing the whistle. Codes of ethics and honor. Professional choices. Legal obligations. Standard ethics theories. Case studies.

25341 **Telecommunications and Computer Networks**

Prerequisite: 23354

Credit Hours: 3

The primary objective of this course is to learn the fundamental principles underlying telecommunication and computer networks. The course introduces the concepts of protocols, layers and the TCP/IP and OSI models. Topics are covered in the application, transport, network, data link and physical layers of the protocol stack with prime concentration on the link layers.

25347 **Cryptography**
Prerequisite: 23354
Credit Hours: 3

Secret-Key Cryptography: Symmetric and asymmetric systems. Cryptanalysis. Alphabets and words. Permutations. Block ciphers. Stream ciphers. Matrices and linear maps. Vigenere, Hill and permutation ciphers. Perfect secrecy. Birthday paradox. Vernam cipher and one-time pad. Deterministic and true random numbers. DES and AES. Mathematical Background Integers. Cost of arithmetic operations. GCD and extended GCD computation. Euclidean algorithm. Factoring into primes. Modular arithmetic. Groups, rings, and fields. Orders of elements, groups and subgroups. Exponentiation. Chinese remainder theorem. Polynomials and finite fields. Public-Key Cryptography: RSA algorithm, Rabin's algorithm, Diffie-Hellman key exchange, ElGamal. Factoring and generating prime numbers, Fermat test, Miller-Rabin test. Discrete logarithms, Pollard RHO algorithm and index calculus.

25441 **Wireless Networks**
Prerequisite: 25341
Credit Hours: 3

The primary objective of this course is to learn the fundamental principles underlying wireless communication networks and systems. The topics include, wireless communication fundamentals, wireless communication techniques and technologies, Wireless Personal Area Networks (WPAN), Wireless Local Area Networks (WLAN) and Wireless Mobile Networks (WMN).

25443 **Information and Networks Security Fundamentals**
Prerequisite: 25341
Credit Hours: 3

This course covers the concepts of information assurance, explicit and implicit policy design, use of basic computer security mechanisms, authentication, access control, policy types. Topics include: Design and use of basic network security mechanisms, asset identification and valuation, determining threats to assets and their vulnerabilities, prioritizing and selecting countermeasures, implementing and deploying countermeasures, and continuing maintenance and assessment of security mechanisms. Introduces firewalls, network intrusion detection, Viruses, Worms, Trojan horses, and other forms of malicious code.

25444 **Wireless Networks Security**
Prerequisite: 25441 and 25442
Credit Hours: 3

This course introduces fundamental security aspects in wireless telecommunications and computer networks including cryptosecurity, physical security, transmission security, emission security and electronic key management.

25445 **Wireless Networks Lab**
Prerequisite: 25441
Credit Hours: 1

This laboratory provides hands-on experience on configuring, implementing, integrating, and testing a variety of wireless technologies. Students will gain a first-hand understanding of the methods and tools for designing and implementing wireless networks such as WLANs and WPANs.

25446 **Network Protocols**
Prerequisite: 25347,11335
Credit Hours: 3

Introduction to computer networks and the Internet. Protocol layers and the OSI model. Application layer: HTTP, FTP, SMTP, POP3, DNS and peer-to-peer applications. Transport layer: UDP, TCP and congestion control. Network layer: virtual circuits, routers, IP protocols and routing algorithms. Link layer: error detection and correction, multiple access, MAC addressing, switches, ARP, Ethernet, PPP, local area networks and wide area networks. Wireless and mobile networks. Security in computer networks.

25447 **Telecommunications and Computer Networks Lab**
Prerequisite: 25341
Credit Hours: 1

Setting up the PC and configuring the NIC. Establishing a LAN. Routers and network tools. Router configuration and router protocols. Securing networks using routers. Configuring switches. Network address conversion. Introduction to wireless networks and configuration.

25490 **Engineering Training**
Prerequisite: Finish 99 Credit Hours
Credit Hours: 3
Grade: Pass/Fail

Students undertake suitable and supervised internships for a period of 8 consecutive weeks in Jordan, or 6 consecutive weeks outside.

25541 **Cloud Computing & Security**
Prerequisite: 25446
Credit Hours: 3

The principles, theory, hardware and software architecture, and programming of cloud computing. The security aspects including policies, technologies, and controls deployed to protect data, applications, and the associated infrastructure of cloud computing.

25542 **Cyber Laws**
Prerequisite: 24411
Credit Hours: 3

This course explores how a "networked" world has bred new crimes and new responses, and investigates how information and communication technology (ICT) has become a tool, a target, and a place of criminal activity and national security threats, as well as a mechanism of response. This course addresses such questions as how emerging technologies challenge existing laws and criminal procedures; how nation-states regulate criminal conduct across traditional geographic and political boundaries; what reasonable expectations of privacy are in cyberspace; and how control is shifting from traditional mechanisms of law enforcement to new regulatory regimes, including technology. The course also covers hacking and unauthorized access; computer use in traditional crimes like financial fraud, extortion, securities fraud, and political terrorism; identity theft and online fraud; electronic interception, search and seizure, and surveillance; censorship and free speech; economic espionage; and information warfare.

25543 **Intrusion Detection & Network Forensics**

Prerequisite: 25444

Credit Hours: 3

This course covers computer security and network forensics, forensic duplication and analysis, network surveillance, intrusion detection and prevention, incident response and trace-back. Signature and anomaly based intrusion detection, Pattern matching algorithms, Viruses, Trojans and worms detection. Multicast Fingerprinting, Anonymity and Pseudonym.

25545 **Network Security Lab**

Prerequisite: 25444

Credit Hours: 1

This course provides laboratory exercises using off-the-shelf security tools. Topics include: eavesdropping, implementing the attacks against ARP, IP, ICMP, TCP, and UDP protocols, exploiting DNS vulnerabilities to launch Pharming (redirecting) attacks, exploiting cross-site scripting (XSS) vulnerabilities and buffer overflow. Experimenting with IPSec, TLS, and SSH protocols. In addition students will configure network servers, routers, hubs, firewalls and NIDSs and study their effects on the overall system security.

25549 **Ethical Hacking Techniques Lab**

Co-requisite: 25543

Credit Hours: 1

The lab is an in-depth study for hacking techniques using hands-on lab exercises. While these hacking skills can be used for malicious purposes, this class teaches you how to use the same hacking techniques to perform a white-hat and ethical hack.

25576 **Network Performance Analysis**

Prerequisite: 25441

Credit Hours: 3

This course is about comparing systems – with focus on networks – using and queueing models. Selection of techniques and metrics, data measurement, simulation, measured data, comparing systems using sample data, presentation, summarizing and fractional factorial designs, introduction to experimental design, factorial number generation, commonly used to simulation, analysis of simulation results, random learn techniques to analyze distributions, introduction to queueing theory. Students will and compare computer systems in general and computer networks in particular.

25581 **Information Systems Security Assessment**

Prerequisite: 25347, 25444

Credit Hours: 3

Requirement Study and Situation Analysis. Security policy creation and update. Document Review. Risk Identification. Vulnerability Scan. Data Analysis. Reporting & Briefing.

25582 **Operation & Administration of Security Centers**

Prerequisite: 25446

Credit Hours: 3

Key components in a SOC. Typical SOC operations, services and challenges. SOC procedures and processes. SOC roles and their interdependencies. SOC stakeholders. SOC workflow and job roles. Monitoring, detecting and containing attack vectors. Incident response lifecycle.

25583 **IT Audit**

Prerequisite: 25446

Credit Hours: 3

Audit Overview; The Audit Process; Auditing Techniques; Auditing Data Centers and Disaster Recovery; Auditing Routers, Switches, and Firewalls; Auditing Web Servers and Web Applications; Auditing Databases; Auditing Storage; Auditing WLAN and Mobile Devices; Auditing Applications; Auditing Cloud Computing and Outsourced Operations; Frameworks, Standards, and Regulations; Risk Management.

25584 **Risk Management**

Prerequisite: 25446

Credit Hours: 3

Introduction to Risk Management. The Risk Management Lifecycle. Risk Assessment and Analysis Techniques. Risk Exposure Factors. Chapter 7. Security Controls and Services. Risk Evaluation and Mitigation Strategies. Reports and Consulting. Threat and Vulnerability Management.

25585 **Multimedia Networks**

Prerequisite: 25341

Credit Hours: 3

Multimedia networking and communication. Error resilient video and audio. Bandwidth adaptation mechanisms. Channel protection fundamentals. Channel modeling and analysis for the internet. Forward error control. Network-adaptive media transport. Cross-layer wireless multimedia. QOS support in wireless environments. Streaming media on demand. Real time communication.

25586 **Hardware Security**

Prerequisite: 22444

Credit Hours: 3

Hardware Implementation of Hash Functions. RSA: Implementation and Security. Security Based on Physical Unclonability and Disorder. Hardware Metering. Secure Hardware IPs by Digital Watermark. Physical Attacks and Tamper Resistance. Side Channel Attacks and Countermeasures. Security for RFID Tags.

25587 **Secure System Architecture**

Prerequisite: 22444

Credit Hours: 3

Security Policies, Standards, and Guidelines. Information Classification and Access Control Plan. Requirements Derivation. Security Infrastructure Design Principles. Network Partitioning. Virtual Private Networks. Wireless Security. Platform Hardening. Intrusion Detection Systems. Application Security. Security Event Management and Consolidation. Security Management.

25591 **Senior Design Project (1)**

Prerequisite: Finish 120 Credit Hours

Credit Hours: 1

Grade: Pass/Fail

Projects are aimed at developing independent engineering problem solving skills. A project should be performed by two or more students under the supervision of a faculty member.

25592 **Senior Design Project (2)**

Prerequisite: 25591

Credit Hours: 2

Continuation of Senior Design Project (1). Students are required to fulfill the project objectives, perform a formal presentation and submit a final report.

25593 **Special Topics in Network Security Engineering (1)**

Prerequisite: To be set by Dept.

Credit Hours: 3

The objective of this course is to introduce advanced and new topics in one of the areas of Network Security Engineering. The topics can be changed from one year to another depending on the instructor's area of specialty.

25594 **Special Topics in Network Security Engineering (2)**

Prerequisite: To be set by Dept.

Credit Hours: 3

The objective of this course is to introduce advanced and new topics in one of the areas of Network Security Engineering. The topics can be changed from one year to another depending on the instructor's area of specialty.

25595 **Special Topics in Information Security (1)**

Prerequisite: To be set by Dept.

Credit Hours: 3

The objective of this course is to introduce advanced and new topics in one of the areas of Information Security. The topics can be changed from one year to another depending on the instructor's area of specialty.

25596 **Special Topics in Information Security (2)**
Prerequisite: To be set by Dept.
Credit Hours: 3

The objective of this course is to introduce advanced and new topics in one of the areas of Information Security. The topics can be changed from one year to another depending on the instructor's area of specialty.

31010 **Arabic Language Placement Test**
Prerequisite: None
Credit Hours: 0

Testing basic grammars in Arabic.

31019 **Arabic Language (Remedial)**
Prerequisite: None
Credit Hours: 0

The verb and noun. Grammars. Punctuation. Al Hamza. Applications.

31020 **English Language Placement Test**
Prerequisite: None
Credit Hours: 0

Testing basic grammars in English.

31029 **English Language (Remedial)**
Prerequisite: None
Credit Hours: 0

Reading. Writing. Speaking. Listening. Application.

31111 **Arabic Language**
Prerequisite: 31019
Credit Hours: 3

Summarization. Punctuation. Spelling. Deletion. Displacement. Construction and inflection. Derivation. Substitution and the vowel system. Number. Indescribability. Sentence. Clause. Rhetoric issues and various applications.

31121 **English Language**
Prerequisite: 31029
Credit Hours: 3

Advanced reading. Advanced writing. Grammar. Speech. Translation.

31151 **National Education**
Prerequisite: None
Credit Hours: 3

Jordan: the land, people and homeland. The Arab nation. History of Jordan. Political system. Jordanian society. Major national institutions. Internal and external challenges facing Jordan. The role of local institutions in achieving development in national awareness. The family and its role in society.

31152 **Islamic Arabic Civilization**

Prerequisite: None

Credit Hours: 3

Concept of civilization. Stages of development of Islamic Arabic civilization. Principles and grounds of Islamic Arabic civilization. Areas of cultural creativity in Islamic Arabic Civilization. Linguistics. Theology. Islamic jurisprudence. Philosophy. Natural and social sciences. Islamic art and music. Unity of the Arab and Islamic worlds.

31161 **Introductions to Library Science**

Prerequisite: None

Credit Hours: 3

Information sources. Types of cataloging. Types of catalogs. Types of classification. Information and knowledge. Information society. Information services. Information technology. Information storage. Information retrieval and dissemination. Information and Internet.

20251 **History of Science**

Prerequisite: None

Credit Hours: 3

Importance of understanding science as a socio-historic phenomenon. Science as industry. Science and development. Cognitive conditions of scientific production. Examples: Kepler and Planck. Science as social production. Socio-historic determinants of the social production of science. Main epochs of the history of natural science. Greek Science. Hellenistic science Roman science. Arabic Islamic science. Modern European science. Science in the contemporary Arab world. Epistemological periodization of natural science. Roots of the philosophy of nature. The Ionians. Platonic project in astronomy. Aristotle. Ptolemy. Arabic Islamic astronomy. The 17th century Scientific Revolution.

31211 **Arabic Literature**

Prerequisite: 31111

Credit Hours: 3

Developing students' taste of Arabic literature through reading of literature essays. Analysis. Introducing some literature aspects from different eras.

31251 **Military Science (Jordanian Students Only)**

Prerequisite: None

Credit Hours: 3

Grade: Pass/Fail

History of the Jordanian army. Jordanian peace forces. Preparing the nation for defense and liberation. Genesis and development of the Hashemite Kingdom of Jordan.

31261 **Introductions to Politics and Economics**

Prerequisite: None

Credit Hours: 3

The nature of political economy. The issues of political economy. The importance of the market. Market effects and political economy. Three ideologies of political economy. The dynamics of the international political economy. The political economy of structural changes. Long-term variations of economic growth and the effect of political hegemonic. The politics of international trade. The political economy of international finance.

31262 **Introductions to Educational Science**

Prerequisite: None

Credit Hours: 3

Education: principles and philosophy. Education and individuals. Education and learning. Education and society. Education and development. Educational courses and methods. Educational institutions and educational assessments. Education in the Arab and Islamic worlds.

31271 **Environmental Science**

Prerequisite: None

Credit Hours: 3

The earth and natural hazards. Ecosystems. Biogeochemical cycles. Man and the Environment. The natural resources in the solid Earth system. Air pollution. Water resources. Management and pollution. Solid waste. Food and Health. Environmental impact assessment.

31351 **Current Issues in the Arab World**

Prerequisite: None

Credit Hours: 3

Social and national fragmentation in the Arab east: Features and roots. The Arab-Israeli conflict. Democracy and civil society in the Arab world. Pan- Arabism and Islam. The self and the other. Secularism. The Arabs and globalization. Human security in the Arab world.

31352 **Jerusalem: History and facts**

Prerequisite: None

Credit Hours: 3

The geographic borders of AL-Quds through history. A glance at the historical discoveries in AL-Quds. AL-Quds and the British occupation. The establishment of Israel. The Israeli plans to jadeite AL-Quds. Importance of AL-Quds from religion point of view. The infringements of AL-Aqsa mosque since 1967 by Israel.

31361 **Introductions to Philosophy**

Prerequisite: None

Credit Hours: 3

Definition of philosophy. The relation between philosophy and science. The science-based and religion-based thoughts. A historical review of philosophy and science. A discussion of the most important fields in philosophy.

31371 **Health Education**
Prerequisite: None
Credit Hours: 3

Understanding the responsibility we have for our own health. Skills for dealing with emergency cases. Personal safety and accident prevention. Mental health, mental illness and stress.

32431 **Engineering Economics**
Prerequisite: Finish 99 Credit Hours
Credit Hours: 3

Introduction. Comparative economic systems. The market economy. Demand, supply and equilibrium price. Elasticity, measurement, economies of scale and learning curves. Theories of firms: NEO - classical economies - price takers and seekers. Objectives of organizations. New institutional economics. Functions in firms: economic theory for marketing and finance in engineering organizations. Directions for research in production and operations management.