Al-Ahliyya Amman University

Faculty of Information Technology

Bachelor of Science in Networks and Information Security

Program Profile

2019-2020

Table of Contents

I. Program Information

1. About the Program

The department of Networks and Information Security was established at the Faculty of Information Technology in 2013 to meet the growing labor market needs of network and information security professionals. The graduate student obtains a Bachelor's degree in Networks and Information Security after completing all compulsory and elective requirements of 132 credit hours. This program includes the latest developments in the fields of computer networks, cybersecurity, network security, ethical hacking, digital forensics, wireless networks, network programming, network management, cloud computing and the Internet and its various applications. The department includes specialized experts with international accreditation and certifications in the field of networking and information security.

The department organizes annually a series of workshops and training courses to refine the skills of students and qualify them to the labor market. The student of the Networks and Information Security program graduates with more than 17 professional certificates including free of charge courses and workshops. The department has also been enter into agreements with local and international companies, such as Cisco that is specialized in the field of networks and information security, in addition to joining the Estarta training and employment incubator.

The department has been developing study plans in line with the rapid developments in the field of information technology. The Network and Information Security program is officially accredited by the international Accreditation Board for Engineering and Technology (ABET). Our program is the first of his kind to receive such international accreditation in Jordan. The ABET certification paves the way for a graduate to work globally, because ABET accreditation is recognized worldwide through international agreements, and many other countries' national accrediting systems are based on the ABET model. In addition, the ABET accreditation enhances employment opportunities as most multinational corporations require graduation from an ABET-accredited program as a minimum qualification.

2. Program Mission

Our mission is to provide a distinguished education in a creative environment which copes with the latest developments in the field of networks and information security. It will meet quality assurance standards that fulfill the requirements of the national and international accreditation to obtain high quality outputs which fulfill labor market needs. It will also stimulate scientific research and strengthen cooperation with the local community.

3. Program Educational Objectives

PEO-1. Apply mathematical foundations, algorithmic principles, and modern tools to design, implement, and analyze systems in the field of networks and information security.

PEO-2. Aware of the societal impact of technology and of the ethical issues in networks and information security discipline which helps them making decisions regarding their professional and social responsibilities.

PEO-3. Work collaboratively, function and communicate effectively, and think creatively, in complex modern work environments.

PEO-4. Adapt to new technologies, tools and methodologies and able to identify contemporary challenges in networks and information security discipline and/or propose a plan of action to tackle them.

4. Student Learning Outcomes

SLO-1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

SLO-2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

SLO-3. Communicate effectively in a variety of professional contexts.

SLO-4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

SLO-5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

SLO-6. Apply security principles and practices to maintain operations in the presence of risks and threats.

5. Program Admission requirements

Admission requirements of the Bachelor's degree in the Network and Information Security program include a High School Certificate with an average not less than 60% or equivalent, in the Scientific, Information Technology, Industrial, Comprehensive Health Education or Agricultural streams. Additional requirements apply:

- **Holders of a Jordanian High School Certificate**

An applicant who has a certificate from a Jordanian school: The school should be a licensed and recognized by the Ministry of Education of Jordan. The student must provide certified copies of the high school certificate with a detailed transcript of the grades obtained in the

course of study. Both documents must be certified by both: the school and the Jordanian Ministry of Education.

- **Holders of a High School Certificate outside Jordan**

Students who have obtained their certificates from schools outside Jordan: the applicant must have graduated from a licensed school recognized by the Ministry of Education in that country and must provide certified copies of the high school certificate and a detailed transcript of the grades obtained in the course of study. These documents must be certified in the country of study by the Ministry of Education, the Ministry of Foreign Affairs, and the Embassy of the Hashemite Kingdom of Jordan; or the Embassy of that country in Jordan, the Jordanian Ministry of Foreign Affairs.

6. Program Career Opportunities

- Network Administrator
- Network Designer
- Network Analyst
- Web Application Developer
- Network Security Administrator
- Cybersecurity Administrator
- Penetration Tester
- Forensics Expert
- Cloud Networking Administrator
- Wireless Networking Engineer

II. Program Requirements

Award of the Bachelor degree of Science in Software Engineering requires the successful completion of 132 credit hours compulsory and elective courses with grade point average not less than 60% or equivalent, as follows:

University Requirements (24) Credit Hours	Compulsory University Requirements.	(12) Credit Hours
	Elective University Requirements.	(12) Credit Hours
Faculty Requirements	Compulsory Faculty Requirements.	(21) Credit Hours
Major (Program) Requirements (87) Credit Hours	Compulsory Major Requirements.	(52) Credit Hours
	Ancillary Major Requirements	(26) Credit Hours
	Elective Major Requirements	(9) Credit Hours

III. Program Structure

1. Study Plan

- Attachment (1)

2. Advisory Plan

- Attachment (2)

3. Advisory Flow Chart

- Attachment (3)

4. Courses Description

A0111101 Mathematics (1) {3} [3-3]

Functions: Intervals, Inequalities, and Absolute Values, New Functions from Old Functions, Exponential Functions, Inverse Functions and Logarithms, The Limit of a Function; Derivatives: Derivatives of Trigonometric Functions, The Chain Rule, Implicit Differentiations, Derivatives of Logarithmic Functions, Linear Approximations and Differentials, Optimization Problems; Integrals: The definite Integral, The Fundamental Theorem of Calculus, Indefinite Integrals and the Net Change Theorem, The Substitution Rule.

Prerequisite: **None**

A0311101 Discrete Mathematics {3} [3-3]

Introduction to Propositional Logic: Propositions, Logical operations, Predicates Quantification, Mathematical induction; Basic Structures: Sets, Functions, Sequences, Sums; Relations; Recursion; Counting Techniques; Graphs: Euler Circuit, Hamilton Circuit, Planar Graphs, and Coloring Graph.

Prerequisite: **None**

A0311201 Introduction to Information Technology {3} [3-3]

Basic elements of computing: programming, computer, program, operating environment, data, file; Number systems: decimal, binary, conversion; Describing problem solution using standard flowcharting notation; Linux basics: basic commands, working with files, working with directories, file name substitution, input/output and I/O redirection; Linux shell: overview, programming tools; User-defined commands and shell variables: command files, variables, integer arithmetic; Passing arguments: $#, $#, ${n}; Decisions: exit status, test command, else, exit, elif, Null, && and || constructs; Loops: for, while, until, breaking a loop, skipping commands in a loop; Git: installation and configuration, basic commands, branching.

Concurrent : **A0331700 Computer Skills (Remedial)**

A0311202 Introduction to Programming* {3} [3-3]

Sequential execution: program structure, command line arguments, string literals, output, Limerick layout; Program errors: syntactic errors, semantic errors, compile time errors, runtime errors; Types, variables and expressions: string, double and integer types, hard-coded data, assignment statement, arithmetic expressions and associativity, type conversions, parsing input data, integer division, grouping expression terms and long statements layout; Conditional and

repeated execution: choice and iteration statements, Boolean expressions, relational operators, program design using pseudo code, lists of command line arguments, comments, standard classes; Control statements nested in loops: declaring variables in compound statements, conditional expression operator; Separate methods: private methods, accepting parameters, void methods, returning value, changing parameters does not affect arguments, local and class variables, logical operators, Boolean type, Boolean variables; Program design concepts: designing data, designing algorithm.

Prerequisite: **A0311201 Introduction to Information Technology**

A0311203 Introduction to Programming Lab {1} [1-2]

A set of 25-35 practical tasks integrated with and supporting concepts presented in the course. These tasks are outlined in the theory course and detailed in separate worksheets that students do individually at their pace during weekly laboratory sessions, using the Java language and its tools. Sessions are controlled via a platform designed to track students' work originality and manage submissions for assessment.

***Concurrent*: A0311202 Introduction to Programming**

A0312101 Data Structures {3} [3-3]

Lists: static allocation, dynamic allocation; Stacks: static implementation, linked implementation, operations, applications; Recursion: applications, program stack; Queues: static implementation, linked implementation, operations, applications; General Trees; Binary Trees; Binary Search Trees: traversal, search, add and delete operations; Files: input, output; Graphs: traversal, adjacency matrix, and adjacency list.

Prerequisite: **A0312201 Object Oriented Programming**

A0312201 Object Oriented Programming {3} [3-3]

Introduction to Object Oriented Programming Concepts using Java language: Classes, Objects, Constructors, Encapsulation: Visibility Modifiers; Packages; Overloading; using **this** keyword; using **static** keyword; Array of objects: Store and Process objects in array; Relationships between Classes: Composition, Inheritance: Superclasses and Subclasses, using **super** keyword, Constructor Chaining, Overriding, Polymorphism, Preventing Extending and Overriding, The Object Class and its toString() Method; Abstract Classes; Interfaces; Exception Handling; introduction to GUI programming.

Prerequisite: **A0311202 Introduction to Programming**

A0312202 Object Oriented Programming Lab {1} [1-2]

A set of 25-35 practical tasks integrated with and supporting concepts presented in the course. These tasks are outlined in the theory course and detailed in separate worksheets that students do individually at their pace during weekly laboratory sessions, using the Java language and its tools. Sessions are controlled via a platform designed to track students' work originality and manage submissions for assessment.

***Concurrent*: A0312201 Object Oriented Programming**

A0314501 Ethical and Professional Issues in Computing {1} [1-1]

An overview of ethics, Professional ethics of workers and users in the field of information technology, Cyberattacks and Cybersecurity, Privacy, Intellectual property, Ethical decisions in software development.

Prerequisite: **Passing 80 credit hours**

A0341301 Networks and Information Security essentials {3} [3-3]

The course studies the basic of computer networks: types of networks, main devices, Ethernet technology, principles and structure of IP addressing; overview of the common protocols such as: TCP, UDP, HTTP, HTTPS, POP, IMAP, SMTP, DNS, FTP, DHCP; basic security measures and tools: malware, general means of authentication, password-based authentication, physical security, firewall basics; cryptography: symmetric and asymmetric algorithms, hash functions, basics of digital signature and steganography.

Prerequisite: **A0311201 Introduction to Information technology.**

A0342301 Computer Networks * {3} [3-3]

The course studies the architecture, functions, components, and models of computer networks; the main functions and protocols of the application, transport, network, data link, and physical layers of the OSI and TCP/IP layered models are discussed; the principles and structure of IP addressing, purpose and types of NAT, basics of routing, and the fundamentals of Ethernet standard are introduced.

Prerequisite: **A0341301 Networks and Information Security Essentials.**

A0342302 Computer Networks Lab {1} [1-2]

This course provides students with hands-on training regarding the design, implement and troubleshooting of computer networks; the topics that are covered in this course include: build the network and configure basic device settings, configure switches with VLANs, configure

static and dynamic routing, configure a DHCPv4 Server and a DHCP Relay agent, configure NATing, and examine the basic commands on a PC.

Concurrent: **A0342301 Computer Networks**

A0342303 Cybersecurity {3} [3-3]

This course covers some of the main topics of protecting information and information systems such as: access control, web security, mail security, social engineering; some of the common vulnerabilities and attacks are also covered: DoS, spoofing, MitM, buffer overflow, CSS; tools related to some of the aforementioned topics will be covered as well; ethical and legal considerations related to cybersecurity are discussed such as: privacy, intellectual property, cybercrime, cyberwarfare, and the organizations involved in the formulation of such laws.

Prerequisite: **A0342301 Computer Networks.**

A0342401 Advanced Internet Protocols {3} [3-3]

The course covers a comprehensive and detailed study of the main and most used Internet protocols, with emphasis on the application layer protocols; these protocols include: HTTP, HTTP, FTP, SMTP, POP, IMAP, DHCP, DNS; the multimedia protocols are also covered: RTP, RTCP, SIP, H323; the header format, messages, security vulnerabilities of each protocol is introduced.

Prerequisite: **A0342301 Computer Networks.**

A0342402 Wireless Networks and Security {3} [3-3]

Wireless technologies: Infrared (IR), Bluetooth, ZigBee, Wi-Fi (Wireless Fidelity); RF coverage: Physical layer standards, antennas; WLAN standards: 8011a, b, g, n, ac; medium access control: 802.11 Frame format, 802.11 Frame Addressing, Accessing the wireless medium, wireless frame types; Planning coverage with Wireless Aps: Tuning Cell Size with Transmit Power, Tuning Cell Size with Data Rates; managing mobility in wireless networks: Mobile IP Basics, Mobile ad hoc network; WLAN security: Wireless threats, Privacy and integrity methods.

Prerequisite: **A0342301 Computer Networks.**

A0342403 Wireless Networks and Security Lab {1} [1-2]

A set of laboratory sessions on the different aspects and topics of applying the wireless local area networks techniques; configuration of wireless networks' devices: access point, wireless routing and security ; Ad hoc networks; Configure router as wireless access point; Connecting Wireless

and Wire networks; configure wireless router: port security and static routes; Install and Configure IoT Devices ; Troubleshoot Wireless configuration .

***Concurrent*: A0342402 Wireless Networks and Security.**

A0343301 Cloud Computing and Security {3} [3-3]

Introduction to cloud computing: basic concepts and terminology, essential cloud characteristics; cloud service and deployment models: the cloud service models, the cloud deployment models; cloud-enabling technology: multitenant technology, service technology, virtualization technology; fundamental cloud security: basic terms and concepts, cloud security threats

Prerequisite: **A0342301 Computer Networks.**

A0343401 Networks Management and Monitoring {3} [3-3]

The course encompasses the technological foundations of network management used to operate large-scale networks and services; this course explores the five functional areas of network management: fault management, configuration management, accounting management, performance management, and security (FCAPS); advanced topics such as: fault diagnosis and isolation, event correlation, MIB architecture, scripting for task automation, performance monitoring, service level agreements (SLA) conformance are also discussed; network management and monitoring protocols including: SNMP, Syslog, Netflow, NTP are discussed to effectively manage a production network.

Prerequisite: **A0342301 Computer Networks.**

A0343402 Networks Servers and Services Administration {3} [3-3]

Software installation in a Windows domain: Deploying, managing and troubleshooting the Windows 2016 infrastructure; Windows Active Directory Domain Services: administration, maintenance, troubleshooting, and disaster recovery; Security planning and administrative delegation: Active Directory Certificate service, Group Policy management and configuration, Windows domain resolution service configuration, Additional Windows domain services: file and print services; Windows Server Update Services (WSUS).

Prerequisite: **A0342301 Computer Networks.**

A0343403 Networks Protocols {3} [3-3]

The course covers a comprehensive and detailed study of the concept of routing, routing design, load balancing and the main routing protocols including: RIP, OSPF, EIGRP, BGP; the WAN technologies and protocols are also covered including: MPLS, PPP, Metro Ethernet, and GRE;

IPv6 protocol, IPv6 addressing, obtaining IPv6, IPv4 and IPv6 coexistence are highlighted; Vulnerabilities and security issues of each of these protocols are also considered in this course.

Prerequisite: **A0342301 Computer Networks.**

A0343404 Networks Protocols Lab {1} [1-2]

This course provides students with hands-on training regarding the design, implement, analyze, evaluate and troubleshooting of computer networks protocols in certain network scenarios; the protocols that are covered in this course include: RIP, OSPF, EIGRP, BGP, MPLS, PPP, Metro Ethernet, GRE, and IPv6 protocol.

Concurrent: **A0343403 Networks Protocols.**

A0343405 Computer Networks Design {3} [3-3]

The course focuses on designing a campus network based on structured design principles: Hierarchy, Modularity, Resiliency, and Flexibility; the protocols, tools, and technologies required to achieve the structured design principles are also covered; these include: switched networks, First Hop Redundancy Protocols (FHRP), Virtual LAN (VLAN), Spanning Tree Protocol (STP), links aggregation, Quality of Service (QoS), End-to-End QoS methodologies, and QoS tools.

Prerequisite: **A0342301 Computer Networks.**

A0343501 Networks Security {3} [3-3]

This course covers the main tools and technologies that are used to protect a computer networks against common attacks including: Firewall, Intrusion Prevention Systems, Intrusion Detection Systems (IDS), Virtual Private Networks (VPNs), Access Control Lists (ACLs), AAA authentication; layer two threats and mitigations such as: CAM table attacks, DHCP attacks, address spoofing attacks, ARP attacks are also detailed.

Prerequisite: **A0342303 Cybersecurity**

A0343502 Networks security Lab {1} [1-2]

This course provides students with hands-on training regarding the design, implement, analyze, evaluate and troubleshooting of certain network security scenarios; the topics that are covered in this course include: Basic security configuration, layer 2 security, privilege levels, Role-Based CLI Access, AAA authentication, Access Control List (ACL), Zone-Based Policy Firewalls, Site-to-Site IPsec VPNs, IPS, ASA Firewall.

Concurrent: **A0343501 Networks Security.**

A0343503 Encryption Theory {3} [3-3]

Introduction to Cryptography: Cryptography and Steganography Terminology, Cryptography Services (CIA); Classical Encryption Techniques: Substitution Techniques, Transposition Techniques, Bit-Manipulation ciphers; Modern Encryption Techniques: DES, El-Gamal, AES; Public key Cryptography: RSA Algorithm, Diffie-Hellman key exchange; Cryptography data integrity algorithm: Hash Algorithm, Message Authentication Codes (MAC), Digital Signatures, key management; Application of Cryptography: Certificate Authority (CA), Digital Certificate.

Prerequisite: **A0342303 Cybersecurity.**

A0343504 Ethical Hacking {3} [3-3]

This course is an introduction to the principles and techniques of using hacking skills for defensive purposes; topics includes: overview of penetration testing, penetration testing methodologies, gathering intelligence, network scanning, conducting vulnerability scanning, vulnerabilities exploitation, retaining access with backdoors and malware, covering hacking tracks and evading detection.

Prerequisite: **A 0342303 Cybersecurity.**

A0344401 Networks Programming {3} [3-3]

The course covers Networks Programming basic concepts using Java; it mainly covers: I/O Streams, Networks Addressing, Socket Classes (TCP & UDP), Multithreaded Client/Server applications and General Network Protocols Implementations; the course also introduces the use of Secure Socket Layer (SSL) Java library to achieve Secure Internet Programming by implementing a basic web server (using concepts covered earlier in the course) and enable it to support secure HTTP (HTTPS) using the SSL.

Prerequisite: **A0312201 Object Oriented Programming + A0342301 Computer Networks**

A0344501 Digital Forensics {3} [3-3]

Principles of digital forensic analysis: where and how these principles should be applied; Windows OS forensics; data acquisition: Understanding storage formats for digital evidence determining the best acquisition method ; current digital forensics tools; recovering graphics files; e-mail and social media investigations; mobile devices investigation; network and Internet forensics.

Prerequisite: **A 0342303 Cybersecurity.**

A0344601 Practical Training {0} [8 Continuous Weeks]

The student is required to do practical training in a well-known software company for a period of 8 weeks full time training with at least (15) hours per week. The student is assigned some tasks to perform that are related to his major, such as developing a software, or learning some new skills, technologies and capabilities. At the end of training, reports should be submitted to the department then evaluated by the supervisor.

Prerequisite: **Pass 90 Credit Hours**

A0344602 Graduation Project 1 {1} [1-3]

Students (through groups) should get familiar with the theoretical and practical aspects associated with the subject matter of the project.

Prerequisite: **Pass 90 Credit Hours.**

A0344603 Graduation Project 2 {2} [2-3]

Students (through groups) will complete the project with some sort of field study that started in Graduation Project I ; the project will require the use of as many curricular subject materials under the supervision of one faculty member; this project is evaluated by a committee of faculty members.

Prerequisite: **Pass 90 Credit Hours**
Concurrent: A0344602 Graduation Project 1.

A0111103 Statistics and Probability {3} [3-3]

Data collections; Sampling; Measure of central tendency; Measures of dispersions; Probability: Rules of probability, Counting rules; Discrete random variables; Binomial distributions; Poisson distributions; Normal distributions; Linear regression and correlation; Applications using software packages.

***Prerequisite*: A0111101 Mathematics (1)**

A0112101 Linear Algebra {3} [3-3]

Systems of linear equations: Homogeneous and non-homogeneous systems; Matrices: operations on matrices; Determinants: Operations on Determinates; Vector spaces; Method for solving systems of linear equations: Case study; Eigenvalues and Eigenvectors ; Error norms of vector and matrix ; Applications using software packages.

***Prerequisite*: A0111101 Mathematics (1)**

A0311301 Digital Logic Design {3} [3-3]

Binary Systems: Digital Computers & Systems Binary numbers, Number Base Conversion: Octal & Hexadecimal Numbers, 1's & 2's Complements Binary codes; Boolean Algebra & Logical Gates: Basic Definitions of Boolean Algebra, Theorems of Boolean Algebra, Boolean Functions Digital Logic Gates, IC Digital Logic Families; Simplification of Boolean Function: Karnaugh Map Method with 3 variable , 4 variable, 5 variable Map. Sum of Products, Product of Sums, Don't care; Combinational Logic: Integrated combinatorial circuits, Sequential circuits, Flip-flops, registers, counters, memory units.

***Prerequisite*: A0311101 Discrete Mathematics**

A0312203 Visual Programming {3} [3-3]

Introduction to Visual Programming; Creating Applications with Visual C#; Processing Data; Making Decisions; Loops; File Access: reading and writing; Random Numbers; Methods; Arrays and Lists; Multiform Projects; Databases.

***Prerequisite*: A0312201 Object Oriented Programming**

A0312401 Fundamentals of Databases {3} [3-3]

Database Concepts; Database Design Methodologies; Data Modeling using ER and EER; Database Integrity Constraints; Relational Model: Relational algebra, Relational Calculus; Functional Dependencies and Normalization.

***Prerequisite*: A0311202 Introduction to Programming**

A0312402 Fundamentals of Databases Lab {1} [1-2]

Introduction and Practice on Structural Query Language (SQL): Creating tables, Querying Data Dictionary, Inserting data, Deletion of data, Updating data, Data retrieval, Limiting selected rows, Single row functions, Group functions, Table Joining commands, Subqueries. A set of worksheets covering these topics are distributed which students do individually at their pace during weekly laboratory sessions, using the SQL language. Sessions are controlled via a platform designed to track students' work originality and manage submissions for assessment.

***Concurrent*: A0312401 Fundamentals of Databases**

A0312403 Systems Analysis and Design {3} [3-3]

Introduction to systems development: System development life cycle, System Development feasibility; Development of Fact-finding methods: Context diagram, Data flow diagram, Decision tables and trees, Data dictionary; Conceptual design: DB design, Normalization;

System Implementation: Installation, System conversion, Training, Development Tools, Documentation.

***Prerequisite*: A0312401 Fundamentals of Databases**

A0313201 Internet Applications Development (1) {3} [3-3]

An overview of the Internet and the World Wide Web (WWW); Hyper Text Markup Language (HTML) to structure web pages; Cascading Style Sheets (CSS) to style web pages; JavaScript (Client-Side) to enhance the user experience: control Statements, operators, functions, arrays; Ajax to build rich webpages: XML, JSON.

***Prerequisite*: A0312401 Fundamentals of Databases**

A0313202 Internet Applications Development (1) Lab {1} [1-2]

A set of practical tasks integrated with and supporting concepts presented in the course. These tasks are outlined in the theory course and detailed in separate worksheets that students do individually at their pace during weekly laboratory sessions, using HTML, CSS, JavaScript, Ajax to design and implement web sites. Sessions are controlled via a platform designed to track students' work originality and manage submissions for assessment.

***Concurrent*: A0313201 Internet Applications Development (1)**

A0313301 Operating Systems {3} [3-3]

Fundamental Concepts of Operating Systems; Evolution of Operating System; Operating System Structure; Process: Process Management, Inter-process Communication, Process Scheduling, Deadlocks, Process Synchronization; Memory Management; File System Management; I/O Management; Secondary Storage Management; Case Studies.

***Prerequisite:* A0342301 Computer Networks.**

A0313203 Internet Applications Development (2) {3} [3-3]

Introduction to ASP.NET to build Web Application using the MVC pattern: the .NET Framework, ASP.NET & MVC Pattern; URL Routing; Controllers and Actions; Views – Razor Engine; Model Binding; Database Access; Cookies; Sessions; Authentication; Web Services.

***Prerequisite*: A0313201 Internet Applications Development (1)**

A0313403 Introduction to Data Science {3} [3-3]

Introduction to data science; The basics of Python; Data preparation; Exploratory data analysis; Preparing to model the data; Introduction to machine learning; Data visualization.

***Prerequisite*: A0312401 Fundamentals of Databases**

A0314301 Parallel Computing and Distributed Systems {3} [3-3]

Distributed Systems: definition, types, goals, hardware concepts; Communication: layered protocols, remote procedure call, remote method invocation, synchronous /asynchronous persistent/transient communication, stream based communication; Processes: threading in the server side, threading in the client side, code migration; Naming: name Spaces, locating mobile entities, removing unreferenced entities; Synchronization: physical clock synchronization, logical Clocks, global State, election algorithms, mutual exclusion algorithms, distributed transactions; Consistency and Replication: reasons for replication, consistency protocols; Fault Tolerance: introduction, process resilience, reliable client server communication, distributed Commit protocols, recovery.

***Prerequisite*: A0313301 Operating Systems**

A0334503 Software Project Management {3} [3-3]

Introduction to project management; The project management and IT context; Project management process groups; Project integration management; Project scope management; Project schedule management; Project cost management; Project quality management; Project communications management; Project risk management.

***Prerequisite*: A0312403 Systems Analysis and Design**

A0342304 Introduction to Linux System {3} [3-3]

Fundamental concepts of Linux: file system, commands, utilities, text editing, shell programming and text processing utilities; Linux shells: command line syntax and features, filename generation, redirection, pipes and quoting mechanisms; Navigating the file system: Controlling file access, File and directory naming rules and conventions, Manipulating files and links; controlling the Terminal: Working with vi, Monitoring and controlling processes, Using command line editing, command substitution, using backup commands; controlling processes: print jobs, communicating over the network, Group Policy management and configuration.

Prerequisite: **A0341301 Networks and Information Security Essentials.**

A 344301 Internet of Things and Security {3} [3-3]

IoT architecture: devices, networking, cloud computing, and big data analysis; Real-time data collection in IoT ; Data analytics in IoT ; IoT applications and requirements ;Security threats and techniques in IoT ; IoT challenges: computation and communication constraints, power constraints, maintenance cost, reliability, data trustworthiness, security, and privacy.

Prerequisite: **A0313201 Internet Applications Development 1**

A0344503 Information Systems Auditing {3} [3-3]

Audit overview: audit process, audit techniques; data center auditing; Checking network devices: routers, switches and firewalls ; audit web servers and web applications; audit mobile devices; cloud-computing auditing; Outsourcing operations; risk management ; fundamental concepts of the international IT standards : COBIT and ISO27001

Prerequisite: **A0342303 Cybersecurity**

A0344402 Special Topics in Networks and Information Security (1) {3} [3-3]

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

Prerequisite: **A0342303 Cybersecurity.**

A0344502 Special Topics in Network and Information Security (2) {3} [3-3]

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

Prerequisite: **A0342303 Cybersecurity.**

IV. Contact Information

Dr. Mosleh Abualhaj
Chairman of Networks and Information Security Department
Location: Al-Ahliyya Amman University / Amman-Jordan/ Zip-Code (Postal Address): (19328)
Email: m.abualhaj@ammanu.edu.jo