THE | 2021

COURSE CATALOG

Undergraduate Course Descriptions

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King Hussein School of Computing Sciences

Computer Science

11100	Computer Skills (Remedial)	Pre-requisites: None	0 credit hours
	This course aims to develop learners' ability to use computers in various aspects of their lives. The course introduces the primary concepts of computers, and the basics of using a GUI-based desktop operating system and office productivity tools including word processing, spreadsheets, and presentation applications, in addition to basics of using emails and navigating through the world wide web. At the end of this course, the students are expected to be able to use desktop computer for everyday tasks.		
11102	Introduction to Computer Science	Pre-Requisites: None	Credit hours: 3
	This course aims to introduce the fundamentals of problem-solving and programming concepts. Topics include an introduction to each of the following: numbering systems, data storage, operations on data, computer organization, problem-solving with the sequential logic structure, problem-solving with decisions and loops, modular problem solving, and an introduction to programming using a high-level programming language. At the end of this course, students are expected to be able to analyze simple computing problems and design simple solutions using algorithms or flowcharts.		
11103	Structured Programming	Pre-requisites: 11102	Credit hours: 3
	This course aims to introduce the fundamentals of structured programming using a high-level programming language. Topics include concepts of structured programming, program design, development. Syntax and semantics of the presently adopted language so that students will develop the ability to program in the language. Basic elements of the language: variables, constants, and data types. Basic input/output functions. Conditional and iterative control structures. Functions (or methods) and parameter passing. Recursive functions (or methods). References and dynamic variables. Basic data structures: one and two-dimensional arrays, string manipulation and structure. At the end of this course, students are expected to be able to analyze a computing problem, design, and implement a solution using a high-level programming language.		
11151	Structured Programming Lab	Co-requisite: 11103	Credit hours: 1
	This course aims to build practical skills for structured programming using a high-level programming language. At the end of this course, students are expected to be able to analyze a computing problem, design, and implement a solution using a high-level programming language.		

11206	Object-Oriented Programming	Pre-requisites: 11103	Credit hours: 3
	The course aims to introduce object-oriented programming concepts and paradigms. Topics include: Data abstraction, encapsulation and information hiding, classes attribute and methods, inheritance, polymorphism, and operator overloading. At the end of the course, students expected to be able to solve computing problems using object-oriented principles including information hiding, inheritance, and polymorphism.		
11212	Data Structures and Introduction to Algorithms	Pre-requisites: 20134, 11206	Credit hours: 3
	The purpose of this course is to introduce the students to the complexity analysis of algorithms, the fundamental methods for representing data in memory and the algorithms which access data. Data structures include: lists, stacks, queues, trees, heaps, priority queues and hashing. Algorithms include searching and sorting. The course introduces a library of pre-defined data structures and algorithms (such as the STL). At the end of the course, students will be equipped with the tools that will enable them to write clear and efficient programs.		
11213	Data Structures and Algorithms for Cybersecurity	Pre-requisite: 15230	Credit Hours: 3
	The purpose of this course is to describe, explain, and implement abstract data types including lists, stacks, queues, trees, heaps, sets, maps, hash tables and graphs. Implement a variety of algorithms for searching and sorting, including linear search, binary search, insertion sort, selection sort, merge sort, quick sort, and heap sort. Write recursive algorithms. Understand when recursion is, and is not, appropriate. Analyze the time and space efficiency of data structures and algorithms and apply this analysis to select the best tools for solving particular problems. At the end of this course, the student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem		
11253	Object-Oriented Programming Lab.	Co-requisite: 11206	Credit hours: 1
	This course aims to build practical skills for object-oriented programming. The course includes laboratory sessions on the different aspects and topics of object oriented programming. At the end of this course, students are expected to be able to analyze a computing problem, design, and implement a solution using object-oriented principles.		
11313	Algorithm Design and Analysis	Pre-requisites: 11212	Credit hours: 3
	This course presents fundamental techniques for designing and analyzing computer algorithms. Students learn how to write efficient algorithms to solve various problems and how to estimate their running times before running them. Students also do programming projects in which they implement different algorithms and compare their actual running times with the theoretical estimates. The course covers general problem solving techniques including divide-and-conquer, greedy, dynamic programming, brute-force, branch-and-bound and backtracking. These techniques are applied to set of problems such as sorting, knapsack, matrix chain multiplication, longest common subsequence, activity selection, graph problems, etc. The course also gives an introduction to the theory of NP-Completeness.		

11316	Theory of computation	Pre-requisites: 11206, 20135	Credit hours: 3
	This course aims to introduce the student to formalisms studied in computer science and mathematical models of computing machines. The language formalisms: regular, context-free and recursively enumerable languages. The machines: finite-state, pushdown and linear bounded automata and Turing machines. At the end of this course students will: Be able to construct finite state machines and the equivalent regular expressions. Be able to prove the equivalence of languages described by finite state machines and regular expressions. Be able to construct pushdown automata and the equivalent context free grammars. Be able to prove the equivalence of languages described by pushdown automata and context free grammars. Be able to construct Turing machines		
11323	Database Systems	Pre-requisites: 11212	Credit hours: 3
	This course aims to introduce the fundamentals of database systems design and implementation. Topics include basic concepts of databases, DBMS components, transaction management, data modeling, entity relationships diagrams, relational databases, database integrity constraints, relational algebra, query languages, dependencies, schema designs normalization and redundancy elimination. At the end of the course, students are expected to be familiar with many of the principles and concepts related to databases and how these are applied in real database systems.		
11335	Operating Systems	Pre-requisites: 11212, 22342	Credit hours: 3
	This course aims to introduce the fundamentals of Operating System (OS) design and implementation. In this course, students will explore the importance of the operating system and its functions. Topics include an overview of the modern operating systems, types of operating systems, operating system structures, process management and threads (concepts of, communication, synchronization and deadlock), CPU scheduling, memory management and virtual memory, file systems, I/O systems and security and protection. Some topics in the course are implemented by writing programs to practically know how. At the end of this course, the students are expected to be familiar with many of the principles and concepts related to most of the actual operating systems and how these are applied in real OSs.		
11343	Special Topics in Computer Science (1)	Pre-requisites: To be set by Dept.	Credit hours: 3
	This course aims to introduce new topics in computer science and information technology. The department determines the content of the course.		

11344	Advanced Topics in Internet Programming	Pre-requisites: 12243	Credit hours: 3
	This course aims to present advanced methods for creating interactive, dynamic and data driven Internet-based applications and within corporate intranet environments using the current state of stable and accepted technologies and frameworks to develop rich and maintainable applications. Topics include specialized web markup languages, server-side programming, web services, enterprise web development, as well as manipulation and visualization of data from various sources, including robust database management systems. Additional topics include integrating search engines, validation, authentication, web application security, and content management systems. Particular attention given to concepts and techniques used to facilitate efficient development.		
11347	E-Business	Pre-requisites: 12243	Credit hours: 3
	This course aims to present e-business and e-commerce terms and concepts. Students are given an overview of online business models, e-business environment factors, and electronic payment methods and information security issues. They also learn about e-business infrastructure: hardware, software and content.		
11354	Database Systems Lab.	Co-requisite: 11323	Credit hours: 1
	This course aims to build practical skills on how to design and implement a complete database application using a modern relational database system: It covers relations, queries, forms, reports, objects, properties, data design, software design, and rapid application development tools.		
11355	Operating Systems Lab.	Co-requisite: 11335	Credit hours: 1
	This course aims to help students understand operating systems and provide them with some practical skills managing an operating system. The students are introduced to the LINUX OS, where they get hands-on experience with the most common commands performing necessary OS operations and services. The students learn to use CLI and GUI interfaces, write shell code, write programs that deal with Processes management including synchronization and threading, interact with files and learn some network and socket programming.		
11391	Practical Training	Pre-requisites: Finish 90 Cr. Hrs.	Credit hours: 3
	The student is required to do practical training in a well-known software company for a period of (2) months, full-time training, with at least (6) hours per day, or 3 months part-time training with at least (4) hours per day. In addition to training hours, for the part-time training, the student is allowed to register not more than (10) credit hours in the first or the second semester, or (4) credit hours in the summer semester. The student is required to perform tasks that are related to her major, such as writing, developing, or learning some new software.		

11417	Compiler Design and Programming Languages	Pre-requisites: 11316	Credit hours: 3
	This course aims to present the theory and practice of compiler design for imperative and object-oriented languages. Topics covered include: phases of compiler writing; lexical analysis; parsing and intermediate code generation; compiler generating tools; basic concepts of programming language theory and a comparative study between them; a compiler for a subset of particular OO languages. Similar imperative languages will be implemented as part of a term project.		
11425	Software Engineering	Pre-requisites: 11323	Credit hours: 3
	This course aims to introduce the fundamentals of software engineering. Topics include software development 'life cycle' including requirements, design and testing, development strategies, prototyping, formal methods, test case, documentation, program efficiency and debugging, object-oriented analysis and design, software quality assurance, metrics reusability and reliability.		
11428	Artificial Intelligence	Pre-requisites: 11212	Credit hours: 3
	This course aims to introduce the basic principles, techniques, and applications of Artificial Intelligence. In this course, emphasis will be placed on the teaching of these fundamentals with the appropriate tools and software of implanting them. Assigned projects promote a 'hands-on' approach for understanding, as well as a challenging avenue for exploration and creativity. Topics include a historical perspective of AI and its foundations, problem solving using search, inference, knowledge representation, and learning. AI techniques in intelligent systems, expert systems, artificial neural networks and other machine learning models. AI development tools such as an 'AI language', and/or data mining tool, experiment with a machine learning model for simulation and analysis At the end of this course, the students are expected to apply basic principles of AI in solutions that require problem solving, demonstrate proficiency in developing AI applications, and applying scientific method of machine learning models, with ability to discuss their limitations and scope.		
11435	Data Communications and Computer Networks	Pre-requisites: 11212	Credit hours: 3
	This course aims to introduce the basic principles of Data Communications and computer networks. In this course, the students will learn the basic principles in the design and the operation of computer networks. Additionally, network reference models, interfaces and services, protocols, communication services, synchronization, flow control, error control, socket programming, routing algorithms, network layer, transport layer and application layer protocols are the main topics covered in this course. At the end of this course, the students are expected to be able to list and define the appropriate network terminology, describe the layered structure of a typical networked architecture and identify the different types of complexity in a network.		

11436	Distributed Systems	Pre-requisites: 11435	Credit hours: 3
	The course aims to provide basic knowledge and understanding on how distributed systems operate. In this course, students will explore and learn the principles, architectures, algorithms and programming models used in distributed systems. Topics include advantages, hardware, software, design issues, communication in distributed systems, layered protocols, asynchronous transfer mode networks, client-server model, remote procedure call, RMI, group communication, clock, mutual exclusion, election algorithms, atomic transactions, deadlocks, processes and processors, threads, system models, allocation, scheduling, fault tolerance, real time, distributed shared memory, consistency, page, variables, object-oriented based and case studies. At the end of this course, students are expected to be able to summarize and describe general properties, challenges, and characteristics of distributed systems. Additionally, students should have the ability to describe general distributed algorithms for synchronization and concurrency, coordination, transactions, and replication.		
11446	Special Topics in Computer Science (2)	Pre-requisites: to be set by the Dept.	Credit hours: 3
	This course aims to introduce new topics in computer science and information technology. The department determines the content of the course.		
11447	Wireless Networks and applications	Pre-requisite: 11435	Credit hours: 3
	This course aims to introduce Wireless Data Communication principles. Topics include: wireless protocols, Mobile IP, Ad hoc Networks, Wireless Sensor Networks, and Vehicular networks.		
11449	Computer and Society	Pre-requisite: Finish 70 Cr. Hrs	Credit hours: 1
	This course aims to discuss the social impacts of computing technology. The course will provide a brief introduction to ethics and to the history of computing and the Internet. It will focus on a number of areas in which computers and information technology are having an impact on society including privacy, freedom of speech, intellectual property, work, distribution of wealth, and the environment. Current issues that will be discussed include electronic voting, spyware, spam, and intellectual property issues associated with digital content distribution.		

11464	Information Systems Security	Pre-requisites: 11435	Credit hours: 3
	This course aims to provide a deep and comprehensive study of the security principles and practices of information systems. Topics include security threats, vulnerabilities and countermeasures, attacks, security services (confidentiality, integrity, availability, non-repudiation, accountability), cryptography: classical encryption techniques, block ciphers and stream ciphers, symmetric-key and asymmetric-key cryptography, authentication and digital signature, key management and cryptographic protocol, DES and AES, Block cipher operation modes, asymmetric ciphers: RSA, Diffie-Hellman key exchange, hash functions, MAC functions, digital signature: digital Signature Standard DSS, key management and distribution, X.509 certificates, user authentication, access control, security in operating systems, web security: SSL and TLS, electronic mail security (PGP. MOME), malicious software, and firewalls. At the end of this course, students are expected to be familiar with many of the basic principles and practices in information systems security. In particular, understand what the foundational theory is behind information security, what the common threats are, what are the basic principles and techniques when designing a secure system, and how to gauge the protections and limitations provided by today's technology.		
11493	Graduation Project 1	Pre-requisites: Finish 90 Cr. Hrs	Credit hours: 1
	Project is aimed at developing real world problem solving skills, including problem definition, analysis, and needed software. A project should be performed by a group of students under the supervision of a faculty member. Students are required to develop a complete implementation fulfilling the project objectives and submit a final report. Project must be presented to a committee of faculty members.		
11494	Graduation Project 2	Pre-requisites: 11493	Credit hours: 2
	Project 2 aims at implementing the planned requirements, which were collected in Project 1 Students must work in groups to achieve a functional system at the end of this course. Students must test the product / system and that should be included in the documentation.		
12243	Web page Design and Internet programming	Pre-requisites: 11206	Credit hours: 3
	The course aims to equip students with the necessary knowledge and skills to design and implement Internet-based applications. Topics include the specific technologies of these applications (including markup language(s), styling, client and server side programming) and how to employ them in building effective and efficient interactive applications. Students will learn about various website design and development best practices.		
12343	Visual Programming	Pre-requisites: 11206	Credit hours: 3
	This course aims to introduce the students who have built a solid background in console systems to the concepts of Visual/GUI design using structured and OO programming skills acquired in previous courses. Topics include Windows Forms and Controls, Event-Driven Programming, Error Handling, Files, Multi-threading, Animation as well as Data Driven Systems. The course also includes a design project, which brings together students coding, and user-interface design principles. After completing this course, the students are ready to undertake professional projects with added business value for clients within a Software Engineering or Systems Analysis context.		

Computer Graphics and Animation

12162	Fundamentals of Drawing and 2D Animation	Pre-requisite: None	Credit Hours: 3
	This course presents theoretical and practical training on the basics of drawing, in addition to animate objects and characters digitally. The program covers traditional drawing by using different materials, and two-dimensional animation using the computer, as a form of digital drawing, where it is commonly used for illustration and animation.		
12213	Data Structures in Visual Programming	Pre-requisites: 11206, 20134	Credit Hours: 3
	The course gives the basics of algorithm design and analysis. Topics: basic data structures; sequential and linked representation of data structures (list, ordered list, sets, stack, queue, tree, binary trees, graph and network) in visual programming; an introduction to graphical user interfaces (GUI); event driven programming; Windows onscreen objects (command buttons, text boxes, option buttons, and graphics). Programming projects require students to design interactive screens as well as code subroutines to implement the programs. The course covers theory and practical aspects.		
12241	Webpage Design and Internet Programming	Pre-requisite: 11323	Credit Hours: 3
	The course aims to equip students with the necessary knowledge and skills to design and implement Internet-based applications. Topics include the specific technologies of these applications (including markup language(s), styling, client and server side programming), how to employ them in building effective and efficient interactive applications. At the end of this course, the students will learn about various website design and development best practices.		
12242	Web page Design and Internet Programming Lab	Co-requisite: 12243	Credit Hours: 1
	This course aims to build practical skills in the design and implementation of web pages and Internet-based applications. The course includes laboratory sessions on the different aspects and topics of programming web pages and Internet-based applications. At the end of this course, students are expected to be able to design and implement interactive, efficient, and effective Internet-based applications.		

12243	Web page Design and Internet programming	Pre-requisite: 11206	Credit Hours: 3
	The course aims to equip students with the necessary knowledge and skills to design and implement Internet-based applications. Topics include the specific technologies of these applications (including markup language(s), styling, client and server side programming) and how to employ them in building effective and efficient interactive applications. Students will learn about various website design and development best practices.		
12259	Computer Application in Computer Graphics	Pre-requisite: 11102	Credit Hours: 3
	The course introduces several concepts of design, art, and illustration as interpretations of real-world concepts. It presents theoretical and practical training that will allow students to apply the acquired technical knowledge of design software, mainly Adobe Photoshop and Adobe Illustrator. Professional applications include photo editing and compositing, print design, and digital painting.		
12264	3D-Modeling	Pre-requisite: 12259	Credit Hours: 3
	This course focuses mainly on introducing 3D modeling for hard surface objects and environments using advanced 3D software. Students will be able to create 3D worlds and props through the application of several tools and methods.		
12273	Computer Graphics	Pre-requisite: 11103	Credit Hours: 3
	This course aims at teaching students the principles of designing 3D graphics applications using OpenGL. Students will learn basic shading and lighting modeling and will study some of the algorithms for rasterization and clipping. The course covers theory and practical aspects.		
12324	Human Computer Interaction	Pre-requisite: 11206	Credit Hours: 3
	This subject is an introduction to human-computer interaction. Emphasis will be placed on understanding human behavior with computing systems, knowing how to design and evaluate interactive software using a human-centered approach, and general knowledge of HCI design issues with multiple types of interactive software.		

12343	Visual Programming	Pre-requisite: 11206	Credit Hours: 3
	This course aims to introduce students who have built a solid background in console systems to the concepts of Visual/GUI design using structured and OO programming skills acquired in previous courses. Topics include Windows forms and controls, event-driven programming, error handling, files, multi-threading, animation, as well as data-driven systems. The course also includes a design project, which brings together coding, and user-interface design principles. After completing this course, students are ready to undertake professional projects with added business value for clients within a software engineering or systems analysis context.		
12348	Multimedia Systems	Pre-requisite: 11206	Credit Hours: 3
	Fundamentals of computer-based multimedia: audio, images and graphics, video streaming, compression, multimedia database. Students will design and develop multimedia applications that combine text, images, sound, video, and animation.		
12351	Game Design	Pre-requisite: 12273	Credit Hours: 3
	The course focuses on the fundamental aspects of Game design. The topics are the concepts of interactive 2D or 3D games, game's themes, genres, elements, player experience, game mechanics, scenarios and strategies, etc. This course also covers the game's prototyping approach and game design documentation.		
12353	3D Materials and Lighting	Pre-requisite: 12264	Credit Hours: 3
	This course presents knowledge in 3D texturing, lighting, and rendering. Students will be able to unfold any given 3D model in addition to manipulating materials and shaders to make them ready for the rendering process.		
12354	Algorithms and AI for Games	Pre-requisite: 12213	Credit Hours: 3
	This course introduces formal techniques of algorithm design and analysis. Algorithmic strategies: Brute-force, greedy, divide-and-conquer, backtracking, branch-and-bound, heuristics, pattern matching and string/text algorithms. This course will expose students to AI approaches such as agent and multi-agent systems, path planning, and fuzzy for game development. Students will also learn some of the algorithms used for game development such as seeks, evade algorithms, pursuit, and flocking, etc.		
12364	3D Animation	Pre-requisite: 12264	Credit Hours: 3
	This course provides students with a solid knowledge about animate objects, cameras, and characters in the 3D world to make the animation performance believable and ready for games or movies. Also studied are body language and acting. The course covers theory and practical aspects.		

12367	3D Rigging and Skinning	Pre-requisite: 12264	Credit Hours: 3
	This course provides students with a solid knowledge about how to rig and skin objects, characters, and creatures to make them ready to be used by animators.		
12373	Interactive 3D Graphics	Pre-requisite: 12273,12213	Credit Hours: 3
	This course introduces students to the theory and practice of interactive computer graphics. It aims to teach the fundamental principles of 3D interactive computer graphics. Students will apply mathematics, physics and computer programming to develop interactive graphics applications. Students will also learn fundamental techniques used in game development, such as shooting, character animation and controllers, inputs, and events. Unity is used as the platform for practical development, and as an example of a system which incorporates many of the algorithms of computer graphics.		
12442	Game Programming	Pre-requisite: 12354,12351	Credit Hours: 3
	This course aims to teach the student the fundamental techniques and algorithms that drive most computer and video games, students will learn the theory and study the implementation details of game architecture, design patterns, AI techniques, scripting, network programming and engine programming. The course covers theory and practical aspects.		
12446	Digital Image Processing	Pre-requisite: 11206,12348	Credit Hours: 3
	Human vision system. Cameras and display systems. Image formation, representation and digitization. Image restoration techniques: gray-scale and color modification, Linear filter techniques for noise suppression and edge enhancement, non-linear filter techniques. Lossless and Lossy compression techniques. Image analysis: segmentation and edge detection, shape descriptors. Frequency domain analysis. Image interpretation. Object detection. Pattern recognition. OCR. Biometrics techniques. Neural network. The course covers theory and practical aspect.		
12447	User Experience	Pre-requisite: 12324	Credit Hours: 3
	This course provides an introduction to the areas of study categorized under the umbrella of "user experience" including design principles, psychological principles, cognitive processes, visual perception and the importance of usability over aesthetics.		

12448	Computer Vision	Pre-requisite: 12446	Credit Hours: 3
	This course provides an introduction to computer vision, including fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification, scene understanding, and deep learning with neural networks. We will develop basic methods for applications that include finding known models in images, depth recovery from stereo, camera calibration, image stabilization, automated alignment, tracking, boundary detection, and recognition. Students will develop intuitions in class, and then learn about the difference between theory and practice in projects.		
12455	Selected Topics in Games	Pre-requisite: 12442	Credit Hours: 3
	The objective of this course is to introduce advanced or new topics in one of the areas of games.		
12461	Visual and Sound Effects	Pre-requisite: 12348	Credit Hours: 3
	This course provides students with exposure to the design, creation and production of audio in interactive applications and computer games. Students will become familiar with the use of sound libraries, recording sounds in the studio and in the field, generating sound with synthesizers, and effects processing. Students will create sound designs for interactive media, integrating music, dialog, ambient sound, sound effects and interface sounds within interactive programs.		
12467	Video Editing and Production	Pre-requisite: 12348	Credit Hours: 3
	The course presents theoretical and practical training in the principles of media making. From devising ideas to final productions on set, the program focuses on audiovisual language and techniques including basic use of camera, lighting, and staging. The course also covers editing and post-production essentials. Professional applications include film, television, animation, and institutional/corporate communications.		
12471	Selected Topics in Computer Animation	Pre-requisite: Set by the department	Credit Hours: 3
	The objective of this course is to introduce advanced or new topics in one of areas in computer animation, film production, and digital media.		
12473	Selected Topics in Computer Graphics	Pre-requisite: Set by the department	Credit Hours: 3
	The objective of this course is to introduce advanced and new topics in one of the areas of computer graphics.		

12479	Advanced Animation	Pre-requisite: 12364	Credit Hours: 3
	This course aims to teach students advanced topics in computer animation, in particular advanced character and creature modeling and human anatomy using various programs such as Autodesk Maya and Mudbox.		
12481	Virtual and Augmented Reality	Pre-requisite: 12373	Credit Hours: 3
	This course will teach students the main principles of VR and AR applications. Students will learn the required mathematics for successful VR and AR applications, including interacting with virtual objects, tracking methods, and rendering for VR and AR. Students will also learn to build effective 3D interaction techniques to use VR applications such as selection, manipulation, wayfinding, menus, and teleporting. Students will learn to build different types of AR apps including location-based and vision-based tracking methods. A selected game engine will be used as the platform for practical development and different VR and AR SDKs will be utilized. The course covers theory and practical aspects.		
12491	Practical Training	Pre-requisite: Finish 90 Credit Hours	Credit Hours: 3
	The student is required to do practical training in a well-known software company. The training period should be 2 months of full-time training, with at least (6) hours per day or, alternatively, 3 months of part-time training with at least (4) hours per day. Students undergoing part-time training are allowed to register for an additional (6) credit hours in the first or second semester, or (3) credit hours for the summer semester. During the training, the student is expected to perform some tasks that are related to his major, such as writing, developing, or learning some new software.		
12494	Graduation Project(1)	Pre-requisite: Finish 90 Credit Hours	Credit Hours: 1
	The graduation project aims to develop the student's skills and ability to deal with real issues, study and analyze them, and use computer programming to solve them. This is achieved through an integrated project that is developed by the students working within groups and supervised by a faculty member. The student is required to complete the project objectives and submit a final report. The project is presented to and evaluated by a committee of faculty members.		
12495	Graduation Project(2)	Pre-requisite: 12494	Credit Hours: 2
	Students are required to develop a complete implementation fulfilling the project objectives and submit a final report. The completed project must be presented before a committee of the faculty.		

Software Engineering

13211	Introduction to Software Engineering	Pre-requisite: 11206	Credit Hours: 3
	Principles of software engineering: Requirements, design and testing. Review of principles of object-orientation. Object-oriented analysis using UML. Frameworks and APIs. Introduction to the client-server architecture. Analysis, design and programming of simple servers and clients. Introduction to user interface technology.		
13212	Software Construction	Pre-requisite:13211 , 11212	Credit Hours: 3
	This course covers basic practical issues in software engineering, software design, and software implementation. It focuses on the importance of modularity, and how it is a crucial concept in software development, by teaching some of the core principles such as the OCP and LSP. Students shall also gain knowledge in software configuration management and source code versioning and control. The course introduces how to write a high quality code that is more readable, understandable, and maintainable; and also includes how to clean the code using refactoring techniques. Students shall practice the concepts of this course using Java language which is introduced at the beginning of the semester. Some well-known software engineering case studies are also included.		
13326	Software Engineering Approaches to Human Computer Interaction	Pre-requisites: 12343	Credit Hours: 3
	The course introduces psychological principles of human-computer interaction. Topics include: evaluation of user interfaces; usability engineering; task analysis; user- centered design, and prototyping, conceptual models and metaphors; software design rationale; design of windows, menus, and commands; voice and natural language I/O; response time and feedback; color, icons, and sound; internationalization and localization; user interface architectures and APIs. Students view case studies and complete a project.		
13327	Software Design and Architecture	Pre-requisites: 13212	Credit Hours: 3
	An in-depth look at software design. Continuation of the study of design patterns, frameworks, and architectures. Survey of current middleware architectures. Design of distributed systems using middleware. Component based design. Measurement theory and appropriate use of metrics in design. Designing for qualities such as performance, safety, security, reusability, reliability, etc. Measuring internal qualities and complexity of software. Evaluation and evolution of designs. Basics of software evolution, reengineering, and reverse engineering.		

13324	Systems Analysis and Design	Pre-requisites: 13211 , 11212	Credit Hours: 3

Fundamental concepts. Notion of a system. Information system. System life cycle. Approaches to system analysis and design (classical, structured and object-oriented). Preliminary and detailed analysis. Workflow and data flow diagrams. Structured English. Decision tables etc. Criteria for software design and evaluation: module coupling, cohesion, modularity, portability. A project is required.

13325	Software Requirements Analysis	Pre-requisites: 13324	Credit Hours: 3

Domain engineering. Techniques for discovering and eliciting requirements. Languages and models for representing requirements. Analysis and validation techniques, including need, goal, and use case analysis. Requirements in the context of system engineering. Specifying and measuring external qualities: performance, reliability, availability, safety, security, etc.
Specifying and analyzing requirements for various types of systems: embedded systems, consumer systems, web-based systems, business systems, systems for scientists and other engineers. Resolving feature interactions. Requirements documentation standards. Traceability. Human factors. Requirements in the context of agile processes. Requirements management: Handling requirements changes.

13334	Mobile Application Development	Pre-requisite: 11206	Credit Hours: 3

This course discusses mobile application programming for developing mobile native applications. A specific programming language along with the necessary libraries of reusable software components of a mobile platform will be introduced. This course explores the key theories, principles, concepts, tools, current issues, and best practices of designing and developing applications for mobile devices. Upon course completion, students are expected to produce an innovative mobile solution for a real life situation.

13335	Server Side Programming	Pre-requisite: 12243 , 11323	Credit Hours: 3

This course provides a solid foundation for the concepts of server-side programming, using a current server-side programming/scripting language(s). The course provides a comprehensive coverage of a server-side scripting language, sessions, security, and considerations related to implementing efficient and maintainable server-side applications. The course includes communicating with databases, file servers, and other types of servers.

13391	Practical Training	Pre-requisite: Finish 90 Cr. Hrs.	Credit Hours: 3

The student is required to do practical training in a well-known software company. The training should be 2 months of full-time training, of at least (5) hours per day, or 3 months of part-time training with at least (4) hours per day. Students undergoing part-time training are allowed to register for not more than (6) credit hours in the first or the second semester, or (3) credit hours in the summer semester. The student is required to perform tasks that are related to his major, such as writing, developing, or learning some new software.

13393	Special Topic in Software Engineering (1)	Pre-requisite: Set by Dept.	Credit Hours: 3
	The objective of this course is to introduce new topics in Software Engineering to be set by the Department.		
13413	Formal Methods in Software Engineering	Pre-requisite: 13324	Credit Hours: 3
	Review of mathematical foundations for formal methods. Formal languages and techniques for specification and design, including specifying syntax using grammars and finite state machines. Analysis and verification of specifications and designs. Use of assertions and proofs. Automated program and design transformation.		
13424	Software Re-Engineering	Pre-requisite: 13212	Credit Hours: 3
	This course discusses methods applied to the evolution of large industrial software systems. The course introduces the phases of the software life-cycle and then focuses on technical issues related to program understanding, program restructuring, and software migration.		
13427	Software Documentation	Pre-requisites: 13324	Credit Hours: 3
	The course gives the essentials of oral, written, and graphical communication for software engineers. Principles of technical writing; types of documents and strategies for gathering information and writing documents, including presentations. Appropriate use of tables, graphics, and references. How to be convincing and how to express rationale for one's decisions or conclusions. Basics of how to work effectively with others; notion of what motivates people; concepts of group dynamics. Principles of effective oral communication, both at the interpersonal level and when presenting information to groups. Strategies for listening, persuasion, and negotiation.		
13428	Software Quality Assurance and Testing	Pre-requisite:13212	Credit Hours: 3
	Quality: how to assure it and verify it, and the need for a culture of quality. Avoidance of errors and other quality problems. Inspections and reviews. Testing, verification and validation techniques. Process assurance vs. Product assurance. Quality process standards. Product and process assurance. Problem analysis and reporting. Statistical approaches to quality control.		
13431	Advanced Topics In Programming	Pre-requisite: 13212.	Credit Hours: 3
	The course presents advanced software engineering topics using a modern programming language. This includes threads, distributed computing, database driven apps. It also includes coverage for design patterns, and implementing different software qualities according to the best practices in industry.		

13432	Software Project Management	Pre-requisites: 13324	Credit Hours: 3
	Project planning, cost estimation and scheduling. Project management tools. Factors influencing productivity and success. Productivity metrics. Analysis of options and risks. Planning for change. Management of expectations. Release and configuration management. Software process standards and process implementation. Software contracts and intellectual property. Approaches to maintenance and long-term software development. Case studies of real industrial projects.		
13433	Risk Management for Software Intensive Projects	Pre-requisite: 13324	Credit Hours: 3
	This course aims to enable the student to become a risk manager on a software project, learning how to reason about risks and the underlying factors that influence them so as to make better project decisions. In the process, students will practice existing tools, techniques and strategies that help identify, analyze and assist in mitigating or avoiding risks completely.		
13434	Secure Software Development	Pre-requisite: 11323 , 12243	Credit Hours: 3
	This course covers the security and safety of software development during all stages of a software life cycle including analysis, design, coding, testing, and maintenance. The courses introduces the students to the main security principles to be followed in software development. Topics include threat modeling, defensive programming, web security, database security, and other security relevant issues.		
13435	Database Management Systems	Pre-requisites: 11323	Credit Hours: 3
	Advanced Topics in DB Systems: Query Processing, Transaction Processing, Recovery System, Concurrency Control, OODB, Distributed Database, Security and privacy, and writing a technical report about a selected topic and in-class presentation.		
13477	Software Engineering	Pre-requisites: 11323	Credit hours: 3
	This course aims to introduce the fundamentals of software engineering. Topics include software development 'life cycle' including requirements, design and testing, development strategies, prototyping, formal methods, test case, documentation, program efficiency and debugging, object-oriented analysis and design, software quality assurance, metrics reusability and reliability.		

13491	Graduation Project 1	Pre-requisite: Finish 90 Cr. Hrs.	Credit Hours: 1
	This is the first of two project courses. Students develop a significant software system, employing the knowledge gained from courses throughout the program. Includes development of requirements, design, implementation, and quality assurance. Students may follow any suitable process model, but must pay attention to quality issues. They must manage the project themselves, following all appropriate project management techniques. The success of the project is determined in large part by whether students have adequately solved their customer's problem. This course is focused on the early stages of the software development process such as requirements analysis and design.		
13493	Graduation Project 2	Pre-requisite: 13491	Credit Hours: 2
	This is the second of two courses. Students develop a significant software system, employing the knowledge gained from courses throughout the program. Includes development of requirements, design, implementation, and quality assurance. Students may follow any suitable process model, but must pay attention to quality issues. They must manage the project themselves, following all appropriate project management techniques. The success of the project is determined in large part by whether students have adequately solved their customer's problem.		
13494	Special Topic in Software Engineering (2)	Pre-requisite: Set by Dept.	Credit Hours: 3
	The objective of this course is to introduce advanced topics in Software Engineering to be set by the Department.		

Data Science and Artificial Intelligence

12446			
	This course covers the fundamentals of image formation, camera imaging geometry, feature detection and matching. Algorithms of stereo, motion estimation and tracking, image classification, neural networks will be deeply addressed in this course, and object detection and tracking.		
14140	Introduction to Data Science	Pre-requisites: 11102	Credit hours: 3
	The aim of this course is to introduce students to the principles of data science. Students will learn the different flavors of data and the essential elements of the data science pipeline. This includes data collection, exploratory data analysis, statistical and machine learning models, and visualization. The focus in the treatment of these topics will be on breadth rather than depth. This course will also introduce students to one of the main data science programming languages.		
14260	Data Engineering	Pre-requisites: 14140	Credit hours: 3
	The course examines the modern data ecosystem and how it relates to running a smart and efficient data hub. Students learn how to perform the principle tasks involved in managing extracting, transforming and loading (ETL) data. This course will explain the data life cycle in a Data Science project covering data types, such as structured, semi-structured and unstructured and the different formats of data and techniques used in the ETL process. It also takes the student through staging, profiling, cleansing, and migrating data as well as insight exploration using basic visualization techniques.		
14261	Data Engineering Lab	Co-requisites: 14260	Credit hours: 1
	This lab provides practical exercises to familiarize students with most of the well-known tools used for data engineering. Students will also be able to extract, transform and load (ETL) all types of data from different sources. Students will be able to extract the important features form the collected data.		
14270	Applied Probability for Data Science and AI	Pre-requisite: 20133	Credit hours: 3
	This course introduces the concept of statistical thinking, different types of studies, sampling techniques, and the impact of such methods on inference. The course introduces basic probability theory and Bayes theorem. Additionally, it introduces various types of discrete and continuous distributions and their application. Basics of inferential statistics and linear models are also introduced. The course will be taught using R and RStudio as data science tools.		

14330	Artificial Intelligence	Pre-requisite: 11212	Credit hours: 3
	Introduction to AI and its scope and applications. AI programming languages. Knowledge representation. Heuristic search and problem solving with different strategies. Introduction to knowledge based systems. Expert systems. Game Playing. Natural language processing. machine learning. Other applications. Project is required.		
14350	Computer Architecture and Machine Learning	Pre-requisites: 14330	Credit hours: 3
	This course will give an undergraduate-level introduction to machine learning providing the foundations for mathematical models and algorithms required for machine learning tasks and their applications. Topics will include supervised learning, unsupervised learning, deep learning, and reinforcement learning. This course will put an emphasis on practical applications of machine learning in artificial intelligence such as computer vision, data mining, speech recognition, text processing and bioinformatics.		
14351	Natural Language Processing	Pre-requisites: 14330	Credit hours: 3
	This course covers the fundamental concepts of Natural Language Processing (NLP). It develops an in-depth understanding of both the algorithms available for the processing of linguistic information and the underlying computational properties of natural languages with focus on Arabic language. Word level, syntactic, and semantic processing from both a linguistic and an algorithmic perspective are considered. The focus is on modern quantitative techniques in NLP: using large corpora, statistical models for acquisition, disambiguation, and parsing. The main NLP applications will be presented: Information Extraction, Question Answering, Summarization, Dialogue and Conversational Agents, and Machine Translation.		
14357	Special Topic in Data Science and AI (1)	Pre-requisite: To be set by Dept.	Credit hours: 3
	The objective of this course is to introduce a new programming language (e.g. Java, C#, ASP.NET, AJAX... etc).		
14362	High performance computing and Big Data	Pre-requisites: 14260	Credit hours: 3
	The course provides an introduction to high performance computing concepts to solve Big Data problems. Strength and limitations of Big Data usage are discussed in depth using real-world examples. Students then engage in case study exercises in which small groups of students develop and present a Big Data concept for a specific real-world case. This includes practical exercises to familiarize students with the Big Data tools and infrastructure. It also provides a first hands-on experience in handling and analyzing large, complex structured, semi-structured, and unstructured data. Upon successful completion of this course, students should be able to understand how and why to use Big Data tools to solve Big Data problems.		

14364	Data Visualization	Pre-requisites: 14362	Credit hours: 3
	This course builds upon the student's knowledge of basic statistical methods such as descriptive statistics, basic probability theory, statistical relationships, and statistical modelling. These methods are used to explore data properties analyzed by data scientists. Also, the course uses the knowledge to create meaningful data visualizations that helps both specialists and non-specialists understand data at hand.		
14391	Practical Training	Pre-requisite: Finish 90 Cr. Hrs.	Credit hours: 3
	The student is required to do practical training in a well-known software company. The training period should be 2 months of full-time training, of at least (6) hours per day, or 3 months of part-time training with at least (4) hours per day. Students undergoing part-time training are allowed to register for not more than (10) credit hours in the first or the second semester, or (4) credit hours in the summer semester. The student is required to perform tasks that are related to his major, such as writing, developing, or learning some new software. Grade: Pass / Fail		
14452	Pattern Recognition	Pre-Requisites: 14330	Credit hours: 3
	This course provides essential topics of pattern recognition for data science & AI students at the undergraduate level. It aims to cover a wide understanding of different related topics, such as pattern recognition systems, preprocessing and feature extraction, supervised and unsupervised learning, object classification and recognition.		
14455	Information Retrieval	Pre-requisites: 11206	Credit hours: 3
	Basic principles of information retrieval. Indexing methods. Query processing. Linguistic aspects of information retrieval. Artificial intelligence approaches to information retrieval. Relation of information retrieval to the World Wide Web. Search engines. Introduction to new areas of information retrieval such as multimedia information retrieval.		
14456	Robotics Programming	Pre-requisites: 11103	Credit hours: 3
	The purpose of this course is to introduce students to basics of the modeling, design, planning, and control of robot systems. In essence, the material treated in this course is a brief survey of relevant results from geometry, kinematics, statics, dynamics, and control. The course equips the student with the needed algorithms for robotics-related problems.		

14458	Computer Vision	Pre-requisites: 12446	Credit hours: 3
	Students will learn fundamentals of image formation, camera imaging geometry, feature detection and matching. Algorithms of stereo, motion estimation and tracking, image classification, with neural networks will be thoroughly addressed in this course. Students will be taught the topics of object detection and tracking.		
14465	Data Mining	Pre-requisites: 14362	Credit hours: 3
	This course introduces the basic concepts, methods, implementation of well-known techniques, and applications of data mining, with a focus on mining frequent patterns, clustering analysis techniques, classification approaches, and anomaly detection.		
14466	Business Intelligence	Pre-requisites: 14364	Credit hours: 3
	This course provides an introduction to the concepts of business intelligence and explores how business problems can be solved and then applying data mining tools and analytics to gain new insights into organizational operations. This course will emphasize the differences between types of reporting and analytics, enterprise data warehousing, data management systems, decision support systems, knowledge management systems and big data. Case studies are used to explore the use of application software, web tools, success and limitations of BI as well as technical and social issues.		
14467	Cloud Computing	Pre-requisites: 11335	Credit hours: 3
	The course gives an introduction to cloud computing, its techniques and main components. It covers the topics of data centers, virtualization, cloud storage and programming models. It discusses the motivating factors, benefits, challenges, and service models. It describes several concepts behind data center design and management. It also presents virtualization, data distribution, durability, consistency and redundancy.		
14468	Security and Privacy of Big Data	Pre-requisites: 11464	Credit hours: 3
	This course discusses security in Big Data environments. It introduces cryptographic principles, mechanisms to manage access controls in your Big Data system. By the end of the course, the aim is to be able to plan your big data projects, ensuring that all security related issues are under control.		
14469	Special Topic in Data Science and AI (2)	Pre-requisite: To be set by the Dept.	Credit hours: 3
	The objective of this course is to provide students with advanced and state-of-the-art topics in data science and artificial intelligence.		

14492	Graduation Project 1	Pre-requisite: Finish 90 Cr. Hrs	Credit hours: 1
	The project aims to develop real world problem-solving skills. This includes: problem definition, analysis, identification of candidate solutions and choice of the optimal solution . The project should be carried out by a group of students under the supervision of a faculty member. Students are required to deliver a final report describing the progress of their project including the design of the solution that is planned for implementation. The project is presented to and evaluated by a committee of faculty members.		
14493	Graduation Project 2	Pre-requisites: 11493	Credit hours: 2
	Project 2 aims at implementing the planned requirements, which were formulated in Project 1. Students must work in groups to achieve a functional system at the end of this course. Students must test the product / system and that should be included in the documentation.		

Cybersecurity Program

15110	Cybersecurity Fundamentals	Pre-requisite: 11103	Credit Hours: 3
	of the security principles and practices of information systems. Topics include security threats, vulnerabilities and countermeasures, attacks, security services (confidentiality, integrity, availability, non-repudiation, accountability), cryptography: symmetric-key and asymmetric-key cryptography, user authentication, access control, social engineering, security in operating systems, web security: SSL and TLS, electronic mail security (PGP. MOME), malicious software, and firewalls. At the end of this course, students will be able to apply these concepts to protect computing infrastructure from cyber security threats and attacks.		
15230	Programming for Security Professionals Lab	Co-requisite: 15230	Credit Hours: 1
	This course aims to practice object oriented programming main concepts and paradigm, with focusing on the definition and use of classes along with the fundamentals of object-oriented design. Topics include practicing classes and objects, encapsulation, constructors and destructors, composition, dynamic memory allocation, inheritance, polymorphism and operator overloading. At the end of this course, the students are expected to be familiar with main principles and concepts related to object oriented programming. Where they can write, build, debug and test their programs. In addition to use their built classes in different projects.		
15232	Secure Assembly Coding	Pre-requisite: 11103	Credit Hours: 2
	This course aims to provide an overview of Assembly Language Fundamentals of Penetration Testing and Reversing course to be discussed during the System Administration, Assembly language is most used programming languages by many reverse engineers. It helps to understand any malware. It is used to analyze the flaw of any malware. For working in reverse engineering, assembly language is required. Learning reverse engineering can be tough but interesting also. Because it tells complete working process of any application.		
15233	Malicious Software Analysis	Pre-requisite: 15232	Credit Hours: 3
	This course will introduce students to modern malware analysis techniques through readings and hands on interactive analysis of real-world samples. After taking this course, the students will be equipped with the skills to analyze advanced contemporary Malware using both static and dynamic analysis. Students will learn how to safely and thoroughly analyze malicious software using the concepts of reverse engineering. Such analysis will be aimed at understanding the behavior and potential security impacts of such code.		

15260	E- Business Security	Pre-requisite: 12241	Credit Hours: 3
	This course introduces the main concepts in e-commerce and e-business various modules such as Business-toBusiness (B2B), Business-to-Customer (B2C), (C2C), Government-to-Government (G2G), etc. Topics include the establishment of e-commerce portal, overview of the technological infrastructure, software technologies for ebusiness, database solutions for e-business, e-payment methods, ethical issues, etc. The course concentrates on security issues across all aspects of e-commerce business and teaches the students how e-business can survive in an environment full of opportunities, but at the same time full of threats.		
15320	ComputerNetworks Architecture and Virtualization	Pre-requisite: 11335	Credit Hours: 3
	Computer Networks Architecture and Virtualization is a technology that rapidly spreads to encompass network infrastructure and its devices, which has become critical to cyber operations. Specific topics to be covered in this knowledge unit must at least include Virtualization techniques, Virtual machine architectures, uses of virtualization for simplicity, doability, security, efficiency, and cost savings. At the end of this course, the students are expected to be familiar with computer networks topologies and their architectures and also virtualization technologies as well as many of the principles and concepts related to the network simulations. In case of simulations the students can implement some scenarios by witting code and call some libraries to accomplish their security tasks.		
15321	Network Security and Protocols	Pre-requisite: 15230	Credit Hours: 3
	The aim of this course is to cover essential Internet protocols: ARP, IP, ICMP, IGMP, UDP, TCP, routing protocols such as RIP, OSPF and BGP, multicasting and multicast routing protocols such as DVMRP, MOSPF and PIM, application protocols such as DNS, DHCP, FTP and HTTP. In addition, this course will cover network security protocols such as: https, SFTP, IPSec, VPNs, TLS, SSL, SSH, Kerberos, OSPF authentication and SNMPv3.		
15322	Network Security and Protocols Lab	Co-requisite: 15321	Credit Hours: 1
	The aim of this lab is to study practically in the lab the common Internet protocols: ARP, IP, ICMP, IGMP, UDP, TCP, routing protocols such as RIP, OSPF and BGP. The students will set up scenarios in the real testbed and collecting the results and then analyzing them to be able to write the final report about their experiments.		

15330	Secure Coding	Pre-requisite: 15232	Credit Hours: 3
	The purpose of the course is to learn about secure software, including its design, implementation and maintenance. During the course students will be exposed to a selection of topics from the following: performing threat modelling, issues in authentication and authorisation, auditing for security, input sanitising, TOCTOU vulnerabilities, memory management issues, fixing vulnerabilities and patch distribution. The course requires previous programming experience and some understanding of computer systems.		
15331	Secure Coding Lab	Co-requisite: 15330	Credit Hours: 1
	This course aims to build practical skills on how to design and implement a secure code and application.		
15360	Database Security	Pre-requisite: 15232	Credit Hours: 3
	This course will provide an overview of database security concepts and techniques and discuss new directions of database security in the context of Internet information management. The topics will cover database application security models, privileges, passwords, roles, database and data auditing, XML access control, trust management and privacy protection, multilevel secure relational model and poly-instantiation, auditing in relational databases, The course also covers advanced topics such as SQL injection, database management security issues such as securing the DBMS, enforcing access controls, and related issues.		
15361	Secure Systems Development Design an	Pre-requisite: 11323	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. This course covers the security and safety analysis in software design and development. It defines and identifies vulnerability detection and avoidance. Topics include threat modeling, and the interaction between security and usability authentication, principle of least privilege, buffer overflows, race conditions, time-of-check vs. time-ofuse, trust management, access control, and other security relevant issues.		

15362	Biometric Security	Pre-requisite: 15110	Credit Hours: 3
	Introduce Biometric and traditional authentication methods. Describe the background theory of image processing required in biometric security. Classify algorithms related to various biometrics Evaluate the performance of various biometric systems		
15370	Cryptography Principles and Practice	Pre-requisite: 15233	Credit Hours: 3
	This course aims to Introduce the basic and mathematical principles of cryptography and its application to computer-network security services and mechanisms. A detailed study of classical and modern cryptosystems, including number theory: modular arithmetic, prime number, Fermat's and Euler›s Theorems, testing for Primality, Cryptographic algorithms: Classical cryptography; Secret Key Encryption; Perfect Secrecy. Cryptanalysis; Block and Stream cipher; Data Encryption Standard (DES) and Advanced Encryption Standard (AES); Public Key Encryption; Diffie-Hellman Key Exchange; RSA, and ElGamal Cryptosystems; Authentication and Digital Signatures; One-time signatures; Randomized Encryption; ElGamal signature schemes; Digital Signature Standard (DSS)› Cryptographically. Identification and entity authentication. Hash algorithms, Message Authentication Codes. Key establishment protocols. Key management techniques.		
15380	Information systems risk management	Pre-requisite: 15110	Credit Hours: 3
	Introduction to Risk Management. The Risk Management Lifecycle. Risk Assessment and Analysis Techniques. Risk Exposure Factors. Security Controls and Services. Risk Evaluation and Mitigation Strategies. Reports and Consulting. Threat and Vulnerability Management.		
15420	Network and Cloud Documenting & Monitoring	Pre-requisite: 15321	Credit Hours: 3
	This course will concentrate on monitoring all the network systems, main devices like servers, routers, gateways, also the traffic, and applications in the network. The students will learn the fundamental knowledge of common network scan tools run by attackers so that they can detect this important activity. They can explore and study attack signatures and behaviours and OS fingerprinting. Moreover, they will learn about common TCP and UDP scan types and how ARP poisoning allows attackers to funnel traffic through their stations. Also, they will learn how to use some free open source tools like; Wireshark network analyzer to capture and analyze network traffic. Finally, When the students finish this course, they will have the skills and knowledge of network monitoring needed to detect and protect against attackers.		

15421	Network and Cloud Monitoring & Documenting	Pre-requisite: 15321	Credit Hours: 3

This course will concentrate on monitoring all the network systems, main devices like servers, routers, gateways, also the traffic, and applications in the network. The students will learn the fundamental knowledge of common network scan tools run by attackers so that they can detect this important activity. They can explore and study attack signatures and behaviours and OS fingerprinting. Moreover, they will learn about common TCP and UDP scan types and how ARP poisoning allows attackers to funnel traffic through their stations. Also, they will learn how to use some free open source tools like; Wireshark network analyzer to capture and analyze network traffic. Finally, When the students finish this course, they will have the skills and knowledge of network monitoring needed to detect and protect against attackers.

15422	Cloud Computing Security	Pre-requisite: 15321	Credit Hours: 3

This course introduces a survey of security and privacy concerns in Cloud Computing systems, as well as an overview of current best practices and technologies available. In this course, the students will learn the concept of cloud computing, the threat model and security issues related to data outsourcing and storage, and will address practical applications of secure Cloud Computing. Topics include: an overview of Cloud Computing and security concepts, Cloud Computing architecture, key strategies and best practices for securing the cloud, and evaluating cloud security. Upon completion of this course, students will be familiar with the technology that enables and facilitates the successful use of Cloud Computing infrastructure; be familiar with a variety of security and privacy concerns in Cloud Computing systems, be familiar with Cloud Computing legal and regulatory issues; and have expertise in debating and writing about cloud computing and security-related issues;

15423	Mobile and Wireless Security	Pre-requisite: 15321	Credit Hours: 3

This course is to focus on advanced topics on security and privacy for wireless communication systems, including cellular and wireless networks such wireless body area networks, personal area networks and area local networks. It will discuss current security threats in wireless and mobile networks. It will cover recent technologies used to protect network security and discuss the design and operation of security protocols designated for wireless networks.

15430	Mobile Secure Coding	Pre-requisite: 15333	Credit Hours: 3
	In this course, students shall learn how mobile applications must be developed in a secure way to protect the data and resources reside in the mobile device from threats of online and offline attacks. Due to the mass usage of mobile apps in today's world, mobile application vulnerabilities have greatly increased. Millions of devices are being affected by malicious code. Students will be able to write code for mobile applications that is not easy to penetrate or reverse engineered by hackers in a bad way. They will use techniques such as continuous patching and code hardening in order to protect the apps and the platform. Topics to be given in this course include: session management and authentication, data storage and protection, communication security, working securely with online servers, online financial transactions, code obfuscation and reverse engineering, and the use of third-party and open source libraries.		
15431	Web Secure Coding	Pre-requisite: 12241	Credit Hours: 3
	This course aims to build practical skills on how to design and implement a complete database application using a modern relational database system: It covers relations, queries, forms, reports, objects, properties, data design, software design, and rapid application development tools.		
15432	Advanced System Administration Windows Linux/ UNIX Server	Pre-requisite: 11335	Credit Hours: 3
	This course shall teach the students the important role of systems administration for reliable and trustworthy operation of an information system. The students will have knowledge in underlying operating systems environments such as Linux and Windows and how they contribute, as hosts, to the success of many other applications like network operations and data centres. They will tackle many areas including networking, backup, data restoration, data security, database operations, load balancing, and more. The students should be able to manage the documentation of hardware resources as well as software resources, conduct server health checkups, plan for backup and disaster recovery, apply the necessary updates, check compatibility and interoperability of deployed software, apply and evaluate security measures, automate and monitor processes using advanced monitoring and administration tools.		

15440	Machine learning and Big Data	Pre-requisite: 15333	Credit Hours: 3
	This course will give an undergraduate-level introduction of machine learning and provide foundations of machine learning, implementation of the algorithms, and their applications. Topics include supervised learning, unsupervised learning, deep learning, and reinforcement learning. This course will put an emphasis on practical applications of machine learning to artificial intelligence and data mining, such as computer vision, data mining, speech recognition, text processing, bioinformatics. Course coverage includes an understanding of the diverse, emerging computer architectures designed for efficient execution of machine learning such as CPU, GPU, Tensorflow Basics		
15441	Open Source Analysis	Pre-requisite: 15333	Credit Hours: 3
	This course aims to provide an overview about open source and its information. The course will give the students an ability to collect and analyze open source information, use open source in vulnerability assessment (Pent/Red/Blue), use open source analysis in Malware analysis.		
15442	Intelligent Threat Detection	Pre-requisite: 15333	Credit Hours: 3
	This course aims to introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given security scenario. This include non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.		
15450	Digital Forensics and Incident Response	Pre-requisite: 11335	Credit Hours: 3
	This course serves as general introduction to the field of Digital Forensics. It covers a number of topics fundamental to the area of digital forensics investigation. Such topics include an overview of computer hardware and digital media and storage formats, data acquisition and validation techniques, forensic methodologies, network traffic analysis, legal issues surrounding forensic investigation, professionalism and ethics, and future development in the field. In addition, the course introduces students to best practices and standards related to incident response.		
15451	Digital Forensics and Incident Response Lab	Co-requisite: 15450	Credit Hours:
	In this lab, students will start practicing digital forensics in a lab environment using the most commonly used and accredited tools in the field. Students will learn and practice the basics of forensics, deal with evidence media and environment, collect evidence, storage formats, apply validation techniques, evaluate forensic methodologies, conduct evidence analysis, report and present outcomes of forensic investigation.		

15452	Advanced Forensics	Pre-requisite: 15450	Credit Hours: 3

This course introduces the methodology and procedures associated with digital forensic analysis of incidents that involve internet, computer, network and mobile forensic. Topics including: configuring a secure OS using command line and graphical utilities. OS file systems architectures, security vulnerabilities, user security, hardening, data and file recovery. network data acquisition, network forensics analysis, network logs and traffic acquisition and analysis, managing Intrusion Detection/ Prevention Systems (IDS/IPS), Managing Security Incident and Event Management (SIEM) systems, etc. mobile technology, mobile devices and cellular networks then to the processes, methods and techniques of mobile forensics. Students will learn about the importance of network forensic principles, legal considerations, digital evidence controls, and documentation of forensic procedures. They will be required to take on the role of problem solvers and apply the concepts presented to situations that might occur on any computer. Students will perform actual mobile forensics investigations using state-of-the-art tools: commercial and open-source.

15460	Hacking Techniques and Detection Intrusion	Pre-requisite: 15450	Credit Hours: 3

This course covers the most common methods used in computer and network hacking with the intention of learning how to better protect systems from such intrusions. These methods include reconnaissance techniques, system scanning, accessing systems by network and application level attacks, and denial of service attacks. Finally, Basic Malware Analysis methods and tools will be studied at the end of this course

15461	Smart Cards/Tokens Security and Applications	Pre-requisite: 15260	Credit Hours: 3

This course will introduce various applications that exploit smart cards/tokens. Examine benefits, threats and attacks. Consider systems for the development, manufacture and management of smart cards/tokens. Review smart card standards and security evaluation methodologies. Topics include: An introduction to smart cards, Smart Cards Trusted Production Environment, Introduction to IoT (Internet of Things), An Overview of Multi-Application Smart Card Operating Systems and Platforms, Smart Cards for Secure Banking and Finance, Applications & Security for Mobile Communications, USIM/SIM and Services, ID Cards and Passports, RFID/ NFCs Explained, Advances in Chip-card Technology, Security For Video Broadcasting, Evaluating Smart Card Security with the Common Criteria, Security Attacks, Countermeasures and Testing for Smart Cards, Application Development Environments for Multos, Overview of Trusted Platform, Introduction to TEE and Related Processors.

15480	Security Testing Theory and Practice	Pre-requisite: 15321	Credit Hours: 3

This course presents the Security Testing foundations as a form of software testing that uncovers vulnerabilities, threats, risks in a software application, and prevents intruders from malicious attacks. In this course, the students must recognize all potential software system vulnerabilities that could result in a loss of knowledge, income, and credibility at the hands of the organization's employees or outsiders. The topics of this course will include: an overview of Security Testing and its types, how to conduct Security Testing with the provision of some Security Testing Scenarios, Security Testing Mechanisms, and Security Testing Tools. At the end of this course, the students will be able to recognize the risks in the system and calculate their possible weaknesses, so that the system does not stop working or is abused. This course will also help students detect all possible security risks in the system and how coding can fix these problems.

15481	Electronic Crime for Law Enforcemen	Pre-requisite: 15233	Credit Hours: 3

The global reach of the Internet, the low marginal cost of online activity, and the relative anonymity of users have contributed to a wide escalation in cybercrimes. Consequently, information and communications technologies (ICT) are being increasingly employed to instigate threats to global civil society. This course provides an overview of cybercrime and the digital law enforcement practices put in place to respond to them. The course will focus on the types and extent of current cybercrimes, how the justice system responds to these crimes, the various constitutional protections afforded to computer users, the law and policies that govern cybercrime detection and prosecution, and related technologies.

15482	System Auditing and Security Polices	Pre-requisite: 15233	Credit Hours: 3

This course aims at introducing the foundations of auditing information systems for the purposes of security and forensics. It covers the concepts of the policies, audit process, governance, and compliance regulations, as well as the latest technology tools. Students will learn the role of an auditor and the types of audits performed, various information security and audit frameworks, as well as the tools and techniques of auditing technical controls, foundations of auditing operating systems, and foundations of auditing applications. In addition, this course will cover the following topics: the information systems audit process, data collection methodologies, regulations and compliance, auditing, vulnerability testing, penetration testing, auditing technical controls, auditing networks & operating systems, and auditing business application systems.

15490	Practical Training	Pre-requisite: Finish 90 C.H	Credit Hours: 3
	The student is required to do practical training in a well-known software company for a period of (2) months, fulltime training, with at least (6) hours per day, or 3 months part-time training with at least (4) hours per day. In addition to training hours, for the part-time training, the student is allowed to register not more than (10) credit hours in the first or the second semester, or (4) credit hours in the summer semester. The student is required to perform tasks that are related to his major, such as writing, developing, or learning some new software.		
15491	Graduation Project (1)	Pre-requisite: Finish 90 C.H	Credit Hours: 1
	Project is aimed at developing real world problem solving skills, including problem definition, analysis, and needed software. A project should be performed by a group of students under the supervision of a faculty member. Students are required to develop a complete implementation fulfilling the project objectives and submit a final report. Project must be presented to a committee of the faculty.		
15492	Graduation Project (2)	Pre-requisite: 15491	Credit Hours: 1
	Project 2 aims at implementing the planned requirements, which were collected in Project 1 Students must work in groups to achieve a functional system at the end of this course. Students must test the product / system and that should be included in the documentation.		
15493	Special Topics in Cybersecurity (1)	Pre-requisite: Department Approval	Credit Hours: 3
	This course aims to introduce new topics in cybersecurity. A series of advanced topics in areas of cybersecurity is offered. The course details a structured discussion of varied subjects to include technological updates related to a specific track, a more intense study of topics covered in other course offerings, and an introduction to advanced concepts. The department determine the content of the course.		
15494	Special Topics in Cybersecurity (2)	Pre-requisite: Department Approval	Credit Hours: 3
	This course aims to introduce new topics in cybersecurity. A series of advanced topics in areas of cybersecurity is offered. The course details a structured discussion of varied subjects to include technological updates related to a specific track, a more intense study of topics covered in other course offerings, and an introduction to advanced concepts. The department determine the content of the course.		

15495	Cyber Competition CTF (Capture the Flag)	Pre-requisite: 15491	Credit Hours: 3
	This course aims to build practical skills on how to apply cyber skills in a Capture the Flag exercise to fully integrate learning with a practical exercise to asses and develop cyber skills.		

King Abdullah II School of Engineering

Basic Sciences

20131	Calculus for Business	Pre-requisite: None	Credit Hours: 3
	Linear Equations and Inequalities, Graphs and Lines, Quadratic Functions, Exponential Functions, Logarithmic Functions, Basic Differentiation Properties, Marginal Analysis in Business and Economics, Derivatives of Exponential and Logarithmic Functions, Derivatives of Products and Quotients, Chain Rule, Implicit Differentiation, Related Rates, Elasticity of Demand, First Derivative and Graphs, Optimization, Concavity and Points of Inflection, Antiderivatives and Indefinite Integrals, Integration by Substitution, Definite Integrals, Applications in Business and Economics, Integration by Parts, Functions of Several Variables, Partial Derivatives, Maxima and Minima for Functions of Two Variables and their Applications in Business.		
20132	Calculus (1)	Pre-requisite: None	Credit Hours: 3
	Topics of study: Functions and their Graphs, Combining Functions, Shifting and Scaling, Trigonometric Functions, Exponential Functions, Inverse Functions and Logarithms, Inverse Trigonometric Functions, Tangents to Curves, Limits of a Function and Limit Laws, Continuity, the Intermediate Value Theorem, Limits Involving Infinity, Asymptotes, Tangents and Derivatives at a Point, the Derivative as a Function, Differentiation Rules, Derivatives of Trigonometric Functions, the Chain Rule, Implicit Differentiation, Derivatives of Inverse Functions and Logarithms, Derivatives of Inverse Trigonometric Functions, Extreme Values of Functions, Rolle's Theorem, the Mean Value Theorem, Monotonic Functions and the First Derivative, Concavity and Inflection Points, Curve Sketching, Indeterminate Forms and L'Hopital's Rule, Antiderivatives, Definite Integrals, the Fundamental Theorem of Calculus, Indefinite Integrals and the Substitution Method, Applications of Definite Integrals: Area Between Curves, Volumes of Solids: Slicing Method, Disc Method, Washer Method, and Cylindrical Shell Method.		
20133	Calculus (2)	Pre-requisite: 20132	Credit Hours: 3
	Hyperbolic Functions, Integration of Transcendental Functions, Techniques of Integration: Integration by Substitution (Review), Integration by Parts, Integration Including Powers of Trigonometric Functions, Integration by Trigonometric Substitution, Partial Fractions, Other Techniques, Improper Integrals, Sequences, Limit of Sequence; Series: Convergent and Divergent Series; Series Tests for Convergence: Partial Sums, Telescoping Series, Geometric Series, Base Divergence Test, Integral Test, P-series Test, Ratio Test, Root Test, Absolute Convergence Test, Alternating Series Test, Conditional Convergence; Power Series and Taylor Series, Interval and Radius of Convergence, Parametric Equations of Curves in Plane, Polar Coordinates, Graphs in Polar Coordinates.		

20134	Discrete Math (1)	Pre-requisite: None	Credit Hours: 3
	Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Rules of Inference, Proof Methods, Sets and Their Operations, Functions, Cardinality of Sets, Sequences and Summations, Matrices, Mathematical Induction, Solving Linear Recurrence Relations, Relations and Their Properties, Graphs and Graph Models, Graph Terminology and Special Types of Graphs.		
20135	Discrete Math (2)	Pre-requisite: 20134	Credit Hours: 3
	Application of Number Theory, The Basis of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Representing Relations, Closures of Relations, Equivalence Relations and Partitions, Representing Graphs, Graphs Isomorphism, Connectivity, Euler and Hamilton Paths, Trees, Spanning Trees, Boolean Functions, Representing Boolean Functions.		
20140	Basic Concepts in Chemistry	Pre-requisite: None	Credit Hours: 1
	Matter and Measurements; Atoms, Molecules, and Ions; The Periodic Table; Ions and Ionic Compounds; Stoichiometry: Calculations with Chemical Formula and Equations; Avogadro's Number and the Mole; Basic Concepts of Chemical Bonding; Gases: Pressure, The Gas Laws, and the Ideal-Gas Equation.		
20141	Physics (1)	Pre-requisite: None	Credit Hours: 3
	Physics and Measurement, Motion in One Dimension, Vectors, Motion in Two and Three Dimensions, Newton's Laws of Motion, Circular Motion and Other Applications of Newton`s Laws, Work and Energy, Conservation of Energy, Conservation of Linear Momentum and Collisions, Rotational Motion.		
20142	Physics (2)	Pre-requisite: 20141	Credit Hours: 3
	Electric Fields, Gauss's Law, Electric Potential, Capacitance and Dielectrics, Current and Resistance, Direct-Current Circuits, Magnetic Fields, Sources of Magnetic Fields, Faraday's Law, Inductance.		
20147	Physics Lab	Co-requisite: 20141	Credit Hours: 0
	Basic Measurements (I), Basic Measurements (II), Introduction to Errors and Graphs, Resultant of Many Forces, The Laws of Motion, Simple Harmonic Motion (I): Single Spring, Simple Harmonic Motion (II): Two Springs, Inertia of Different Objects.		

20150	Physics Lab	Co-requisite: 20142	Credit Hours: 1
	Basic Measurements and Introduction to Errors and Graphs, Static Equilibrium, The Laws of Motion, Ohm's Law, Resistance and Resistivity, Power Transfer, Wheatstone Bridge, Kirchhoff's Rules, RC-circuits, AC Circuits: RC- and RL-Circuits.		
20200	Technical Writing and Communication Skills	Pre-requisite:31111 , 31121	Credit Hours: 3
	Engineering and Writing: Controlling the Writing System. Letters, Email, and Other Media for Engineers. Writing Style for Business Correspondence, Communication Strategies for Tricky Situations, Business Letters, Email, New Internet Media. Writing Common Engineering Documents: Research, Laboratory, and Field Reports, Specifications, Proposals, Progress Reports, Instructions, Recommendation Reports. Writing Research Paper and Design Reports. Constructing Engineering Tables and Graphics: Tables, Charts and Graphs, Illustrations, Graphics and Tables (Guidelines). Engineering Your Speaking: Preparing The Presentation, Delivering the Presentation. Writing to Get an Engineering Job: Engineering Resume, Application Letter, Follow-Up Letter. Engineering Your Online Reputation: Introduction to Social Media Management.		
20231	Calculus (3)	Pre-requisite: 20133	Credit Hours: 3
	Three Dimensional Coordinate System, Vectors, Dot and Cross Products, Lines and Planes in Space, Cylindrical and Quadric Surfaces, Curves in Space and Their Tangents, Integral of Vector Functions, Arc Length in Space, Curvature and Normal Vectors of a Curve, Tangential and Normal Components of Acceleration, Velocity and Acceleration in Polar Coordinates, Functions of Several Variables, Limits and Continuity in Higher Dimensions, Partial and Directional Derivatives, Chain Rule, Gradient Vector, Tangent Planes and Normal Lines of Surfaces in Space, Differentials, Extreme Values and Saddle Points, Lagrange Multipliers, Double Integrals in Cartesian and Polar Coordinates, Triple Integrals in Cartesian, Cylindrical and Spherical Coordinates.		
20232	Engineering Mathematics (1)	Pre-requisite: 20133	Credit Hours: 3
	Basic Concepts and Ideas of ODEs, First-order Differential Equations, Separable Equations, Exact Equations, Linear and Bernoulli Equations, Second-order and Higher Order ODEs, Homogeneous Equations with Constant Coefficients, Complex Roots, Euler-Cauchy Equation, Wronskian, Non-homogeneous Equations, Undetermined Coefficients, Variation of Parameters, Power Series Method, Theory of Power Series, Frobenius Method, Laplace Transforms and Tables, Applying Laplace Transforms to Solve ODEs, Convolution, Vectors and Matrices, Homogeneous Systems of ODEs, Nonhomogeneous Systems of ODEs, Solving Systems Using Eigenvalues and Laplace Transform.		

20233	Statistical Methods	Pre-requisite: None	Credit Hours: 3
	Introduction to Statistics: Data and Data Sources, Populations and Samples, Variables, Organizing Data, Contingency Tables; Visualizing Data: Charts, Scatter Plots; Descriptive Statistics: Central Tendency Measures, Measures of Variation, Quartiles, Symmetry and Skewness; Elements of Probability Concepts: Conditional Probability, Probability Independence, The Probability Distribution for a Discrete Variable, Binomial Distribution, Geometric Distribution, Poisson Distribution and Hypergeometric Distribution, Continuous Probability Distributions; The Normal Distribution: Sampling Distributions, Sampling Distribution of the Mean; Confidence Interval: Estimate for the Mean (σ Known), and Confidence Interval Estimate for the Mean (σ Unknown). Hypothesis-Testing for the Mean (σ Known), t-Test of Hypothesis for the Mean (σ Unknown); The Simple Linear Regression Equation Correlation.		
20234	Linear Algebra	Pre-requisite: None	Credit Hours: 3
	System of Linear Equations: Row-echelon Form, Gaussian Elimination, Gauss-Jordan Method; Matrix: Operations, Properties of Matrix Arithmetic, Matrix Transpose, Special Matrices; Determinants: Properties of Determinants, The Method of Cofactors, Adjoint Matrix and Inverse of a Matrix, Cramer's Rule; Euclidean n-space: Vectors, Dot Product, Cross Product, Euclidean n-space, Linear Transformations; Vector Spaces: Vector Spaces, Subspaces, Span, Basis and Dimensions, Fundamental Subspaces, Inner Product Spaces, Orthogonal and Orthonormal Basis, Least Squares, QR- decomposition, Orthogonal Matrices; Eigenvalues and Eigenvectors: Eigenvalues and Eigenvectors, Diagonalization. Linear Transformations: General Linear Transformations, Kernel and Range.		
20235	Statistical Methods for Business	Pre-requisite: None	Credit Hours: 3
	Introduction to Statistics: Data and Data Sources, Populations and Samples, Variables, Organizing Data, Contingency Tables, Visualizing Data, Charts, Scatter Plots; Descriptive Statistics: Central Tendency Measures, Measures of Variation, Quartiles, Symmetry and Skewness; Elements of Probability Concepts: Conditional Probability, Independent Events; The Probability Distribution for a Discrete Variable: Binomial Distribution, Probability Distribution of Continuous Variables; The Normal Distribution: Sampling Distributions, Sampling Distribution of the Mean. Confidence Interval: Estimate for the Mean (σ Known), and Confidence Interval Estimate for the Mean (σ Unknown). Hypothesis-Testing for the Mean (σ Known), t-Test of Hypothesis for the Mean (σ Unknown); P-value, The Completely Randomized Design: One-Way ANOVA; The Simple Linear Regression Equation Correlation.		
20242	Materials Physics and Chemistry for Engineers	Pre-requisites: 20132 , 20142	Credit Hours: 3
	The Crystal Structure of Solids and Crystal Defects, Bonding in Solids, Polymers, Electronic Theory of Solids, Superconductivity, Magnetism in Matter, Optical Properties of Materials and Optical Devices, Basic Concepts in Nano Structures and Thin Films.		

20251	History of Science	Pre-requisite: None	Credit Hours: 3
	Classification of the Sciences, The Importance of the History of Science, Historical Periodization of Natural Science in the Mediterranean Basin, Epistemological Periodization of Natural Science, Natural Philosophy, Aristotle's Cosmology and Physics, Greek Astronomy, Arabic Astronomy, The Scientific Revolution: Copernicus, Tycho, Gilbert, Kepler, Galileo, Descartes, Newton.		
20252	The Arabic-Islamic Scientific Heritage	Pre-requisite: None	Credit Hours: 3
	Arabs and Muslims as Builders of a Civilization; Ancient Civilizations: Mesopotamia, Egypt, the Greek, the Hindu and Chinese; Transmission of Foreign Literature, Learning, Schools and Learning Resources, Experimenting and Observations; Mathematics and Geometry, Astronomy, Astronomical Instrumentation, Timekeeping and Calendars, Mechanics, Chemistry, Medicine and Pharmacy, Hospitals, Industry, Geography, Aviation, Posting and Communications, Irrigation and Care of Rivers.		
20331	Engineering Mathematics (2)	Pre-requisites: 20231 , 20232	Credit Hours: 3
	Vector Fields, Divergence of a Vector Field, Curl of a Vector Field, Line Integrals, Path Independence of Line Integral, Green's Theorem in the Plane, Surface Integrals, Divergence Theorem for Gauss, Stoke's Theorem, Fourier Series, Functions of Any Period, Even and Odd Extensions, Fourier Integral, Fourier Transforms; PDEs: Basic Concepts; Modeling: Vibrating String, Wave Equation, Separation of Variables, One-dimensional Heat Equation; Heat Equation: Solution by Fourier Transforms, Laplacian in Polar Coordinates, Laplace's Equation in Cylindrical and Spherical Coordinates, Solution by Laplace Transform.		
20332	Operations Research	Pre-requisite: 20133	Credit Hours: 3
	Introductory Steps of OR, Linear Programming, Graphic Solutions, Simplex Method, Dual Problem, Sensitivity Analysis, Special Linear Programming Problems (Transportation, Assignment, and Transshipment), Project Scheduling (CPM and PERT), Projects.		
20333	Numerical Analysis	Pre-requisite: 20133	Credit Hours: 3
	Error Analysis, Iterative Methods for Solving Linear and Nonlinear Equations of One Variable, System of Linear Algebraic Equations, Direct Methods for Solving Linear Systems, Iterative Methods for Solving Linear and Nonlinear Systems of Equations, Interpolation and Approximation, Introduction to Numerical Differentiation and Integration, Numerical Methods for Solving Initial Value Problem.		

20335	Applied Probability and Statistics	Pre-requisite: 20231	Credit Hours: 3
	Introduction to Descriptive Statistics: Measures of Central Tendency, Measures of Dispersion, Measures of Position, and Graphical and Tabular Displays; Introduction to Inferential Statistics: Point Estimate, Confidence Interval and Hypothesis Testing; Basic Probability and Set Theory, Conditional Probability and Independence, Random Variables and Moments, Special Probability Distributions (Discrete and Continuous Distributions), Multiple Random Variables, Covariance and Correlation Coefficient, Functions of Random Variables, Transforms and Moment Generating Function, Practical Applications.		
20336	Principles of Probability	Pre-requisites: 20133 , 20233	Credit Hours: 3
	Distributions of Random Variables, Conditional Probability and Stochastic Independence, Some Special Distributions (Discrete and Continuous Distributions), Univariate, Bivariate and Multivariate Distributions, Distributions of Functions of Random Variables (Distribution Function Method, Moment Generating Function Method, and Transformation Methods), Limiting Distributions.		

Electronics Engineering

21218	Engineering Drawing Lab	Pre-requisite: 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.		
21219	Engineering Workshop	Pre-requisite: None	Credit Hours: 1
	Industrial and personal safety at site, basic electrical components and instruments. Electrical wiring and printed circuit boards. Covers the design thinking methodology to identify and address engineering problems. Includes solid modeling, rapid prototyping, understanding end users, their unarticulated needs, and creating alternative solutions. Focus on creativity, identify potential solutions, and innovation of new products and work processes.		
21221	Electric Circuits (1)	Pre-requisite: 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 step forcing function. The RLC circuit: source-free parallel and series RLC and complete response. Sinusoidal forcing function. Phasor concept.		
21222	Electric Circuits (2)	Pre-requisite: 21221	Credit Hours: 3
	The sinusoidal steady state response: application of phasor concept and circuit analysis techniques AC circuits. Average power and RMS values. Types of Electrical Machines. Poly-phase circuits: three phase (Y) and (Δ) connection. Complex frequency. Frequency response and Bode plot. Magnetically coupled circuits. Two-port networks.		
21229	Electric Circuits Lab	Co-requisite: 21222	Credit Hours: 1
	DC circuit: Kirchhoff's laws and mesh analysis. Thevenin's and Norton's theorems. Superposition theorem. Wheatstone bridge. Transient response: RL, RC, and RLC circuits. AC circuits: impedance concept, frequency response, three-phase circuits. Y- Δ transformation. Maximum power transfer. Two-port networks.		

21231	Electronics (1)	Pre-requisite: 21221	Credit Hours: 3
	Basic semiconductor concepts. Diodes: DC and AC analysis, special type diodes. Theory of Bipolar Junction Transistors (BJT): biasing techniques, BJT amplifier analysis. Field Effect Transistors (FET): biasing techniques, FET amplifier. Simple applications of BJT's and FET's.		
21331	Electronics (2)	Pre-requisite: 21231	Credit Hours: 3
	Operational amplifiers: basic theory, characteristics and applications. BJT and MOSFET current mirrors. Differential and multistage amplifiers. Frequency response of single and multistage BJT and CMOS amplifiers. Negative feedback analysis: feedback topology, properties and stability analysis. Operational amplifier design and simulations project.		
21332	Digital Electronics	Pre-requisite: 21331	Credit Hours: 3
	Introduction to logic families: Resistor Transistor Logic (RTL), Transistor-Transistor Logic (TTL), Emitter-Coupled Logic (ECL), Complementary Metal-Oxide Semiconductor logic (CMOS), and BiCMOS. Introduction to CMOS fabrication and layout concepts. Sequential circuits (latches and flip-flops) and memories (SRAM, DRAM, ROM). Analog to digital converter and digital to analog converter. Multivibrator and Schmitt trigger circuits and application.		
21338	Electronics Lab	Pre-requisite: 21229 Co-requisite: 21331	Credit Hours: 1
	Diode characteristics and applications. BJT characteristics and DC biasing. FET characteristics and DC biasing. BJT amplifiers. Operational amplifiers. Multistage amplifiers. Differential amplifiers. Frequency response. Feedback techniques.		
21339	Digital Electronics Lab	Pre-requisite: 21229 Co-requisite: 21232	Credit Hours: 1
	Basic TTL circuits. TTL characteristics. Basic MOS logic circuits. MOS characteristics. Logic gate-based oscillators. Sampling circuits. A/D and D/A converters. Introduction to Hardware Description Language (HDL).		
21431	Communication Electronics	Pre-requisites: 21331 , 23357	Credit Hours: 3
	Power amplifiers: classification of output stage A, B, C, and AB. Efficiency analysis of power amplifiers and basic techniques in heat sink design. Tuned amplifier: theory and design. Oscillators: LC and crystal oscillators. Modulation and demodulation circuits and synthesizers. Phase-Locked Loop (PLL): theory and design. Active and passive filters.		

21432	Optical Electronics	Pre-requisite: 21331	Credit Hours: 3
	Semiconductor concepts and energy bands. Direct and indirect band gap semiconductors. PN junction principles. The PN junction band diagram. Light-Emitting Diodes. LED materials. Heterojunction high intensity LEDs. LED characteristics. LED for optical fiber communications. Introduction to LASER stimulated emission devices. Photodetectors. Photovoltaic devices. Principles of fiber-optic communication links.		
21439	Communication Electronics Lab	Pre-requisite: 21338 Co-requisite: 21431	Credit Hours: 1
	Power amplifier. Oscillators. Modulation and demodulation circuits. Phase Locked Loop (PLL) circuits. Active filters.		
21490	Practical Training	Pre-requisite: Finish 99 Credit Hours	Credit Hours: 3
	Students undertake suitable and supervised internships for a period of 8 consecutive weeks in Jordan, or 6 consecutive weeks outside. Grade: Pass / Fail		
21531	Very Large Scale Integrated (VLSI) Circuits	Pre-requisite: 21332	Credit Hours: 3
	Introduction to the digital design flow cycle. Design and techniques for rapid implementation and evaluation of very large scale integrated circuits, including behavioral, and functional logic circuits and devices. Physical IC fabrication and layout issues. CMOS technology. Logic and transmission gates. Switching characteristics and processing.		
21533	RF Microelectronics	Pre-requisites: 21331, 23357	Credit Hours: 3
	Communication systems overview. Transceiver architectures. S-parameters and impedance transformers. MOS transistors, passive components and gain-bandwidth issues for broadband amplifiers. High frequency broadband amplifiers. Low-noise amplifiers. Voltage controlled oscillators. Mixers. Power amplifiers: class 'A', 'B' and 'C'. Advanced RF topics.		
21534	Mixed Signal IC Design	Pre-requisite: 21331	Credit Hours: 3
	Introduction to data communications IC design terminology, signal integrity and signaling conventions. Data transmission media and noise sources. Transistor-level design techniques for timing circuits: phase-locked loops, delay-locked loops, clock and data recovery. Phase-locked loops components: phase/frequency detectors, charge pumps and voltage controlled oscillators. Interface, signal conditioning and wave shaping techniques. Current mode and voltage mode drivers. Transceiver analysis and design. Concepts of power, speed, and signal integrity.		

21535	Solid State Electronics	Pre-requisite: 21231	Credit Hours: 3
	The crystal structure of solids. Introduction to the quantum mechanics of solids: Heisenberg's uncertainty principle, the Schrodinger equation, the free electron problem, the step potential, the Kronig-Penney model, the simple harmonic oscillator. Introduction to the quantum theory of solids: the Fermi-Dirac distribution function. Introduction to semiconductor physics: carrier transport in semiconductors. Introduction to semiconductor diodes. Introduction to the bipolar junction transistor. Introduction to the field-effect transistor.		
21536	Analog IC Design	Pre-requisite: 21331	Credit Hours: 3
	Basic analog circuit blocks: reference bias circuits, comparators, operational amplifiers and sample-and-hold amplifiers. Concepts of stability, bandwidth, gain bandwidth product, frequency response and gain response. Switched-capacitors circuit techniques. Integrated circuit analog-to-digital converters and topologies: flash, pipeline, and successive rate approximation. Digital-to-analog convertors: current mode and resistor ladder topologies. Concepts of resolution and speed for data convertors. Filter design techniques using operational amplifiers and GmC based integrated circuits. Concepts of bandwidth, filter order, and stability.		
21572	Industrial Electronics	Pre-requisite: 24471	Credit Hours: 3
	DC & AC bridges. Ammeters. Voltmeters. Power measurements and power meters. Loading effects. Sensors: thermal, mechanical, optical. Relay controllers and ladder diagrams. Analog controllers (P), (PI) and (PID). Digital and programmable logic controllers.		
21573	Image Processing	Pre-requisite: 23351	Credit Hours: 3
	Enhancement in the spatial domain. Image enhancement in the frequency domain. Image restoration. Color image processing. Wavelets. Image compression. Morphological image processing. Image segmentation.		
21574	Medical Electronics	Pre-requisite: 21331	Credit Hours: 3
	Basic sensors. Bio-potential signals. Bio-potential amplifier circuits. Blood pressure measurements. Heart sound measurements. Blood flow measurements. Respiratory system measurements. Clinical laboratory instrumentation. Therapeutic and prosthetic devices. Introduction to medical imaging systems. Four practical lab experiments.		
21579	Industrial Electronics Lab	Pre-requisite: 21338 Co-requisite: 21572	Credit Hours: 1
	Experiments covering: Analysis and measurement of various sensing circuits; including RTD, thermistor, thermocouple, IC temperature sensor, strain gauge, ultrasonic, capacitive, and infra-red sensors. Programmable logic controller application.		

21581	Special Topics in Electronics Engineering	Pre-requisite: To be set by the Dept.	Credit Hours: 3
	The objective of this course is to introduce advanced and new topics in one of the areas of electronics engineering. The topics can be changed from one year to another depending on the instructor's area of specialty.		
21591	Senior Design Project (1)	Pre-requisite: Finish 120 Credit Hours	Credit Hours: 1
	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.		
21592	Senior Design Project (2)	Pre-requisite: 21591	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.		

Computer Engineering

22241	Digital Logic Design	Pre-requisite: 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 HDL. Memory devices and systems: RAM, ROM, FIFO, LIFO and DRAM.		
22348	Digital Logic Lab	Pre-requisite: 22241	Credit Hours: 1
	This lab introduces students to the fundamentals of designing and building digital circuits using hardware ICs as well as HDL. The lab includes an introduction to HDL, and focuses on building combinational circuits such as parallel adder, multiplexers and decoders using HDL and hardware components. The second part of the lab deals with building sequential circuits in hardware and describing them in HDL using behavioral modeling.		
22442	Embedded Systems	Pre-requisites: 21231, 22348	Credit Hours: 3
	Embedded systems characteristics. Microprocessors versus microcontrollers. Microcontroller characteristics. General-purpose microcontrollers. Examples of microcontroller architectures. Interrupts. Counters/timers. Input/output ports. Microcontroller programming. Instruction set. Program development and use of assemblers. Memory maps and addressing modes. Digital to analogue and analogue to digital conversion in microcontrollers. Data acquisition and distribution. Serial and parallel communications. Real-time systems and its constraints. Interfacing to external devices. Power consumption consideration. Applications.		
22443	Computer Networks	Pre-requisites: 20335, 23355	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.		
22344	Microprocessors	Pre-requisites: 22241 , 21231	Credit Hours: 3
	Assembly language instruction set. Addressing modes. Arithmetic instructions. Logical and bit manipulating instruction. I/O instructions. Microprocessor pin out and timing diagram. Address decoding circuits. Memory interfacing. Input output interfacing. Serial and parallel communications. Counter and timers. Interrupts. DMA controllers.		

22320	Computer Architecture (1)	Pre-requisite: 22241	Credit Hours:3
	Register transfer & micro-operations. Design of arithmetic logic unit. Computer Instructions. Number representations and computer arithmetic. Computer organization and components. Processor design: data-path and control units. Instruction cycle. Pipelining.		
22321	Computer Architecture (2)	Pre-requisite: 22320	Credit Hours: 3
	Technology trends. Computer performance: CPU time equation, benchmarks, die cost, power and Amdahl's law. Instruction-level parallelism: pipeline review, pipeline hazards, superscalar processors, static multiple issue, VLIW, dynamic scheduling, speculative execution and branch prediction. Memory hierarchy: caches, cache performance, advanced cache designs, memory organization and virtual memory. Storage and I/O: performance, disk storage, flash storage, system and I/O busses and RAID. Parallel computers: shared-memory multiprocessors, coherence protocols, NUMA, message passing, clusters, multithreading and multi-core processors.		
22420	Computer Design Lab	Pre-requisite: 22321	Credit Hours 1
	Digital systems design, simulation and FPGA implementation using HDL Languages. Finite State Machines. Implementing algorithms in hardware. Introduction to the development of dedicated embedded systems based on soft processors using high-level programming languages.		
22448	Embedded Systems Lab	Pre-requisite: 22442	Credit Hours: 1
	Advances in Microcontroller-Based Embedded Systems and Microcontrollers, Model-Based Embedded Software Design, Auto-code generation and Rapid Prototyping. Interfacing Digital, Analog and Serial Communication peripherals and devices.		
22449	Computer Networks Lab	Pre-requisite: 22443	Credit Hours:1
	Router and switch basic configuration and security management. Routing protocols configuration. VLANs and VLAN routing mechanisms. Natting, and DHCP configuration and management. Leased lines configuration and security management. Utilizing IPv6 and implementing IPv6 routing protocols.		
22460	Operating Systems and Security	Pre-requisites: 25330, 11212	Credit Hours 3
	This course explores both fundamentals and advanced topics in operating systems and security. Topics include historical aspects of operating systems development, process handling, synchronization of concurrent processes, memory segmentations, I/O and file systems, basic OS security techniques such as authentication, system call monitoring, and buffer overflow exploitation. Additionally, the course will cover policies in investigating and defending against real-world attacks on computer systems, such as self-propagating worms, stealthy rootkits and large-scale botnets.		

22461	Operating Systems and Security Lab	Co-requisite: 22460	Credit Hours:1
	This lab emphasizes on applying the principles and concepts of operating systems. It also emphasis on discovering and exploiting the vulnerabilities of the standard operating systems. Additionally, the lab focuses on using tools and techniques to decrease risks arising from vulnerabilities in Microsoft Windows operating systems, Linux and Android.		
22466	Mobile Application Programming	Pre-requisite: 11206	Credit Hours:3
	This course discusses mobile application programming for mobile devices such as smart phones, tablets, and pads. It focuses on developing mobile platform. A specific programming language along with the necessary libraries of reusable software components of a mobile platform will be introduced. Students will explore the key theories, principles, concepts, tools current issues, and best practices of designing and developing applications for mobile devices. Upon course completion, students are expected to produce an innovative mobile solution for a real life situation.		
22490	Practical Training	Pre-requisite: Finish 99 Cr. Hrs	Credit Hours: 3
	Students undertake suitable and supervised internships in an approved institute for a period of 8 consecutive weeks in Jordan, or 6 consecutive weeks abroad. Credit Grade: Pass / Fail		
22520	Parallel Processing	Pre-requisite: 22321	Credit Hours: 3
	Fundamental concepts of parallel processing and parallel architectures. Parallel programming paradigms: Distributed-memory (message-passing) and shared-memory programming. Parallel algorithms design and implementation. Performance analysis: speedup, efficiency, and scalability. Parallel programming environments and tools.		
22530	Software Reverse Engineering	Pre-requisite: 22442	Credit Hours: 3
	This course introduces the students to the principles and concepts of Software Reverse Engineering. The course places emphasis on reversing and analyzing the binary file of both Microsoft Windows and Linux operating systems in order to review, assess and exploit the software. The course also covers Reverse Engineering ethics, basic and advanced malware analysis, copyright protection, and anti-reversing techniques.		
22542	Advanced Computer Networks	Pre-requisite: 22443	Credit Hours: 3
	Review of the OSI reference model. Logical link control. HDLC. Multiplexing. WANs. ATM. Frame relay. Ethernet LANs and VLANs. Wireless LANs.		

22543	Digital System Design	Pre-requisite: 22321	Credit Hours: 3

Modern design methodology: register transfer level modeling (RTL), algorithmic state machines (ASMs), introduction to hardware description languages (Verilog), system-level modeling and simulation, use of hardware description languages to implement hybrid sequential and combinational designs. Design and implementation of significant digital designs using representative Computer Aided Design (CAD) tools.

22545	Neural Networks and Fuzzy Logic	Pre-requisites: 11212 , 22241	Credit Hours: 3

Introduction to Artificial Neural Networks (ANN) and fuzzy systems. The Perceptron. Perceptron learning rule. Multi-layer perceptron. Hebbian learning algorithm and its variations. Widrow-Hoff learning algorithm and its applications. The Back Propagation (BP) learning algorithm and its variations. Unsupervised learning. Self-organization maps. Associative learning rules. Unsupervised Hebb rule. Instar rule. Outstar rule. Radial basis networks. Hopfield networks. Recurrent ANNs. Reinforcement learning via Approximate Dynamic Programming (ADP). Fuzzy set theory. Fuzzy logic. Fuzzy membership functions. Fuzzy relations. Fuzzy implications. Fuzzification and defuzzification. Fuzzy rule base and fuzzy inference engine. Applications: control systems, robotics, pattern recognition, nonlinear system modeling, speech processing, image processing, filtering systems, machine/artificial intelligence, data mining and knowledge discovery.

22546	Network Management and Security	Pre-requisite: 22443	Credit Hours 3

Network management overview. Security policy and procedures. Cryptography and its application to network security. Authentication. Intrusion detection and prevention. Securing e-Commerce systems. Web security. Firewalls security implementation. Application of security tools. Wireless security technologies. Disaster recovery and continuation of e-Business functions.

22560	Network Programming and Applications	Pre-requisites: 22443, 22460	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).

22570	Artificial Intelligence and Machine Learning	Pre-requisites: 20234, 11212, 20335	Credit Hours: 3

This course consists of two parts; the first part of the course covers the fundamentals of AI, and techniques like Fuzzy logic, evolutionary algorithms, and Neural Networks. The second focuses on machine learning techniques; supervised learning, unsupervised learning, recommender systems, and deep learning.

22582	Special Topics in Computer Engineering (1)	Pre-requisite: To be set by the Dept.	Credit Hours: 3
	The objective of this course is to introduce advanced and new topics in one of the areas of Computer Engineering. The topics may be changed from one year to another depending on the instructor's area of specialty.		
22583	Special Topics in Computer Engineering (2)	Pre-requisite: To be set by the Dept.	Credit Hours: 3
	The objective of this course is to introduce advanced and new topics in one of the areas of Computer Engineering. The topics may be changed from one year to another depending on the instructor's area of specialty.		
22591	Senior Project (1)	Pre-requisite: Finish 120 Cr. Hrs.	Credit Hours:1
	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. Grade: Pass / Fail		
22592	Senior Project (2)	Pre-requisite: 22591	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.		

Communications Engineering

23321	Electromagnetics (1)	Pre-requisites: 20142 , 20331	Credit Hours: 3
	Review of coordinate systems and vector calculus. Electrostatic fields. Electric fields in material space. Magnetostatic fields. Magnetic fields in material space. Maxwell's equations.		
23351	Signals and Systems	Pre-requisites: 21222 , 20232 Co-requisite: 23356	Credit Hours: 3
	Classification of signals and systems. System modeling and time domain analysis. The Fourier series, the Fourier transform, and Laplace transform and applications. Frequency response and filter concepts. Signal transmission. Spectral analysis. Discrete-time signals and systems: classification of signals and systems. The Z-Transform and applications.		
23355	Communication Principles	Pre-requisite: 23351	Credit Hours: 3
	Transmission through a Linear System. Amplitude, Frequency and Phase Modulation and Demodulation. Sampling Theorem, A/D Conversion, Line Coding and M-ary. Baseband Transmission: PAM, PPM, PWM, PCM. Multiplexing Techniques: TDM, FDM and CDM. Digital Modulation and Demodulation Techniques: QAM, ASK, PSK and FSK.		
23356	Programming Applications in Signals and Systems Lab	Co-requisite: 23351	Credit Hours: 1
	Introduction to MATLAB. The MATLAB-based experiments cover the following topics: Linear time invariant systems (LTI), frequency domain representation of signals and systems, and design and analysis of filters. Practical applications will be given along with the lab experiments.		
23357	Communications (1)	Pre-requisite: 23351	Credit Hours: 3
	Spectral densities. Correlation function. Power-bandwidth product. Distortion and distortionless channels. Analog modulation: DSB-SC, DSB-AM, SSB, Vestigial AM, modulator, demodulator: coherent, non-coherent. Angle modulation: FM, PM, modulator, demodulator. Base-band modulation: sampling theorem, PAM, PWM, PPM. Noise in analog communications: noise types, signal-to-noise ratio, the additive white Gaussian noise, signal interference.		

23411	Engineering Economics	Pre-requisite: Finish 99 Credit Hours	Credit Hours: 3
	Cost concepts, decision-making process, concepts of time value of money, simple and compound interest, interest formulas, rate of return, cash flow, project evaluation methods, break-even analysis, evaluating a single project, comparison and selection among alternatives and depreciation calculations.		
23421	Electromagnetics (2)	Pre-requisite: 23321	Credit Hours: 3
	Electromagnetic wave propagation. Transmission lines. Smith chart. Rectangular and cylindrical waveguides. Waveguide resonators. Antennas.		
23423	Antenna and Microwave Engineering	Pre-requisite: 23421	Credit Hours: 3
	Antenna Design Fundamentals, Types of Antenna, Antenna Arrays and Radio Wave Propagation over Ground, through Troposphere and Ionosphere. Microwave Transmission Lines, Matching Techniques, Microwave Network Analysis and Passive Devices. Design of Microwave Amplifiers and Oscillators.		
23452	Communications (2)	Pre-requisites: 23357 , 20335	Credit Hours: 3
	Base band digital modulation techniques: PCM, DM, D-Σ, and DPCM. Line coding. Intersymbol interference: M-ary signaling, bandwidth, data rate. Multiplexing: FDM, TDM, CDM. Passband digital modulation and demodulation techniques: ASK, FSK, PSK, DPSK, M-ary, coherent and non-coherent detection. Bit error rate performance. Channel coding theory: convolution coding, block codes. Error performance using coding.		
23453	Virtual Reality Mobile Applications Development	Pre-requisite: 11103	Credit Hours: 3
	This course will involve the design, development, troubleshooting, and publication of mobile virtual reality applications using appropriate application development tools (such as Unity for Google Daydream, Gear VR, etc). Using industry-standard techniques, a complete mobile virtual reality mobile application will be built taking into consideration factors such as interaction, teleportation and navigation design for mobile virtual reality applications.		
23454	Communication Networks	Pre-requisite: 23452	Credit Hours: 3
	Introduction to communications networks. Design principles of communications networks TCP/IP protocol. The OSI model and applications. Introduction to queuing theory. Network capacity improvements using coding techniques.		

23455	Communication Networks Lab	Co-requisite: 23454	Credit Hours: 1
	Network structure evaluation. Packet routing and delay evaluation. Throughput evaluation. Packet arrival and queue distribution. Open project: evaluation of a complete network performance and usage of different technologies to improve the actual performance.		
23457	Cellular Communications	Pre-requisite: 23452	Credit Hours: 3
	Elements of cellular radio systems: specifications, cell coverage for signal traffic, cell site, mobile antenna, frequency management and channel assignment. GSM network systems. Introduction to the latest developments.		
23459	Communications Lab	Pre-requisite: 21338 Co-requisite: 23452	Credit Hours: 1
	Spectral analysis. Amplitude modulation. Frequency modulation: phase shift keying, amplitude shift keying, frequency shift keying. TDMA. FDMA. Lab project.		
23481	Information Theory and Encryption	Pre-requisite: 23357	Credit Hours: 3
	The fundamentals of information theory and source coding. Linear block codes theory. Secure communication by focusing on encryption and physical layer security. Block and stream ciphers, public key encryption.		
23482	Satellite Communications	Pre-requisite: 23452	Credit Hours: 3
	Orbital aspect of satellite communications and spacecraft. Satellite link design, modulation and multiplexing techniques for satellite links. Earth station technology. Global position satellite systems (GPS).		
23483	Advanced Communications Systems	Pre-requisite: 23452	Credit Hours: 3
	Point-to-point and point-to-multipoint communication link design and analysis. Optimal design of practical communication systems. Spread spectrum, multicarrier technologies.		
23484	Radar Systems	Pre-requisite: 23357	Credit Hours: 3
	Basic concepts of radar: reflection and refraction. Radar equation. Detection theory. Radar signal types: AM, FM, and CW radars. Analysis of tracking. Radar Resolution. Frequency (Doppler) measurements. Moving Target Indicators (MTI).		

23485	Smart Grid Communications	Pre-requisites: 23453, 23571	Credit Hours: 3
	Smart grid elements and functionalities. Communication protocols applied to smart grids and automation systems. IEC 61850 standard and configuration of protection relays. Broadband power line communication. Smart grid frequency spectrum. Smart metering and Automated Meter Reading Infrastructure (AMRI). SCADA and Integrated energy and communications system architecture (IntelliGrid).		
23486	Multimedia Communications	Pre-requisite: 23587	Credit Hours: 3
	Fundamentals of computer-based multimedia. Audio. Images and graphics. Video streaming. Data compression. Multimedia database. Multimedia contents processing and transmission. Multimedia transmission enhancement using coding.		
23490	Practical Training	Pre-requisite: Finish 99 Credit Hours	Credit Hours: 3
	Students undertake suitable and supervised internships for a period of 8 consecutive weeks in Jordan, or 6 consecutive weeks abroad. Grade: Pass / Fail		
23551	Optical Communications	Pre-requisite: 23357	Credit Hours: 3
	Light propagation. Types of optical fibers and their properties. Light sources for optical fibers. Optical detectors. Optical digital communications. Fiber optic communications.		
23557	Optical Communications Lab	Co-requisite: 23551	Credit Hours: 1
	Optical transmitter, optical receiver and detector, channel (fiber optics), dispersion, attenuation, spectral analysis, WDM, OTDM, Q factor, BER.		
23558	Cellular Communications Lab	Pre-requisite: 23457	Credit Hours: 1
	Cell analysis and planning. Frequency management and channel assignment. GSM network evaluation and performance measurements of cells through frequency noise technique measurements of signal to noise ratio.		
23571	Digital Signal Processing	Pre-requisite: 23351	Credit Hours: 3
	Discrete-time signals and systems. Frequency analysis of discrete-time signals and systems. Sampling and quantization. Discrete Fourier transform. Windowing effect. Z-transform. FIR and IIR Digital filters design. Digital filters realization. Fast Fourier transform.		

23576	Wireless Internet of Things	Pre-requisite: 23452	Credit Hours: 3
	Overview of the Wireless Internet of Things (WIoT) concepts, standards, including benefits, limitations, and operation. Identifying the key drivers behind the development of WIoT as well as implementation. Key technology concepts of the radio interface, design requirements of the cellular IoT standards (EC-GSM-IoT, LTE-M, NB-IoT, and 5G) are explored as well as unlicensed spectrum technologies (LoRa, SigFox, Inginue, ..etc) . Performance comparisons will be carried-out.		
23582	Special Topics in Communications Engineering (1)	Pre-requisite: To be set by the Dept.	Credit Hours: 3
	The objective of this course is to introduce advanced and new topics in one of the areas of Communications engineering. The topics can be changed from one year to another depending on the instructor's area of specialty.		
23583	Special Topics in Communications Engineering (2)	Pre-requisite: To be set by the Dept.	Credit Hours: 3
	The objective of this course is to introduce advanced and new topics in one of the areas of Communications engineering. The topics can be changed from one year to another depending on the instructor's area of specialty.		
23584	Coding and Cryptography	Pre-requisite: 23452	Credit Hours: 3
	Shannon limit theorem. Punctured codes. Turbo code-decode process (iterative decoding). Iterative decoding error performance for block and convolutional codes. Private and public key cryptography.		
23585	Wireless Network Architecture	Pre-requisite: 23452	Credit Hours: 3
	This course emphasizes the description, modeling and performance evaluation of the physical and media access control layers of the wireless personal area networks, Wireless Local Area Networks, Wireless Ad hoc networks (WANET) and Wide Area Networks. Vehicle to vehicle (V2V), Vehicle to Infrastructure (V2I) and Vehicle to Everything (V2X) communications will also be covered.		
23586	Sensor Networks	Pre-requisite: 23454	Credit Hours: 3
	Introduction to the Wireless Sensor Network (WSN) Concepts and Applications. WSN Deployment and Configuration. Localization and calibration in WSN. WSN Coverage and connectivity. Shadowing and fading effects in Wireless Communications. WSN Medium Access and Scheduling sleep cycles. Data Acquisition. Lifetime optimization. Geographic Routing and Querying. Storage and retrieval. Collaborative Signal Processing and Distributed Computations. Energy-efficient distributed algorithms. Security, Attacks and Privacy issues over WSN.		

23587	Digital Image Processing	Pre-requisite: 23571	Credit Hours: 3
	Basics of 2D and 3D images. Image sampling and quantization, color, segmentation, morphological image processing, linear image filtering and correlation, image transforms, multiresolution image processing, edge detection and noise reduction and restoration, feature extraction and recognition tasks. Image quality enhancement using coding.		
23588	Computer Vision	Pre-requisite: 23571	Credit Hours: 3
	Introduction to computer vision, including fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification, scene understanding, deep learning with neural networks, and basic methods for applications that include finding known models in images, depth recovery from stereo, camera calibration, image stabilization, automated alignment, tracking, boundary detection, and recognition.		
23591	Senior Design Project (1)	Pre-requisite: Finish 120 Credit Hours	Credit Hours: 1
	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.		
23592	Senior Design Project (2)	Pre-requisite: 23591	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.		

Electrical Power & Energy Engineering

24311	Thermodynamics	Pre-requisite: 20142	Credit Hours: 3
	Thermodynamics concepts and definitions. States. Properties. Systems. Control volume. Processes. Cycles and units. Pure substances. Equation of states. Table of properties. Work and heat. The first law. Internal energy and enthalpy. Conservation of mass. SSSF and USUF processes. The second law. Heat engines and refrigerators. Reversible processes. Carnot cycle. Entropy. Clausius inequality. Principle of the increase of entropy. Efficiencies. Vapor, air power and refrigeration cycles. Mixtures of real gases and vapors. Psychrometry. Combustion. Elementary chemical kinetics.		
24322	Instrumentation & Measurements	Pre-requisite: 21231, 21222	Credit Hours: 3
	Systems of units, Dimensions and Standards. Measurements Error, Systematic and statistical errors and Loading effects. Resistance measurements: voltmeter and ammeter, Wheatstone Bridge, accuracy and sensitivity, earth and high resistance measurement, Loss of charge method, commercial Megger. Inductance and capacitance measurements: classical ac bridges, Schering, Maxwell, Wien and Hay's Bridges, Q-factor of inductor and D factor of capacitor. Digital LCR meter, Q-meter. Mutual inductance measurements (Heaviside Bridge). Magnetic measurements: B/H curve and Hysteresis loop. Power and Energy measurement methods. Power Factor meters; single- and three-phase. Phasor measurement unit (PMU). Principles of Digital Instruments: Digital voltmeters, Multi-meters and frequency meters and digital energy and power meters. Applications of spectrum analyzers. Fault localization of cables.		
24329	Instrumentation & Measurements Lab	Pre-requisite: 21229 Co-requisite: 24322	Credit Hours: 1
	Construction and use of potentiometers in DC & AC bridges. DC & AC indicating instruments. Shunts. Transformers & error measurements. Multimeters. Power measurements. Frequency meters & power supplies. Oscilloscopes.		
24361	Electric Machines (1)	Pre-requisites: 21222 , 23321	Credit Hours: 3
	Basic elements of Power Systems. Magnetic circuits: Parameters, relationships, equivalent circuit's representation, hysteresis and eddy current losses. Power transformers: construction, principles and operation, ideal and practical transformer, determination of equivalent circuit parameters, voltage regulation, efficiency, all-day efficiency, three-phase power transformers, autotransformers, and per-unit system. Electromechanical energy conversion: Field energy, mechanical force in electromagnetic systems, rotating machines, cylindrical machines. DC machines: construction, classifications, DC generators, DC motors, analysis of DC machines, speed control of DC motors, an introduction to AC machines.		

24411	Engineering Ethics	Pre-requisite: Finish 99 Credit Hours	Credit Hours: 1
	Safety and responsibility. Professional responsibility to customers and to employers. Blowing the whistle. Codes of ethics and honor. Professional choices. Legal obligations. Standard ethics theories. Case studies.		
24462	Electric Machines (2)	Pre-requisite: 24361	Credit Hours: 3
	Induction Machines: Construction, rotating magnetic field, three modes of operation, equivalent circuit model, no load test, blocked rotor test and equivalent circuit parameters, performance characteristics, power flow, effect of rotor resistance, speed control, starting of induction motor. Synchronous Machines: Construction, synchronous generators, synchronous motors, equivalent circuit model, power and torque characteristics, capability curves, power factor control, salient pole synchronous machines, speed control of synchronous motors, applications. Single Phase Motors: Single-phase induction motors, starting winding design, equivalent circuit of single-phase induction motor, single-phase synchronous motors, speed control. Special Machines: Servomotors, stepper motors.		
24463	Power System Analysis	Pre-requisite: 21222 Co-requisite: 24361	Credit Hours: 3
	Current and Voltage relations on a power transmission line. Power system modeling. Network calculations using Ybus and Zbus matrices. Symmetrical three phase faults. Symmetrical components and sequence networks. Unsymmetrical faults		
24467	Power Electronics	Pre-requisite: 21331,24361	Credit Hours: 3
	This course provides the students with foundation for the knowledge of the power semiconductor devices, their characteristics and operation. It also gives a deep understanding of power electronic circuits such as rectifiers, converters and inverters. Their analysis and some design aspects are also investigated.		
24575	Power Systems Economics& Reliability	Pre-requisite: 24463	Credit Hours: 3
	Economic structure of power systems. Mathematical problem formulation. Mathematical optimization. Economic dispatch of thermal units. Simulation tools for economic analysis of power system operation and planning. Unit commitment. Interchange of power. Fundamentals of, and participation in, electricity markets. Power system security and ancillary services. Factors that affect investments in generation and transmission. Main concepts in power system reliability. Distribution system reliability indices.		

24468	Electric Machines Lab	Co-requisite: 24462	Credit Hours: 1
	Single and three phase transforms, DC machines (motors and generators), synchronous machines (motors and generators), three phase induction motors, synchronous reluctance motor, single phase capacitor, start capacitor run induction motor, computer-aided tools for operating and controlling of rotating machinery.		
24469	Power Systems Lab	Co-requisite: 24470	Credit Hours: 1
	Transmission line. Simulation of power systems. Earthing of power systems. Symmetrical components and sequence filters. Balanced and unbalanced faults.		
24471	Automatic Control	Pre-requisite: 23351	Credit Hours: 3
	Transfer Functions: block diagrams and signal flow graphs. Mathematical modeling of physical systems. State space representations. Control systems characteristics. Time response of systems and closed loop performance of second order systems. Stability and Routh-Hurwitz stability criterion. Root locus analysis. Nyqist stability criterion. Bode plots. Frequency domain analysis. Design of control systems.		
24479	Automatic Control Lab	Co-requisite: 24471	Credit Hours: 1
	A set of experiments that cover the following: analog simulation, first and second order systems, transient and steady state for step, ramp, and parabolic inputs. Time and frequency response of second order systems. DC motor control. Application of PID controller, phase-lead, and phase-lag controllers. Level control. Applications using simulation software.		
24490	Practical Training	Pre-requisite: Finish 99 Credit Hours	Credit Hours: 3
	Students undertake suitable and supervised internships for a period of 8 consecutive weeks in Jordan, or 6 consecutive weeks outside. Grade: Pass / Fail		
24562	Power Systems Protection	Co-requisite: 24470	Credit Hours: 3
	Protection System Paradigms, Types of Relays (Electromechanical, solid state, and digital (numerical) relays), Instruments Transformers (CTs & VTs), Over-current Protection, Directional Over-current Protection, Distance Protection, Pilot Protection, Transformer Protection, Busbar Protection, Generator Protection, Motor Protection, Numerical Relaying Fundamentals.		

24470	Power System Planning, Operation and Control	Pre-requisite: 24463	Credit Hours: 3
	Load forecasting. Load flow solutions. (Gauss-Siedel & Newton-Raphson) Power system stability. Active and reactive power control in power system. (Control of power and frequency, control of reactive power and voltage).		
24472	Energy Conversion	Pre-requisite: 24311	Credit Hours: 3
	Energy classifications, sources and utilization. Energy growth and economics. Fossil-fuel systems and combustion in steam power plants. Steam generators. Boiler rating and performance. Environmental aspects of thermal power plants. Overview of renewable energy sources with emphasis on solar and wind energy systems. Introduction to direct energy conversion systems; Thermoelectric, photovoltaic and thermionic converters. Concentrated Solar Power (CSP).		
24574	Energy Efficiency & Auditing	Pre-requisite: 24463	Credit Hours: 3
	Energy efficiency definition. Concepts and benefits. Common barriers for enhancement of energy efficiency. Energy management and conservation. Energy efficiency in generation side: Energy efficiency in power plants (gas turbines, cogeneration cycle, combined cycle power plants, supercritical power plants, fluidized bed combustion). Methods of control for improving energy efficiency, boiler efficiency calculation. Energy efficiency in demand side: Power factor improvements, Energy efficiency of electric machines, efficiency curves, demand side management, energy auditing of buildings, calculations of normalized performance indicators (NPI) for buildings, energy efficient building.		
24568	Power Electronics Lab	Pre-requisite: 24467	Credit Hours: 1
	Simulation: MATLAB Simulink and PSIM; Rectification: Controlled and uncontrolled single phase half and full wave rectification; Three phase rectification; DC-DC conversion: buck and boost converters; Inversion: single phase and three phase inverters, Electric Drives.		
24569	Power Systems Protection Lab	Pre-requisites: 24562, 24469	Credit Hours: 1
	Instrument transformers, Overvoltage and Undervoltage relay, Overcurrent relay, Differential relay, Tranformer protection, Transmission line protection, Electrical insulation, Air and oil insulation, Grounding.		
24576	Renewable Energy Systems (1)	Pre-requisite: 24463	Credit Hours: 3
	Electric Power Fundamentals, Introduction to Renewable Energy Types and Resources, Solar Energy, Photovoltaic Material and Characteristics, Photovoltaic Systems, Wind Power Systems, Introduction to Smart Grids, Energy Storage.		

24564	Transmission & Distribution Systems	Pre-requisite: 24463	Credit Hours: 3
	Components of Transmission and Distribution systems (TD). Planning of TD. Overhead lines. Cables. Bulk power transmission. TD Grid. Losses. HVDC. FACTS. Substation. Distribution networks: radial, interconnected.		
24565	High Voltage Engineering	Pre-requisite: 24463	Credit Hours: 3
	Insulating materials and their application. Breakdown of insulating materials: gases, liquid and solid dielectrics. Generation and measurement of high voltages and currents. Insulation coordination in electrical power systems. High voltage testing of electrical equipment.		
24566	Reliability of Power Systems	Pre-requisite: 24463	Credit Hours: 3
	Basic concepts of reliability engineering. Reliability of generating capacity and transmission systems. Composite systems reliability evaluation. Reliability of distribution systems. Reliability cost-worth analysis. Ancillary services in electricity markets.		
24567	Power Systems Design	Pre-requisite: 24463	Credit Hours: 3
	Design of: three-phase synchronous generators, power station, transmission lines, and substation. Industrial and commercial electrical systems.		
24572	Electrical Drives Systems	Pre-requisite: 24462	Credit Hours: 3
	Introduction to electrical drive systems. Stepper motor control. DC-motor control methods. Induction motor control methods. Synchronous motor control methods. Design of microprocessor-based drive systems.		
24573	Digital Control	Pre-requisite: 24471	Credit Hours: 3
	Discrete-time systems. Difference equations. Z-transform. Inverse Z-transform. Flow graphs. State variables. Transfer functions. Sampling and reconstruction of control systems. Zero-order and first-order hold. System time response characteristics. Stability analysis. Bi-linear transform. Jury's stability test. Pole assignment and state estimation. Controllability and observability. Ackerman's formula. Linear quadratic optimal control.		

24581	Special Topics in Electrical Power Engineering	Pre-requisite: To be set by the Dept.	Credit Hours: 3
	The objective of this course is to introduce advanced and new topics in one of the areas of Electrical Power engineering. The topics can be changed from one year to another depending on the instructor's area of specialty.		
24582	Special Topics in Electrical Energy Engineering	Pre-requisite: To be set by the Dept.	Credit Hours: 3
	The objective of this course is to introduce advanced and new topics in one of the areas of Electrical Energy engineering. The topics can be changed from one year to another depending on the instructor's area of specialty.		
24583	Special Topics in Power & Energy Engineering	Pre-requisite: To be set by the Dept.	Credit Hours: 3
	The objective of this course is to introduce advanced and new topics in one of the areas of Energy and Power engineering. The topics can be changed from one year to another depending on the instructor's area of specialty.		
24588	Renewable Energy Systems (2)	Pre-requisite: 24576	Credit Hours: 3
	Fuel Cells: Types and Applications, Biomass: The composition of biomass, Biomass as fuel, Energy Storage Systems: Electrochemical Storage (Batteries) and Capacitive Storage, Grid Integration of Renewable Energy Sources, Introduction to Phasor Measurement Units and Smart Grids.		
24591	Senior Project (1)	Pre-requisite: Finish 120 Credit Hours	Credit Hours: 1
	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. Grade: Pass / Fail		
24592	Senior Project (2)	Pre-requisite: 24591	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.		

Networks Information Security Engineering

25330	Information Security Fundamentals	Pre-requisites: 20234 , 20134	Credit Hours: 3
	This course covers the use of basic computer security mechanisms, authentication, access control, policy types. The course introduces firewalls, network intrusion detection, Viruses, Worms, Trojan horses, and other forms of malicious code. Coverage of the IT security management process: 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. Design and use of basic network security mechanisms.		
25347	Cryptography	Pre-requisites: 20234 , 20134	Credit Hours: 3
	Computer and Network Security Concepts. Classical Encryption Techniques. Symmetric Key Cryptography: Block Ciphers such as the Data Encryption Standard (DES) and the Advanced Encryption Standard (AES), and Stream Ciphers such as the RC4 Cipher. Asymmetric or Public Key Cryptography : the RSA algorithm, the Diffie-Hellman Key Exchange Protocol, ElGamal Cryptosystems, and Elliptic Curve Cryptography. Cryptographic Hash Functions. Message Authentication Codes (MAC). Digital Signatures. Key Management and Distribution.		
25420	Networks Security	Pre-requisite: 25347 Co-requisite: 25441*	Credit Hours: 3
	This course introduces fundamental security aspects in computer networks and wireless telecommunications. Topics include introducing security protocols for: Network Access Control, Transport-Level Security, Wireless Network Security Protocols, Electronic Mail Security, IP Security, and Internet Authentication Applications.		
25441	Wireless Networks	Pre-requisite: 22443	Credit Hours: 3
	The primary objective of this course is to learn the fundamental principles of wireless networks. The topics include, wireless network standards and protocols, wireless communication technologies, Wireless Personal Area Networks (WPAN), Wireless Local Area Networks (WLAN) and Wireless Mobile Networks (WMN).		
25445	Wireless Networks Lab	Pre-requisite: 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		

25490	Practical Training	Pre-requisite: Finish 99 Cr. Hrs.	Credit Hours: 3
	Students undertake suitable and supervised internships in an approved institute for a period of 8 consecutive weeks in Jordan, or 6 consecutive weeks abroad.		
25520	Penetration testing	Pre-requisite: 25420	Credit Hours: 3
	This course introduces students to the underlying principles and many of the techniques associated with penetration testing or ethical hacking. Students will learn about the entire penetration testing process including planning, reconnaissance, scanning, exploitation, post-exploitation, and result reporting. The course also enables students to understand the importance of vulnerability in penetration testing by providing the appropriate industry knowledge and skills.		
25530	Information Systems Security Assessment	Pre-requisite: 25330	Credit Hours: 3
	Requirement study and situation analysis. Security policy creation and update. Document review. Risk identification. Vulnerability scan. Data analysis. Reporting & briefing.		
25541	Cloud Computing & Security	Pre-requisites: 22443 , 25330	Credit Hours: 3
	This course provides an introduction to cloud computing. It starts by covering the cloud-enabling technologies. Subsequently, it explains the fundamentals of cloud computing, different services and delivery models. The course also covers different cloud architectures as well as providing a business perspective on making choices to migrate to the cloud. Finally, the course covers cloud security and possible cloud related threats.		
25542	Cyber Laws	Pre-requisite: 25330	Credit Hours: 3
	This course examines the mutual relationship between the Internet and the law. The course addresses the question of how nation-states control and mitigate criminal conduct across traditional geographic and political boundaries; what reasonable expectations of privacy are in cyberspace. 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; information warfare; search and seizure; electronic surveillance; censorship and freedom of speech.		

25543	Intrusion Detection & Network Forensics	Pre-requisite: 25420	Credit Hours: 3
	This course covers computer security and networks forensics, digital forensics, network surveillance, intrusion detection and prevention, incident response and trace-back. Signature and behavioral-based intrusion detection, and the basics of static and dynamic malware analysis.		
25545	Network Security Lab	Pre-requisite: 25420	Credit Hours: 1
	This course provides laboratory exercises using off-the-shelf security tools. Topics include: sniffing, implementing the attacks against ARP, IP, ICMP, TCP, and UDP protocols, exploiting DNS vulnerabilities. Experimenting with IPSec, TLS, and SSH protocols. In addition, students will configure network servers, routers, firewalls, WLAN attacks and NIDS and study their effects on the overall system security.		
25549	Ethical Hacking Techniques Lab	Co-requisite: 25543	Credit Hours: 1
	This lab provides students with the practical experience on performing attacks against ICT systems. Topics include: reconnaissance, port scanning, vulnerability assessment, buffer overflow, post exploitation, web pen-testing and basic forensics techniques. By the end of the lab, the students will build a strong foundation of the common hacking techniques, security tools and the defensive approaches to secure ICT systems.		
25576	Network Performance Analysis	Pre-requisite: 20335 , 22443	Credit Hours: 3
	The course covers three main techniques for the performance analysis of computer networks: queuing theory, simulation, and measurement. The course puts emphasis on data presentation; statistical analysis of simulated data; comparing systems using sample data; introduction to experimental design; bandwidth estimation; introduction to simulation analysis and random number generation. Students will learn techniques to analyze and compare computer systems in general and computer networks in particular.		
25582	Operation & Administration of Security Centers	Pre-requisites: 22443, 25330	Credit Hours: 3
	Key components in a Security Operations Center (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	Pre-requisites: 25330, 22443	Credit Hours: 3
	This course will familiarize the students with 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; Frameworks, Standards, and Regulations; Risk Management.		
25584	Risk Management	Pre-requisites: 20335, 25330	Credit Hours: 3
	Introduction to Risk Management. The Risk Management Lifecycle. Risk Assessment and Analysis Techniques. Risk Exposure Factors. Security Controls and Services. Risk Evaluation and Mitigation Strategies. Reports and Consulting. Threat and Vulnerability Management.		
25585	Multimedia Networks	Pre-requisite: 22443	Credit Hours: 3
	Multimedia networking applications. Streaming stored audio and video. Protocols for real-time interactive applications RTP, RTCP, and SIP. Providing multiple classes of service. Providing QoS guarantees. Distributing Multimedia: content distribution networks.		
25586	Hardware Security	Pre-requisites: 22442, 25330	Credit Hours: 3
	This course covers basic concepts in the security of hardware systems. Topics include; active and passive attacks, hardware clonability, security for RFID tags, side channel attacks, counterfeiting, and design of hardware security primitives (e.g., random number generators, crypto-processors).		
25587	Secure System Architecture	Pre-requisite: 25330	Credit Hours: 3
	This course covers basic concepts in the secure system architecture. Topics include; Security Polices, 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 Project (1)	Pre-requisite: Finish 120 Credit Hours Grade:	Credit Hours: 1
	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. Pass / Fail		

25592	Senior Project (2)	Pre-requisite: 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)	Pre-requisite: 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 may be changed from one year to another depending on the instructor's area of specialty.		
25594	Special Topics in Network Security Engineering (2)	Pre-requisite: 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 may be changed from one year to another depending on the instructor's area of specialty.		
25595	Special Topics in Information Security (1)	Pre-requisite: 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 may be changed from one year to another depending on the instructor's area of specialty.		
25596	Special Topics in Information Security (2)	Pre-requisite: 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 may be changed from one year to another depending on the instructor's area of specialty.		

King Talal School of Business Technology

Coordination Unit for Service Courses

31019	Arabic Language (Remedial)	Pre-requisite: None	Credit Hours: 0
	This course focuses on the applications that develop the four skills through a set of various tools. The aim is to give students trainings so that they can read loudly and silently, comprehend what they listen to, deepen their abilities to write creatively and functionally, and develop 'speaking' skills.		
31021	Arabic Language Communication Skills (Remedial)	Pre-requisite: None	Credit Hours: 0
	This course aims to develop the student's cognitive abilities in the basics of the Arabic language, through a variety of chosen literary texts, followed by a variety of topics including some simplified grammatical issues. In addition, it focuses on the skill of writing such as spelling, punctuation and the use of the Arabic dictionary, which prepare the student to possess the necessary knowledge, reading, writing, listening and conversation, on which the Arabic language communication skills course is based.		
31022	English Language Communication Skills (Remedial)	Pre-requisite: None	Credit Hours: 0
	This course aims at developing the four skills (listening, reading, writing and speaking) and at enabling students to read the different texts and summarize them in their own language as well as guessing the meaning of the word from the context and make predictions before reading for main ideas. Since this course is intended for students who are less proficient in the English language, the focus is on giving students the structure of different sentences through the grammar lessons, which in turn enables the student to write correct sentences and thus speak without errors by constructing correct sentences when speaking. Regarding vocabulary, the students will be able to find and use synonyms as well as use context clues to find meaning.		
31029	English Language (Remedial)	Pre-requisite: None	Credit Hours: 0
	This course is offered to students at the intermediate level to develop the students' ability in the four basic skills: reading, writing, speaking and listening. The materials and activities included in the course are designed in such a way to provide practice in these four skills. Therefore, the practice will improve the students' use of English for academic purposes and communication.		

31100	Health & Sport	Pre-requisite: None	Credit Hours: 3
	This course deals with the concept of physical education and how it relates to our general concept of education, as well as its objectives and historical development. Also examined are the different fields and types of contemporary sports education. While studying human anatomy in detail, the course explains the effect of sports activity on different parts of the body, as well as discussing the various elements that contribute to physical fitness. The student also learns about a number of tests designed to measure different aspects of physical fitness. The course deals with nutrition in terms of basic food groups and the roles they play in the human body, in addition to looking at the most common sports injuries and their symptoms. The course also examines a number of today's diseases such as obesity, anorexia, diabetes and heart disease, concentrating on their causes and how to prevent them. The course discusses some contemporary issues regarding demand for sports activities.		
31111	Arabic Language Communication Skills	Pre-requisite: 31019	Credit Hours: 3
	This course addresses the communication skills in Arabic (Reading, writing, listening and speaking). It focuses on the applications that develop these skills through a set of various basics and tools. The aim is to give students trainings so that they can read loudly and silently, comprehend what they listen to, deepen their abilities to write creatively and functionally, and develop 'speaking' skills through, debate, discussions and critical thinking.		
31112	Arabic Language Communication Skills	Pre-requisite: 31019	Credit Hours: 3
	This course addresses communication skills in Arabic (Reading, writing, listening and speaking). It focuses on the applications that develop these skills through a set of various basics and tools. The aim is to give students trainings so that they can read loudly and silently, comprehend what they listen to, deepen their abilities to write creatively and functionally, and develop 'speaking' skills through, debate, discussions and critical thinking.		
31121	English Language Communication Skills	Pre-requisite: 31029	Credit Hours: 3
	This course aims at developing students' ability in the four basic skills: (reading, writing, speaking and listening). Practice will improve the students' use of English for academic purposes and communication. The speaking is intended to enable students practice the oral skills and to improve students' pronunciation. Thus, different speaking techniques are undertaken during classes throughout the semester.		
31122	English Language Communication Skills	Pre-requisite: None	Credit Hours: 3
	This course aims at developing students' ability in the four basic skills: (reading, writing, speaking and listening). Practice will improve the students' use of English for academic purposes and communication. The speaking is intended to enable students practice the oral skills and to improve students' pronunciation. Thus, different speaking techniques are undertaken during classes throughout the semester.		

31130	Foreign Language	Pre-requisite: None	Credit Hours: 3
	PSUT offers some foreign languages such as Mandarin (Chinese) course, Spanish, French and other languages to catch up with language skills trend. In each of the languages offered, Students will learn the pronunciation, Common words and some basic but practical grummer, such as introduction of oneself, greeting, hoppy, shopping, etc. The Course also covers some basic theoretical principles in the art of translation, qualities of translator, problems involved in translation and analysis of translated texts. The course aims at equipping students with the skills of practical translation from Arabic into English and vice versa. The Course will be mainly applied offering practice in translating a variety of texts from various fields of knowledge: Economy, Politics, Literary texts, Administrations, fashion, Media, Sports etc.		
31151	National Education	Pre-requisite: None	Credit Hours: 3
	This course discusses 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 as well as the role of local institutions in achieving development in national awareness and the family and its role in society.		
31152	Islamic Arab Civilization	Pre-requisite: None	Credit Hours: 3
	Arab-Islamic civilization is considered an extension of Arabs heritage and their history through the successive historical stages and a linked series of Arab history and civilization's rings. It is derived from faith, social cultural and intellectual assets of Islamic Arab society.(Arab Islamic civilization) course stems from Arab and Islamic constant stopped by tolerant Islamic faith, Arab heritage and Arab history and their civilization.		
31153	Introduction to Society, Technology and Environmental Protection	Pre-requisite: None	Credit hours: 0
	This course aims to inform the student on the issues that are of most concern to him during his university career, and links them to his community and the surrounding environment. These issues include university life and numerous general cultural topics which help to strengthen the student's sense of loyalty and belonging to his university and local community.		

31154	Community Service	Pre-requisite: None	Credit hours: 0
	This course addresses the concept of physical education, how it relates to our general concept of education, as well as its objectives and historical development. Also, it examines the different fields and types of contemporary sports education. While studying human anatomy in detail, the course explains the effect of sports activity on different parts of the body, as well as discussing the various elements that contribute to physical fitness. The course presents a number of tests designed to measure different aspects of physical fitness. The course deals with nutrition in terms of basic food groups and the roles they play in the human body, in addition to looking at the most common sports injuries and their symptoms. The course further covers a number of today's diseases such as obesity, anorexia, diabetes and heart disease, concentrating on their causes and how to prevent them.		
31160	Leadership & Societal Responsibility	Pre-requisite: None	Credit Hours: 3
	This course covers different theoretical and frameworks of leadership, moral leadership, and the philosophical foundations of socially responsible leadership. Further, this course explores the manner in which leaders personally and professionally deal with ethical and social issues as they guide their organizations in such a way to instill and optimize positive social impact.		
31161	Introductions to Library Science	Pre-requisite: None	Credit Hours: 3
	This course discusses how to get to information sources, the types of cataloging, the types of catalogs, types of classification, information and knowledge, information society, information services. Information technology, information storage, information retrieval and dissemination, information and Internet.		
31211	Arabic Literature	Pre-requisite: 31111	Credit Hours: 3
	The aim of this course is to developing students' taste of Arabic literature through reading of literature essays, analysis, introducing some literature aspects from different eras, introducing some preliminary concepts such as: literature, text, taste, criticism, realizing the basic steps in processing the literary text, recognizing the literary texts of different genres, such as: poetry, Thoughts, story, Essay, and authors of her book and studying models of literary texts which belong to different periods of time, and analysis and interpretation.		
31251	Military Science	Pre-requisite: None	Credit Hours: 3
	This course is intended to present the history of the Jordanian army, Jordanian peace forces, preparing the nation for defense and liberation, as well as genesis and development of the Hashemite Kingdom of Jordan.		

31252	Governance and Development	Pre-requisite: None	Credit Hours: 3

The course covers the basic concepts of governance and development, the nature of the impact associated with the mechanisms of good governance and its indicators on the levels of development in the country. The course highlights the conceptual framework of the concept of good governance and its origins, along with its political, economic, administrative and cultural dimensions; as well as various standards and indicators. The course also covers the concept of development and its theories, types and dimensions, with a focus on indicators of sustainable development.

The course deals with the nature of the environment created by different forms of government, and the impact on economic growth rates in the long term, and the role of good governance as a link to transforming economic growth into sustainable development by creating an enabling environment for development. It also addresses the role of the system of values and principles associated with good governance, and the complementary roles of its three components (the State, the private sector and civil society), in addition to the pivotal role of the effectiveness of governance in influencing development policies by attracting financial aid, solving the issue of poverty and achieving stability, in a comparative study of the reality of these concepts in developing countries and developed countries.

31254	Entrepreneurship and Innovation	Pre-requisite: None	Credit Hours: 3

This course focuses on the behaviour and attributes of entrepreneurs who operate in a competitive environment. It elaborates on the role of entrepreneurs in a competitive market and that of government in the creation of a business environment conducive to entrepreneurship. The course also highlights the relevance of attitudes, values and beliefs to entrepreneurial activity; the management of risks; the process of new product development; and the reasons for the high failure rate of new businesses. Students are expected to prepare a business plan for a new business as their main objective by the end of the semester. The course will develop students' skills and understanding of the risks and rewards of entrepreneurial activities. There will be a special focus on SMEs and entrepreneurship in Jordan.

31255	Entrepreneurship for Business	Pre-requisite: None	Credit Hours: 3

This course focuses on the behaviour and attributes of entrepreneurs who operate in a competitive environment. It elaborates on the role of entrepreneurs in a competitive market and that of government in the creation of a business environment conducive to entrepreneurship. The course also highlights the relevance of attitudes, values and beliefs to entrepreneurial activity; the management of risks; the process of new product development; and the reasons for the high failure rate of new businesses.

Students are expected to prepare a business plan for a new business as their main objective by the end of the semester.

The course will develop students' skills and understanding of the risks and rewards of entrepreneurial activities. There will be a special focus on SMEs and entrepreneurship in Jordan.

31260	Human Rights	Pre-requisite: None	Credit Hours: 3
	The course includes the definition of human rights, their importance, characteristics, intellectual and philosophical roots. It focuses on the historical development of human rights, their sources, types, and criteria for differentiating them, including civil and political rights, economic, social and cultural rights. in addition, the course addresses human rights that are guaranteed through charters, conventions, international declarations, national legislation and mechanisms for protecting these rights. The course also sheds light on humanitarian intervention and attitudes towards it, especially in the post-Cold War period. It, further, deals with the impact of globalization mechanisms on human rights, with a focus on discussing applied cases at the international level.		
31261	Introductions to Politics and Economics Science	Pre-requisite: None	Credit Hours: 3
	The course addresses the nature of political economy, the issues of political economy, and 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	Pre-requisite: None	Credit Hours: 3
	This course discusses 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 and education in the Arab and Islamic worlds.		
31264	Introduction to Psychology	Pre-requisite: None	Credit Hours: 3
	The course deals with the concept of psychology, its history, schools, main fields, and research methods. It also deals with the concept of growth, its principles, factors affecting it, and its various stages. The course shows the nature of motivation, the development of its concept, and the classification of motivations. The course focuses on the nature and theories of learning. The course also deals with the concept of intelligence, factors affecting it, and methods of measuring it. It also focuses on personality, its theories, and its measurements. The course also deals with some aspects of stress, defense mechanisms, treatment methods and methods of psychological counseling.		

31271	Environmental Science	Pre-requisite: None	Credit Hours: 3
	This course focuses on the basic concepts in ecology; organization, structure and function of ecosystem and ecosystem properties; cycling of matter and flow of energy in ecosystems and their equilibrium; factors involved in the regulation, growth, and general dynamics of populations; data needed to describe populations, population growth, population models, and regulatory mechanisms; spatial and temporal variation and properties of populations; community structure and interactions; succession patterns in aquatic and terrestrial communities.		
31272	Development and Environment	Pre-requisite: None	Credit Hours: 3
	This course has five different components; introducing learner to the relationship between the environment (natural resources, ecosystem services) and development, the link between environment and development process along with the multiple dimensions of sustainability, analyzing the sustainable development and the approach to achieve the development, environmental quality, and social equity, presenting theoretical perspectives of development and environment and how to achieve its sustainability.The course also gives a comprehensive introduction to all major issues, ways of saving the earth from ecological collapse, as well as defining the roles of sustainable development on the future of humanity.		
31311	Scientific Research Methods and Writing Skills	Pre-requisite: None	Credit Hours: 3
	This course outlines the concept of scientific research including its nature, categories, elements, and procedures. This course also presents a comprehensive introduction to data collection tools, the use of statistical methods in analysis and interpretation, SPSS, the generation of findings and recommendations, in addition to the use of libraries, references, and online documentation in preparing academic reports.		
31351	Contemporary Issues in the Arab World	Pre-requisite: None	Credit Hours: 3
	This course focuses on 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 and human security in the Arab world.		
31352	Jerusalem: History and Facts	Pre-requisite: None	Credit Hours: 3
	The aim of the course is to address the following topics: 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	Pre-requisite: None	Credit Hours: 3
	The course tackles the 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.		
31362	Philosophy and Critical Thinking	Pre-requisite: None	Credit Hours: 3
	This course aims to build the theoretical mind and philosophical understanding, and to provide the student with thinking skills, including critical thinking. It presents the student with the foundations of philosophical thinking and methods of investigation and logical reasoning. In addition, it introduces to the rules of organized thinking and its procedural, and what it contains of the foundations of the theory of knowledge and access to the formation of mental bases. Furthermore, it equips students with the learning the skills of critiquing scientific texts and evaluating different situations in life to reach correct conclusions and solutions based on the facts and existing data.		
31371	Health Education	Pre-requisite: None	Credit Hours: 3
	This course is an attempt to understand the responsibility we have for our own health, learn skills for dealing with emergency cases, and have personal safety and accident prevention as well as discussing mental health, mental illness and stress.		
31373	Business Skills	Pre-requisite: Finish 60 Cr. Hrs	Credit Hours: 3
	Business Skills Subject, Maharat Training for Employability/Maharat Training for Entrepreneurship is implemented over 10-12 weeks that gives Jordanian youth the ideal tools and equips them with the skills required to become productive members of society capable of obtaining jobs as well as becoming successful entrepreneurs. The course is taught using the Maharat methodology, "Learning by Doing" and is conducted within an interactive business-like environment, providing the practical skills necessary for fresh graduates to land successful careers.		
31374	Life Skills	Pre-requisite: None	Credit Hours: 3
	This course aims to help students explore and develop the essential skills on a personal and professional level in the age of the Internet, by educating them on how to improve their decision-making process and apply critical/creative thinking to reach ultimate solutions for different situations/problems that they can experience within a business environment. The module is broken into three main categories: Learning Skills, Literacy Skills, and Life Skills. All of which intend to support students in keeping up with the lightning-pace of today's modern marketplace and to better prepare them for the competitive job market they are about to enter.		

Business Administration

33101	Principles of Management	Pre-requisite: None	Credit Hours: 3
	This course offers a broad insight into the basic principles of management, its importance, evolution, and schools of thought other topics include the evolution of contemporary administrative thought, decision making steps, managerial functions (planning, organizing, leading, and controlling), and how to exercise these functions in business organizations.		
33103	Microeconomics	Pre-requisite: None	Credit Hours: 3
	This course is designed to develop the students understanding of the system for allocating resources among competing wants, analysis of supply and demand and market equilibrium, Elasticity, consumer behavior theory, Theory of production & profit maximization, Analysis of markets and pricing in competitive and noncompetitive markets and other markets.		
33202	Organization Theory	Pre-requisite: 33101	Credit Hours: 3
	This course outlines the theoretical framework of an organization, including its types and dimensions. Main topics include organizational evolution, the importance of organization in achieving optimal productivity; the main theories and schools of thought surrounding the concept of organization.		
33203	Organizational Behavior	Pre-requisite: 33101	Credit Hours: 3
	This course underlines the concept of organizational behavior. Main topics include organizational structure; behavioral patterns at the individual and group levels; employee communication, motivation, and conflict; organizational climate; and environmental factors that can influence employee behavior and performance.		
33204	Macroeconomics	Pre-requisite: 33103	Credit Hours: 3
	This course introduces economic analysis of aggregate employment, income, and prices. Topics include major schools of economic thoughts; aggregate supply and aggregate demand; economic measures, fluctuations, and growth. Upon completion, students should be able to evaluate national economic components, conditions, and alternatives for achieving socioeconomic goals.		
33205	Financial Planning and Control	Pre-requisite: 33101 , 34101	Credit Hours: 3
	This course deals with the methods of financial planning and control at the level of the private sector institutions. Financial Control examines its objectives, methods, tools and institutions at the private sector level with a simple reference to these institutions at the public sector level in Jordan.		

33207	Islamic Business Management	Pre-requisite: 33101	Credit Hours: 3
	This course introduces students to Islamic Management in terms of its definition, concepts, nature, evolution and historical development. It also enables students to understand the basic components of traditional management from a comparative Islamic perspective. It covers concepts, problems and opportunities facing Islamic management within its competitive, political-legal, economic, social and global environments.		
33209	Management Communication Skills	Pre-requisite: 33101	Credit Hours: 3
	This course highlights the importance of managerial communications for businesses organizations. Main topics include providing effective communication systems; utilizing communications in the business field; and an emphasis on business writing skills.		
33212	Operations Research for Business	Pre-requisite: 20131	Credit Hours: 3
	This course outlines the concept of operations research (OR), its history, and evolution. Main topics include formulating OR models; linear programming and its tools (graphical solutions, simplex method, and the problem-solving method), decision theory; building decision matrices; decision-making under risk and conflict, and analyzing business networks.		
33215	Data Analysis	Pre-requisite: 20235	Credit Hours: 3
	This course explores the use of data mining and analytics to create business intelligence and use it for improving internal operations and understanding customers and supply chains. Moreover, this course provides an introduction to the concepts and methods of data analysis for decision-making. In this course students are required to learn a comprehensive set of spreadsheet skills and tools, including how to design, build, test, and use spreadsheets for business analysis. Students are also required to develop an understanding of the uses of business data analysis for decision-making, forecasting, and obtaining and maintaining a competitive advantage.		
33218	Logistics Management	Pre-requisite: 33101	Credit Hours: 3
	This course explains the concept of logistics management, and illustrating the main activities, and roles of logistics in any organization (services/manufacturing) as different modes of transportation, warehousing and storing, industrial packaging, materials handling, inventory control, order fulfillment, demand forecasting, production planning/scheduling, Procurement, customer service, facility location, return goods handling, parts and service support, salvage and scrap disposal, as well as its value to the customer. Furthermore, this course introduces the effective management of supply chains, considering both cost and customer service such as the relationship between logistics and marketing, production, and sales processes.		

33238	Investment Management	Pre-requisite: None	Credit Hours: 3
	This course deals with the investment decision in detail with the areas of real and financial investment, immediate and future instruments, returns and risks, and the exchange between its returns and risks and calculate the fair price of financial investment instruments. It also provides an overview of the composition of investment portfolios and measures their risks and returns and management and some investment institutions. It also examines the sources and costs of financing investments and methods of evaluating real investment alternatives.		
33247	Administrative Development	Pre-requisite: 33101	Credit Hours: 3
	This course includes defining the concept of administrative development and its linkages and elements as part of the overall integrated and balanced development process. It explains the process of analyzing the administrative and organizational reality of business institutions, public policy, strategies, and the mechanism of linking the various components of growth within the framework of interventions proposed to improve the organizational capacity address such reality.		
33309	Business Ethics and Social Responsibility	Pre-requisite: 33203	Credit Hours: 3
	This course underlines the concept of social responsibility, its history, and approaches that measure social performance and social responsibility for international companies. Main topics include basic business ethics problems, the historical development of business ethics theories, important issues in business ethics, environmental responsibility and professional ethics, transparency, and corporate governance. In this course, students are presented with the most significant contemporary ethical challenges faced by business organizations.		
33313	Production and Operations Management	Pre-requisite: 33212	Credit Hours: 3
	This course outlines the basic principles of production and operations management and their importance in business organizations. Main topics cover the objectives of production and operations management including their historical development, functions, and specific performance criteria. This course also provides a holistic view of the factors that affect the production process, productivity and quality and its strategic significance, in addition to recent trends in production and operations management. In this course students learn about the importance of production planning under flowing production and under production payments, short-term planning in industrial companies, and planning and scheduling industrial projects as well as production control.		

33317	Quality Management	Pre-requisite: 33203	Credit Hours: 3
	This course outlines the concept of total quality management, including its elements, and focuses on the application of quality management in organizations as well as the means by which business firms overcome quality-based challenges. This course also highlights total quality as an input to improve performance in business enterprises; performance management using the balanced scorecard; change management and how to deal with resistance to change; and finding ways to ensure the success of change and development initiatives in business organizations (practical applications).		
33326	Innovation Management	Pre-requisite: None	Credit Hours: 3
	This course provides students with an understanding of how creativity and innovation can be facilitated and managed in a work setting. In this course, students learn about theoretical conceptualizations of creativity and innovation as well as practical applications involved in fostering creativity and innovation in the workplace. Students are also expected to play an active role in learning through class exercises, class discussions, and presentations about real (or planned) innovations in business organizations.		
33330	Services Management	Pre-requisite: 33101	Credit Hours: 3
	This course outlines the concept of service organizations and its importance. Main topics include the characteristics of service organizations in addition to their categories, requirements, and challenges, and contemporary issues facing service sectors such as cost Escalation, quality, competition, and marketing.		
33331	Public Relations Management	3 Pre-requisite: 33209	Credit Hours: 3
	The course outlines the principles of public relations (PR). Main topics include PR functions and objectives, and the pillars of effective PR management and its connection with marketing and customer relations.		
33336	Knowledge Management	Pre-requisite: 33209	Credit Hours: 3
	This course offers an introduction to the main theories in the knowledge management field, and how knowledge management can enhance organizational performance. This course also highlights the importance of knowledge management in improving collective and individual performance, and focuses on how to utilize and measure knowledge, in addition to the impact of the internet and communications technology on knowledge management.		

33337	Financial Analysis	Pre-requisite: 34101	Credit Hours: 3
	This course emphasis on the analysis of financial data, which is used in evaluating organizational performance. Main topics include methods of analysis, financial control, and economic value. In this course, students are required to financially analyze changes in stock market prices in addition to speculating financial failure. Other topics include financial analysis for banks and other financial institutions.		
33342	Managerial Economics	Pre-requisite: None	Credit Hours: 3
	This course outlines the tools and techniques needed for effective economic decisions under the conditions of risk and uncertainty. This course also gives emphasis on decisions related to pricing, demand, and costs, in addition to procedures and criteria for decision-making. Additional topics include the theory of demand; pricing theory and practice; cost estimation; and pricing new products and competitive offers in addition to bid pricing.		
33400	Risk Management	Pre-requisite: 33313	Credit Hours: 3
	This course outlines the concept of risk management, including its types and historical development. The main topics include the concept of uncertainty and its levels; risk identification and methods of measurement; analyzing risk-based indicators; classic and modern risk management; and risk control both in the short-term and in long-term.		
33404	Strategic Management	Pre-requisite: Finish 90 Credit hours	Credit Hours: 3
	This course highlights the basic concepts of strategic management, including the steps of formulating an organization's vision, mission strategic analysis of the internal and external environment and formulating strategic objectives. The course also covers how strategies are generated, selected, implemented and evaluated.		
33405	Human Resource Management	Pre-requisite: 33203	Credit Hours: 3
	This course outlines the concept of human resources management and its importance in organizations. Other topics include human resource planning; employee recruitment, selection, and placement; job analysis and job descriptions; employee training; employee appraisal and rewarding; career planning; employee empowerment; and maintaining employee safety.		

33408	Change Management	Pre-requisite: 33313	Credit Hours: 3
	This course outlines the importance of planned organizational change in light of the dynamic environment that surrounds organization. In addition, this course focuses on the importance of organizational change and how to manage the overall process successfully in terms of the choice of strategies aimed at promoting organization performance at both the individual and group levels. Other topics include managing resistance to change; its pros and cons and, as well as the means to tackle the issue successfully.		
33409	Special Topics in Management	Pre-requisite: 33317	Credit Hours: 3
	This course highlights contemporary topics in the field of business administration including administrative obstacles to development, contemporary technology as an input for development, crisis management and modern leadership, managing creativity and innovation, team management, and other selected topics (to be assigned by the Department).		
33432	Purchasing and Inventory Management	Pre-requisite: 33101	Credit Hours: 3
	This course outlines the key features of purchasing and inventory management, including storage management; job procurement (quality and quantity); purchasing products at the right time and at the right price; supplier selection process; and the purchase of machinery and equipment. This course also focuses on the importance of storage and warehouses, stock control, production planning (including system scheduling and overall planning), intermittent production, quality and maintenance management, and management information systems.		
33434	Conflict and Negotiation Management	Pre-requisite: 33209	Credit Hours: 3
	This course offers an introduction to the theory of negotiation and explores the different models of negotiation and bargaining. This course also highlights the similarities and differences in the forms and methods of negotiation. Other topics include: the stages of negotiation (from pre- negotiation to post-settlement), negotiation skill development, and the strategic importance of negotiation and conflict management in business enterprises (types, causes, stages, and the skills required to reach solutions to crises to the satisfaction of the disputing parties).		
33435	International Business Management	Pre-requisite: 33404	Credit Hours: 3
	This course outlines the concepts of international business and globalization. Main topics include risk management; analyzing the international business environment; functional business strategies (human resource, finance, operations, marketing, and research and development); and the responsibilities of the director of international business development (future vision and mission).		

33439	Project Management	Pre-requisite: 33313	Credit Hours: 3
	This course outlines project management as a concept with an emphasis on the project life cycle. Main topics include: an introduction to project planning (budgeting, scheduling, staffing, directing, and controlling); network design and the application of widespread project management techniques (Critical Path Method "CPM", Project Evaluation and Review Technique "PERT"); and information systems (use and selection criteria).		
33445	Commercial & Electronic Legislation	Pre-requisite: Finish 99 Credit	Credit Hours: 3
	This course outlines the concepts of electronic and commercial legislation. Main topics include: the classification of companies, brokerage and agency contracts, financial securities and commercial papers, bankruptcy, electronic crimes, and topics related to insurance and collateral.		
33499	Graduation Project	Pre-requisite: Finish 100 Credit	Credit Hours: 3
	This course includes writing up a research proposal, developing proposed solutions to the problem, designing a questionnaire, producing analytical results and findings, in addition to presenting conclusions and recommendations in accordance with the integrated research methodology.		

Accounting

34101	Principles of Accounting I	Pre-requisite: None	Credit hours: 3
	This course covers the definition of accounting, the accounting system and its main elements, the double entry system, transactions related to capital, cash transactions, inventory transactions, accounts receivable, and preparing the trial balance, income statement and statement of financial position.		
34102	Principles of Accounting II	Pre-requisite: 34101	Credit hours: 3
	This course covers the accounting treatment for inventory, property, plant and equipment, intangible assets, current liabilities, long-term liabilities, and cash reconciliation.		
34115	Principles of Finance	Pre-requisite: 34101	Credit hours: 3
	The course covers different topics in finance, such as the time value of money, short term finance (including trade credit, accruals, bank loans, money market instruments), intermediate term finance (including term loan finance, machines and equipment finance, lease financing), and long term finance (including bonds, preferred and common stocks, working capital management, capital budgeting, and capital structure strategies).		
34204	Intermediate Accounting (1)	Pre-requisite: 34102	Credit hours: 3
	This course introduces the student to the conceptual framework to accounting, and also covers the income statement, the statement of financial position, the statement of cash flows, and accounting issues related to inventory and receivables.		
34205	Intermediate Accounting (2)	Pre-requisite: 34204	Credit hours: 3
	This course covers accounting issues related to earnings per share, revenue recognition (including construction contracts), investment accounting (non-equity method), lease accounting, and accounting disclosure.		
34206	Corporate Accounting	Pre-requisite: 34102	Credit hours: 3
	This course covers accounting for partnerships and corporations. Main topics covered include accounting for establishing partnerships, change in partners, liquidating partnerships, establishing corporations, issuing bonds, creating reserves, and liquidating corporations.		

34216	Financial Management	Pre-requisite: 34115	Credit hours: 3
	This course covers fundamental concepts of financial management. This includes investment goals, sources and methods of financing firms, financial evaluation of business firms, profitability, liquidity and financial planning, and asset management.		
34218	Financial Markets	Pre-requisite: 34216	Credit hours: 3
	This course emphasizes the nature of financial markets, roles, types, structure, and investment tools used. The course discusses the intermediary institutions such as market makers, speculators, and hedgers. It explores the significance of financial markets in achieving economic development and market efficiency in international financial markets. It also covers information on Asian financial markets and the Amman stock exchange.		
34227	Auditing (1)	Pre-requisite: 34102	Credit hours: 3
	This course introduces the student to the concepts of auditing under International Standards on Auditing. It covers the topics of the audit report, auditor's professional ethics, auditor independence, responsibilities of auditors, audit objectives, audit evidence, and the analysis of the client's internal and external environment and preliminary analytical procedures.		
34231	Accounting for Financial Institutions (Banking and Insurance)	Pre-requisite: 34102	Credit hours: 3
	This course covers accounting in financial institutions, emphasizing banks and insurance companies. It covers various types of banks, the development of banks, the role of banks in the economy, the main departments of commercial banks and accounting in each of them, and the financial statements of banks. It also covers the nature of insurance, the types of insurance, and the benefits of insurance, reinsurance, and accounting for various types of insurance.		
34233	Governmental Accounting	Pre-requisite: 34102	Credit hours: 3
	This course covers the conceptual framework for accounting for governmental and not-for-profit institutions. For these institutions, it includes fund accounting, preparing financial reports and budgeting for control and performance evaluation.		

34307	Advanced Accounting	Pre-requisite: 34205	Credit hours: 3
	This course covers the accounting treatment for business combinations and group accounts, and includes purchasing companies, the use of the equity method in accounting, consolidated financial statements, accounting for transactions made in foreign currencies, accounting for forward contracts, and translation and measurement of foreign financial statements.		
34311	Financial Statements Analysis (1)	Pre-requisite: 34102	Credit hours: 3
	The course presents the financial statement analysis tools and techniques from the viewpoint of the primary users of financial statements. It covers the fundamental concepts of financial reporting, and basic analysis by using vertical, horizontal, and ratio analysis.		
34313	International Accounting Standards	Pre-requisite: 34205	Credit hours: 3
	This course introduces the students to international accounting standards and the International Accounting Standards Board, and it covers international accounting standards on accounting issues not covered in other courses.		
34314	Banking	Pre-requisite: 33103	Credit hours: 3
	This course aims at identifying the basic concepts of money, the origin of money and banks, the value of money and its role in the economy, the demand for and supply of money, the financial and banking system. Types of banks including objectives, functions and budgets. Types of accounts and checks, types of securities, types of loans and their purposes, credits, and guarantees. Banking services and facilities. Financial and monetary markets, electronic banks, and banking risks. Examples of financial institutions and banking in the world. The banking system in Jordan.		
34318	Portfolio Management	Pre-requisite: 34216	Credit hours: 3
	This course aims to give an introduction about the efficiency of capital markets and the role of speculators and brokers. It is also based on the need for explaining the process of investment decisions incorporating the risk factor and the use of various methods of analysis of risks in that. It explains the correlation between return and risk of the portfolio and understanding the properties of multiple elements of the portfolio and clarifying the theory behind the Capital Asset Pricing Model and the Arbitrage Pricing Theory, and the main characteristics of both of them. The course also covers the efficient portfolio, the application of utility theory, and determines the optimal portfolio.		

34419	Modern Cases in Accounting	Pre-requisite: 34205	Credit hours: 3
	This course covers various contemporary issues in accounting that are not included in any other subject courses.		
34321	Managerial Accounting	Pre-requisite: 34102	Credit hours: 3
	This course covers the principles and methods of using financial information for planning and control and making managerial decisions at different managerial levels. The course covers cost classifications, cost-volume-profit analysis, budgeting, relevant costs for managerial decisions, and using accounting information for making capital budgeting decisions.		
34324	Auditing (2)	Pre-requisite: 34227	Credit hours: 3
	This course covers auditing under International Standards on Auditing, and includes assessing the client's risks, the client's internal control system, the role of the external auditor in detecting fraud, the types of audit tests and procedures (substantive tests, tests of control, and analytical procedures), final audit procedures, audit sampling, and the design of an audit program.		
34326	Cost Accounting	Pre-requisite: 34321	Credit hours: 3
	This course covers the main concepts of cost in manufacturing companies, job-order costing, process costing, activity-based costing, cost allocation for support departments, and standard costing and variance analysis.		
34332	Accounting for Taxation	Pre-requisite: 34102	Credit hours: 3
	This course covers main taxation concepts and methods of calculating tax taking into account the Jordanian tax laws related to individuals and companies. The course also covers the International Accounting Standard No. 12, related to taxation accounting.		
34414	Accounting Theory	Pre-requisite: 34307	Credit hours: 3
	This course covers accounting theory and includes approaches to accounting thought, regulation, and research. It covers the conceptual framework for accounting, accounting standard-setting, accounting measurement, the role of accounting in society, theories of selecting accounting choices, and the relation of accounting information with market variables.		

34415	International Accounting	Pre-requisite: 34313	Credit hours: 3
	This course covers accounting in an international context, and includes the main reasons for differences in accounting practices between countries, the nature of such differences, and harmonization of accounting practices, in addition to covering international accounting standards on accounting issues not covered in other courses.		
34430	Forensic Accounting	Pre-requisite: 34205	Credit hours: 3
	This course covers auditing that aims at discovering fraud. The course includes methods of financial fraud including fraudulent financial reporting and misappropriation of assets. It also covers methods of discovering financial fraud and methods of preventing its occurrence in companies.		
34432	Accounting Information Systems	Pre-requisite: 34227	Credit hours: 3
	This course covers the main concepts of accounting information systems, and includes the design and development of accounting information systems, database concepts, internal control system technology, and the security of accounting information systems.		
34437	Islamic Accounting	Pre-requisite: 34102	Credit hours: 3
	This course covers the accounting and auditing standards issued by the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), accounting for Islamic finance procedures, and financial reporting and financial statements in Islamic financial institutions.		
34438	Islamic Banking	Pre-requisite: None	Credit hours: 3
	This course covers the concept of Islamic finance and banking, Shariah law and the Shariah Supervisory Board in Islamic banks, the difference between Islamic banking and conventional banking, and tools of Islamic finance contracts (murabaha, musharakah, ijarah).		
34439	Computer Applications in Accounting	Pre-requisite: 34432	Credit hours: 3
	This course enables students to operate interrelated computerized accounting systems. They learn how to set up different records for service and merchandizing companies using different modules such as quick-book, Excel and customized ERP financial systems. Students also study about transferring manual accounting systems to computerized accounting systems.		

34499	Graduation Project	Pre-requisite: Finish 99 Cr. Hrs	Credit hours: 3
	In this course, groups of students undertake the task of producing a research study or a business plan. Under the supervision of a faculty member, students choose a research problem, review relevant literature, collect data, analyze the data, and discuss the findings and their implications. The graduation project is presented orally by the students in front of a panel of faculty at the end of the semester.		

Electronic Marketing and Social Media

35101	Principles of Marketing	Pre-requisite: None	Credit Hours: 3
	This course underlines the importance of marketing, the development of marketing concepts, marketing environment, consumer buying behavior, organizational buying behavior, market segmentation, marketing research, services marketing, elements of the marketing mix (product, price, place and promotion), in addition to introducing the concept of international marketing.		
35103	Introduction to Electronic Marketing	Pre-requisites: 36101 , 35101	Credit Hours: 3
	This course presents an overview of the exciting and effective world of the online marketing of products and services, whilst addressing the creative and technical aspects of maintaining a marketing website, including the importance of web design, web development, advertising, public relations, and sales. In addition, this course highlights key terms and concepts including search engine marketing, display advertising, e-mail marketing, affiliate marketing, and interactive advertising.		
35105	Marketing Social Media	Pre-requisite: 35101	Credit Hours: 3
	This course covers the understanding of social marketing as a concept and as a contemporary philosophical thought on the basis of corporate social responsibility. This course also emphasizes the role of social marketing in enhancing consumer protection and business ethics, in conjunction with the modern society, including the status quo of creativity and innovation in different world markets.		
35202	Consumer Behavior	Pre-requisite: 35101	Credit Hours:3
	This course outlines the concept of consumer behavior and outlines the frameworks for analyzing changes in consumer behavior in terms of knowledge, the learning process among consumers, and other related concepts such as needs, motivations, incentives, perceptions, attitudes, cultural influences, social classes, and reference groups. In addition, this course underlines the purchasing-decision process for end consumers as well as industrial consumers. Other topics include market segmentation, product position, and consumer attitudes towards new products.		
35215	Marketing Management	Pre-requisites: 33101, 35101	Credit Hours: 3
	This course covers the administrative functions applied in the marketing department, which include planning, organizing, directing and controlling marketing activities, in addition to marketing styles utilized in the marketing mix (product, pricing, promotion and place).		

35218	Sales Management	Pre-requisite: 33101 & 35101	Credit Hours: 3
	This course defines the different approaches used for identifying and rehabilitating customers, customer needs, product features and utilities, dealing with objections, closing sales contracts, in addition to outlining the main responsibilities carried out by the director of sales, such as sales forecasting, analyzing and designing sales areas, evaluation of vendors, selection and training, motivation, compensation, and the assessment of sales staff.		
35217	Services Marketing	Pre-requisite: 35101	Credit Hours: 3
	This course covers the contemporary development of services marketing, its main features, and the challenges encountered by managers in the field. Other topics include service design, demand management, the perceived quality of services, and the challenges associated with services marketing.		
35235	Communication Skills and Technologies	Pre-requisite: None	Credit Hours: 3
	This course outlines and investigates the applications of communication technologies in terms of their cultural, economic and political significance, whilst focusing on a range of traditional and digital technologies. In addition, wide emphasis is placed on the analysis of a number of different frameworks through modern as well as classical techniques with the most modern innovation circumstances. This course focuses on how businesses interact with the fast-changing world of information and communications technology, and also defines the basic knowledge that counters the technological limitations faced by companies today, including the technicalities that must be addressed when creating marketing websites and other forms of web-based user interface.		
35233	Fundamentals of Graphic Design for Business	Pre-requisite: None	Credit Hours: 3
	This course covers the basic principles of the creative work process, namely graphic design, and focuses on visual language skills, in addition to the creative and aesthetic aspects of traditional & modern graphic design. It also identifies the implications of graphic design via digital format. Finally, students are required to practice their acquired skills on a project involving digital marketing of designs using the trends of Internet and social networking.		

35308	Product and Brand Management	Pre-requisite: 35202	Credit Hours: 3
	This course defines the concept of product and brand management, its inception, forms, and objectives applied in consumer and business markets. It also outlines the laws of registration whilst focusing on building and protecting the brand name, developing branding strategies, and clarifying the relationship between brands and products. In addition, this course covers the decision-making process surrounding product and brand selection, registration, and design, including legal requirements and performance measurement.		
35314	Electronic Marketing Channels	Pre-requisites: 35218, 35103	Credit Hours: 3
	This course outlines the importance of marketing distribution channels as a concept, including its functions. This course also focuses on the analysis of the marketing environment including its intermediaries (wholesalers, retailers, and agents), the distribution channels of goods and services, and the factors that affect the distribution channel design including selection, leadership, motivation, and evaluation. In addition, this course identifies the opportunities and the causes of conflict between members of the marketing channels, including key aspects such as administration, physical distribution, and modern methods of digital distribution.		
35319	Marketing Research	Pre-requisites: 20235, 35202	Credit Hours: 3
	This course covers the importance of marketing research, marketing information systems, methods, and types, and defines the procedures and processes related to marketing research and design including the various types of marketing research (descriptive, experimental, analytical, and causality-based research).This course also gives emphasis to a variety of statistical tools and techniques that are useful in the analysis of populations and samples including data selection and collection, and the various sources of data, in addition to hypotheses testing and how to infer conclusions and recommendations in order to assist in the rationalization of marketing decisions.		
35323	Integrated Electronic Marketing Communication	Pre-requisite: 35235	Credit Hours: 3
	This course covers the basic concept of integrated electronic marketing as well as its key components and planning processes (digital and traditional) through the optimal use of the main elements of personal selling, advertising, publicity, public relations, publishing, and direct marketing, in addition to identifying the challenges that may hinder the success of the communication process such as language barriers, regulatory constraints, and individual differences.		

35326	Advertising Technology	Pre-requisite: 35235	Credit Hours: 3

This course outlines the importance of social and economic roles in advertising in accordance with key aspects, including marketing, productivity and other social and educational elements. It also focuses on online advertising and covers the scientific methods in the planning and preparation of advertising campaigns, in addition to identifying the requirements for planning and implementing traditional and digital advertising campaigns.

35336	Designing of Commercial Websites	Pre-requisite: 35233	Credit Hours: 3

This course builds on the concept of web design and advertising, focusing on how to create a website that embodies web design principles that heighten the marketing message and promote customer sales. Other topics in this course include branding, traditional and digital advertising principles, web design and functionality, and enhancing customer experience. The overall goal of this course is to highlight the web design and advertising principles that are specific to the field of electronic marketing and sustaining trademarks and consumer loyalty. Students practice on design tools in order to sharpen their UI & UX skills.

35407	International Marketing	Pre-requisite: 35323	Credit Hours: 3

This course covers the cultural, social, economic, competitive, technological, and legal factors that influence international marketing practices. This course also focuses on the analysis of opportunities in foreign markets as well as evaluating international marketing plans and strategies. Students develop the essential ability to apply such concepts in analyzing organizations, in addition to developing the appropriate marketing strategies in dealing with international markets.

35408	Customer Relationship Management	Pre-requisites: 36232, 35101	Credit Hours: 3

This course gives emphasis to the importance of building a strong and ongoing relationship between a business organization and its customers – Customer Relationship Management (CRM) – on the basis of mutual positive interaction between the two parties and to serve the marketing process. This course also underlines the importance of building a database for strategic planning in a business organization to support its interaction with the consumer environment, and also to form and strengthen marketing knowledge.

35415	Pricing Policies	Pre-requisite: 35323	Credit Hours: 3

This course highlights the importance of pricing, its objectives and policies towards new products, and the different approaches used in determining prices in different forms of competition (pure competition, monopoly, oligopoly, and monopolistic competition) and evaluating pricing policies.

35416	Social Marketing	Pre-requisite: 35319	Credit Hours: 3
	This course covers the concepts of social media and other networks utilized by customers, as well as the differences between traditional marketing and Electronic-Marketing via social networks, and the importance of social networks as tools that are used for building brand awareness and promoting the business sector. This course also requires students to develop and submit a written marketing plan that would help a company achieve its objectives through social media.		
35419	Marketing Through Mobile	Pre-requisite: 35323	Credit Hours: 3
	This course highlights the importance of marketing via mobile phones for different types of companies (public, private, local and international), and identifies the marketing strategies that can be applied to mobile phones. It also focuses on how to measure the effectiveness of marketing via mobile phone, including the quality of text messages, mobile phone ads, and smart phone applications which companies can access. The interaction between consumer behavior and mobile devices is thoroughly examined.		
35421	Electronic Tourism Marketing	Pre-requisite: 35217	Credit Hours: 3
	This course identifies the strategic and operational importance of information technology and electronic marketing in the tourism, travel, and entertainment sectors. More specifically, it focuses on the available technologies that can help to enhance the competitiveness of institutions working in the aforementioned sectors. This course also gives emphasis as to how these sectors may take advantage of new technologies such as Web 2.0 to interact with stakeholders and thereby enhance their performance and maximize their productivity.		
35424	Global Marketing Strategies	Pre-requisite: 35314	Credit Hours: 3
	This course identifies digital as well as traditional marketing strategies that are utilized by local and international companies. This course focuses on how to develop and implement a marketing strategy based on the organization's mission and objectives for a number of branded goods and services, by exploring the most contemporary strategic analysis tools.		
35435	Modern Electronic Marketing Topics	Pre-requisite: 35323	Credit Hours: 3
	This course outlines and discusses a list of topics related to electronic marketing. These topics are selected on the basis of the most recent developments in the field of electronic marketing in the contemporary world.		

35436	Interactive Web Design and Analysis	Pre-requisite: 35336	Credit Hours: 3
	This course is designed to introduce the principles of website design and creation from a marketing and sales promotion perspective. It covers the basic principles of traditional advertising and their relevance to online advertising. This course also outlines the functions and principles of web design that enhance the consumer experience, in addition to online branding and corporate website advertising from an e-marketing perspective that may support consumer online activity and increase consumer loyalty.		
35437	Search Engine Marketing	Pre-requisite: 35336	Credit Hours: 3
	This course provides a full insight into the concept of Search Engine Optimization (SEO), including its advertisement method and the manner in which it integrates the process of market planning with marketing communication. In addition, this course embarks on a variety of topics including how search engines work, the search process for users, methods of improving a website's ranking on search engines, and how to develop an advertising campaign via search engines and thereby establish a measurement of success.		
35397	Practical Training	Pre-requisite: Finish 90 credit hours	Credit Hours: 3
	This course offers students the opportunity of transforming their theoretical knowledge into practical application via an internship at an organization in the field of electronic marketing. This course ensures that students develop their technical as well as their professional skills.		
35449	Graduation Project	Pre-requisite: Finish 100 credit hours	Credit Hours: 3
	This course requires that students submit an undergraduate dissertation which typically includes the selection of a suitable title, research problem, hypotheses, and objectives, in addition to an adequate selection of a population and sample for the purpose of the study. It also includes writing up a research proposal, developing proposed solutions to the problem, designing a questionnaire, producing analytical results and findings, in addition to presenting conclusions and recommendations in accordance with the integrated research methodology.		

Business Information Technology

36101	Management Information Systems	Pre-requisite: None	Credit hours: 3
	This course introduces information systems, their components, types and usage in the business world. Topics covered include databases, networking, systems development, data warehouses and analytics. In addition, it introduces the major enterprise systems: SCM, CRM, and ERP and explains their role in business.		
36111	Computer Applications in Business	Pre-requisite: None	Credit hours: 3
	This is a practical course that is given in the lab. It introduces computer terminology, hardware, software, operating systems, and information systems in the business environment. Topics covered include word processing, spreadsheets, databases, presentation graphics, business-oriented utilization of the Internet, design of algorithms, and an introduction to 4th generation languages and methodologies.		
36112	Business Applications Programming	Pre-requisite: 11102	Credit hours: 3
	This course introduces high-level programming languages using one of the most common. The language is selected according to the business market's needs. Topics covered include syntax rules and structures, how data is processed using high level programming language, compilation and implementation issues, files and storage mechanisms.		
36113	Business Applications Programming Lab	Co-requisite: 36112	Credit hours: 1
	This course presents the practical aspect of the "Business Applications Programming" course (36112). It shows students the best practices to develop business applications. The lab focuses on the object paradigm including classes, inheritance, functions, and templates in the development of object-oriented programs.		
36202	Web Development for Business Applications	Pre-requisite: 11102	Credit hours: 3
	This course provides an overview of how websites function, their structure, and how to select a website name and an online host. It covers the design and creation of websites by exploring the HTML language. In addition, it includes a scripting language to make websites dynamic and cascading style sheets to graphically design and layout web pages. The course concludes with an examination of server-side web applications.		

36203	Database Management for Business	Pre-requisite: 36101	Credit hours: 3
	This course provides students with an introduction to database management and covers the design and the development of efficient business information systems. Topics covered include data modeling, data integrity, SQL, and the implementation of a database application.		
36232	E-Business for Business Students	Pre-requisite: 36101	Credit hours: 3
	This course introduces the main concepts in e-commerce and e-business models with a focus on (B2B), (B2C) and (C2C). Topics covered include the creation of e-commerce sites, an overview of the technological infrastructure, software technologies for e-business, database solutions for e-business, e-payment methods, as well as ethical and security issues.		
36251	Database Management for Business Lab	Co-requisite: 36203	Credit hours: 1
	This course presents the practical aspect of the "Database Management for Business" course (36203). It covers the design and the implementation of a complete database application for a specific business idea using a modern relational database management system. Topics covered include relations between entities, queries, forms and reports.		
36301	Business Data Communications	Pre-requisite: 36101	Credit hours: 3
	This course introduces the concepts of data communications and networking in the business context. Topics covered include the types and protocols of data communication networks with a focus on Open System Interconnection (OSI). In addition, the course covers some key concepts such as network and digital security, Internet of Things (IoT), and simulators to enable students to manage virtual networks.		
36312	Advanced Business Applications Programming	Pre-requisite: 36112, 36202	Credit hours: 3
	This course introduces the basics of Python programming environment, including fundamental Python programming techniques. Topics covered include the introduction to data manipulation and cleaning techniques using the popular Python library, and how to import and export data in Python.		
36316	Analysis and Design of Information System	Pre- requisite: 36203	Credit hours: 3
	This course introduces the concept of information systems, levels of meaning: data, information and knowledge. It also introduces Information Systems (IS), managerial levels and types of IS. Topics covered include the different approaches to develop an information system and the principles of IT project management. In addition, it covers the system development life cycle with a focus on both analysis and design phases.		

36334	Decision Support Systems	Pre-requisite: 36101	Credit hours: 3
	This course covers the overall decision-making process and how it can be supported by means of decision support systems (DSS). The course demonstrates the importance of business analytics at the different levels (descriptive, predictive, and prescriptive) in DSS. Topics covered include data warehouse, business intelligence, modeling, decision analysis.		
36336	Enterprise Resource Planning Systems (ERP)	Pre-requisite: 36203	Credit hours: 3
	This course introduces the architecture, setup, configuration, operations and management of information systems that is of "enterprise class". Topics covered include fundamentals of business processes, process re-engineering, selection, process mapping, GAP analysis, and the implementation of enterprise systems. The course highlights how ERP modules can facilitate executing business processes in a specific department such as sales and marketing, accounting, production, and supply chain. Moreover, it includes how to manage the organizational changes when adapting an ERP system within a company.		
36339	Knowledge Management Systems	Pre-requisite: 33101, 36101	Credit hours: 3
	This course introduces the concepts of knowledge management (KM) and the forces that drive KM systems. Topics covered include the issues in KM; KM systems foundation, infrastructure, solutions and technologies; knowledge organizations; types of knowledge application systems and how to develop them.		
36357	Enterprise Resource Planning Systems (ERP) Lab	Co-requisite: 36336	Credit hours: 1
	This is the practical part of the "Enterprise Resource Planning Systems" course (36336). It enables students to explore and apply the main modules covered in the ERP course such as sales and marketing, supply chain, production, material management and purchase.		
36395	Practical Training	Pre-requisite: Finish 80 credit hours	Credit hours: 3
	This course offers students the opportunity of transforming their theoretical knowledge into practical application via an internship at an organization in the field of electronic marketing. This course ensures that students develop their technical as well as their professional skills.		
36402	Information Security	Pre-requisite: 36301	Credit hours: 3
	This course introduces the basic concepts in information security. Topics covered include cryptography primitives, security protocols, systems security, digital watermarking, public digital signature, and authentication. In addition, it covers related topics and their applications such as e-mail security, e-commerce security and network security.		

36404	Business Intelligence Systems	Pre-requisite: 36203	Credit hours: 3
	This course introduces the concepts of Business Intelligence (BI) systems. It is focused on the role of BI in supporting the decision-making process. Topics covered include components of BI systems, data warehousing, multi-dimensional analysis, data mining. In addition, it presents the applications of BI in the different fields and its current trends. The course includes a practical element which covers some of the most popular BI systems such as OLAP, Tableau and QlikView.		
36405	Mobile Business Applications	Pre-requisite: 36112	Credit hours: 3
	This course focuses on mobile applications for business fields. It defines the top mobile systems and applications that are used in business. Moreover, it describes the way that these applications work and how to build these applications using specialized programs. This is a practical course which is given in the lab to enable students to develop simple mobile applications for the business field.		
36406	Advanced Database Management Systems	Pre-requisite: 36203	Credit hours: 3
	This course presents the concepts of Data Base Management Systems (DBMS). It focuses on the concepts, advantages and statements for the Structured Query Language (SQL) and its applications in building and manipulating relational databases. In addition, it introduces the Query by Example processor (QBE) to manipulate relational databases. The course includes practical sessions in which students apply and practice using SQL statements and QBE to build and manipulate relational databases using a DBMS in the lab.		
36408	Advanced Topics in BIT	Pre-requisite: Finish 60 Cr. Hrs	Credit hours: 3
	This course is dedicated to new trends in the BIT field to keep the students familiar with the new trends and market demands. The topics covered depend on the selected material with a focus on research methodologies.		
36415	Cloud Computing	Pre-requisite: 36203	Credit hours: 3
	The course introduces several topics in cloud computing. It reviews previous traditional computing models and their role in the emergence of the cloud computing model. It also discusses the various service and deployment models in cloud computing including architectures, cloud resource management, and cloud storage systems. Finally, the course explains the main security issues in cloud computing.		
36416	Logistics and SCM Systems	Pre-requisite: 36232	Credit hours: 3
	This course introduces the concepts of logistics and supply chain management (SCM). Special attention is given to SCM activities including production, transportation, inventory, purchasing, sales, marketing, and customer service. Topics covered include supply chain structure, demand and sales forecasting, inventory management, transportation operations, sourcing and procurement, pricing.		

36417	Advanced System Analysis and Design	Pre-requisite: 36316	Credit hours: 3
	This course introduces the concepts and terminologies of the object-oriented (OO) approach in systems development. Topics covered include life cycle of systems development using the OO approach and the modeling of the development process phases using a selected modeling language. Special attention is given to the application of the OO approach on real business projects using one of the object-oriented modeling languages in practical sessions. The course also introduces RAD technique.		
36428	Business Process Modeling	Pre-requisite: 36232	Credit hours: 3
	This course focuses on modeling business processes using the most popular modeling languages. Topics covered include an introduction to the business process concepts, process modeling languages, and simulating the execution of business processes. In addition, it introduces the concept of process re-engineering and enhancement.		
36435	IT Project Management	Pre-requisite: Finish 80 Cr. Hrs	Credit hours: 3
	This course introduces the applications of project management on IT projects. It introduces the basic concepts of feasibility studies and budgeting in IT projects. It also introduces the planning process for IT projects through creating work breakdown structure, building, implementing and revising a plan, and organizing and managing the project team. The course focuses on the tools and techniques of enforcing total quality management (TQM) in IT projects. Special attention is given to the strategies for staying within budget, minimizing delays, and leading IT project teams.		
36436	Advanced Applications in E-Business & SCM	Pre-requisite: 36232	Credit hours: 3
	This is an advanced course in e-business applications. Topics covered include: Electronic Payment Systems (EPS), Customer Relationship Management (CRM and E-CRM), Supply Chain Management (SCM and E-SCM), and Enterprise Resource Planning (ERP). In addition, it covers some related topics such as social commerce, e-government, regulations, and ethics.		
36499	Graduation Project	Pre-requisite: Finish 90 Cr. Hrs, 36435	Credit hours: 3
	Students take this course in their final year and it gives them the opportunity to apply the knowledge gained during their study. Students are supervised to choose a suitable idea, write the proposal, and develop the project using methodologies that are suitable for the project idea.		