

ملحق (1) المحتوى العلمي للمقررات

مقررات المواد الإنسانية

HUM111	English Language I	لغة إنجليزية 1
Credits	2 Hours	
Prerequisites	-	
Contents	The material reflects the stylistic variety that advanced earners have to be able to deal with. The course gives practice in specific points of grammar to consolidate and extend learners existing knowledge. Analysis of syntax; comprehension; skimming and scanning exercises develop the learner's skills, comprehension questions interpretation and implication. The activities aim to develop listening, speaking and writing skills through a communicative, functional approach, with suggested topics for discussion and exercises in summary writing and composition.	
HUM112	English Language II	لغة إنجليزية 2
Credits	2 Hours	
Prerequisites	HUM111	
Contents	The course aims at enabling the students to further polish and develop their skills in English language through various interactive activities. The need for more articulate written English is reinforced through further in depth study of applied grammar. Again a conversational and situational dialogue based contents are presented to attract students' interest. Pronunciations and comparatively complex grammar are simultaneously introduced. Field related terminology and longer conversations are also presented with emphasis on contrastive grammar and a more articulate pronunciation.	
HUM121	Social Context of Computing	السياق الاجتماعي للحوسبة
Credits	1 Hour	
Prerequisites	-	
Contents	Introduction to the social implications of computing – Social informatics – Social impact of IT on society – Social implications of networked communication – Growth of, control of, and access to the Internet – International issues – Online communities & social implications – Philosophical context – Diversity issues – Gender-related issues – Cultural issues – Accessibility issues – Globalization issues – Economic issues in computing –Digital divide	
HUM122	Intellectual Property	الملكية الفكرية
Credits	1 Hour	
Prerequisites	-	
Contents	Foundations of intellectual property – Ownership of information – Copyrights, patents, trademarks and trade secrets – Software piracy – Software patents – Transnational issues concerning intellectual property – Fair use – Digital Millennium Copyright Act (DMCA) – International differences – Egyptian Intellectual Property law	

HUM131	Organizational Behavior	سلوكيات الهيئات
Credits	2 Hours	
Prerequisites	-	
Contents	Perception, learning, motivation and value; individual differences and work performance; understanding yourself; motivating yourself and others, working within groups, achieving success through goal setting, achieving high personal productivity and quality; achieving rewarding and satisfying career; communicating with people; leading and influencing others; building relationships with supervisors, co-workers and customers.	
HUM132	Interpersonal Communication	التواصل الشخصي
Credits	2 Hours	
Prerequisites	-	
Contents	Elements of the communication process, barriers to communications, effective writing skills, report writing, and oral presentation skills. Good diction, extempore speaking in the appropriate context will be key skills in this course.	
HUM133	Computing Economics	اقتصاديات الحوسبة
Credits	2 Hours	
Prerequisites	-	
Contents	Monopolies and their economic implications; Effect of skilled labor supply and demand on the quality of computing products; Pricing strategies in the computing domain; cost-benefit analysis and break-even analysis; return on investment; analysis of options; time value of money; management of money: economic analysis, accounting for risk; Differences in access to computing resources and the possible effects thereof.	
HUM141	Computer Law	قوانين الحاسوبات
Credits	2 Hours	
Prerequisites	-	
Contents	History and examples of computer crime – “Cracking” (“hacking”) and its effects – Viruses, worms, and Trojan horses – Crime prevention strategies – System use policies & monitoring – Risks and liabilities of computer-based systems – Accountability, responsibility, liability.	
HUM142	Privacy and Civil Liberties	الخصوصية والحربيات المدنية
Credits	1 Hour	
Prerequisites	-	
Contents	Ethical and legal basis for privacy protection; Privacy implications of computer and information systems; Technological strategies for privacy protection; Freedom of expression in cyberspace; International and intercultural implications.	
HUM151	Hand Drawing	الرسم باليد
Credits	2 Hours	
Prerequisites	-	
Contents	Introduction and proportions - Gestalt theory and gestural drawing - Blind contour drawing - Using light and dark; discovering mass drawing; using negative space as a tool to create atmosphere and shape - Exploring different mediums and paper - Conclusion and final portfolio drawing	

تاريخ الحوسبة

HUM152 History of Computing

Credits 2 Hours

Prerequisites –

Contents Prehistory – the world before 1946; Implications of: History of computer hardware, software; History of the Internet; Telecommunications ; The IT profession; IT education; Pioneers of computing.

HUM153 Islamic Culture

الثقافة الإسلامية

Credits 1 Hours

Prerequisites –

Contents Fundamental elements of the Islamic Culture; Islamic culture concept; Islamic culture resources; Islamic culture importance; Islamic culture relation with other cultures; The faith's impact on society.

HUM154 Scientific Thinking

التفكير العلمي

Credits 1 Hour

Prerequisites –

Contents Personal Development Planning – Learning and personal skills development – Transferable skills development, including time and stress management, note taking, essay writing, literature finding, and exam and revision skills – Develops an understanding of the nature of scientific thinking – Scientific methods are introduced and evaluated – Critical and creative thinking skills – The processes of induction and deduction – Empirical reasoning and the evaluation of evidence – Heuristic strategies for critical and creative thinking – A range of motivating examples on sustainability and personal development.

HUM231 Business Administration

ادارة الاعمال

Credits 2 Hours

Prerequisites –

Contents Management concepts, level and types of management, planning and organization of work flow, delegation, leadership styles, decision making, stress and time management, and employee relations, decision-making in such areas as investment in operations, productions planning, scheduling and control, reliability and maintenance.

HUM232 Technical Writing

الكتابة التقنية

Credits 2 Hours

Prerequisites HUM111

Contents General Principles of Good Writing – Design and Usability – Documentation Development Process – Writing Procedures – Aspects of the Language – Obstacles to Readability – Writing Reports – Practices in Technical Writing

HUM241 Computers and Ethics

الحاسبات والأخلاقيات

Credits 1 Hour

Prerequisites –

Contents Community values and the laws by which we live – The nature of professionalism in computing – Various forms of professional credentialing and the advantages and disadvantages – The role of the professional in public policy – Maintaining

awareness of consequences – Ethical dissent and whistle-blowing – Codes of ethics, conduct, and practice (IEEE, ACM, SE, AITP, and so forth) – Dealing with harassment and discrimination – “Acceptable use” policies for computing in the workplace.

مقررات العلوم الأساسية

MATH101	Mathematics I	رياضيات ١
Credits	3 Hours	
Prerequisites	-	
Contents	Pre-calculus review: sets and functions; limits and continuity - Derivatives: techniques of differentiation; derivatives of the basic and fundamental functions; implicit differentiation; linear approximation and differentials; extreme of functions; optimization problems; velocity and acceleration - Integrals: indefinite integrals; change of variables; definite integrals; the fundamental theorem of calculus - Techniques of integration: integration by parts; trigonometric integrals and substitutions; integrals of rational functions - Numerical integration - Applications of definite integrals.	
MATH101	Mathematics II	رياضيات ٢
Credits	3 Hours	
Prerequisites	MATH101	
Contents	Partial fractions - Infinite series: sequences, convergent and divergent series, positive-term series, tests of convergence, alternating series and absolute convergence, power series, power series representations of functions, Maclauran and Taylor series - Differential equations: definition, classifications and terminology, techniques of solution of ordinary first-order linear differential equations - Matrices - Linear equations - Vector spaces, inner product spaces - Linear transformations - Eigen-values and eigenvectors.	
MATH201	Mathematics III	رياضيات ٣
Credits	3 Hours	
Prerequisites	MATH102	
Contents	Laplace transform - Inverse Transform - Fourier series - complex Fourier series - Fourier integrals - Fourier cosine and sine transforms - Fourier transform - Discrete and fast Fourier transforms - Z-transform - Inverse Z-transform - Discrete-time systems and difference equations - Discrete linear systems - Wavelet transform - Applications.	
MATH202	Probability and Statistics	الاحتمالات والاحصاء
Credits	2 Hours	
Prerequisites	MATH102	
Contents	Introduction to probability: Basic concepts; Properties of probability; Conditional probability and independence; Total probability and Bayes' rule; Random variables; Probability distributions. Introduction to statistical analysis: Sampling and sampling distributions; Point estimation; Methods of moments and maximum likelihood; Interval estimation; Least squared concept; Testing hypotheses; Statistical tests. Applications: Statistical software packages; Applications of statistics to reliability engineering.	
MATH301	Numerical Analysis	تحليل عددي
Credits	3 Hours	

Prerequisites	MATH102	
Contents	Numerical Computing and Computers – Solving Nonlinear Equations – Solving Sets of Equations – Interpolation and Curve Fitting – Approximation of Functions – Finite Differences – Numerical Differentiation and Numerical Integration – Numerical Solution of ODEs – Boundary-Value Problems – Sample applications using software tools.	
CS201	Discrete Structures	هيكل متقطعة
Credits	3 Hours	
Prerequisites	MATH102	
Contents	Introduction to logic and proofs – Fundamental structures: Functions; relations; sets; cardinality and countability – Boolean algebra – Propositional logic: Logical connectives; truth tables; normal forms; validity – Elementary number theory: Factorability; properties of primes; greatest common divisors and least common multiples; Euclid's algorithm; modular arithmetic; the Chinese Remainder Theorem – Basics of counting: Counting arguments; pigeonhole principle; permutations and combinations; binomial coefficients – Predicate logic: Universal and existential quantification; modus ponens and modus tollens; limitations of predicate logic – Recurrence relations: Basic formulae; elementary solution techniques – Graphs and trees: Fundamental definitions; simple algorithms; traversal strategies; proof techniques; spanning trees; applications.	
CS301	Operation Research	بحوث عمليات
Credits	3 Hours	
Prerequisites	CS201	
Contents	Linear programming: The Simplex method – Integer programming – Probabilistic modeling – Queuing theory: Petri nets; Markov models and chains – Optimization – Network analysis and routing algorithms – Prediction and estimation: Decision analysis; Forecasting; Risk management; Econometrics and microeconomics; Sensitivity analysis – Dynamic programming – Sample applications – Software tools.	
CS302	Modeling And Simulation	النمذجة والمحاكاة
Credits	3 Hours	
Prerequisites	MATH202	
Contents	Definition of simulation and modeling: Purpose including benefits and limitations – Important application areas: healthcare; economics and finance; classroom of the future; training and education; city and urban simulations; simulation in science and in engineering; games; military simulation – Different kinds of simulations – The simulation process – Model building: use of mathematical formula or equation, graphs, constraints – Methodologies and techniques – Use of time stepping for dynamic systems – Theoretical considerations; Monte Carlo methods, stochastic processes, queuing theory – Technologies in support of simulation and modeling – Human computer interaction considerations – Assessing and evaluating simulations in a variety of contexts – Software in support of simulation and modeling; packages, languages.	
PHY101	Physics I	الفيزياء ١
Credits	3 Hours	
Prerequisites	–	

Contents	Mechanics: Physics and measurements; Motion in one dimension; Vectors; Motion in two dimensions; Laws of motion; Circular motion and its applications; Work and energy; Potential energy and conservation of energy; Linear momentum and collision; Rotation of a rigid body; Rolling motion; Law of gravity. Waves: Oscillatory motion; Wave motion; Sound waves.	
PHY102	Physics II	الفيزياء ٢
Credits	3 Hours	
Prerequisites	-	
Contents	Physical optics: Interference, diffraction and polarization. Magnetic fields: Definitions and properties; Sources of magnetic fields; electromagnetic waves; The four Maxwell's equations. Selected topics: Introduction to modern physics and applications, Molecules and solids; Semiconductors and semiconductors devices; Superconductivity.	
EE101	Electronics	الإلكترونيات
Credits	3 Hours	
Prerequisites	-	
Contents	Electrical circuit laws and theorems: Ohm's Kirchhoff's, mesh, nodal, Thevenin's maximum power transfer theorems for both DC and AC circuits , R, L, C elements. Electronic components and circuits diodes – bipolar junction transistors – field-effect transistors and use of transistors in amplifiers. OP-Amp, digital circuits – physical design of simple gates – flip-flops and memory circuits.	
EE102	Digital Circuits	الدوائر الرقمية
Credits	2 Hours	
Prerequisites	-	
Contents	Numbering systems, logic functions and logic gates, Boolean algebra. Combinational circuits: Simplification of logic circuits using Karnaugh maps and tabulation method. Gate level design, adders, subtractors, encoders and decoders, multiplexers and demultiplexers. MSI Design, Programmable devices (ROM, PAL, PLA,). Sequential circuits: Flip-flops, latches, analysis and design of simple sequential circuits, state tables and state diagrams, counters, registers, RAMs. Integrated circuits and logic families.	
EE201	Digital Signal Processing	معالجة الاشارات الرقمية
Credits	3 Hours	
Prerequisites	MATH201	
Contents	Digital processing of signals, sampling, difference equations, discrete-time Fourier transforms, discrete and fast Fourier transforms, digital filter design.	

مقررات الحوسبة الأساسية

CS141	Programming Fundamentals	أساسيات البرمجة
Credits	3 Hours	
Prerequisites	IT101	
Contents	Fundamental programming constructs: Syntax and semantics of a higher-level language; variables, types, expressions, and assignment – Simple I/O – Conditional and iterative control structures – Functions and parameter passing – Structured decomposition – Algorithms and problem-solving: Problem-solving strategies; the role of algorithms in the problem-solving process; implementation strategies for algorithms; debugging strategies; the concept and properties of algorithms – Fundamental data structures – Machine level representation of data – Human-computer interaction: Introduction to design issues – Software development methodology: Fundamental design concepts and principles; structured design; testing and debugging strategies; test-case design; programming environments; testing and debugging tools.	
CS211	Data Structures and Algorithms	هيكل البيانات والخوارزميات
Credits	3 Hours	
Prerequisites	CS241	
Contents	Review of elementary programming concepts – Fundamental data structures: Stacks; queues; linked lists; hash tables; trees; graphs – Basic algorithmic analysis: big “O,” little “o,” omega, and theta notation – Fundamental computing algorithms: $O(N \log N)$ sorting algorithms; hash tables, including collision-avoidance strategies; binary search trees; representations of graphs; depth- and breadth-first traversals – Recursion and divide-and-conquer strategies – Basic algorithmic strategies: Brute-force algorithms; greedy algorithms; divide and conquer; backtracking – Standard complexity classes.	
CS241	Object-Oriented Programming	البرمجة الشيئية
Credits	3 Hours	
Prerequisites	CS141	
Contents	Introduction to object-oriented programming – Using an object-oriented language; classes and objects; syntax of class definitions; methods; members – Simple data: variables, types, and expressions; assignment – Control structures: Iteration; conditionals – Message passing: Simple methods; parameter passing – Sub-classing; encapsulation and information hiding; separation of behavior and implementation; class hierarchies; inheritance; polymorphism – Collection classes and iteration protocols – Using APIs: Class libraries; packages for graphics and GUI applications – Object-oriented design: Fundamental design concepts and principles; introduction to design patterns; object-oriented analysis and design; design for reuse .	
CS321	Operating Systems	نظم التشغيل
Credits	3 Hours	
Prerequisites	CE221	
Contents	Overview: Role and purpose of operating systems; history of operating system development; functionality of a typical operating system; design issues (efficiency, robustness, flexibility, portability, security, compatibility). Basic principles:	

Structuring methods; abstractions, processes, and resources; device organization; interrupts; user/system state transitions. Concurrency: The idea of concurrent execution; states and state diagrams; implementation structures; dispatching and context switching; interrupt handling in a concurrent environment. Mutual exclusion: Definition of the “mutual exclusion” problem; deadlock detection and prevention; solution strategies; models and mechanisms (semaphores, monitors, condition variables, rendezvous); synchronization; multiprocessor issues. Scheduling: Preemptive and non-preemptive scheduling; scheduling policies; processes and threads; real-time issues. Memory management: Review of physical memory and memory management hardware; overlays, swapping, and partitions; paging and segmentation; page placement and replacement policies; working sets and thrashing; caching. Device management: Characteristics of serial and parallel devices; abstracting device differences; buffering strategies; direct memory access; recovery from failures. File systems: Fundamental concepts (data, metadata, operations, organization, buffering, sequential vs. non-sequential files); content and structure of directories; file system techniques; memory-mapped files; special-purpose file systems; naming, searching, and access; backup strategies. Security and protection: Overview of system security; policy/mechanism separation; security methods and devices; protection, access, and authentication; models of protection; memory protection; encryption; recovery management.

CS322	Computer Architecture and Operating Systems	معماريات الحاسوب ونظم التشغيل
Credits	3 Hours	
Prerequisites	CS141, CS201	
Contents	Computer architecture: data representation, digital logic, the internal structure of the CPU, primary and secondary storage, input/output, control unit, and assembly language. Operating systems: processes, inter-process communication, process scheduling, resource allocation, memory management, virtual memory, file systems, and input/output device management.	
CS341	Visual Programming	البرمجة المرئية
Credits	3 Hours	
Prerequisites	CS211	
Contents	Graphical user interface (GUI), review of concepts, and anatomy of a windows program using different languages. Available developing tools. Keyboard and mouse input, menus creating, adding menus to programs. Dialog boxes: buttons, text, list boxes, grids and spreadsheets. Graphics files and file handling. Multiple documents interfaces and views (MDI). Exception Handling and Debugging. Object Linking and Embedding (OLE).	
CS351	Computer Graphics	الرسم بالحاسوب
Credits	3 Hours	
Prerequisites	IT101, CS201	
Contents	This course introduces techniques for 2D and 3D computer graphics, including simple color models, homogeneous coordinates, affine transformations (scaling, rotation, translation), viewing transformation, clipping, illumination and shading, texture maps, rendering, high level shader language, video display devices, physical and logical input devices, hierarchy of graphics software, hidden surface removal methods, Z-buffer and frame buffer, color channels, and using a graphics API.	

CS361	Artificial Intelligence	الذكاء الاصطناعي
Credits	3 Hours	
Prerequisites	IT101, CS201	
Contents	Fundamental issues in intelligent systems – History of artificial intelligence – Agents: Definition of agents; successful applications and state-of-the-art agent-based systems; software agents, personal assistants, and information access; multi-agent systems – Modeling the world; the role of heuristics – Search and constraint satisfaction – Knowledge representation and reasoning – Advanced search: Genetic algorithms; simulated annealing; local search – Advanced knowledge representation and reasoning – Structured representation; nonmonotonic reasoning; reasoning on action and change – AI planning systems: Definition and examples of planning systems; planning as search; operator-based planning; propositional planning.	
CS391	Software Engineering	هندسة البرمجيات
Credits	3 Hours	
Prerequisites	CS211	
Contents	Software processes: Software life-cycle and process models; process assessment models; software process metrics. Software requirements and specifications. Software design: Fundamental design concepts and principles; software architecture; structured design; object-oriented analysis and design; component-level design; design for reuse. Software validation: Validation planning; testing fundamentals; unit, integration, validation, and system testing; object-oriented testing; inspections. Software evolution: Software maintenance; characteristics of maintainable software; reengineering; legacy systems; software reuse. Software project management. Component-based computing: Fundamentals; basic techniques; applications; architecture of component-based systems; component-oriented design; event handling; middleware.	
IS201	Foundations of Information Systems	أساسيات نظم المعلومات
Credits	3 Hours	
Prerequisites	IT101	
Contents	Information systems components. Information systems in organizations: Characteristics of IS professionals, IS career paths, Cost/value information, Quality of information, competitive advantage of information, IS and organizational strategy, Value chains and networks. Globalization. Valuing information systems: Investment evaluation, Multi-criteria analysis, Cost-benefit analysis, Identifying and implementing innovations. E-business: B-to-C, B-to-B, Intranets, Internet, extranets, E-government, Web 2.0 Technologies: e.g., wikis, tags, blogs, netcasts, self-publishing, New forms of collaboration: social networking, virtual teams, viral marketing crowd-sourcing. Security of information systems: Threats to information systems, Technology-based safeguards. Business intelligence: Organizational decision making, functions, and levels, Executive, managerial, and operational levels, Systems to support organizational functions and decision making. Information and knowledge discovery: Reporting systems, Online analytical processing, Data, text, and Web mining, Business analytics. Application systems: Executive, managerial, and operational support systems, Decision support systems.	

تنظيم الملفات

IS211 File Organization

Credits 3 Hours

Prerequisites CS241

Contents Introduction to the Design and Specification of File Structures – Fundamental File Processing Operations – Fundamental File Structure Concepts – Managing Files of Records – Secondary Storage and System Software – Organizing Files for Performance. Indexing – Multi-Level Indexing and B-Trees – Indexed Sequential File Access and Prefix B+ Trees. Hashing.

قواعد البيانات

IS212 Databases

Credits 3 Hours

Prerequisites CS141

Contents Database systems: History and motivation for database systems; components of database systems; DBMS functions; database architecture and data independence. Data modeling: Data modeling; conceptual models; object-oriented model; relational data model. Relational databases: Mapping conceptual schema to a relational schema; entity and referential integrity; relational algebra and relational calculus. Database query languages: Overview of database languages; SQL; query optimization; 4th-generation environments; embedding non-procedural queries in a procedural language; introduction to Object Query Language. Relational database design: Database design; functional dependency; normal forms; multivalued dependency; join dependency; representation theory.

تحليل وتصميم النظم

IS231 Systems Analysis and Design

Credits 3 Hours

Prerequisites IT101

Contents Information requirements: Structuring of IT-based opportunities into projects; Project specification; Project prioritization; Analysis of project feasibility. Operational, Tangible costs and benefits (financial and other measures such as time savings), Intangible costs and benefits such as good will, company image: Technical; Schedule; Cultural (organizational and ethnic). Fundamentals of IS project management in the global context. Using globally distributed communication and collaboration platforms. Analysis and specification of system requirements; Data collection methods; Methods for structuring and communicating requirements; Factors affecting user experience; User interface design; System data requirements; Factors affecting security; Ethical considerations in requirements specification. Different approaches to implementing information systems to support business requirements: Packaged systems; enterprise; systems; Outsourced development; In-house development. Specifying implementation alternatives for a specific system. Methods and impact of implementation alternatives on system requirements specification. Different approaches to systems analysis and design: structured SDLC, unified process/UML, agile methods

أساسيات تكنولوجيا المعلومات

IT101 IT Fundamentals

Credits 3 Hours

Prerequisites –

Contents Introduction: Brief history of computing; the components of a computing system. Machine level representation of data: Bits, bytes, and words; numeric data representation and number bases; signed and twos-complement representations; fundamental operations on bits; representation of nonnumeric data.

Digital logic: Switching circuits; gates; memory.
 Assembly level machine organization: Basic organization of the von Neumann machine; control unit; instruction fetch, decode, and execution; instruction sets and types; assembly / machine language programming; instruction formats.
 Hardware realizations of algorithms: Data representation; the von Neumann model of computation; the fetch/decode/execute cycle; basic machine organization.
 Operating systems and virtual machines: Historical evolution of operating systems; responsibilities of an operating system; basic components of an operating system.
 Computing applications: Word processing; spreadsheets; editors; files and directories.
 Introduction to net-centric computing: Background and history of networking and the Internet; demonstration and use of networking software including e-mail, telnet, and FTP.

IT251	Data Communications	تراسل البيانات
Credits	3 Hours	
Prerequisites	IT101	
Contents	Communication models, Data communication, networks, protocol architectures. Data Transmission, Transmission media wired and wireless, transmission impairment. Encoding and modulating baseband, Digital and analog modulation. Flow control and Error control. Multiplexing.	
IT351	Computer Networks	شبكات الحاسوب
Credits	3 Hours	
Prerequisites	IT251, CE221 or CS322	
Contents	Standards bodies. Switched vs. packets networking. OSI model. Internet model (TCP/IP). Nodes & links. LAN, WAN. Bandwidth, throughput. Components and architectures. Routing and switching. Communication protocols. Application, Transport, and network layers protocols.	
IT371	Web Programming	البرمجة العنكبوتية
Credits	3 Hours	
Prerequisites	CS141, IT251	
Contents	The fundamental technologies behind the Web. Concepts of Web Programming both client-side and server-side. HTML and CSS Web page development. Fundamentals of Server side scripting language such PHP. Fundamentals of Client side scripting language such as JavaScript.	
MM301	Introduction to Multimedia Technology	مقدمة في تكنولوجيا الوسائط المتعددة
Credits	3 Hours	
Prerequisites	CS241	
Contents	Basic knowledge about multimedia and multimedia technology. Basic media such as text, image, animation, graphic, and sound. Current multimedia technology. Roles and uses of multimedia technology in many areas such as education, advertisement, and public relation etc.	
CE221	Computer Architecture	معماريات الحاسوب
Credits	3 Hours	
Prerequisites	CS141, CS201	

Contents	Register transfer notation; physical considerations (gate delays, fan-in, fan-out). Assembly level organization: Basic organization of the von Neumann machine; control unit; instruction fetch, decode, and execution; instruction sets and types (data manipulation, control, I/O); assembly/machine language programming; instruction formats; addressing modes; subroutine call and return mechanisms; I/O and interrupts. Memory systems: Storage systems and their technology; coding, data compression, and data integrity; memory hierarchy; main memory organization and operations; latency, cycle time, bandwidth, and interleaving; cache memories (address mapping, block size, replacement and store policy); virtual memory (page table, TLB); fault handling and reliability. Interfacing and communication: I/O fundamentals: handshaking, buffering, programmed I/O, interrupt-driven I/O; interrupt structures: vectored and prioritized, interrupt acknowledgment; external storage, physical organization, and drives; buses: bus protocols, arbitration, direct-memory access (DMA); introduction to networks; multimedia support; raid architectures. Functional organization: Implementation of simple datapaths; control unit: hardwired realization vs. microprogrammed realization; instruction pipelining; introduction to instruction-level parallelism (ILP). Multiprocessor and alternative architectures: Introduction to SIMD, MIMD, VLIW, EPIC; systolic architecture; interconnection networks; shared memory systems; cache coherence; memory models and memory consistency. Performance enhancements: RISC architecture; branch prediction; prefetching; scalability. Contemporary architectures: Hand-held devices; embedded systems; trends in processor architecture.
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مقررات التخصص

CS311	Algorithm Design and Analysis	تصميم وتحليل الخوارزميات
Credits	3 Hours	
Prerequisites	CS211	
Contents	Review of proof techniques – Basic algorithmic analysis: Asymptotic analysis of upper and average complexity bounds; best, average, and worst case behaviors; big-O, little-o, Ω , and Θ notation; standard complexity classes; empirical measurements of performance; time and space tradeoffs in algorithms; using recurrence relations to analyze recursive algorithms – Algorithmic strategies: branch-and-bound; heuristics; pattern matching and string/text algorithms; numerical approximation – Graph and tree algorithms: Shortest-path algorithms (Dijkstra's and Floyd's algorithms); transitive closure (Floyd's algorithm); minimum spanning tree (Prim's and Kruskal's algorithms); topological sort – Dynamic Programming – Randomized Algorithms – NP-complete problems.	
CS342	Automata and Language Theory	نظرية الآليات واللغات
Credits	3 Hours	
Prerequisites	CS141, CS201	
Contents	Introduction: The purpose of automata theory; relationship of automata and languages; the Chomsky hierarchy. Finite automata: Definition of finite automata and their operation; deterministic and nondeterministic automata and their equivalence; two-way finite automata; minimization of deterministic automata. Regular expressions: Relationship of regular expressions and finite automata; Kleene analysis and synthesis theorems; applications of regular expressions. Properties of regular sets: The Myhill-Nerode theorem; the pumping lemma; closure properties; decision algorithms. Context-free grammars: Equivalence and ambiguity of grammars; languages generated by context-free grammars; simplification of context-free grammars; Chomsky and Greibach normal forms; general strategies for top-down and bottom-up parsing. Properties of context-free languages: The pumping lemma for context free languages; closure properties of context-free languages; decision algorithms. Pushdown automata: Languages accepted by pushdown automata; pushdown automata and context-free languages. Linear-bounded automata: Definition and operation; context-sensitive languages; properties of context-sensitive languages. Turing machines: Definitions and introduction to the mechanics of Turing machine operation; the universal Turing machine; the Church-Turing thesis; variations of Turing machines; languages recognized by Turing machines; computable languages; undecidability; the P = NP question.	
CS352	Image Processing	معاجة الصور
Credits	3 Hours	
Prerequisites	CS211	
Contents	Scope and applications of image processing. Perspective transformations (Modeling picture taking, perspective transformations in homogeneous coordinates and with two reference frames). The spatial frequency domain (The sampling theorem, template matching and the convolution theorem, spatial filtering). Enhancement and restoration, image segmentation. Image representation: (Spatial differentiation and smoothing, template matching, region	

analysis, contour following). Descriptive methods in scene analysis. Hardware and software considerations. Applications.

CS353	Advanced Computer Graphics	الرسم بالحاسوب المتقدم
Credits	3 Hours	
Prerequisites	CS351	
Contents	This course will study advanced topics in computer graphics which includes GPU programming, shader languages, modeling natural phenomena, real-time rendering for games, information visualization, geometric optimization, level-of-detail rendering, bi-directional reflectance distribution functions (BRDFs), environment mapping, bump mapping, subdivision surfaces, higher-order surface modeling.	
CS421	Advanced Operating Systems	نظم التشغيل المتقدمة
Credits	3 Hours	
Prerequisites	CS321	
Contents	Parallel and distributed operating systems. Load sharing, scheduling, reliability, recovery, memory management. Distributed file systems, distributed agreement, and object- oriented operating systems.	
CS431	Parallel Computation	الحسابات المتوازية
Credits	3 Hours	
Prerequisites	CS311, CS321	
Contents	Introduction to parallel computing – Models of parallel computers – Data and task parallelism – Shared and Distributed memory parallel machine architecture concepts – Interconnection networks – Basics of threaded parallel computation– Parallel algorithmic design – Languages and libraries for threaded parallel programming – Languages and libraries for distributed memory parallel programming – Co-processor techniques including GPU and FPGA – Experimental techniques – Measuring performance and computing speed-up.	
CS441	Compiler Construction	بناء المترجمات
Credits	3 Hours	
Prerequisites	CS211, CS341, CE221	
Contents	Compiler Functions, Language Elements – BNF Grammars, Regular Expressions, Finite State Machines, Lexical Analyzers – Context Free Grammars, Grammar Ambiguity, Parse Trees, Push Down Automata – Parsing Methods; Top-Down, Recursive Descent, LL, LR – Symbol Table Construction, Type Checking – Code Generation – Handling Recursion and Arrays – Code Optimization Techniques.	
CS442	Programming Language Design	تصميم لغات البرمجة
Credits	3 Hours	
Prerequisites	CS211, CE221	
Contents	Fundamental issues in language design: General principles of language design; design goals; typing regimes; data structure models; control structure models; abstraction mechanisms. Overview of programming paradigms: Procedural paradigm; object-oriented paradigm; functional paradigm; logic paradigm. Type systems: Data types; type-checking models; semantic models of user-defined types; parametric polymorphism; subtype polymorphism; type-checking algorithms.	

Models of execution control: Order of evaluation of subexpressions; exceptions and exception handling; parallel composition; functions with delayed evaluation; runtime systems. Declaration, modularity, and storage management: Declaration models; parameterization mechanisms; type parameterization; mechanisms for sharing and restricting visibility of declarations; garbage collection. Programming language semantics: Informal semantics; overview of formal semantics; denotational semantics; axiomatic semantics; operational semantics. Language-based constructs for parallelism: Communication primitives for tasking models with explicit communication; communication primitives for tasking models with shared memory; programming primitives for data-parallel models; comparison of language features for parallel and distributed programming; optimistic concurrency control vs. locking and transactions; coordination languages; asynchronous remote procedure calls; other approaches.

CS451	Computer Animation	الحركة بالحاسوب
Credits	3 Hours	
Prerequisites	-	
Contents	Basics of key-frame animation, camera animation, forward and inverse kinematics, particle systems, rigid body simulation, flocking, autonomous behavior, modeling natural phenomena such as water and gases, animation of articulated structures, facial animation, clothes, scripting system, morphing, motion capture, and deformation.	
CS452	Computer Vision	الرؤية بالحاسوب
Credits	3 Hours	
Prerequisites	CS241, PHYS102	
Contents	An introduction to the concepts and applications in computer vision. Topics include: cameras and projection models, low-level image processing methods such as filtering and edge detection; mid-level vision topics such as segmentation and clustering; shape reconstruction from stereo, as well as high-level vision tasks such as object recognition, scene recognition, face detection and human motion categorization. Applications such as scene reconstruction and tracking.	
CS453	Game Programming	برمجة الألعاب
Credits	3 Hours	
Prerequisites	MM301	
Contents	This course describes the techniques and programming tricks used to build efficient game engines that support landscape visualization, complex scenes, lighting, shadows, motion control, collision, dynamics, image based rendering, and multi-player.	
CS461	Intelligent Systems	النظم الذكية
Credits	3 Hours	
Prerequisites	CS361	
Contents	Application Areas of Intelligent Systems – Intelligent System Architecture – Knowledge Engineering and Control –Languages Used in Expert Systems – Bayesian Interference – Fuzzy Logic – Decision Support Systems – Software tools for developing expert systems – Software tool for developing intelligent systems). Robotics: Overview; configuration space; planning; sensing; robot programming;	

navigation and control.

CS462	Machine Learning	تعلم الآلة
Credits	3 Hours	
Prerequisites	CS361	
Contents	Introduction to machine learning – Definition and examples of machine learning – Supervised learning (of classification and regression functions); K-nearest neighbors, decision trees, naïve Bayes, support vector machines, logistic regression, evolutionary algorithms, Bayesian Networks, hidden Markov model, neural networks, boosting – Unsupervised learning and clustering K-means, hierarchical clustering (agglomerative and divisive), principal component analysis, independent component analysis, Expectation Maximization algorithm – Reinforcement learning – Kernel methods – Sparse kernel machines – Mixture models and the EM algorithm – Combining multiple learners.	
CS463	Pattern Recognition	التعرف بالماذج
Credits	3 Hours	
Prerequisites	CS361	
Contents	Introduction – Statistical Decision Theory – Statistical Decision Theory continued – Parameter Estimation – Parameter Estimation continued – Introduction to Principal Component Analysis and Linear Discriminant Analysis – Face Recognition – Non-parametric Techniques – Decision Trees – Neural Networks – Classifier Combination – Feature Selection – Unsupervised Learning, Clustering, and Multidimensional Scaling – Semi-supervised learning.	
CS471	Introduction to Computer Security	مقدمة أمن الحاسوب
Credits	3 Hours	
Prerequisites	CS211, IT351	
Contents	Security Goals, Fundamentals (confidentiality, integrity, availability, etc.). Introduction to risk assessment and management. Security standards in government and industry. Computer system protection principles (UNIX and Windows). Access controls, including MAC, DAC, and role-based. Cryptography fundamentals. Authentication, passwords, introduction to protocols, Kerberos. Security operations. Attacks: software attacks, malicious code, buffer overflows, social engineering, injection attacks, and related defense tools. Network attacks: Denial of service, flooding, sniffing and traffic redirection, defense tools and strategies. Attacking web sites: cross-site scripting. IPSec, Virtual Private networks and Network Address Translation. Ethics, SP issues that are related. Introduction to Forensics.	
CS472	Cryptography	التشفيير
Credits	3 Hours	
Prerequisites	CS211, IT351	
Contents	Introduction – Secret-Sharing – Defining Encryption – Symmetric-Key Encryption – Public-Key Encryption – Hash functions, Digital Signatures – Key Exchange – Secure Communication Protocols – Homomorphic Encryption – Private Information Retrieval – Attribute-based Cryptography – Pairing-based Cryptography – Formal Methods in Cryptography – Private Set Intersection – Signatures.	

CS491	Software Quality Assurance and Testing	ضمان جودة البرمجيات وختبارها
Credits	3 Hours	
Prerequisites	CS391	
Contents	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.	
IS311	Geographical Information Systems	نظم المعلومات الجغرافية
Credits	3 Hours	
Prerequisites	IS201, IS212	
Contents	Fundamentals of Geographic Information Systems concepts to create, edit, and query spatial data. An introduction to map projections, coordinate systems, data capture, attribute tables, data manipulation, remote sensing, aerial and satellite imagery and using Global Position Systems (GPS). Transferring data to GIS data models. Spatial relationships analysis and making decisions from presented information through various geo-processing techniques. Using GIS in many fields. Hands-on experience in GIS techniques using appropriate tools.	
IS321	Advanced Project Management	ادارة المشروعات المتقدمة
Credits	3 Hours	
Prerequisites	IS221	
Contents	Managing Project Quality. Managing Project Risk. Managing Project Procurement: Alternatives to systems development; External acquisition; Outsourcing-domestic and offshore; Steps in the procurement process; Managing the procurement process. Project Execution, Control & Closure: Managing project execution; Monitoring progress and managing change; Managing Project Control & Closure; Cost control; Change control; Administrative closure; Personnel closure; Contractual closure; Project auditing.	
IS341	Decision Support Systems	نظم دعم اتخاذ القرار
Credits	3 Hours	
Prerequisites	IS201	
Contents	Basic concepts of DSS and their architectures and different components. Characteristics, structures, and uses of DSS in different fields. DSS models. Institutional and ad hoc DSS. DSS operating and evolving. Application of decision support systems in different disciplines. Hardware and software selections of DSS.	
IS342	IS Strategy, Management and Acquisition	استراتيجية وإدارة واكتساب نظم المعلومات
Credits	3 Hours	
Prerequisites	IS201	
Contents	The Strategic Role of Information Systems; Information Systems and Organizations; Information Management, and Decision Making; Ethical and Social Impact of Information Systems; Information Systems Software; Managing Data Resources: Telecommunications, Enterprise-Wide Computing and Networking; Redesigning the Organization with Information Systems; Ensuring Quality with Information Systems; Systems Success and Failure: Implementation, Information	

and Knowledge Work Systems; Enhancing Management Decision Making; Controlling Information Systems; Managing International Information Systems.

IS411	Advanced Database	قواعد البيانات المتقدمة
Credits	3 Hours	
Prerequisites	IS212	
Contents	Data and database administration: Transaction processing; Using a database management system from an application development environment; Use of database management systems in an enterprise system context; Data / information architecture; Data security management. Basic data security principles. Data security implementation: Data quality management. Data quality audits. Data quality improvement: Business intelligence. On-line analytic processing. Data warehousing.	
IS412	Distributed and Object Databases	قواعد البيانات الموزعة والشبيهة
Credits	3 Hours	
Prerequisites	IS212	
Contents	Levels of distribution transparency. Distributed database design, mapping users' transactions to distributed level. Optimization of accesses strategies. The management of distributed transactions. Distributed concurrence control, recovery in distributed database. Distributed database administration. Commercial systems. The SDD 1 system. Object-databases.	
IS413	Web Information Systems	نظم المعلومات الشبكية
Credits	3 Hours	
Prerequisites	IS201, IT371	
Contents	Expertise and skills in web technologies. Professional web publishing and web-application development. Server side and client side scripting languages. Using the web technology to manage and maintain information systems. Concepts of the distributed database and developing its web interface. Web master administration.	
IS414	Data Mining and Business Intelligence	استخلاص البيانات وذكاء الأعمال
Credits	3 Hours	
Prerequisites	IS201	
Contents	Main concepts and algorithms to data mining. Data warehouses/data marts. Online analytic processing. Data, text, web mining. Applied studies on problems in financial engineering, e-commerce, geo-sciences, bioinformatics and elsewhere. Reporting systems; Business analytics; Organizational decision making, functions, and levels: Executive, managerial, and operational levels; Systems to support organizational functions and decision making. Information visualization: Visual analytics; Dashboards.	
IS415	Database Administration	ادارة قواعد البيانات
Credits	3 Hours	
Prerequisites	IS212	
Contents	Different DBA job roles (VP of DBA, developer DBA, production DBA). The changing job role of the DBA. Environment management (network, CPU, disk and RAM). Instance management (managing SGA regions). DBMS table and index management. Instance Architecture. The three security methods (VPD, Grant	

security/role-based security, grant execute). Creating New Database Users. Auditing User activity. Identifying System and Object Privileges. Granting and Revoking Privileges. Creating and Modifying Roles. Displaying user security Information from the Data Dictionary. Object management. Database maintenance.

IS416	Transaction Processing	معالجة المعاملات
Credits	3 Hours	
Prerequisites	IS212	
Contents	Overview of transaction processing systems and their implementation for applications such as airline reservations, banking, and inventory control. Evolution and history of transaction processing systems. Fault tolerance, processing monitors and their implementation. Lock managers, recovery managers, file management and access paths, and disaster recovery and data replication. Understanding replication including single-master and multi-master replication.	
IS417	Multimedia Databases	قواعد بيانات الوسائط المتعددة
Credits	3 Hours	
Prerequisites	IS212, CS241	
Contents	Types of multimedia information; multimedia database applications; characteristics of multimedia objects; components of a multimedia database management system; Multimedia storage and retrieval; Multimedia object storage; file retrieval structures; disk scheduling and server admission; Multimedia information modeling; Metadata for multimedia; multimedia data access; Object-oriented models temporal models, spatial models and multimedia authoring; Querying multimedia databases; Query processing and query languages; multimedia database architecture.	
IS441	Quality Assurance of Information Systems	ضمان جودة نظم المعلومات
Credits	3 Hours	
Prerequisites	IS201	
Contents	Quality Assurance in designing information systems. Data quality in information systems. Quality Assurance in Designing the Supply Chain Network. Supply Chain Performance, Metrics, and Quality Attributes. Optimization and Uncertainty of Supply Chain Network. Demand Uncertainty: Forecasting. Managing Uncertainty in the Supply Chain (Safety Inventory). Decision-Support Systems for Supply Chain.	
IS442	IS Application Development	تطوير تطبيقات نظم المعلومات
Credits	3 Hours	
Prerequisites	IS212, IS413	
Contents	Database access. Development approaches: Object-oriented; Procedural; Declarative; Rapid application; Structured. Application integration. Prototyping. Development of various applications in information systems.	
IS451	Social Information Systems	نظم المعلومات الاجتماعية
Credits	3 Hours	
Prerequisites	IS413	
Contents	Identifying the major social and technical elements of an online community, drawing on relevant social science theories. Analysis of online communities'	

technology and social support needed to make these social interactions successful. Understanding specific social network design choices and their implications on the community. Guiding an on-line community through the startup phase and the selection and configuration of new social and technical features and activities. Current research in analysis and security of social networks.

IT311	Network Security	أمن الشبكات
Credits	3 Hours	
Prerequisites	IT351	
Contents	Fundamentals of cryptography. Applications of cryptography to networks. Secret-key algorithms; Public-key algorithms; Authentication protocols; Digital Signatures; VPN applications. Network security protocols, Network attack scenarios (DOS, Intrusion, Repudiation, Malicious SW...etc). Firewalls. Intrusion detection. Wired, wireless and mobile network security.	
IT331	Network Management	ادارة الشبكات
Credits	3 Hours	
Prerequisites	IT351	
Contents	Management models FCAPS & OAMP. Management layers, Manager/agents, MIB, OID, management communication patterns, polling, event based management. Management protocols SNMP, netflow, netconfig. CLI, Management metrics, SLA. Labs experiment.	
IT411	Information Assurance and Security	ضمان المعلومات وحمايتها
Credits	3 Hours	
Prerequisites	IT351	
Contents	Threats to information systems. Technology-based safeguards. Human-based safeguards. Information systems security planning and management. Identification and authentication, authorization rules. Different encryption and decryption techniques, different types of ciphers, characteristics of good ciphers, crypt analysis, public-key system, single-key system and data encryption standards. Computer virus protection, privacy and data protection, designing of secure system, models of security, database security, reliability and integrity, sensitive data.	
IT431	Wireless and Mobile Computing	الحوسبة اللاسلكية وال محمولة
Credits	3 Hours	
Prerequisites	IT251	
Contents	Overview of the history, evolution, and compatibility of wireless standards. The special problems of wireless and mobile computing. Wireless local area networks and satellite-based networks. Mobile Internet protocol. Mobile aware adaptation. Extending the client-server model to accommodate mobility. Mobile data access: server data dissemination and client cache management. The software packages to support mobile and wireless computing. The role of middleware and support tools. Performance issues. Emerging technologies.	
IT432	Network Programming	برمجة الشبكات
Credits	3 Hours	
Prerequisites	IT351	
Contents	Programming aspects of computer networks. Computer networks and	

communication protocols, socket programming, inter-process communication, and development of network software.

IT433	Network Forensics	الأدلة الشرعية في الشبكات
Credits	3 Hours	
Prerequisites	IT351	
Contents	Fundamentals of computer and network forensics, forensic duplication and analysis, network surveillance, intrusion detection and response, incident response, anonymity and pseudonymity, cyber law, computer security policies and guidelines, court report writing and presentation, and case studies.	
IT441	Enterprise Architecture	المعمارية التكنولوجية للشركات
Credits	3 Hours	
Prerequisites	IT351	
Contents	Design, selection, implementation and management of enterprise IT solutions. Applications and infrastructure and their fit with the business. Frameworks and strategies for infrastructure management, system administration, data/information architecture, content management, distributed computing, middleware, legacy system integration, system consolidation, software selection, total cost of ownership calculation, IT investment analysis, and emerging technologies. Managing risk and security within audit and compliance standards.	
IT451	Network Analysis and Design	تحليل وتصميم الشبكات
Credits	3 Hours	
Prerequisites	IT351, MATH202	
Contents	Introduction to the design and performance analysis of local computer networks. Emphasis is on performance analysis of representative multi-access procedures.	
IT452	Networked Embedded Systems	الأنظمة المدمجة الشبكية
Credits	3 Hours	
Prerequisites	IT351, CE422	
Contents	Why networked embedded systems. Example networked embedded systems: automobiles, factory automation systems. The OSI reference model. Types of network fabrics. Network performance analysis. Basic principles of the Internet protocol. Internet-enabled embedded systems.	
IT471	E-commerce	التجارة الإلكترونية
Credits	3 Hours	
Prerequisites	IT371	
Contents	Electronic commerce economics, business models, value chain analysis, technology architectures for electronic business, supply chain management, consumer behavior within electronic environments, legal and ethical issues, information privacy and security, transborder data flows, information accuracy and error handling, disaster planning and recovery, solution planning, implementation and rollout, site design, Internet standards and methods, design of solutions for the Internet, intranets, and extranets, EDI, payment systems, support for inbound and outbound logistics.	
MM302	Introduction to Digital Video	مقدمة في الفيديو الرقمي
Credits	3 Hours	

Prerequisites	CS241, MATH202	
Contents	This course introduces principles and current technologies of digital video. Topics include video compression, digital video formats, and video and audio standards such as JPEG, MPEG, and H.26x. This course introduces the basic concepts of digital video editing operations such as import video and audio media, layout video and audio media, edit media, insert transitions and digital effects, export final products to different digital video formats. This course also discusses image and video manipulation tools.	
MM321	3D Modeling and Animation	النمذجة والحركة ثلاثية الأبعاد
Credits	3 Hours	
Prerequisites	IT101	
Contents	This course addresses how 3D modeling and animation software packages such as 3D Studio MAX, Maya and Mudbox software are used in various industries. Focus is on developing the basic skills required to navigate the program's various modules. The student explores computer generated modeling concepts, such as parametric and primitives, spline, sub-object, and mesh. The course also covers basic lofting techniques, Boolean Operations, and camera and lighting concepts and techniques, material mapping and placement, and rendering concepts and techniques. In addition, this course introduces animation and visual effects principles, timing and spacing, mass and weight, overlapping action, anticipation, follow-through, secondary animation, forward and inverse kinematics, character animation, facial animation principles, concepts of rigging, hair, and cloth. The course covers many visual effects such as snow, smoke, fire, sparks and plasma. The course also covers a large range of particles systems such as the standard Particle Flow, AfterBurn, FumeFx, and Cebas's Thinking Particles.	
MM401	Interactive Multimedia Development	تطوير الوسائط المتعددة التفاعلية
Credits	3 Hours	
Prerequisites	MM301	
Contents	Students learn and practice the principles of interactive multimedia authoring using software such as Flash as a development tool. Emphasis is placed on good planning and production practices, and on effective user interface design.	
MM402	Scripting and Storyboarding	
Credits	3 Hours	
Prerequisites	MM301	
Contents	This course will introduce students to the concepts and practices of developing and actualizing scripts and storyboards for projects in many media. The use of scripts, storyboards and animation for different purposes and outcomes will also be examined and applied. Emphasis is placed on telling a story in terms of action, storytelling with images, and an examination of narrative, documentary, and experimental approaches. In addition to analyzing the works of others, students will also produce their own projects thus, putting theory into practice.	
MM403	Digital Sound	الصوت الرقمي
Credits	3 Hours	
Prerequisites	MM301	
Contents	This course is an introduction to sound editing and sound design. The course	

examines the place of sound in cinema, both artistic and technological. The course will cover the basics of sound, microphones, and analogue-to-digital conversion. Film clips will be used to illustrate the language of film sound, as practiced by film directors, sound designers, and editors. Students will learn to edit sound assignments with Pro Tools and current technologies.

MM411	Virtual Reality	الواقع الافتراضي
Credits	3 Hours	
Prerequisites	CS352	
Contents	Stereoscopic display; Force feedback simulation, haptic devices; Viewer tracking; Collision detection; Visibility computation; Time-critical rendering, multiple levels of details (LOD); Image-base VR system; Distributed VR, collaboration over computer network; Interactive modeling; User interface issues; Applications in medicine, simulation, and training.	
MM412	Human Computer Interaction	تفاعل الإنسان والجهاز
Credits	3 Hours	
Prerequisites	CS341	
Contents	Foundations of human-computer interaction: Motivation; contexts for HCI; human centered development and evaluation; human performance models; human performance models; accommodating human diversity; principles of good design and good designers; engineering tradeoffs; introduction to usability testing. Human-centered software evaluation: Setting goals for evaluation; evaluation without users; evaluation with users. Human-centered software development: Approaches, characteristics, and overview of process; functionality and usability; specifying interaction and presentation; prototyping techniques and tools. Graphical user-interface design: Choosing interaction styles and interaction techniques; HCI aspects of common widgets; HCI aspects of screen design; handling human failure; beyond simple screen design; multi-modal interaction; 3D interaction and virtual reality. Graphical user-interface programming: Dialogue independence and levels of analysis; widget classes; event management and user interaction; geometry management; GUI builders and UI programming environments; cross-platform design. HCI aspects of multimedia systems: Categorization and architectures of information; information retrieval and human performance; HCI design of multimedia information systems; speech recognition and natural language processing; information appliances and mobile computing. HCI aspects of collaboration and communication: Groupware to support specialized tasks; asynchronous group communication; synchronous group communication; online communities; software characters and intelligent agents.	
MM421	3D Photography and Geometry Processing	التصوير ثلاثي الأبعاد والمعالجة الهندسية
Credits	3 Hours	
Prerequisites	MM301	
Contents	Computational Photography describes the convergence of computer graphics, computer vision, and the Internet with photography. Its goal is to overcome the limitations of traditional photography using computational techniques to enhance the way we capture, manipulate, and interact with visual media. In 3D	

Photography, cameras and lights are used to capture the shape and appearance of 3D objects represented as graphical models for applications such as computer animation, game development, electronic commerce, heritage preservation, reverse engineering, and virtual reality. This course covers 3D capture techniques and systems, surface representations and data structures, image completion/inpainting, Image based lighting and rendering, high dynamic range, Photo quality assessment, non photorealistic rendering as well as methods to smooth, denoise, edit, compress, transmit, simplify, and optimize very large polygonal models.

MM422	Principles of 2D Animation	أساسيات الحركة ثنائية الأبعاد
Credits	3 Hours	
Prerequisites	MM301	
Contents	This is an introductory course in 2D animation. Students will study the historical context of 2D animation, its current applications, animation principles, and styles and methods of animation – with emphasis on 2D digital animation.	
CE421	Advanced Computer Architecture	معمارية الحاسوب المتقدمة
Credits	3 Hours	
Prerequisites	CE221	
Contents	Single-threaded execution, traditional microprocessors, DLP, ILP, TLP, memory wall, Parallel architecture and performance issues, Shared memory multiprocessors, Synchronization, small-scale symmetric multiprocessors on a snoopy bus, cache coherence on snoopy buses, Scalable multiprocessors, Directory-based cache coherence, Interconnection network, Memory consistency models, Software distributed shared memory, multithreading in hardware, Chip multiprocessing, Current research and future trends.	
CE422	Embedded Systems	الأنظمة المدمجة
Credits	3 Hours	
Prerequisites	CE221	
Contents	Nature of embedded systems, particular problems, special issues; role in information technology; embedded microcontrollers, embedded software; real time systems, problems of timing and scheduling; testing and performance issues, reliability; low power computing, energy sources, leakage; design methodologies, software tool support for development of such systems; problems of maintenance and upgrade.	

مقررات المشروعات والتدريب

CS381	Software Development and Professional Practice	تطوير البرمجيات والممارسة المهنية
Credits	3 Hours	
Prerequisites	CS211, CS391	
Contents	Event-driven programming – Foundations of human-computer interaction – Using APIs – Building a graphical user interface – Graphic systems – Professional issues of software processes including software requirements and specifications; Software design; Software validation; Software evolution – Software project management – Methods and tools of analysis – Professional and ethical responsibilities – Risks and liabilities of computer-based systems.	
IS221	Project Management	ادارة المشروعات
Credits	2 Hours	
Prerequisites	IT101	
Contents	Managing the system life cycle: requirements determination, design, implementation; system and database integration issues; network management; project tracking, metrics, and system performance evaluation; managing expectations of managers, clients, team members, and others; determining skill requirements and staffing; cost-effectiveness analysis; reporting and presentation techniques; management of behavioral and technical aspects of the project; change management. Software tools for project tracking and monitoring. Team collaboration techniques and tools.	
CS382	Field Training	تدريب ميداني
Credits	3 Hours	
Prerequisites	IS221	
Contents	Students should interact with the society to what they can and should expect from people professionally trained in the information systems discipline. The private and public sectors can support the education process by encouraging them to play a greater role in helping to train students. By laying the this training as part of an undergraduate program, students can avoid the sense of isolation from the computing field work in the society that young professionals often feel and be well equipped to practice their profession in a mature way.	
IS352	Field Training	تدريب ميداني
Credits	3 Hours	
Prerequisites	IS221	
Contents	Students should interact with the society to what they can and should expect from people professionally trained in the computer science discipline. The private and public sectors can support the education process by encouraging them to play a greater role in helping to train students. By laying the this training as part of an undergraduate program, students can avoid the sense of isolation from the computing field work in the society that young professionals often feel and be well equipped to practice their profession in a mature way.	
IT361	Field Training	تدريب ميداني
Credits	3 Hours	

Prerequisites	IS221	
Contents	Students should interact with the society to what they can and should expect from people professionally trained in the information technology discipline. The private and public sectors can support the education process by encouraging them to play a greater role in helping to train students. By laying the this training as part of an undergraduate program, students can avoid the sense of isolation from the computing field work in the society that young professionals often feel and be well equipped to practice their profession in a mature way.	
MM331	Field Training	تدريب ميداني
Credits	3 Hours	
Prerequisites	IS221	
Contents	Students should interact with the society to what they can and should expect from people professionally trained in the multimedia discipline. The private and public sectors can support the education process by encouraging them to play a greater role in helping to train students. By laying the this training as part of an undergraduate program, students can avoid the sense of isolation from the computing field work in the society that young professionals often feel and be well equipped to practice their profession in a mature way.	
CS481	Capstone Project I	مشروع التخرج ١
Credits	3 Hours	
Prerequisites	CS381, IS221	
Contents	Computer Science Capstone Project I course will provide coverage of some of the material from the body of knowledge, such as: Foundations of human-computer interaction – Graphical user-interface design – Graphical user-interface programming – Software design – Using APIs – Software tools and environments – Software processes – Software requirements and specifications – Software validation – Software evolution – Software project management – Team management – Communications skills. The focus of the course must remain on the project, which gives students the chance to reinforce through practice the concepts they have learned earlier in a more theoretical way.	
CS482	Capstone Project II	مشروع التخرج ٢
Credits	3 Hours	
Prerequisites	CS481	
Contents	Computer Science Capstone Project II course gives the student more practical and professional skills in developing a project.	
IS451	Capstone Project I	مشروع التخرج ١
Credits	3 Hours	
Prerequisites	CS381, IS221	
Contents	Information Systems Capstone Project I course will provide coverage of some of the material from the body of knowledge, such as: Foundations of human-computer interaction – Graphical user-interface design – Graphical user-interface programming – Software design – Using APIs – Software tools and environments – Software processes – Software requirements and specifications – Software validation – Software evolution – Software project management – Team	

management – Communications skills.

The focus of the course must remain on the project, which gives students the chance to reinforce through practice the concepts they have learned earlier in a more theoretical way.

IS452	Capstone Project I	مشروع التخرج ٢
Credits	3 Hours	
Prerequisites	IS451	
Contents	Information Systems Capstone Project II course gives the student more practical and professional skills in developing a project.	
IT461	Capstone Project I	مشروع التخرج ١
Credits	3 Hours	
Prerequisites	CS381, IS221	
Contents	Information Technology Capstone Project I course will provide coverage of some of the material from the body of knowledge, such as: Foundations of human-computer interaction – Graphical user-interface design – Graphical user-interface programming – Software design – Using APIs – Software tools and environments – Software processes – Software requirements and specifications – Software validation – Software evolution – Software project management – Team management – Communications skills. The focus of the course must remain on the project, which gives students the chance to reinforce through practice the concepts they have learned earlier in a more theoretical way.	
IT462	Capstone Project II	مشروع التخرج ٢
Credits	3 Hours	
Prerequisites	IT461	
Contents	Information Technology Capstone Project II course gives the student more practical and professional skills in developing a project.	
MM431	Capstone Project I	مشروع التخرج ١
Credits	3 Hours	
Prerequisites	CS381, IS221	
Contents	Multimedia Capstone Project I course will provide coverage of some of the material from the body of knowledge, such as: Foundations of human-computer interaction – Graphical user-interface design – Graphical user-interface programming – Software design – Using APIs – Software tools and environments – Software processes – Software requirements and specifications – Software validation – Software evolution – Software project management – Team management – Communications skills. The focus of the course must remain on the project, which gives students the chance to reinforce through practice the concepts they have learned earlier in a more theoretical way.	
MM432	Capstone Project II	مشروع التخرج ٢
Credits	3 Hours	
Prerequisites	MM431	