



COURSE CATALOG 2018
Computer Science B.Sc.

Course No.	Course Description
20132	<p>Calculus (1) Pre-requisites: - 3 credit hours Functions, limits and continuity. Derivatives. Differentiation. Inverse functions. Trigonometric functions. Logarithmic and exponential functions. Hyperbolic functions. Integrals.</p>
20133	<p>Calculus (2) Pre-requisites: 20132 3 credit hours Methods of integration. Applications of integration. Plane analytic geometry including polar coordinates. Sequences and series, including power series.</p>
20134	<p>Discrete Mathematics Pre-requisites: - 3 credit hours Mathematical models. Proof methods. Program correction methods. Sets and operations. Relations and types. Charts and branches. Searching methods. Dividing. Functions and types. Algorithms. Counting methods.</p>
20135	<p>Discrete Math (2) Pre-requisites: 20134 3 credit hours 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, Spanning Trees, Boolean Functions, Representing Boolean Functions.</p>
20141	<p>Physics (1) Pre-requisites: - 3 credit hours Units and measurements. Vector algebra. Kinematics. Projectile and circular motions. Newton's laws of motion. Forces of nature. Applications of Newton's laws on rectilinear and circular motions. Work and energy. Law of conservation of mechanical energy. Laws of conservation of linear and angular moment.</p>

20142	<p>Physics (2) Pre-requisites: 20141 3 credit hours Electric Fields. Gauss's Law. Electric Potential. Capacitance and Dielectrics. Current and Resistance. Direct Current Circuits. Magnetic Fields. Source of Magnetic Fields. Faraday's Law. Inductance. Alternating Current Circuits. Electromagnetic Waves.</p>
20233	<p>Statistical Methods Prerequisites: - 3 credit hours Introduction to statistics. Elements of probability. Probability distributions (e.g., binomial, Poisson, geometric, hyper geometric, normal, t, F, and λ^2). Sampling. Simple linear regression. Correlation. Test of hypotheses. Analysis of variance.</p>
20234	<p>Linear Algebra Prerequisites: 20133 3 credit hours System of Linear Equations: Row-echelon Form, Gaussian Elimination, Gauss- Jordan Method. Matrices: 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.</p>
20325	<p>Project Management Pre-requisites: 80 credit hours 3 credit hours Introduction to public management. Introduction to Project Management and Control. Project Life Cycle (Investigation, Planning, Development, Testing, Implementation, and Documentation). Introduction to Project Planning Elements (Budgeting, Scheduling, Staffing, Management, and Control). Network Design and Application of Project Management Techniques (Critical Path Method "CPM", Project Evaluation and Review Technique "PERT"). Project Management Information Systems: Selection Criteria and Use.</p>
20332	<p>Operations Research Pre-requisites: 20133 3 credit hours Introductory steps of OR. Linear programming. Graphic solutions. Simplex method. Dual problem. Special linear programming problems (transportation, assignment, and transshipment). Project scheduling (CPM and PERT).</p>

20333	<p>Numerical Analysis Pre-requisites: 20133,20234 3 credit hours Vectors and matrices. Determinants. System of linear algebraic equations. Cramer's rule and characteristics-value problem. Error analysis. Iterative methods for solving linear and nonlinear systems of equations. Interpolation and approximation. Introduction to numerical differentiation and integration.</p>
20334	<p>Applied Probability Prerequisites: 20232 3 credit hours 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 the Jacobian Transformation Method); Limiting Distributions.</p>
31010	<p>Arabic Language placement test Pre-requisites:- 0 credit hours Testing basic grammars in Arabic.</p>
31019	<p>Arabic Language (Remedial) Pre-requisites:- 0 credit hours The verb and noun. Grammars. Punctuation. Al Hamza. Applications.</p>
31020	<p>English placement test Pre-requisites:- 0 credit hours Testing basic grammars in Arabic.</p>
31029	<p>English Language (Remedial) Pre-requisites: - 0 credit hours Reading. Writing. Speaking. Listening. Application.</p>
31111	<p>Arabic Language Pre-requisites: 31019 3 credit hours Summarization. Punctuation. Spelling. Deletion. Displacement. Construction and inflection. Derivation. Substitution and the vowel system. Number. Indescribability. Sentence. Clause. Rhetoric issues and various applications</p>

<p>31121 **This is the new English course</p>	<p>English Language New Pre-requisites: 31029 3 credit hours Advanced reading. Advanced writing. Grammar. Speech and Translation.</p>
<p>31151</p>	<p>Jordan: History and Culture Pre –requisites: -- 3 credit hours Jordan: the land and the people. Jordan: our homeland. The Arab Nation. History of Jordan. Political system in Jordan. Jordanian Society. Major national institutions. Internal and external challenges facing Jordan. The role of local institutions in achieving development in national awareness. The family, childhood and woman and its role in society.</p>
<p>31152</p>	<p>Arabic and Islamic Civilization Pre-requisites: - 3 credit hours Concept of Civilization. Stages of Development of Arabic Islamic Civilization. Principles and Grounds of Arabic Islamic Civilization. Areas of cultural creativity in Arabic Islamic Civilization. Linguistics, Theology, Islamic Jurisprudence, Philosophy, Natural and Social Sciences, Islamic Art and Music. Unity of the Arab and Islamic worlds.</p>
<p>31161</p>	<p>Introduction to Library Science Pre-requisites: - 3 credit hours Information sources. Types of Cataloging. Types of Catalogs. Types of Classification. Information and Knowledge. Information Society. Information Services. Information Technology. Information Storage. Information Retrieval and Dissemination. Information and Internet.</p>
<p>31171</p>	<p>History of Science Pre-requisites: - 3 credit hours Importance of understanding science as a socio – historic phenomenon. Science as industry. Science and development. Cognitive conditions of scientific production. Examples: Kepler and Planck. Science as social production. Socio –historic determinants of the social production of science. Main epochs of the history of natural science. Greek science. Hellenistic science Roman science. Arabic Islamic science. Modern European science. Science in the contemporary Arab world. Epistemological periodization of natural science. Roots of the philosophy of nature. The Ionians. Platonic project in astronomy. Aristotle. Ptolemy. Arabic Islamic astronomy. The 17th century Scientific Revolution.</p>

31211	<p>Arabic literature Pre-requisites: 31111 3 credit hours Developing students' taste of Arabic literature through the reading of literature essays. Analyzing. Introducing some literature aspects from different eras.</p>
31251	<p>Military Science Pre-requisites: -- 3 credit hours Grade: Pass / Fail (for Jordanians only) History of the Jordanian Army. Jordanian peace forces. Preparing the Nation for defense and liberation. Genesis and development of the Hashemite Kingdom of Jordan.</p>
31261	<p>Introduction of politics and economy Pre-requisites:- 3 credit hours The nature of Political Economy. The Issues of political Economy. The importance of the market. Market effects and political Economy. Three Ideologies of political Economy. The Dynamics of the international political Economy. The political Economy of Structural changes. Long-Term variations of Economic Growth and the effect of political hegemonic. The politics of International Trade. The political Economy of international Finance.</p>
31262	<p>Introduction to Educational Science Pre-requisites:- 3 credit hours Education: Principles and Philosophy. Education and individuals. Education and Learning. Education and Society. Education and development. Educational courses and methods. Educational institutions and educational assessments. Education in the Arab and Islamic world.</p>
31263	<p>Technical Writing Communication Skills Pre-requisites: 31111, 31121 3 credit hours Organization of the technical report. Layout and organization of the front page. Arrangement of information. Organization and layout of headings and sub-headings. Numbering systems. Order of arrangements of results and recommendations. How to prepare an un detailed proposal on any technical and scientific work.</p>

31271	<p>Environmental Science Pre-requisites:- 3 credit hours The earth and natural hazards. Ecosystems. Biogeochemical Cycles. Man and the Environment. The Natural Resources in the Solid Earth System. Air Pollution. Water Resources. Management and Pollution. Solid Waste. Food and Health. Environmental Impact Assessment.</p>
31351	<p>Current Issues in the Arab World Pre-requisites: -- 3 credit hours Social and national fragmentation in the Arab East: Features and Roots. The Arab-Israeli conflict. Democracy and Civil Society in the Arab world. Pan- Arabism and Islam. The self and the other. Secularism. The Arabs and globalization. Human security in the Arab world.</p>
31352	<p>Al-Quds History and Facts Pre-requisites: -- 3 credit hours The geographic borders of AL- Quds through the history. A glance at the historical discoverers in AL-Quds. AL-Quds and the British occupation. The establishment of Israil . The Israili plans to Jadeite AL-Quds. Importance of AL-Quds from the religion point of view. The infringement of AL-Aqsa mosque since 1967 by Israil.</p>
31361	<p>Introduction to Psychology Pre-requisites:- 3 credit hours 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.</p>
31371	<p>Health education Pre-requisites:- 3 credit hours Understanding the responsibility we have for our own health. Skills for dealing with emergency cases. Personal safety and accident prevention. Mental health, mental illness, stress and mental health.</p>
31372	<p>Business skills Pre-requisites: 60 credit hours 3 credit hours</p>

11000	<p>Computer Skills Placement Test Pre-requisites: - 0 credit hours The test MUST include all topics mentioned in 11100: Computer skills (s. table below). Student MUST pass this test to be able to go directly to 2103 (old) / 11103 (new): Structured Programming using C++. If the student fails in the test then she/he MUST (mandatory) take 2100 before she/he can take 11103.</p>
11100	<p>Computer Skills (Remedial) Pre-requisites: -- 0 credit hours Introduction to computers: historical, components, functionality. Introduction to computer software and hardware. Programming Languages. Introduction to operating systems. Introduction to word processing with practical applications in preparing homework and reports. Spreadsheets. Computer graphics. Presentation design. Introduction to using Database Management Systems. Using Internet E- mails.</p>
11102	<p>Introduction to Computer Science Pre-Requisites: -- 3 credit hours Introduction to computer science. Components of PC and Data representation. Low level data representations (Binary, hexa, octal, conversions, Binary Arithmetic). Introduction to programming computers. Evolution of programming languages and techniques. Problem solving by computers. Flowcharts. Problem solving through analysis and then through an introduction to programming language (Basic program structure, main function, I/O control structures, Functions, Arrays and Structures).</p>
11103	<p>Structured Programming Pre-requisites: 11102 3 credit hours Concepts of structured programming. Structured programming languages. Program design, development, running, and testing, and debugging programs. Syntax and semantics of the programming language C++. Basic elements of the language: variables, constants, and data types. Basic input/output functions. Conditional and iterative control structures. Concept of procedural programming, Top/down design. Structured decomposition. Functions and parameter passing. Recursive functions. Pointers and dynamic variables. Basic data structures: one and two-dimensional arrays, string manipulation, structures. Input / Output Files, Concepts of OOP and Classes.</p>
11151	<p>Structured Programming Lab Co-requisite: 11103 1 credit hour Laboratory sessions on the different aspects and topics of the structured programming using C++.</p>

11201

Geographic Information Systems (GIS)***

Pre-requisites:-

3 credit hours

The goal of this course is to prepare students to introduce to the students basics of GIS. Specific features of the course include: Coverage of basic geographic, cartographic, and GIS concepts. Topics Include:

- 1) Computer representation of physical, political, statistical, and social aspects of space using vector-based maps.
- 2) Graphic design principles for using shape, hue, size, and patterns in mapping
- 3) Attribute-based and graphic feature-based queries for spatial analysis.

Geographic Information Systems (GIS) allow individuals and organizations to pose, explore and answer a variety of public- and private-sector questions using spatial data.

11206

Object Oriented Programming

Pre-requisites: 11103

3 credit hours

Object oriented programming concepts and paradigms. Review of control structures, data types, functions, arrays and pointers. Data abstraction. Encapsulation and information hiding. Classes attributes and methods. Inheritance. Overloading. Polymorphism. Templates.

12343

Visual Programming

Pre-requisites: 11206

3 credit hours

This course introduces computer programming using a modern visual programming language with object-oriented programming principles. Emphasis is on event-driven programming methods, including creating and manipulating objects, classes, and using object-oriented tools such as the class debugger.

COURSE OBJECTIVES:

Upon completion of this course, the student will be able to:

- Build programs that use a modern visual programming environment
- Write object-oriented programs emphasizing object reusability
- Build state-of-the-art user interfaces for their programs
- Work in the context of event-driven programming.
- Work and design: text boxes, labels, forms, buttons, frames, message boxes, input boxes, check boxes, combo boxes, and list boxes.
- Design, code, test and debug visual programs
- Write programs with client/server capabilities that interact as clients and servers with respect to database

11212	<p>Data Structures and Introduction to Algorithms Pre-requisites: 20134, 11206, 11253 3 credit hours Basics of algorithm design and analysis. Asymptotic analysis of upper and average complexity bounds: best, average, and worst case behaviors. Big "O" notation. Searching and sorting algorithms. Recursion. Data abstraction and review of object oriented concepts. Basic data structures. Sequential and linked representation of data structures. List, Ordered List, Sets, Stack, Queue, tree, Binary trees, graph and network.</p>
12241	<p>Webpage Design and Internet Programming Pre-requisites: 12343 3 credit hours This course focuses on how to design and maintain interactive and dynamic web sites using HTML, Cascading Style Sheets (CSS) and client-side scripting with JavaScript. The students will also learn basic Web Page design principles. The goal is to develop effective, pleasing and useful Web sites. In the JavaScript part of the course students will develop real-world projects to learn JavaScript programming, the JavaScript Object Model, JavaScript event handlers, and how to integrate JavaScript programs in a HTML document. Other client-side technologies (Ajax and XML) will be introduced.</p>
12252	<p>Webpage Design and Internet Programming Lab Co-Requisite: 11241 1 credit hour Laboratory sessions on how to design interactive and dynamic WebPages. Programming tools: HTML, JavaScript, Ajax and XML.</p>
11253	<p>Object Oriented Programming Lab. Co-requisite: 11206 1 credit hour Laboratory sessions on the different aspects and topics of object oriented programming.</p>
11313	<p>Algorithm Design and Analysis Pre-requisites: 11212 3 credit hours Formal techniques of the design and analysis of algorithms. Asymptotic analysis of upper and average complexity bounds. Empirical measurements of performance; time and space tradeoffs in algorithms. Correctness and finiteness of algorithms. Algorithmic strategies: Brute-force, greedy, divide-and-conquer, backtracking, branch-and-bound, heuristics, pattern matching and string/text algorithms. Implementation strategies for Graph, Network and Tree algorithms.</p>

11316	<p>Theory of computation Pre-requisites: 11103, 20134 3 credit hours Introduction to formalisms studied in computer science and mathematical models of computing machines. The language formalisms: regular, context-free, context-sensitive, and recursively enumerable languages. The machines: finite-state, pushdown and linear bounded automata and Turing machines.</p>
11323	<p>Database Systems Pre-requisites: 11212 3 credit hours Basic concepts of databases. DBMS components. Transaction managements. Data modeling. Entity relationships diagrams. Relational databases. Database integrity constraints. Relational Algebra. Query languages. Dependencies, schema designs normalization and redundancy elimination.</p>
11323	<p>Systems Analysis and Design Pre-requisites: 11212 3 credit hours 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 Dataflow Diagrams. Structured English. Decision Tables etc. Criteria for software design and evaluation: module coupling, cohesion, modularity, portability. A project is required.</p>
11335	<p>Operating Systems Pre-requisites: 11212 3 credit hours Introduction to Operating Systems. Processes. Threads. CPU Scheduling. Process Synchronization. Dead-Locks problem. Memory management. Virtual memory. File System. Mass Storage management. Case Study: UNIX.</p>
11341	<p>Simulation Tools Co-Requisite: 20333 1 credit hour Student is expected to learn one of the available software packages used for simulation and modeling, such as, MAPLE, MATLAB, SCILAB, SIMULA...etc. These software packages are used in diverse application areas including automotive, aerospace, electronics, energy, and finance. These products are used to harness the power of mathematics, transforming the way engineers, scientists, and applied mathematicians develop and deploy their solutions. These products are a high-level technical computing language and interactive environment that enables students to perform computationally intensive tasks (algorithm development, data visualization, data analysis, image processing, communications, control design, test and measurement, financial modeling and analysis, computational biology and numeric computation) faster than with traditional programming languages such as C, C++, Java and FORTRAN.</p>

11343	<p>Special Topics in Computer Science (1) Pre-requisites: To be set by Dept. 3 credit hours The objective of this course is to introduce a new programming language (e.g. Java, C#, ASP.NET, AJAX...etc).</p>
11344	<p>Advanced Topics in Internet Programming Pre-requisites: 11323 3 credit hours This course focuses on how to design and maintain interactive and dynamic Web applications using server-side programming. Students will learn server-side scripting by using Active Server Pages (ASP). Students will learn using Scripting Languages Such as Java Script or VBScript and the ASP Object Model to program interactive Web applications. Processing of XHTML forms on the web server as well as file management on the web server will be discussed in detail. An important component of this course is the construction of data-driven web sites that interact with databases using ActiveX Data Objects (ADO) & Other server-side technologies (PHP), Perl Cold Fusion, and Java Servlet) will be introduced.</p>
11347	<p>Electronic Business Pr-requisites: 11241 3 credit hours E-Business and E-Commerce terms and concepts. Overview of online business models. Illustration of e-business infrastructure: hardware, software and content. Overview of e-business environment factors. Overview of electronic payment methods and information security issues.</p>
11354	<p>Database Systems Lab. Co-requisite: 11323 1 credit hour 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.</p>
11355	<p>Operating Systems Lab. Co-requisite: 11335 1 credit hour This course will provide practical skills needed for using a UNIX type operating system. This will include LINUX installation, Vi environment and commands file and process management commands, email, shell programming, and system administration, in addition to implementing some of operating system concepts, such as memory management or CPU scheduling.</p>
11356	<p>Internet Programming and Application Lab Co-Requisite: 11342 1 credit hour Laboratory sessions on how to design and build web-based applications. Students will learn how to construct data-driven web sites that interact with databases using ADO (other technologies).</p>

<p>11391</p>	<p>Practical Training Pre-requisites: 90 Cr. Hrs. 3 credit hours Grade: Pass / Fail 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 his major, such as writing, developing, or learning some new software</p>
<p>11417</p>	<p>Compiler Design and Programming Languages Pre-requisites: 11316 3 credit hours Theory and practice of compiler design for imperative and object-oriented languages. Phases of compiler writing. Lexical analysis, Parsing and intermediate code generation. A compiler for a subset of particular OO languages. Similar imperative languages will be implemented as part of a term project. Compiler generating tools. Basic concepts of the programming language theory and a comparative study between them.</p>
<p>13211</p>	<p>Introduction to Software Engineering Pre-requisites: 13323 3 credit hours Software development 'life cycle'. Development Strategies. Prototyping. Formal methods. Test case. Documentation. Program efficiency and Debugging. Object-oriented analysis and design. Software quality assurance. Software metrics. Software reusability. Software reliability. A project is required.</p>
<p>11428</p>	<p>Artificial Intelligence Pre-requisites: 11212 3 credit hours Introduction to AI and its scope and applications. AI programming languages. Knowledge representation. Heuristic Search and Problem-Solving with different strategies for solving different types of problems. Introduction to knowledge based systems. Expert Systems. Natural Language processing. Machine learning. Other AI applications. A project is required.</p>
<p>11435</p>	<p>Data Communications and Computer Networks Pre-requisites: 11335 3 credit hours Data Communication principles. Network Reference Model. Interfaces and Services. Protocols. Physical Layer. Communication Services. Data Link Layer. Synchronization. Flow Control. Socket Programming. MAN Protocol. Ethernet. Token Ring. FDDI. Wireless Communication. Protocols and Programming. TCP/IP Reference Model. Routing Algorithms. Network Layer. Network Security. Transport Layer. Data Encryption and Decryption. Application Layer.</p>

11436	<p>Distributed Systems Pre-requisites: 11435 3 credit hours Concepts of distributed system: advantages, hardware, software; design issues, communication in distributed systems: layered protocols, asynchronous transfer mode networks, client-server model, remote procedure call, RMI, group communication; synchronous: 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; case studies.</p>
12446	<p>Digital Image Processing Pre-requisites: 11206 3 credit hours Human vision system. Artificial 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.</p>
11446	<p>Special Topics in Computer Science (2) Pre-requisites: to be set by the Dept. 3 credit hours The objective of this course is to introduce advanced and new topics in one of the areas of Computer Science and Information Technology.</p>
11447	<p>Wireless Networks and applications Pre-requisite: 11435, 20334 Credit hours: 3 This course provides an overview of Wireless Data Communication principles. The topics that will be covered in this course include: wireless protocols, Mobile IP, Ad hoc Networks, Wireless Sensor Networks, Vehicular networks.</p>
11449	<p>Computer and Society Co-requisite: : 90 Cr. Hrs 1 credit hour Seminars on the social, ethical, and legal issues of computing. Social impact of computerization on local and global organizations. Public perception of computers and computer scientists. Intellectual property: copyrights, patents, trademarks, and commercial law. Computer crime. Economic issues in computing. Privacy and civil liberties. Professional and ethical responsibilities.</p>

11464	<p>Information Systems Security Pre-requisites: 11212 3 credit hours This course explains Security protocols, authentication protocols, data integrity, digital signatures, intrusion detection, key management and distribution, viruses and other malicious codes, information flow, mobile code and agent security. Cryptographic algorithms: Secret Key Encryption (DES), Public Key Encryption (RSA), Message Digest Algorithm (MD5); Attacks and countermeasures: Packet sniffing, Spoofing and denial of service; Application layer security: HTTPS, secure email; Transport layer security: TLS, SSL; Network layer security: IP security (IPSec), AH protocol, ESP protocol; access control and Firewalls: Filter-based firewalls, Proxy-based firewalls; wireless networks security, security in IEEE 802.11, WEP protocol, EAP protocol.</p>
11493	<p>Graduation Project 1 Pre-requisites: 90 Cr. Hrs 1credit hours 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.</p>
11494	<p>Graduation Project 2 Pre-requisites: 90 Cr. Hrs 2 credit hours</p>
12273	<p>Computer Graphics Pre-requisites: 20133, 11103 3 credit hours A comprehensive introduction to the field of Computer Graphics. The conceptual framework for interactive computer graphics: transformations, viewing, projection, shading, clipping, and texture mapping. Interactive graphic systems and 3D graphics.</p>
12324	<p>Human-Computer Interaction Pre-requisites: 12348 3 credit hours Designing, building, and programming graphical user interfaces, Human-centered software evaluation, Human-centered software development, HCI aspects of multimedia systems and Web-based systems, these topics are intended as an introduction to human-computer interaction. Emphasis will be placed on understanding human behavior with interactive objects, knowing how to develop and evaluate interactive software using a human-centered approach, and general knowledge of HCI design issues with multiple types of interactive software.</p>

12348	<p>Multimedia Systems Pre-requisites: 11206 3 credit hours 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.</p>
22241	<p>Digital Logic Design Pre-requisites:- 3 credit hours Binary system. Boolean algebra and logic gates. Simplification of Boolean functions. Combinational logic with MSI and LSI. Sequential logic. Registers. Counters. The memory unit.</p>
22342	<p>Computer Organization and Assembly Pre-requisites: 22241 3 credit hours Register transfer and micro-operations. Basic computer organization and design. Design of arithmetic logic unit. Design of accumulator. Central processing unit. Hardwired control. Micro programmed control. Execution of instructions. Pipelining. Introduction to memory hierarchy. Microprocessor organization. Central processing unit. Addressing modes. Instruction set. Programming in assembly language. Software interrupts and interfacing with BIOS and DOS. A specific microprocessor will be studied in detail.</p>
22541	<p>Computer Architecture Pre-requisites:22342 3 credit hours Computer Evolution and Performance. System Buses and Memory. Input/Output. Computer Arithmetic. CPU Structure and Function. Multimedia instruction set. Reduced Instruction Set Computers (RISCs). Instruction-Level Parallelism and Superscalar Processors. Control Unit Operation. Parallel Processing. SMPs, clusters, and NUMA systems.</p>