



كلية الحاسبات وتقنية المعلومات

ب- المقررات الدراسية الاختيارية (٦) وحدة معتمدة:

يختار الطالب بتوجيه من المشرف وموافقة رئيس القسم ما مجموعه (٦) وحدة معتمدة من المقررات الاختيارية التالية :

الوحدات الدراسية	اسم المقرر	رمز ورقم المقرر	
		English	عربي
٣	الخوارزميات المتقدمة	CS 705	ع ح ٧٠٥
٣	تصميم التجارب	CS 706	ع ح ٧٠٦
٣	نظم قواعد البيانات الشبئية	CS 720	ع ح ٧٢٠
٣	نظم قواعد البيانات موزعة	CS 721	ع ح ٧٢١
٣	الرؤية بالحاسب	CS 730	ع ح ٧٣٠
٣	معالجة صور متقدمة	CS 731	ع ح ٧٣١
٣	الواقع الافتراضي	CS 732	ع ح ٧٣٢
٣	نظم الكمبيوتر الأمانة	CS 740	ع ح ٧٤٠
٣	الترميز التطبيقي	CS 741	ع ح ٧٤١
٣	أمن الشبكات	CS 742	ع ح ٧٤٢
٣	تعليم الآلة	CS 750	ع ح ٧٥٠
٣	مقدمة في العلوم المعرفية	CS 751	ع ح ٧٥١
٣	الإدراك الحوسبي	CS 752	ع ح ٧٥٢

الدكتوراه في علوم الحاسبات

(بالرسالة وبعض المقررات)

المتطلبات العامة للبرنامج:

للحصول على درجة الدكتوراه الفلسفة في علوم الحاسبات يجب أن يكمل الطالب ما لا يقل عن (٣٨) وحدة دراسية معتمدة بما فيها رسالة الدكتوراه، وتكون موزعة على النحو الآتي:

- (١٢) وحدة معتمدة للمقررات الإجبارية .
- (٦) وحدة معتمدة للمقررات الاختيارية .
- (٢٠) وحدات معتمدة لرسالة الدكتوراه .

أ- المقررات الدراسية الإجبارية (١٢) وحدة معتمدة :

الوحدات الدراسية	اسم المقرر	رمز ورقم المقرر	
		English	عربي
٣	موضوعات متقدمة في الشبكات	CS 701	ع ح ٧٠١
٣	بنائية وتصميم البرمجيات	CS 702	ع ح ٧٠٢
٣	نظم قواعد البيانات المتقدمة	CS 703	ع ح ٧٠٣
٣	بنائية الحاسب المتقدمة	CS 704	ع ح ٧٠٤

دليل برامج الدراسات العليا

الوحدات الدراسية	اسم المقرر	رمز ورقم المقرر	
		English	عربي
٣	تقييم شبكات الاتصال	CS 760	ع ح ٧٦٠
٣	التطبيقات والخدمات الشبكية	CS 761	ع ح ٧٦١
٣	نظم شبكات النطاق العريض	CS 762	ع ح ٧٦٢
٣	تصميم البرامج واسعة النطاق	CS 770	ع ح ٧٧٠
٣	اختبار وصيانة البرمجيات	CS 770	ع ح ٧٧١
٣	نمذجة منظومات الحوسبة	CS 772	ع ح ٧٧٢
٣	المعلوماتية الحيوية ١	CS 780	ع ح ٧٨٠
٣	المعلوماتية الحيوية ٢	CS 781	ع ح ٧٨١

ج- الرسالة (٢٠) وحدات معتمدة:

الوحدات الدراسية	اسم المقرر	رمز ورقم المقرر	
		English	عربي
٢٠	رسالة الدكتوراه	CS 799	ع ح ٧٩٩

Courses Description

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-701	Advanced topics in networking	3	
Description	<p>The purpose of this course is to help students be up to date with the new networks technologies and broadband communications issues as well as traffic characteristics and QOS provisioning. This course introduces advanced concepts of modern computer and telecommunication networks such as new technologies for TCP/IP, MPLS, Mobile IP, and Next Generation Internet: architecture and protocols. In addition, advanced topics such as Internetworking architectures and mobility management issues will be introduced in terms of user mobility, service continuity, and the corresponding performance analysis.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-702	Software Architecture and Design	3	
Description	<p>Modeling and design of software at the architectural level. Architectural styles. Basics of model-driven architecture. Object-oriented design and analysis. Iterative development and unified process. Design patterns. Design by contract. Component based design. Product families. Measurement theory and appropriate use of metrics in design. Designing for qualities such as performance, safety, security, reliability, reusability, etc. Analysis and evaluation of software architectures. Introduction to architecture definition languages. Basics of software evolution, reengineering, and reverse engineering. Case studies. Introduction to distributed system software.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-703	Advanced Database Systems	3	
Description	<p>Current and emerging issues in advanced database systems are introduced. The state-of-the-art techniques for various DB topics are studied. Topics include OODBMS, and ORDBMS. Deductive DB, and optimization techniques. Properties and specialized multidimensional indexing methods used to access spatial and temporal data. Querying unstructured and semi structured data.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-704	Advanced Computer Architecture	3	
Description	<p>This course helps students to be up to date with new research trends in computer architecture as Coarse-Grained Adaptable Architectures, Quantum Architectures, Ultra Energy Efficient Computing, Brain Architecture, new models of computation, and Parallel memories. In addition such topics as programmability and reliability of multiprocessor and multicore systems are covered. Structured Shared-Memory Communication, simultaneous multithreading Dependable Systems, Clusters, Grids and interconnects will be introduced.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-705	Advanced Algorithms	3	
Description	<p>This course builds on the Design and Analysis of Algorithms course and will extend the concepts learned in the Design and Analysis of Algorithms course. The main focus will be on algorithm design, analysis and optimization for more advance problem areas. In particular design and analysis of Geometric, Parallel, Distributed and evolutionary computing will be discussed in this course. Implementation of the algorithms will also be done using a suitable programming environment.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-706	Experimental Design	3	
Description	<p>This course provides an integrated treatment to the models and practices of experimental computer science. Topics covered include scientific evaluation methods applied to computing, workload characterization, forecasting of performance and quality metrics of systems, uses of analytic and simulation models, design of experiments, interpretation and presentation of experimental results, hypothesis testing, and statistical analyses of data.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-720	Object-Oriented Database Systems	3	
Description	<p>The objective of this course is to give a thorough understanding of the advances in data modeling, database design, and a new generation of applications that are a challenge for database management. The course emphasizes the object-oriented modeling approach to support such applications. Basic concepts, research papers, prototypes and approaches will be discussed. The course includes some exposure to commercial implementations.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-721	Distributed Database Systems	3	
<i>Description</i>	<p>This course starts by presenting an architectural model for distributed database systems (DDBS) and then go on to study four fundamental topics of DDBS. The first topic, deals with the design of distributed databases. It examines the different issues and algorithms for horizontal and vertical partitioning of relations in a DDBS. The second topic is concerned with the query processing component of a relational DDBS. The three major tasks of query will be looked: decomposition, localization and optimization. The third topic deals with transaction management and in particular concurrency control. Here, course will focus on how lock-based and timestamp-based techniques used in centralized database systems can be enhanced for a DDBS. The last topic involves the reliable execution of transactions. It discuss a number of distributed reliability protocols that maintain the atomicity and durability of distributed transactions that execute over a number of databases. In addition to the four fundamental areas of distributed database systems, the course will cover the area of parallel database systems and how it has emerged from the DDBS area and discuss the basic principles of parallel DB systems. Finally, the course shows how parallel processing can be applied to the area of data mining.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-730	Computer Vision	3	
<i>Description</i>	<p>Principles, techniques, and practice in data, information, multivariate, and scientific visualization. Includes visualization methods, data structures, examples, and tools.</p> <p>In addition to mathematical/physical/perceptual principles and modeling/rendering techniques used to create, represent, display, and animate models of 3D shapes and their properties (Computer Graphics).</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-731	Advanced Image Processing	3	
<i>Description</i>	<p>A study of methods for enhancing, analyzing, interpreting, and visualizing information from two- and three-dimensional data obtained from a variety of medical image modalities. In addition to advanced techniques in realistic image synthesis based on the physics of light. Anti-aliasing, textures, surface reflectance, distribution ray tracing, volume rendering, radiosity, and image-based rendering (Advance Image Synthesis) including multi-resolution, compression, collision, morphing, visibility, and computational geometry techniques in engineering, scientific, business, or entertainment applications.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-732	Virtual Reality	3	
Description	<p>An introduction to virtual reality and virtual environments. Issues covered will include VR technology, software design, 3D human-computer interaction, and applications for VR. In addition to New trends in the area of Virtual Reality.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-740	Secure Computer Systems	3	
Description	<p>This course explores problems such as authentication and access control that are traditionally handled at the system level. It gives in depth introduction to the implementations of mechanisms that address these problems and security policies that can be supported by them. System level security issues in distributed systems will be covered as well.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-741	Applied Cryptography	3	
Description	<p>This course provides an intensive overview of the field of cryptography, a historical perspective on early systems, and the theoretic foundations of modern day cryptosystems. Students will learn how cryptosystems are designed, and to match cryptosystems to the needs of an application. Students will also study basic cryptanalysis and will be presented with real life breaches of common cryptosystems so that they better understand the dangers that lurk in cryptosystem design and in the design of systems that rely on cryptography.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-742	Network Security	3	
Description	<p>This course provides an in-depth study of network attack techniques and methods to defend against them. Topics include firewalls and virtual private networks; network intrusion detection; denial of service (DoS) and distributed denial-of-service (DDoS) attacks; DoS and DDoS detection and reaction; worm and virus propagation; tracing the source of attacks; traffic analysis; techniques for hiding the source or destination of network traffic; secure routing protocols; protocol scrubbing; and advanced techniques for reacting to network attacks.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-750	Machine Learning	3	
Description	<p>This course gives thorough grounding in the methods, theory, mathematics and algorithms needed to do research and applications in machine learning. The topics of the course are drawn from machine learning, classical statistics, data mining, Bayesian statistics, and from information theory.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-751	Special Topics	3	
Description	<p>Discussion of topics by a member of graduate faculty related to new concepts in the computer fields such as distributed database systems, parallel processing, multimedia, speech processing, translation systems, . . . etc.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-752	Computational Perception	3	
Description	<p>This course teaches advanced aspects of perception and scene analysis in both the visual and auditory modalities, concentrating on those aspects that allow us and animals to behave in natural, complex environments. In this course, student will learn how to reason scientifically about problems and issues in perception and scene analysis, how to extract the essential computational properties of those abstract ideas, and finally how to convert these into explicit mathematical models and computational algorithms. In the process, student will cover a wide range of literature that provide very different perspectives on problems and properties of natural perception.</p> <p>The course will consider both classical and modern theories that relate biological sensory systems to ecological context and behavioral function. Readings will be drawn from systems neurophysiology, neuroethology, computational theory, psychophysics and cognitive psychology.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-760	Communication Networks Evaluation	3	
Description	<p>Methods for evaluating the performance of communication networks with emphasis on modeling, mathematical analysis, computer simulation, and measurement. Error, flow and congestion control protocols, multiplexing and multiple-access, switching, routing. Selected case studies on Access networks, packet networks, Broadcasting network, satellite and terrestrial radio networks.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-761	Networked Applications and Services	3	
Description	<p>End-to-end functional building blocks and their use in adaptive and non-adaptive applications, including multimedia: coding, compression, security, directory services Underlying principles of personal communications and Cellular systems.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-762	Broadband Networking Systems	3	
Description	<p>Focus on the data link layer and its relationship to layers below and above. Gigabit Ethernet, SONET, fibre channel; media including wireless, satellite, xDSL, cable. In addition to latest broadband technologies. In Wireless & Multimedia Networks: Standards: 802.11, 802.11e, 802.11n, 802.15, and 802.16, etc. QoS, wireless & multimedia networks new trends and applications.</p>		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-770	Large scale Software design	3	
Description	Designing architectures: architectural conception, styles and architectural patterns. Connectors: connector types, connector dimensions, event-based data distribution connectors, grid-based data distribution connectors, client-server-based data distribution connectors, P2P-based data distribution connectors. Deployment and mobility: software architecture and deployment, software architecture and mobility. Applied architectures and styles: distributed and networked architectures, architectures for network-based applications, decentralized architectures, service-oriented architectures and web services, agent-based architectures.		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-771	Software Testing, and Maintenance	3	
Description	Concepts and techniques for testing and modifying software in evolving environments. Topics include software testing at the unit, module, subsystem, and system levels; developer testing; automatic and manual techniques for generating test data; testing concurrent and distributed software; designing and implementing software to increase maintainability and reuse; evaluating software for change; and validating software changes.		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-772	Modeling of Computing Systems	3	
Description	This course will cover the techniques for modeling and formally analyzing computing systems, with a focus on applications in software, hardware, and security. Students will learn the fundamentals of classical logic, induction and recursion, program semantics, rewriting, reactive systems, temporal logic, model checking, and abstraction. We will examine how these methods can be used to verify software, hardware, and security protocols. Students will learn how to use various tools, including theorem proving and model checking tools, and will work in groups to apply the tools to various domains. We will discuss the limitations of current techniques and systems and we will examine promising research directions including building more useful systems and developing more powerful techniques.		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-780	Bioinformatic-1	3	
Description	Introduction to biological databases and bioinformatics software. Sequence comparison algorithms and tools. Sequence analysis and molecular phylogenetics. Biomolecular 3D structure and modeling. Bioinformatics theory, tools, and techniques		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-781	Bioinformatic-2	3	
Description	This course studies computational biology problems along both algorithmic and statistical approaches. It covers different methods for multiple sequence alignment, genome sequencing, comparative analysis of genome information, gene prediction, finding signals in DNA, phylogenetic analysis, protein structure prediction. Other topics covered include microarray gene expression analysis and computational proteomics.		

<i>Course Code</i>	<i>Course Title</i>	<i>Credits</i>	<i>Prerequisite</i>
CS-799	Thesis	20	
Description	A thesis/dissertation is a requirement for all Doctor of Philosophy (Ph.D.) students. It is considered as primary evidence of the student's capacity for research, independent thought and of his ability to write professionally in the language of instruction.		