

**King Saud University  
College of Computer and Information Sciences**



**The Joint Ph.D. Program in Computer and Information Sciences  
(Thesis option)**

**Academic Year: 2009-2010**

**College:** Computer and Information Sciences

**Department:** Joint PhD Program between the departments of Computer Science, Computer Engineering, and Information Systems.

**Introduction:**

The College of Computer and Information Sciences (CCIS) was founded in response to the need for computer specialists by the Royal Decree No. 7/1558/M, dated 10/05/1404 A.H.

The college has five scientific departments offering Bachelor of Science degrees: Computer Science, Computer Engineering, Information Systems, Software Engineering and Information Technology for females' students. Besides, the college offers three Master of Science in Computer Science, Computer Engineering, and Information Systems. Today the number of graduates from the Master programs are over 153 students. The college has 64 academic staff, most of whom provide many professional and consulting services of diverse computer technology areas for various governmental, public and private sectors. In the recent decades, the world witness tremendous developments in information technology, computer science, and information and knowledge systems. The reliability aspects of contemporary life and quality of life on many of these technologies has led to the increasing demands for specialized cadre that combines high expertise in computer science computer engineering, and information systems, to work in research and development centers at universities, research centers such as King Abdul Aziz City for Science and Technology, etc. In addition, there is an increasing demand for computer graduates, males and females, to work as academic staff in the expanding computer departments in new public and private universities.

Furthermore, it became scientifically important to raise the scientific and technology level of Saudi leaderships and decision makers in the information technology fields. This can be achieved through university graduate programs. The Kingdom's Information Technology National Plan shows that there is a fast growing demand in the next decade for cadre in advanced scientific and professional areas of computers and communication technologies. The study proposed number of recommendations to address the high shortage level of specialized cadres in information technology. The most important of which is to increase the recourses of the information technology departments, the expansion in postgraduate programs to qualify Saudi teaching staff and academic faculty.

Another important recommendation is to facilitate the attraction of distinguished scholars and scientists in information technology in order to transfer of expertise and learning from the international experiences.

From these standpoints, a graduate joint Ph.D. program between 3 departments of the college is proposed herewith to contribute to provide graduate studies and advanced research in the fields of computer science, computer engineering and information systems. This will contribute in creating qualified researchers and faculty members in the area of computer and information sciences.

**Degree Name**

PhD in Computer and Information Sciences (Track name).

**Program Objectives:**

1. To promote advanced research and scientific publication and to contribute to the future scientific and technical world advancement in computer science and engineering, and information technology;
2. To prepare highly specialized scholars, professionals and Saudis research personnel, manpower and expertise that meet the Saudi society development needs, and jobs demand; and support the successful transfer of advanced information technologies in industry, academic and scientific sectors.
3. To create solutions for the persistent IT problems in the public and governmental institutions through a higher level of applied research and IT technology transfer;
4. To provide graduate students and Saudis researchers with skills, means, methodology, innovation and scientific approaches necessary for distinguished professionals in IT sectors.

## **Program Tracks**

The program includes the following three tracks:

1. Computer science,
2. Computer Engineering,
3. Information Systems.

The specialized department council handles all academic affairs related to the track.

### **Admission Requirements:**

1. The admission requirements enumerated in the unified bilaws organizing the graduate studies in Saudi universities.
2. Having a Master degree (M. Sc.) in computer science, computer engineering, information systems, information technology, software engineering, or an equivalent field approved by the program council.
3. Applicants should demonstrate English proficiency by achieving a score of 500 or above in TOEFL or equivalent.
4. The applicant should achieve a score of at least 600 in GRE (Quantitative) exam.
5. Fulfill track admission requirements and passing a written admission exam, in addition to an interview to be announced by the program council.

### **Degree Requirements:**

1. Successful completion of 25 credit hours of graduate courses in the PhD program as follows:
  - a. 3 credit hours of program general courses or university graduate courses as approved by the supervisor.
  - b. 6 credit hours outside student's track from the common courses offered by other tracks of the program.
  - c. 7 credit hours of compulsory courses in student's track.
  - d. 9 credit hours of elective courses in student's track.

No more than two courses from Master Program level are counted for the course requirements in the PhD program.

2. To pass a comprehensive exam in his specialty or other subspecialties decided by the program council and according to the general rules for the comprehensive exam as issued by the deanship of graduate studies.
3. Completion and successful defense of an original thesis.
4. To publish or obtain an acceptance for at least one publication in a specialized referred venue according to student's track.

### **Program Council:**

Based on article (11) of Graduate Studies bylaws, a council for the Ph. D common program will be responsible for administration of the program and to coordinate with related department councils. CCIS college council will define the PhD program council bylaws and tasks according to university regulations. PhD program council members will be nominated by the college council from available university professor and associate professors for a period of three years.

### Program Structure:

Twenty five credit hours and a thesis are required:

Course Number	Number and Type of Courses	Credit hours
---	One general course (list 1 -a)	3
---	2 common courses (list 1 -b)	6
6--	3 compulsory courses in student's track	7
6--	3 elective courses in student's track	9
700	Thesis in student's track	--
Total		25

### Program Schedule

#### First Level

Course Code	Course Title	Credit hours
---	General course or university graduate course as approved by the supervisor (list 1-a)	3
---	Common course outside student's track from the courses offered by other tracks of the program (list I -b)	3
---	common course outside student's track from the courses offered by other tracks of the program (list 1 -b)	3
Total		9

#### Second Level

Course Code	Course Title	Credit hours
6--	Compulsory course in student's track (list 2,4, or 6 / according to track)	3
6--	Elective course in student's track (list 3,5, or 7 according to track)	3
6--	Elective course in student's track (list 3,5, or 7 according to track)	3
Total		9

### Third Level

Course Code	Course Title	Credit hours
696	Independent Research Study1 in student's track	2
6--	Elective course in student's track (list 3,5, or 7 according 6-- to track)	3
<b>Total</b>		<b>5</b>

### Fourth Level

Course Code	Course Title	Credit hours
697	Independent Research Study2 in student's track	2
700	Thesis in student's track	--
<b>Total</b>		<b>2</b>

## General and Common Courses

### List 1 -a: General Courses

Student selects one general course from list (1-a) - needs supervisor's approval

Course Code	Course Title	Credit hours
---	A University graduate course	3
Math 505	Numerical Linear Algebra	3
Stat 503	Probability and Mathematical Statistics for Engineers	3
Math 507	Advanced operations Research	3

## List 1-b: Common Courses

Student selects 2 common courses outside his specialized track from list (1-b) of courses offered by other tracks - needs supervisor's approval

Course Code	Course Title	Credit hours
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### Computer Science Track

CSC 612	Analysis and Design of Algorithms	3
CSC 642	Advanced Software Engineering	3
CSC 662	Artificial Intelligence	3
CSC ---	A graduate course offered by Computer Science department	3

### Computer Engineering Track

CEN 621	Advanced Computer Architecture	3
CEN 631	Advanced Computer Networks	3
CEN 643	Digital Signal Processing	3
CEN ---	A graduate course offered by Computer engineering department	3

### Information Systems Track

CIS 601	Enterprise Resources and Planning	3
CIS 602	IT Project Management	3
CIS 603	Systems Analysis and Design	3
CIS ---	A graduate course offered by Information Systems department	3



## Computer Science Track Courses

### List 2: Compulsory courses in Computer Science

Course Code	Course Title	Credit hours
CSC 601	Advanced Computing Science and Applications	3
CSC 696	Independent Research Study1	2
CSC 697	Independent Research Study2	2
Total		7

### List 3: Elective courses in Computer Science

Course Code	Course Name	Credit hours
CSC 618	Selected topics in Computer Systems and Networks	3
CSC 619	Selected topics in Computer Security	3
CSC 626	Advanced Theory Of Computation And Computability	3
CSC 62V	Design and Implementation of Real-Time Systems	3
CSC 628	Selected topics in Programming Languages	3
CSC 629	Selected topics in Arabisation	3
CSC 637	Parallel Processing	3
CSC 647	Software Testing, Validation, and Verification	3
CSC 648	Selected topics in Software Engineering	3
CSC 657	Pervasive Computing Architecture and Design	3
CSC 661	Emergent Computing and Swarm Intelligence	3
CSC 662	Artificial Intelligence	3
CSC 663	Machine Learning	3
CSC 668	Selected topics in Artificial Intelligence	3
CSC 669	Selected topics in Image Processing and Pattern Recognition	3
CSC 677	Selected topics in Computer Graphics	3
CSC 678	Selected topics in Virtual Reality and Computer Vision	3
CSC 679	Human Computer Interaction	3
CSC 687	Data Warehouse and Mining Systems	3

CSC 688	Selected topics in Database Systems	3
CSC 691	Bioinformatics	3
CSC 698	Advanced topics in CS	3
--- ---	Graduate course from the college of Computer and Information Sciences or from the university (requires department council approval)	3

### **Computer Engineering Track Courses**

#### List 4: Compulsory courses in Computer Engineering

Course Code	Course Title	Credit hours
CEN 601	Engineering Stochastic Processes and its Applications	3
CEN 696	Independent Research Study1	2
CEN 697	Independent Research Study2	2
<b>Total</b>		<b>7</b>

#### List 5: Elective courses in Computer Engineering

Course Code	Course Name	Credit hours
CEN 61 1	Design of CAD Tools	3
CEN 628	Advanced Parallel Computing	3
CEN 629	Fault Tolerant Systems	3
CEN 632	Graphs and Network Flows Theory and Applications	3
CEN 633	Networks Design and Algorithms	3
CEN 634	Personal Communication Systems	3
CEN635	Telecommunication Networks: Protocols and Performance Analysis	3
CEN 636	Optical Networks	3
CEN 637	Sensor Networks	3
CEN 638	Wireless and Multimedia Networks	3
CEN 639	High Performance Interconnection Networks	3
CEN 645	Speech and Video Signal Processing	3
CEN 647	Pattern Recognition	3

CEN 651	Nanorobotics	3
CEN69 1	Advances Topics in Computer Engineering	3
--- ---	Graduate course from the college of Computer and Information Sciences or from the university (requires department council approval)	

### **Information Systems Track Courses**

#### List 6: Compulsory courses in Information Systems

Course Code	Course Name	Credit hours
CIS 611	Information and Knowledge Management	3
CIS 696	Independent Research Study1	2
CIS 697	Independent Research Study2	2
Total		7

#### List 7: Elective courses in Information Systems

Course Code	Course Name	Credit hours
CIS 621	Web Content Management	3
CIS 622	Advanced Topics in Information Security	3
CIS 623	Data Warehouses and Knowledge Discovery	3
CIS 624	Enterprise Systems	3
CIS 625	Spatial Information Systems	3
CIS 626	Artificial Intelligence Techniques and Applications	3
CIS 627	Advanced Simulation Techniques	3
CIS 628	E-Business Strategies	3
CIS 629	Advanced Systems Analysis and Design	3
CIS 679	Advanced Topics in Information Systems	3
CSC ---	Graduate course from the college of Computer and Information Sciences or from the university (requires department council approval)	3

## **Course Description: Computer Science department**

### **CSC 601 Advanced Computing Science and Applications** 3(3+0)

Graph theory and applications in computer science - Computational methods and application in computing science - Advanced data structures -Applications in computing - Discrete mathematics applications in computing - New trends in computing science.

### **CSC 612 - Analysis and Design of Algorithms** 3(3+0)

Major data structures design techniques - Divide and conquer - Dynamic programming - Heuristics - Parallel algorithms - Analysis of algorithms - Orders of magnitude - Lower bound theory - Time and space complexity - NP-hard and NP-complete problems - Applications and examples - Correctness of algorithms - Structure of algorithms.

### **CSC 618 - Selected topics in Computer Systems and Networks** 3(3+0)

New trends and research directions in the area of Computer Systems and Networks.

### **CSC 619 - Selected topics in Computer Security** 3(3+0)

New trends and research directions in the area of Computer Security including: Threats and vulnerabilities - Identification and authentication - Access control - Intrusion detection - Encryption and privacy - Security policies and their evaluation - Steganography and applications.

### **CSC 626 - Advanced Theory Of Computation And Computability** 3(3+0)

In-depth study of concepts related to computability - Chomsky hierarchy - Turing machines - Computability - Decidability - Nondeterministic automats, recursive function theory - Theory of complexity and complexity classification.

### **CSC 627 - Design and Implementation of Real-Time Systems** 3(3+0)

Real-Time Systems - Real-Time applications and support Real-Time Languages - Specific hardware interfaces for Real-Time Systems: real-time data collection and processing - Different types and levels of Control in Real-Time Systems (e.g. closed-loop control) - Real-Time Operating Systems - Predictability in Real-Time Systems -

Introduction to methodologies for the design and implementation of Real-Time Systems - Cases studies.

**CSC 628 - Selected topics in Programming Languages** 3(3+0)

New trends and research directions in the area of Programming Languages.

**CSC 629 - Selected topics in Arabisation** (3+0)

New trends and research directions in the area of Arabisation.

**CSC 637 - Parallel Processing** 3(3+0)

Overview of High Performance Computers, parallel program performance measurement, study different paradigms for achieving parallelism including explicit and implicit parallelization, fine grain and data flow models, shared memory and message passing parallel computers, and the difference between the SIMD versus MIMD types of Computers. Experiments will be conducted on different parallel programming frameworks, including PVM, MPI and LAP1 as provided with the IBM RS/6000 eServer computer.

**CSC 642 - Advanced Software Engineering** 3(3+0)

Software methodologies - Software requirements - Software Project Management - Software Cost - Software Quality - Software Testing - Software Measurements - Software Risk Management - Case Study.

**CSC 647 - Software Testing, Validation, and Verification** 3(3+0)

Testing in the development life cycle - Testing methodology - Methods for evaluating software for correctness, performance and reliability - Software validation and verification - Static testing - Code inspection - Dynamic testing - Unit testing - System testing - Statistical testing - Testing tools - New trends in software testing.

**CSC 648 - Selected topics in Software Engineering** 3(3+0)

New trends and research directions in the area of software engineering.

**CSC 657 – Pervasive Computing Architecture and Design** 3(3+0)

This course covers pervasive computing principles and applications in depth. The topics include: sensor networks; primitive data types for sensor networks; programming sensor networks; mobility support; MANETs; middleware systems; context modeling and awareness; software engineering principles for pervasive computing; usability aspects of pervasive computing; wireless security and privacy.

**CSC 661 – Emergent Computing and Swarm Intelligence** 3(3+0)

Evolutionary algorithms - Artificial Immune Systems - Evolving Connectionist systems - Cellular Automata - Collective Intelligence - Reverse Emergence - Cellular neural network - Amorphous computing - DNA Computing - Bioinformatics - Quantum Computing.

**CSC 662: Artificial Intelligence** (3+0)

Introduction to AI problem solving - Knowledge representation - Automatic theorem proving - Learning by example - Learning by analogy - Learning by discovery - Self-reference and Self-production - Reasoning: causal reasoning - commonsense reasoning - default reasoning - measure-based approaches - reasoning with uncertainty - Confirmation theory - Belief theory - Necessity and possibility theory - Theory of endorsements - Spatial and temporal reasoning.

**CSC 663 – Machine Learning** 3(3+0)

This course covers the theory and practice of machine learning from a variety of perspectives (including Design, analysis, implementation and applications of learning algorithms). The course covers theoretical concepts such as induction, deduction, reinforcement and interaction. Topics include learning decision trees, neural network learning, statistical learning methods, genetic algorithms, Bayesian learning methods, explanation-based learning, and reinforcement learning, support vector machines, decision trees, Bayesian networks, association rules, dimensionality reduction, feature selection and visualization.

**CSC 668 - Selected topics in Artificial Intelligence** 3(3+0)

New trends in the area of Artificial Intelligence

**CSC 669 - Selected topics in Image Processing and Pattern Recognition**

3(3+0)

New trends in the area of digital image processing and pattern recognition including: Images enhancement - Images segmentation - Representation of objects - Pattern Classes - Recognition based on Decision Theoretic and Structural Methods.

**CSC 677 - Selected topics in Computer Graphics**

3(3+0)

New trends in the area of Computer Graphics including Three dimensional Modeling and viewing.

**CSC 678 - Selected topics in Virtual Reality and Computer Vision**

3(3+0)

New trends in the area of Virtual Reality and Computer Vision.

**CSC 679 - Human Computer Interaction**

3(3+0)

New trends in the area of Human Computer Interaction including: Human sensory systems - Interaction-handling Models - Speech Computing and other Forms of Input/Output.

**CSC 68v - Data Warehouse and Mining Systems**

3(3+0)

Decision Support Systems (DSS) - Development of DSS - Data Modeling Techniques and Development of Data Warehouse in an architected Environment - Study of different Data Warehouse Architectures and Development Techniques - User-Interface for Data Warehouses - Data Mining - Application Domains for Data Warehouse and Mining - Project: Development of a Prototypical Data WarehouseMining System.

**CSC 688 - Selected topics in Database Systems**

3(3+0)

New trends in the area of Database Systems.

**CSC 691 - Bioinformatics**

3(3+0)

Bioinformatics is a rapidly evolving field that studies biological systems and biological data (such as DNA/protein sequences, macromolecular structures and functional genomics data) using analytic theory and practical tools of computer science, mathematics and statistics. The topics include concepts of molecular genetics, biological databases, database searching, sequence alignments, phylogenetic trees, structure prediction, and microarray data analysis.

**CSC 696 - Independent Research Study1**

2(2+0)

The student selects a research topic and conducts a literature review in relation to the topic.

**CSC 697 - Independent Research Study2**

2(2+0)

The student selects a research topic and conducts a literature review in relation to the topic.

**CSC 698 - Advanced topics 1 in Computer Science**

3(3+0)

In this course, students are able to study advanced topics in Computer Science. The content and syllabi of this course is designed by a member of staff and approved by the department.

**CSC 699 - Advanced topics 2 in Computer Science**

3(3+0)

In this course, students are able to study advanced topics in Computer Science. The content and syllabi of this course is designed by a member of staff and approved by the department.

**CSC 700 - Thesis.**



## **Course Description: Computer Engineering department**

### **CEN 601 - Engineering Stochastic Processes and its applications** 3(3+0)

Random variables. Moments. Conditional distributions and moments. Functions of random variables. Joint distributions and moments. Random process models: basic concepts, properties. Stationary random processes: covariance and spectrum. Response of linear systems to random inputs: discrete-time and continuous-time models. Time averages and Ergodic principle. Sampling principle and interpolation. Selected applications in Control, Networks and Communication Systems

### **CEN 611 - Design of CAD Tools** 3(3+0)

Solving logic design problems with CAD tools for VLSI circuits. Analysis and design of exact and heuristic algorithms for logic synthesis. Topics: representation and optimization of combinational logic functions (encoding problems, binary decision diagrams), representation and optimization of multiple level networks (algebraic and Boolean methods, don't-care set computation, timing verification, and optimization), modeling and optimization of sequential functions and networks (retiming), semi custom libraries and library binding.

### **CEN 621 - Advanced Computer Architecture** 3(3+0)

Instruction set principles, Pipelining, pipelining hurdles. Instruction level parallelism, Data hazards avoidance, Dynamic Scheduling, Dynamic Hardware prediction. Memory Hierarchy Design, Cache design, Storage systems, Busses, I/O performance measures. Interconnection Networks, Introduction Multiprocessors architectures.

### **CEN 628 - Advanced Parallel Computing** 3(3+0)

The principles and tradeoffs in the design of parallel architectures. Emphasis is on naming, latency, bandwidth, and synchronization in parallel machines. Parallel programming models, multiprocessor systems, multi-computer clusters, Case studies on shared memory, message passing, data flow, and data parallel machines. Architectural studies and lectures on techniques for programming parallel computers.

### **CEN 629: Fault Tolerant Systems** 3(3+0)

Physical Fault Errors and Failures; Fault Analysis and Diagnosis in Digital Circuits; Fault Modeling; Testing Techniques; Test Generation and Fault Simulation; Design

For Testability; Built-in-self-Test; Reliability Concepts; Fault prevention (fault intolerance); Fault Tolerance; Replication, Redundancy, and Diversity.

**CEN 631 - Advanced Computer Networks** 3(3+0)

Review of OSI layered Architecture, TCP/IP Protocols, Data link layer: HDLC, Window flow control, Network layer: Datagram and virtual circuit, Transport protocol: Error-detection and recovery, Presentation layer: Security, Privacy, Text compression, Application layer: Distributed computing, Network operating systems

**CEN 632 - Graphs and Network Flows Theory and Applications** 3(3+0)

Solutions to analysis and synthesis problems that may be formulated as flow problems in capacity constrained (or cost constrained) networks. Tools for network flow theory using graph theoretic methods. Applications to communication, and transmission problems.

**CEN 633 - Networks Design and Algorithms** 3(3+0)

Principles of network design, network design algorithms, centralized network design, static and dynamic routing algorithms, application of minimum spanning tree and shortest path algorithms to problems in network design, distributed network design, case studies.

**CEN 634 - Personal Communication Systems** 3(3+0)

Underlying principles of personal communications and Cellular systems. Radio signal propagation and signal impairments:, Noise & interference-limited communications, multiple access, radio resources management, and mobility management. Building blocks of personal networks. Essential functions of cellular systems . Examination of the leading and standard systems.

**CEN 635 -Telecommunication Networks: Protocols and Performance Analysis**  
3(3+0)

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.

**CEN 636 - Optical Networks****3(3+0)**

Components, topologies and architecture of optical networks. Basics of the Physical layer, higher network layers and protocols (Media Access Control, Network and Transport Layers) as integral parts of network design. Performance metrics, analysis and optimization techniques will be developed to help guide the creation of high performance complex optical networks.

**CEN 637 Sensor Networks****3(3+0)**

Sensor network and Ad-Hoc networks: characteristics & applications, routing and performance analysis. deployment; energy-efficiency; wireless communications; data-centric operation; capacity and lifetime; reliability, fault-tolerance and security. Standards of sensor networks

**CEN 638 - Wireless and Multimedia Networks****3(3+0)**

Overview of wireless networks with multimedia services. Physical Layer, Wireless Networks Medium-Access Control (MAC) protocols (TDMA, FDMA, CDMA, ALOHA-based, CSMNCA). Wireless & Multimedia Networks: Standards: 802.11, 802.11e, 802.11n , 802.15, and 802.16 . . .etc , QoS , wireless & multimedia networks new trends and applications.

**CEN 639 - High Performance Interconnection Networks****3(3+0)**

Basics, theories, architectures, and technologies for high-performance high-speed large-scale routers and switches. Fundamental concepts and technologies of packet forwarding, classification, and switching in **IP** routers, Ethernet switches, and optical switches. IP Route Lookup, Packet Classification, Packet Scheduling, Buffer Management, Basics of Packet Switching, Input-buffered Switches, Output-buffered Switches, Shared-memory Switches, Crosspoint-buffered Switches, Close-network Switches, Multi-Stage Buffered Switches, Two- Stage Load-Balanced Switches, Optical Packet Switches, and ASIC for IP Routers.

**CEN 643 - Digital Signal Processing****3(3+0)**

Discrete time signals, Z-transforms. Discrete Fourier transform (DFT). Fast Fourier transform (FFT). Design of finite impulse response filter (FIR) and Infinite impulse response filter (IIR), Effects of finite word length

**CEN 645: Speech and Video Signal Processing** **3(3+0)**

This course deals with some of the common digital signal processing techniques for the analysis of speech and video signals. Topics include: signal analysis using short-time Fourier transform, linear prediction, and cepstrum processing; applications in speech (& video) compression and coding, speech and speaker recognition, audio and video watermarking and steganography, and speech & video enhancement, inferring 3D properties from, object detection & recognition, multiview geometry, and structure from motion. Pre-requests: Digital signal processing and Digital image processing.

**CEN 647 - Pattern Recognition** **3(3+0)**

Decision theory, parameter estimation, density estimation, non-parametric techniques, supervised learning, linear discriminant functions, clustering, unsupervised learning, artificial neural networks, feature extraction, support vector machines, and pattern recognition applications (e.g., face recognition, fingerprint recognition, automatic target recognition, etc.), overview of other machine learning techniques and data mining. Pre-requests: Probability theory and random variables course and an introductory linear algebra course

**CEN 651 - Nanorobotics** **3(3+0)**

Introduction to robot architectures; Software programming methods including: sensors, planning, control, and learning. Nanorobotics: nanotechnology, sensing, control, actuation, and propulsion; Communication, power, programming and coordination of robot swarms. Nanomanipulation and nanoassembly with atomic force microscopes.

**CEN691- Advanced Topics in Computer Engineering** **3(3+0)**

In this course, students are able to study advanced topics in Computer Engineering. The content and syllabi of this course is designed by a member of staff and approved by the department council.

**CEN 696 - Independent Research Study1****2(2+0)**

The student selects a research topic and conducts a literature review in relation to the topic.

**CEN 697 - Independent Research Study2****2(2+0)**

The student selects a research topic and conducts a literature review in relation to the topic.

CEN 700 - Thesis.

**Course Description: Information Systems department****CIS 601- Enterprise Resources and Planning****(3+0)**

Basic elements and considerations of an enterprise computing solution, including systems integration issues, people versus technology issues, plus project management and implementation issues. Concepts of production planning and control with ERP systems, relationship with manufacturing and logistics strategies. Other ERP related topics, including technical, management, and global issues common to a typical business and manufacturing environment.

**CIS 602: IT Project Management****(3+0)**

Introduction to Project Management. The nine project management knowledge areas - project, integration, scope, time, cost, quality, human resource, communications, risk, and procurement management. The five process groups - initiating, planning, executing, controlling, and closing. Project Management and Information Technology Context, Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Human Resource Management, Project Communications Management, and Project Risk Management.

**CIS 603 - Systems Analysis and Design****(3+0)**

Approaches used by information system developers to discover and model the requirements. Construct an acceptable design to implement a successful system

solution. Tools and techniques that the programmer or analyst uses to develop information systems.

**CIS 611 - Information and Knowledge Management** (3+0)

Knowledge as a manageable asset. Organizations classes, adaptive systems, information and knowledge environment. Information handling. Organizational setting and technologies used for handling information and knowledge.

**CIS 621 - Web Content Management** (3+0)

Concepts and techniques in website content representation, organization, presentation, and development with the extensible Markup Language (XML). Basic XML syntax, XML vocabulary specification, data modeling, XML style sheets and transformation, and Document Object Model (DOM). Design the Document Type Definitions (DTDs) and XML schemas. Creation and manipulating of XML documents. Advanced topics in manipulating XML data, including standards, namespaces and schemas, XML Transformation Language, and databases in relation to *XML*.

**CIS 622 - Advanced Topics in Information Security** (3+0)

Policies, models, and mechanisms for secrecy, integrity, and availability. Operating system models and mechanisms for mandatory and discretionary controls, data models, concepts and mechanisms for database security, basic cryptography and its applications, security in computer networks and distributed systems, controlling and preventing viruses and other rogue programs. Authentication, access control, non-repudiation; and their integration in network protocols. Key management, cryptographic protocols and their analysis. Access control, delegation and revocation in distributed systems. Security architectures, multilevel systems, and security management and monitoring.

**CIS 623 - Data Warehouses and Knowledge Discovery** (3+0)

Advanced topics in deductive, active, temporal and OR DBs, extensible databases, spatial queries and storage structures, time series, data warehouses and knowledge discovery, and databases and the Web (queries on semi-structured data). Modern Trends in Intelligent Information Systems and DBMSs, Deductive Databases and

knowledge bases, Temporal Queries and Reasoning, Active Databases, Object-Relational DBMSs.

**CIS 624 - Enterprise Systems (3+0)**

Enterprise resource planning (ERP) client/server systems and e-business. The marketplace for ERP, CRM, SCM, and e-procurement; and management issues, strategy, business value, risks, usability and outsourcing. Future and predicted enterprise system trends.

**CIS 625 - Spatial Information Systems (3+0)**

Principles in representing and organizing spatial data in geographic databases, and procedures of spatial analysis utilizing geospatial data. Concepts of the nature of spatial problems, the properties of spatial data, the entity and field approaches, Euclidean and fractal geometries, topology and graphs, regular and irregular tessellations, hierarchical data structures, spatial addressing, spatial data operations, and computational geometry. Representation for hydrological modeling and land use analyses; map overlay modeling, using grid and vector data; and geocoding and network analyses for transportation analyses.

**CIS 626 - Artificial Intelligence Techniques and Applications (3+0)**

Foundational techniques in Artificial Intelligence: history, symbol system hypothesis, intelligent modeling and modeling intelligence, critique of classic AI problems. Problem spaces and search: State space, search, heuristics, graph methods. Knowledge representation and inference: Inference, inheritance, slot and filler structures, sets and attributes, frames and frame languages. Knowledge representation and logic: Predicate logic, Non-classical logics: fuzzy logic, non-monotonic reasoning. AI Applications including Planning and Scheduling, Computer-based Vision, Neural Networks, Natural language Understanding, Generation and Translation, Intelligent Agents.

**CIS 627 - Advanced Simulation Techniques (3+0)**

Dynamical systems theory. Simulation systems and their classification. Principles of simulation system design and implementation. Using general programming languages

for simulation. Algorithms for control of simulation. Continuous simulation; numerical methods, spatial models. Discrete simulation; events, processes, quasi-parallel execution. Combined simulation; state events. Advanced and special simulation methods. Basics of sensitivity analysis. Digital system models. Qualitative simulation. Models of uncertainty, using fuzzy logic in simulation. Knowledge-based simulation. Model optimization. Parallel and distributed simulation. Modern visualization methods. User interfaces of simulation systems and models. Simulation for virtual reality. Theoretical foundations of model validation and verification. Simulation results analysis. Application of artificial intelligence principles to system modeling and simulation.

**CIS 628 - E-Business Strategies**

**(3+0)**

Different aspects of conducting business over the Internet. Business-to-business and business-to-consumer e-Business models. The history and future of the Internet, Internet infrastructure, website design, Internet security, web server platforms, the components that comprise an e-Business strategy and demonstrate methods strategy. Software tools and protocols for web-based applications, identify the components of e-Business strategies and methods. Integration of e-business applications to back-office.

**CIS 629 - Advanced System Analysis and Design**

**(3+0)**

Advanced tools and techniques that the programmer or analyst uses to develop information systems. Object-oriented tools and the Unified Modeling Language (UML), objects, use cases, actors, structured scenarios, hierarchies, dependencies, message flows, state transition, and user interfaces. object-oriented CASE tool.

**CIS 696 - Independent Research Study1**

**2(2+0)**

The student selects a research topic and conducts a literature review in relation to the topic.

**CIS 697 - Independent Research Study2**

**2(2+0)**

The student selects a research topic and conducts a literature review in relation to the topic.



**CIS 699 – Advanced Topics in Information Systems** 3(3+0)

In this course, students are able to study advanced topics in Information Systems. The content and syllabi of this course is designed by a member of staff and approved by the department council.

**CIS 700 - Thesis.**

**General Courses from College of Sciences**

**503 STAT – Probability Mathematical Statistics for Engineering** 3(3+0)

Probability , Random Variable , Expectation, Some Distributions Functions of R. V. , Sampling distributions , Estimation , Hypothesis , Testing , Correlation and regression , Analysis of Experiments

**505 MATH – Numerical Linear Algebra** 3(3+0)

Direct & Iterative methods for solving system of linear equations (including cases with special matrices) along with error convergences analysis . Numerical methods for solving least square problems and approximation of functions). Various methods for computing the eigenvalues and eigenvectors for symmetric and non-symmetric matrices. Applications.

**507 MATH – Advanced Operations Research for Engineering:** 3(3+0)

Linear optimization models. Geometric interpretation. Simplex, two phase, revised simplex and Karmarkar's methods for solving linear programming. Duality and sensitivity analysis. Parametric programming. Applications Introduction to the nonlinear programming.