جامعة حائل
University of Ha'il

2021

COMPUTER SCIENCE ACADEMIC PROGRAM GUIDE

Contents

Introduction

Over the last decade, the demand for IT and Computer Science professionals has increased exponentially in the Kingdom of Saudi Arabia. This would obviously mean that more institutions and especially quality ones are needed to produce these professionals, which include graduates who pursue positions in the workforce, or those who enroll for advanced studies in the discipline.

The Hail University Computer Science program certainly meets these requirements well enough through offering excellent infrastructure and training to its students. Thus it satisfies in some measure the ever-growing demand of IT professionals in the Kingdom, but more importantly helping generate a trained human resource for the future**.**

Computers science provides greater opportunity to students in becoming computer professionals, so that they can participate in the development of the society and country. Computer science helps to form social change and finds solution to problems involving vulnerable individuals, as well as contributes in societies, communities, and groups to improve the conditions in which individuals live, as well as the overall well-being of the population.

Program Vision

University of Hail Vision:

Local and regional leadership in spreading knowledge, research excellence, and sustainable community partnership.

College of Computer Science and Engineering Vision:

The College of Computer Science and Engineering strives for excellence in education and learning fields, scientific research, and social services in Computer Science, Software Engineering, and Computer Engineering regionally and nationally.

Computer Science Program Vision:

Academic and research excellence and social partnership in computer science and its applications at the national and regional levels.

Program Mission

University of Hail Mission:

Provide academic programs to prepare qualified graduates for the labor market and produce scientific research that serves the community by applying the highest quality standards and utilize the university's human and technical resources to reach the society of knowledge.

College of Computer Science and Engineering Mission:

The College of Computer Science and Engineering is committed to graduate distinguished students to fulfill labor market needs and local community through providing educational environment attracting qualified personnel and utilizing the best technology aligned with Saudi society values.

Computer Science Program Mission:

Prepare qualified computer science graduates capable of competing in the national and regional labor market, contribute to scientific research, and engage in community services through high quality standards to enhance digital society.

Program Objectives

The Computer Science program goals are set to:

1. Prepare scientifically distinguished and practically qualified graduates to solve complex computing problems.
2. Develop the scientific research through contributing in the latest trends of computing.
3. Contribute to the development of society's needs in the field of various computer sciences.
4. Encourage the graduates to gain self-learning ability, different communication skills, and teamwork while considering ethical standards and academic and professional rules.

Organizational Chart of Program

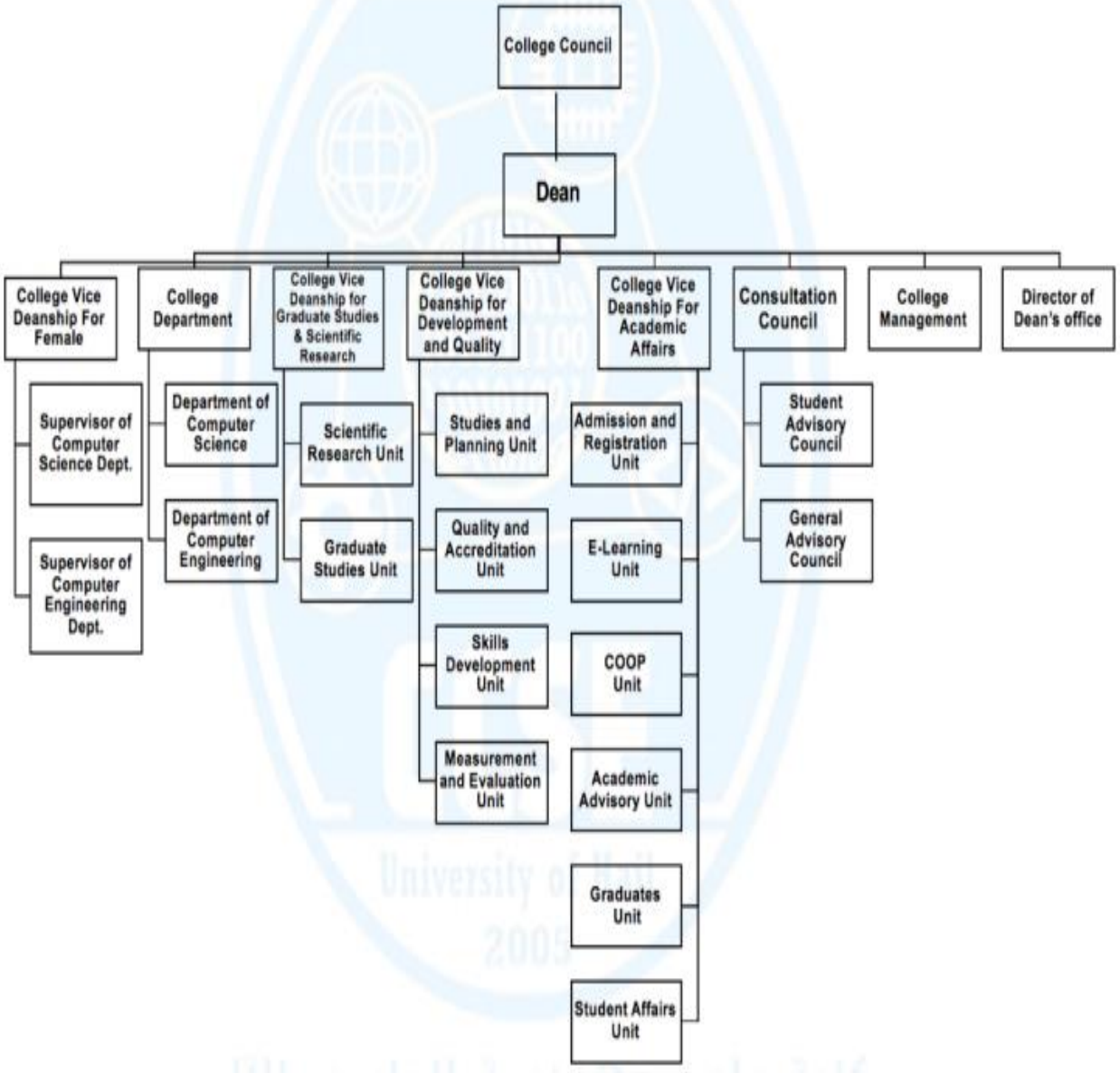

Figure 1. Organization Chart

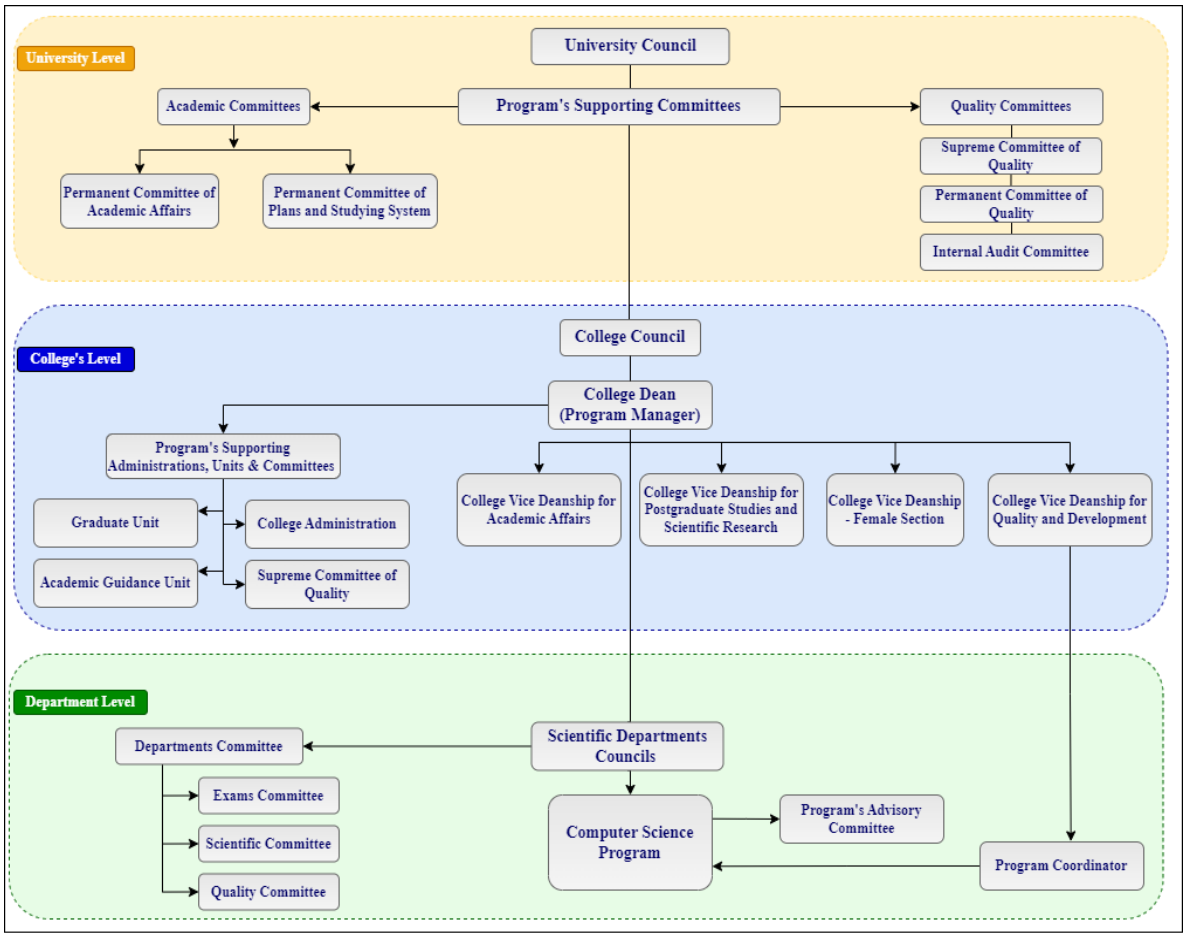

Figure 2. College of Hierarchy

Admission Requirements

The number of accepted students is determined by the college councils and the deanship of admission and registration. The conditions for accepting students are as follows:

1. An official high school certificate is required from inside or outside the kingdom of Saudi Arabia.
2. The high school certificate is valid for 5 years for acceptance; exceptions in this regard are referred to the university.
3. Applicants must have a character certificate of good conduct.
4. Applicants must pass all examinations and interviews conducted by the university council.
5. Applicants must be medically fit.
6. If the applicant is working, no objection letter from the employer is required.
7. The applicant must fulfill any other conditions or requirements required by the University Council during the admission process.
8. The competition between applicants depends on high school percentage, interviews and acceptance exam such as (Qudurat and Tahsili).
9. The minimum passing percentage of high school certificates and examinations may vary every year depending on the number of students and the number of available seats in the course. Admission in the college majors depends on preparatory year GPA, applicants' choices, and seats available
10. Acceptance in the Software Engineering Program depends on preparatory year GPA and the availability of seats.

Graduation Requirements

Students in the Computer Science (CS) program are required to complete 132 semester-credit hours covering general educational requirements, core requirements and some elective courses.

ARTICLE (19):

A student graduates after successfully completing the graduation requirements according to the degree plan, provided his cumulative GPA not less than "PASS". Following the recommendation of the department council, the college council may determine certain additional courses the student should take to improve his cumulative GPA if he has passed the required courses, but with a low GPA. Implementation Rules of ARTICLE (19):

1. The student is required to pursue his major degree plan and complete all requirements before graduation.
2. The Deanship of Admissions & Registration will provide the relevant departments with copies of the academic records of all candidates for graduation. The department will then review these records to ensure that the students have satisfied all graduation requirements and will provide the Deanship of Admissions & Registration with a list of the students who qualify for graduation.
3. The student must attain a cumulative GPA and major GPA of 2.00 or above (out of 4.00) to graduate.
4. If the cumulative GPA is lower than the required limit, it may be re-calculated at the student's request, provided he has successfully completed all the courses required for obtaining the degree. This will be based upon the recommendation of the department council in coordination with the Deanship of Admissions & Registration and the approval of the college

council. However, at the time of graduation, the student's cumulative GPA should not be more than 2.00 (out of 4.00) after recalculation.

5. Cumulative GPA Re-Calculation Rules: Following are the specific rules pertaining to GPA recalculation (applicable only at the time of graduation if the cumulative GPA is < 2.00):
   a. To exclude any previous grade of a course studied by a student, the student must have successfully repeated the course and obtained grade D or higher.
   b. The grades F, DN, WF and D may be excluded by subtracting the number of credit-hours of a certain course from the total credit-hours used in calculating the student's cumulative GPA, and subtracting the quality points assigned to these credit hours from the total quality points used for calculating the student's cumulative GPA.
   c. The total credit-hours of the courses to be excluded from the cumulative GPA calculation should not exceed 24. The academic record must include all the grades of the courses taken by the student, showing the grades earned on each occasion. A special mark should be introduced to identify the courses which have been excluded from the cumulative GPA calculation. The academic record should show the re-calculated cumulative GPA.
   d. No change is to be introduced to the academic record after the graduation document is issued.
   e. The rules of re-calculation of cumulative GPA will be applied to courses the student has repeated at UOH.
   f. Under no circumstances will the re-calculation of cumulative GPA raise the GPA above 2.00, which is the minimum required to satisfy graduation requirements.
6. To obtain any degree from UOH, the student must have studied a minimum of 36 credit hours, at the University, including at least 18 credit hours in his major field.
7. The Deanship of Admissions & Registration thoroughly reviews all student records to ensure that all graduation requirements are satisfied.
8. The Deanship of Admissions & Registration submits a draft recommendation to the University Council listing the students nominated for graduation at the end of each semester.

9. The Deanship of Admissions & Registration submits a draft recommendation to the University Council listing the students who have satisfied all graduation requirements and actually graduated.
10. A graduating student is obliged to obtain a clearance form from the Deanship of Student Affairs and have it signed by the following departments:
11. The Central Library, Bookstore, Security, Medical Center, Student Housing, Academic Major Department, Student Fund, Deanship of Admissions & Registration, Accounting, and any other departments as determined by the Deanship of Student Affairs.
12. The Deanship of Admissions & Registration prepares and releases the official graduation certificates and degrees and maintains copies of these documents.

Academic Reference Standards of Program

1- Knowledge and Understanding

K1 Memorize the basic sciences, mathematics, and natural languages related to computer science issues.

K2 Recognize the structures and operations of hardware, programming languages, and software systems.

K3 Retrieve the steps of solving computing-based problems using different representations, techniques, and models.

K4 Differentiate between techniques, software components, models, and measurements that are used to address computer science issues.

K5 Identify the different directions of computer science subjects and their applications to interdisciplinary.

2- Skills

S1 Analyze computing problems and their solutions to build effective computer applications.

S2 Design the solutions of computing-based problems using different techniques, representations and platforms.

S3 Utilize appropriate programming languages and tools to develop and implement computer programs and systems

S4 Enhance the communication skills using various information technologies including oral and writing skills to demonstrate the ability for understanding the different aspects of computer science.

S5 Apply relevant knowledge of science, mathematics, and technologies in different areas of computing problems.

3-Values

V1 Demonstrate responsibility, accountability, and effective cooperation during teamwork for developing work skills.

V2 Apply the ethical standards and academic and professional rules.

Program Intended Learning Outcomes

Knowledge and Understanding	
K1	Memorize the basic sciences, mathematics, and natural languages related to computer science issues.
K2	Recognize the structures and operations of hardware, programming languages, and software systems.
K3	Retrieve the steps of solving computing-based problems using different representations, techniques, and models.
K4	Differentiate between techniques, software components, models, and measurements that are used to address computer science issues.
K5	Identify the different directions of computer science subjects and their applications to interdisciplinary.
Skills	
S1	Analyze computing problems and their solutions to build effective computer applications.
S2	Design the solutions of computing-based problems using different techniques, representations and platforms.
S3	Utilize appropriate programming languages and tools to develop and implement computer programs and systems
S4	Enhance the communication skills using various information technologies including oral and writing skills to demonstrate the ability for understanding the different aspects of computer science.
S5	Apply relevant knowledge of science, mathematics, and technologies in different areas of computing problems.
Values	
V1	Demonstrate responsibility, accountability, and effective cooperation during teamwork for developing work skills.
V2	Apply the ethical standards and academic and professional rules.

Study Plan of Program

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution, College or Department)
Level 1	CHEM 101	General Chemistry I	Required		4	College
	ENGL 110	English Compos. I	Required		3	University
	MATH 101	Calculus I	Required		4	College
	PHYS 101	General Physics I	Required		4	College
	PE 101	Physical Educ. I	Required		1	College
	ARAB 101	Practical Grammar	Required		2	University
Level 2	ICS 102	Computer Programing	Required	MATH 101	3	Program
	ENGL 102	English Composition II	Required	ENGL 110	3	College
	MATH 102	Calculus II	Required	MATH 101	4	College
	PHYS 102	General Physics II	Required	PHYS 101	4	College
	PE 102	Physical Educ. II	Required	PE 101	1	College
	IC 101	Intro. To Islamic Culture	Required		2	University
Level 3	ICS 201	Introduction to Computer Science	Required	ICS 102	4	Program
	ENGL 214	Technical Report Writing	Required	ENG 102	3	College
	MATH 201	Calculus III	Required	MATH 102	3	College
	ICS 251	Foundation of Computer Science	Required	MATH 101	3	Program
	COE 200	Foundation of Computer Engineering	Required	PHYS 102	4	College
Level 4	ICS 202	Data Structure	Required	ICS 201	4	Program
	ICS 232	Computer Org & Assembly Program.	Required	ICS 201, COE 200	4	Program

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution, College or Department)
	MATH 260	Introduction to Differential Equation & Linear Algebra	Required	MATH 201	3	College
	ICS 252	Discrete Structures	Required	MATH 101, ICS102	3	Program
	XE xxx	General Elective I	Elective		3	Program
Level 5	COE 308	Computer Architecture	Required	ICS 232	3	Program
	ICS 313	Fundamental of Programing. Language	Required	ICS 202	3	Program
	ICS 334	Database Systems	Required	ICS 202	4	Program
	ICS 353	Des. & Analysis of Algorithms	Required	ICS 202	3	Program
	IC 102	Islamic & Society Building	Required		2	University
	STAT 319	Prob. & Stat	Required	MATH 201	3	College
Level 6	IC 103	Economic System in Islam	Required		2	University
	ICS XXX	ICS Elective I	Elective		3	Program
	ICS 432	Computer Networking Systems	Required	ICS 232	4	Program
	ICS 413	Software Engineering	Required	ICS 202	4	Program
	ARAB 102	Arabic Composition	Required		2	University
	XE xxx	General Elective II	Elective		3	Program
Summer Session						
	ICS 350	Summer Coop	Required	ENGL 214, ICS334, ICS313		Program
Level 7	ICS 351	COOP Education	Required	ENGL 214, ICS334, ICS313	9	Program
Level 8	ICS XXX	ICS Elective III	Elective		3	Program

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution, College or Department)
	ICS XXX	ICS Elective II	Elective		3	Program
	ICS 431	Operating Systems	Required	ICS 232	4	College
	ICS 411	Senior Project	Required	ICS 334, ICS413, ENGL 214	3	Program
	IC 104	The Political System in Islam	Required		2	University
	XE xxx	General Elective III	Elective		3	Program

1. Elective Courses (9 - Credit Hours).

Course Number	Course Name	Credit			Prerequisite
ICS 381	Intro to Artificial Intelligence	3	0	3	ICS 202
ICS 434	Advanced Database Systems	3	0	3	ICS 334
ICS 435	Computer Graphics	3	0	3	ICS 202
ICS 481	Neural Networks	3	0	3	ICS 381
ICS 490	Special Topics 1	3	0	3	Department Approval
ICS 491	Special Topics 2	3	0	3	Department Approval
SWE 344	Internet Protocols & C/S Prog	2	3	3	ICS 202
SWE 423	Multimedia Systems	3	0	3	ICS 202
SWE 444	Internet & Web App Development	3	0	3	ICS 334

2. Free Elective Courses (9 - Credit Hours).

Course Number	Course Name	Credit			Prerequisite
ECON 101	Principles of Economics 1	3	0	3	--
ECON 202	Principles of Economics 2	3	0	3	ECON 101
ECON 403	Engineering Economics	3	0	3	--
MGT 301	Principles of Management	3	0	3	--
MGT 311	Legal Environment	3	0	3	--
MGT 401	Human Resources Management	3	0	3	MGT 301
MGT 410	Organization Behaviour & Design	3	0	3	MGT 301
MKT 301	Principles of Marketing	3	0	3	ECON 202

Course Description

Note:

CR = Credit Hours

(3-0-3) = (Lecture Credit - Lab Credit- Total Credit)

Computer Science Course Catalog	
ICS 102 Introduction to Computing	**(CR:2-3-3)**
Overview of computers and computing, Introduction to a typical object-oriented programming language, Basic data types and operators, Basic object-oriented concepts, Wrapper classes. Console input/output. Logical expressions and control structures. Classes and methods, Arrays and strings.	
Co-requisite: MATH 101 or MATH 132	
ICS 103 Computer Programming in C	**(CR: 2-3-3)**
Overview of computer hardware and software; Programming in C with emphasis on modular and structured programming technique; Problem solving and algorithm development; Simple engineering and scientific problems.	
Co-requisite: MATH 101 or MATH 132	
Note: ICS 103 cannot be taken by ICS/SWE students.	
ICS 201 Introduction to Computing II	**(CR: 3-3-4)**
Advanced object-oriented programming; inheritance; polymorphism; abstract classes and interfaces, container and collection classes, packages, object-oriented design, software modeling, event-driven programming, recursion, use of stacks, queues and lists from API, searching and sorting.	
Prerequisite: ICS 102	

ICS 202 Data Structures	**(CR: 3-3-4)**
Review of object-oriented concepts; Introduction to design patterns; Basic algorithms analysis; Fundamental data structures - implementation strategies for stacks, queues and linked lists; Recursion; Implementation strategies for tree and graph algorithms; Hash tables; Applications of data structures (e.g. data compression and memory management).	
Prerequisite: ICS 201	
ICS 232 Computer Architecture and Assembly Language	**(CR: 3-3-4)**
Machine organization; assembly language: addressing, stacks, argument passing, arithmetic operations, decisions, modularization; Input/Output Operations and Interrupts; Memory Hierarchy and Cache memory; Pipeline Design Techniques; Super-scalar architecture; Parallel Architectures.	
Prerequisite: COE 200, ICS 201	
ICS 251 Discrete Structures I	**(CR: 3-0-3)**
Propositional Logic, Predicate Logic, Sets, Functions, Sequences and Summation, Proof Techniques, Mathematical induction, Inclusion-exclusion and Pigeonhole principles, Permutations and Combinations (with and without repetitions), The Binomial Theorem, Recurrence Relations; Graphs terminology and applications, Connectivity, Isomorphism, Euler and Hamilton Paths and Circuits, Planarity and Coloring; Trees terminology and applications.	
Prerequisite: ICS 102, Math 101	
ICS 252 Discrete Structures II	**(CR: 3-0-3)**
Number Theory: Modular Arithmetic, Integer Representation, Fermat's Little Theorem, Chinese Remainder Theorem, RSA.; Proof Techniques: Methods of Proofs, Applications from Number Theory, Recursive Definitions; Algorithm Correctness; Relations: Closures and Equivalence Relations, Partial Orderings and Lattices, Hasse Diagrams; Recurrence Relations and Generating Functions; Automata Theory: Finite State Machines, Regular Expressions, DFA, NDFA and their equivalence, Grammars and Chomsky Hierarchy, Introduction to Turing Machines.; Abstract Algebra: Groups, Homomorphisms and Lagrange's Theorem, Applications.	
Prerequisite: ICS 102, Math 101	

ICS 313 Programming Languages	**(CR: 3-0-3)**
Programming Paradigms: Object-oriented, imperative, functional, and logic. Application development in these paradigms. Fundamentals of Language Design: Syntax and Semantics. Language implementation: virtual machines; compilation, interpretation, and hybrid.	
Prerequisite: ICS 202	
ICS 334 Database Systems	**(CR: 3-3-4)**
Basic database concepts, conceptual data modeling, relational data model, relational theory and languages, database design, SQL, introduction to query processing and optimization, and introduction to concurrency and recovery.	
Prerequisite: ICS 202	
ICS 350 Cooperative work	**(0-0-0)**
Beginning of Coop in summer. Description is as given in ICS 351.	
Prerequisite: Major GPA ³ 2, Completion of at least 85 hours, Department Approval, ENGL 214 & ICS334& ICS313	
ICS351 Cooperative work	**(0-0-6)**
A continuous period of 28 weeks spent as a normal employee in industry, business, or government agencies with the purpose of familiarizing students with the real world of work and enabling them to integrate their classroom learning to a real work environment. During this period, a student is exposed to a real-life work in the field. Each student is required to participate with at least one project. Students are required to submit progress reports during the work period. Students are also required to give a presentation and submit a final report on their experience and the knowledge they gained during their cooperative.	
Prerequisite: Major GPA ³2, Completion of at least 85 hours, Department Approval, ENGL 214& ICS334& ICS313	
ICS353 Design and Analysis of Algorithms	**(CR: 3-0-3)**

Algorithms and Problem Solving; Basic Algorithmic Analysis; Advanced algorithmic analysis; Advanced Data Structures; Algorithmic strategies &Analysis of fundamental computing algorithms; Basic computability; The complexity classes P and NP.
Prerequisites: ICS 202
ICS 381 Principles of Artificial Intelligence (CR: 3-0-3)
Introduction to Artificial Intelligence (AI) history and applications; First order logic; State space representation; Blind and heuristic search; Constraint satisfaction and planning; Knowledge representation; Reasoning in uncertain situations; Machine learning; Prolog programming; Natural language processing, Expert systems and real AI applications.
Prerequisite: ICS 202
ICS 411 Senior Project (1-6-3)
Project-oriented course in which students work in teams on an applied real-world problem of their interest, go through its software development lifecycle in order to develop a prototype software solution for the problem at hand. The senior project offers the opportunity to integrate the knowledge acquired in preceding courses, as well as promote and instill communication skills, writing skills, and lifelong self-learning.
Prerequisite: ICS 334, ICS413, ENGL 214and Senior Standing
ICS 412 Compiler Construction Techniques (CR: 3-0-3)
Compiler techniques and methodology; Organization of compilers. Lexical and syntax analysis; Parsing techniques; Object code generation and optimization, detection and recovery from errors; Contrast between compilers and interpreters.
Prerequisite: ICS 313
ICS413 Principles of Software Engineering (CR: 3-3-4)
History and overview of software engineering. Software processes. Software project management. Software requirements and specification. Software design. Software testing and validation. Software metrics. Software quality assurance. Software evolution. Using APIs. Software tools and environments.

Prerequisite: ICS 202
ICS 426 Data Warehousing and Data Mining (CR: 2-3-3)
Review of relational databases and Conjunctive queries, Data Warehousing Concepts and OLAP, Data Warehouse Design and Development, Information and data Integration, OLAP Technology for Data Mining. Data Mining: Primitive, Languages and Application Developments.
Prerequisite: ICS 334
ICS 431 Operating Systems (CR: 3-3-4)
This course introduces the fundamentals of operating systems design and implementation. Topics include history and evolution of operating systems; Types of operating systems; Operating system structures; Process management: processes, threads, CPU scheduling, process synchronization; Memory management and virtual memory; File systems; I/O systems; Security and protection; Distributed systems; Case studies.
Prerequisite: ICS 232.
ICS 432 Fundamentals of Computer Networks (CR: 3-3-4)
Introduction to computer networks and layered architectures: connectivity, topology, circuit and packet switching, TCP/IP and ISO models; Application layer: C/S model, DNS, SMTP, FTP, WWW, socket programming and network security; Transport layer: TCP and UDP, congestion control; Network layer: internetworking, addressing and routing algorithms and protocols; Data link layer: framing, flow and error control protocols, PPP, MAC and LANs; Physical layer: principles of data communications, circuit switching, coding, multiplexing and transmission media.
Prerequisite: ICS 232
ICS 434 Advanced Database Systems (CR: 3-0-3)
Advanced data models: object-oriented model, and object-relational model, conceptual database design. Transaction processing: transactions, failure and recovery, and concurrency control techniques. Database backup and recovery. Query processing and optimization. Database security. Distributed databases: distributed data storage, distributed query processing, distributed transaction processing and concurrency

control. Homogeneous and heterogeneous solutions, client-server architecture.XML and relational databases. Introduction to data warehousing, introduction to other current trends in database systems.
Prerequisite: ICS 334
ICS 435 Computer Graphics (CR: 3-0-3)
Applications of Computer Graphics; Graphics systems and devices; Output Primitives and their Attributes; Geometric Transformations; Window to Viewport Mapping and Clipping; Curves and Surfaces; Three-Dimensional viewing; Hidden surface removal; illumination and color models, Animation.
Prerequisite: ICS 202
ICS 436 Systems and Network Administration (CR: 3-0-3)
Install and upgrade different popular operating systems. Managing File Systems. Managing User Accounts. Setting up X Windows System. Configuring Printing Services. Upgrading and installing software packages. Backing up data. Tuning kernel parameters. Configuring and managing various protocols: DNS, DHCP, Routing, Electronic Mail, and Network File System. Managing and troubleshooting computer systems and networks. Network and System Security.
Prerequisite: ICS 432
ICS 437 Distributed Systems (CR: 3-0-3)
Introduction to Distributed Systems; Distributed Systems Architecture; Computer Networks for distributed systems; Distributed Objects and Remote Invocation; Distributed Naming; Distributed File Systems; Security; Synchronization; Distributed Coordination and Agreement; Distributed Transactions; Distributed Replication; Distributed Multimedia Systems, Distributed Shared Memory; Case Studies such as CORBA, MACH, DCOM, and GLOBE.
Prerequisite: ICS 334 and ICS 431
ICS 442 Computer Network Technologies (CR: 3-0-3)

Various advanced topics on LANs and internetworking technologies will be addressed. Topics include: Performance measures and evaluation techniques; Advanced network architectures and differentiated services in IP networks; High-speed access technologies; Switched, Fast and Gigabit Ethernet; VLANs; Wireless LANs; ISDN and ATM; Frame Relay; Mobile computing and mobile IP; VPN and Enterprise networks; Emerging network trends and technologies.
Prerequisite: ICS 432 and Senior Standing
ICS 443 Network Design and Management (CR: 3-0-3)
Overview of network design and management; Design methodologies; Network management strategies; Network configuration management; Network management protocols: SNMP, and RMON; Network management tools and systems; Network management applications; Desktop and web-based network management; Network troubleshooting.
Prerequisite: ICS 432
ICS 444 Computer and Network Security (CR: 3-0-3)
Introduction to computer and network security; Security services: confidentiality, integrity, availability, accountability; Hacker techniques and attack types; Public and private key encryption; Authentication; Digital signature; User identification and access control; Computer viruses, Trojans and worms; Risk management and analysis; Information security process; Internet security: security protocols such as IPSec, SSL, TLS, email and web security; Security technologies and systems: Firewalls, VPN and IDS.
Prerequisite: ICS 432, ICS 431 and Senior Standing
Note: ICS 444 is Equivalent to SWE 421. Students can take credit for only one of them.
ICS 452 Theory of Computing (CR: 3-0-3)
Regular Grammars: equivalence of DFA, NDFA and regular expressions, pumping lemma, emptiness and membership. Context-Free Grammars: parsing and ambiguity, normal forms, applications, equivalence of PDA's and CFG's, pumping lemma, emptiness and membership. Turing Machine: programming techniques for Turing machines, equivalence of one-tape and multitape TM's, universal Turing-machine. Undecidability: recursively enumerable and recursive languages, undecidability, problem reduction, undecidable problems of CFG's, RE's and TM's.
Prerequisite: ICS 252

ICS 454 Principles of Cryptography (CR: 3-0-3)
Classical cryptography; Secret Key Encryption; Perfect Secrecy. Cryptanalysis; Block and Stream cipher; Data Encryption Standard (DES) and Advanced Encryption Standard (AES); Public Key Encryption; Diffie-Hellman Key Exchange; RSA, ElGamal and Rabin's Cryptosystems; Authentication and Digital Signatures; One-time signatures; Randomized Encryption; Rabin and ElGamal signature schemes; Digital Signature Standard (DSS)' Cryptographically Secure Hashing; Message Authentication Codes; Network Security; Secure Socket Layer (SSL); IPsec.
Prerequisite: ICS 252 and ICS 353.
ICS 471 Parallel & Dist. Processing (CR: 3-0-3)
Introduction to high performance computing: types of parallel computers, system architectures, performance measures; Message passing programming; Complexity analysis of parallel algorithms; Embarrassingly parallel computations; Partitioning and divide-and-conquer strategies; Pipelined computations; Synchronous computations; Load balancing and termination detection; Programming with shared memory; Parallel sorting algorithms; Numerical algorithms; Parallel image processing; Searching and optimization; Project/Programming-assignments.
Prerequisite: ICS 431
ICS 481 Artificial Neural Networks (CR: 3-0-3)
Introduction to neural computing: Real vs. artificial neurons; Threshold logic; Training a linear threshold unit, the perceptron rule; Multilayer feed-forward networks and the back propagation algorithm; The Hopfield net; Self-organizing maps; Radial basis functions; Adaptive resonance theory; Applications of Neural Networks (ANN).
Prerequisite: Senior Standing
ICS 482 Natural Language Processing (CR: 3-0-3)
This course examines a range of issues concerning computer systems that can process human languages. Among the issues to be discussed are morphological and syntactic processing, semantic interpretation, discourse processing and knowledge representation.
Prerequisite: Senior Standing

ICS 483 Computer Vision	**(CR: 3-0-3)**
Image acquisition, the digital image and its properties, Image preprocessing, Segmentation (thresholding, edge- and region-based segmentation), Shape representation and object recognition, Motion analysis, Case studies (object recognition / object tracking).	
Prerequisite: Senior Standing	
Note: ICS 483 cannot be taken for credit with COE 487 or EE 410	
ICS 484 Arabic Computing	**(CR: 3-0-3)**
This course examines a range of issues concerning computer concepts related to Arabic. Among the issues to be discussed are: Arabic Language Characteristics, Arabic Character Sets, Standardization, Unicode, Arabization systems, Arabic software tools, Arabic programming languages and Introduction to Arabic Computations.	
Prerequisite: Senior Standing.	
ICS 485 Machine Learning	**(CR: 3-0-3)**
Introduction to machine learning; Concept learning; Supervised learning - decision tree learning; Unsupervised learning - clustering. Artificial neural networks. Evaluating hypotheses; Bayesian learning; Computational learning theory; Instance based learning. Genetic algorithms; Learning sets of rules - Inductive Logic Programming; Reinforcement learning; Analytical learning.	
Prerequisite: Senior Standing	
ICS 486 Multi-agent Systems	**(CR: 3-0-3)**
Agents, agent definitions and classification; Multi-agent systems (MAS) and their characteristics; Models of agency, architectures and languages, logics for MAS, deductive and practical reasoning agent, reactive and hybrid agents; Distributed problem solving and planning; Coordination mechanisms and strategies; Learning in MAS; Interaction, negotiation and coalition formation; Applications of agent technology (agents in electronic commerce and information retrieval).	
Prerequisite: ICS 381	
ICS 488 Soft Computing	**(CR: 3-0-3)**

Introduction to Soft Computing, Fuzzy Sets Theory, Fuzzy Logic, Artificial Neural Networks, Probabilistic Reasoning, Genetic Algorithms, Neuro-Fuzzy Technology, Combination of Genetic Algorithms with Neural Networks, Combination of Genetic Algorithms and Fuzzy Logic, Applications of Soft Computing (three to four real life applications).
Prerequisite: STAT 319 and Senior Standing
ICS 490 Special Topics I **(CR: 3-0-3)**
State-of-the-art topics in Computer Science and Information Systems.
Prerequisite: Senior Standing.
ICS 491 Special Topics II **(CR: 3-0-3)**
State-of-the-art topics in Computer Science and Information Systems.
Prerequisite: Senior Standing

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Program Key Performance Indicator (KPI's)

Standard	Code	Key Performance Indicators
-1- Mission and Goals	**KPI-P-01**	Percentage of achieved indicators of the program operational plan objectives **(i8)**
	KPI-P-02	The awareness and support of the teaching staff and administrators of the mission of the program/institution **(i2)**
-3- Teaching and Learning	**KPI-P-03**	Students' Evaluation of quality of learning experience in the program **(i10)**
	KPI-P-04	Students' evaluation of the quality of the courses **(i6)**
	KPI-P-05	Completion rate **(i12)**
	KPI-P-06	First-year students retention rate **(i1)**
	KPI-P-07	Students' performance in the professional and/or national examinations
	KPI-P-08	Graduates' employability and enrolment in postgraduate programs **(i14,19)**
	KPI-P-09	Average number of students in the class
	KPI-P-10	Employers' evaluation of the program graduates proficiency **(i26)**
	KPI-P-11	Student evaluation of the Value and Quality of Field Activities **(i15)**
-4- Students	**KPI-P-12**	Students' satisfaction with the offered services **(i18,28)**
-5- Teaching Staff	**KPI-P-13**	Ratio of students to teaching staff **(i9)**
	KPI-P-14	Percentage of teaching staff distribution
	KPI-P-15	Proportion of teaching staff leaving the program **(i37)**
	KPI-P-16	Percentage of publications of faculty members **(i36)**

	KPI-P-17	Rate of published research per faculty member **(i42)**
	KPI-P-18	Citations rate in refereed journals per faculty member **(i44)**
	KPI-P-19	Relevance of the qualifications and experience of faculty members to the courses they teach **(i17)**
	KPI-P-20	The percentage of full-time teaching staff members and the others of administrative staff that participate in community services activities **(i49)**
-6- Learning Resources,	**KPI-P-21**	Satisfaction of beneficiaries with the learning resources **(i13,27,33)**

Images

Figure 3. Entrance to the College of Computer Science and Engineering - male side

Figure 4. Side of the College of Computer Science and Engineering

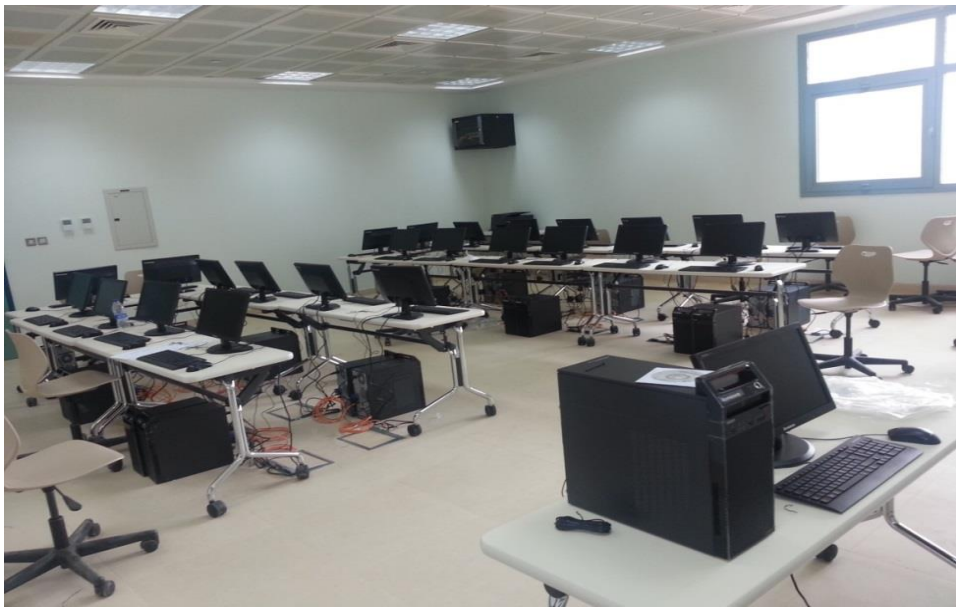

Figure 5. Teaching labs in the College of Computer Science and Engineering.

Figure 6. Classrooms in the College of Computer Science and Engineering

Figure 7. Microprocessor Lab

Figure 8. Electronics and Electrical Lab

Figure 9. Networks Lab

Figure 10. Digital Logic Circuits Lab

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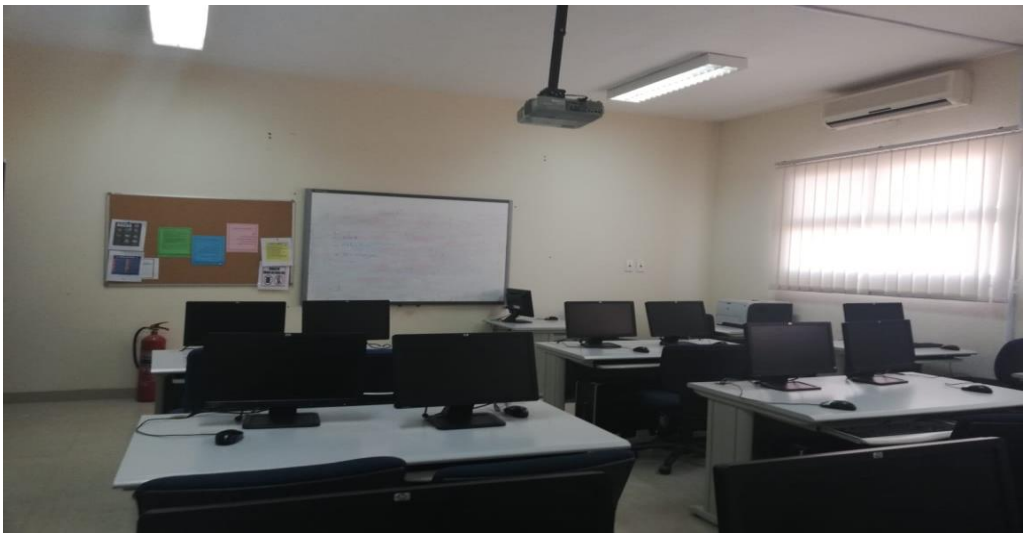

Figure 11. Programming I- Lab in Female Side

Figure 12. Database – Lab in Female Side

Figure 13. Operating System Lab in Female Side

Figure 14. Meeting Room

Figure 15. Library in the College of Computer Science and Engineering at Female Side

Facilities (Classrooms – Laboratories - Specialized Equipment)

Material Resources

Items	Male Branch	Female Branch
Class rooms	26	17
Specialized Labs/ workstations	10	3
Laboratories	9	14
Faculties Offices	55	18
Admin offices	19	8
Meeting rooms	3	1
Technical equipment (projectors (Data show)- computers	One in each lab and class room	one each lab and class room
College Library internal	1	1

Male Campus: List of Labs with Location and Capacity

No	Lab	Location	Capacity	Courses/Lab Taught
1	Electrical/Electronic Circuits Lab	G118	25	EE201,203
2	Microcomputer System Design	G123	12	COE305
3	Robotics	G140	8	Robotics
4	Digital System Design	G140	8	
5	Digital Logic/ Oracle	G119	28	COE200
6	Printed Circuit Board	G134	5	
7	High Performance Computing (HPC)	G181	27	Research
8	Information Systems and Networks (ISaN)	G183	25	Research
9	Computer Networks	G129	20	ICS432,COE344
10	Computer Lab I	G145	23	
11	Computer Lab II	G150	19	COE200,ICS101,ICS201, ICS202,ICS232,ICS431, Stat-319,SWE214 ICS491, COE305,SWE316.

12	Computer Lab III	G153	25	COE200,ICS101, ICS201,ICS202,ICS232.
13	Computer Lab IV	G161	24	COE200,ICS101,ICS201,ICS202, ICS232,ICS431, SWE214.
14	Computer Lab V	G167	24	COE200,ICS101,ICS201,ICS202 ICS232,ICS431,Stat-319, ICS491,SWE316,COE305.
15	Computer Lab VI	G172	24	COE200,ICS101, ICS201,ICS202,ICS232,COE305.
16	Computer Lab VII	G177	23	ICS101,ICS201, ICS202,ICS232, SWE214,ICS491,COE305.
17	Computer Lab IX	G194	21	COE200,ICS101,ICS201,ICS202, ICS232,ICS431,Stat-319, SWE214,ICS491,SWE316,COE305.
18	Computer Lab VIII	G188	16	

Female Campus:

S#	Lab	Location	Capacity
1	Electrical/Electronic Circuits Lab	11C-105	10
2	EMC	11C-106	15
3	Oracle	11C-107	24
4	Networks/CISCO lab	11C-108	12
5	Computer Science Lab	11C-205	15
6	Microprocessor Lab	11C-206	8
7	Digital System Design Lab	11C-207	5
8	Robotics	11C-209	8
7	Digital Logic Lab	11C-004	15
8	Electrical/Electronic Circuits Lab	11C-005	15

Graduates Employment Opportunities

Job opportunities for Graduates from computer science program

Organization	Job Title	Brief Job Description
Programming Development Companies	Computer Programmer	Creates, modifies and debug computer programs by converting project requirements into code under different platforms (desktop, Web, Mobile, ect.)
Programming Development & IT Companies	Program Analyst	Use data sources to identify programmatic needs. Perform data validation and quality control checks. Provide data management and analysis for studies and maintain assigned projects.
Public and Private sector	Software Systems Administrator	Installing and configuring software and networks. Monitoring system performance and troubleshooting issues. Upgrade software systems and processes as required for enhanced functionality and security issue resolution.
Programming Development & IT Companies	Software Project Manager	Plan, design, schedule and coordinate program development. Translate user requirements into software specifications, resource estimates, and schedules.
Educational institutions	Computer Science Teacher	Responsible for instructing computer science to students, guide and assist them in their entire learning experience and teach students to write computer programs,

		algorithms and even programming languages.
Computer Programming Training Companies	Computer Trainer	Designs and teaches various computer courses, especially for international certificates.
Academic Institutions and Large Companies of Software Development.	Computer Research Scientist	Computer scientists conduct research to develop new or update computer technologies in order to solve problems in a variety of fields.