Rules of procedure

Faculty of Computing and Information

Kafr El - Sheikh University

Bachelor's degree in credit hours

2018

Contain

Faculty of Computing and Information - Kafr El - Sheikh University

Faculty Vision

Faculty of Computers and Information at Kafr El-Sheikh University seeks to raise the level of education and scientific research in computers and information technology to achieve excellence and innovation in scientific research and community service at the local and regional levels.

Faculty Mission

- **The mission of the faculty of Computers and Information includes:**
  - Building an advanced educational system that is compatible with the rapid growth in the fields of computers and information .
  - Supply the student with assets of knowledge and scientific research in the areas of computer science, information technology and the development of the student's personality to make him willing to innovation and a lover of teamwork and able to compete locally, regionally and globally.
  - Developing and updating curricula continuously in line with scientific progress and requirements of the age and needs of the labor market.
  - Raise awareness about the value of continuing education, the inevitability of self-learning and the importance of using modern methods in this field.
  - Use scientific research as a means to achieve innovation in the fields of college by studying the economic, commercial and social importance of the results of scientific research.
  - Providing outstanding community service in the areas of information technology.
  - Promote the principles of credibility and ethics.

Article (1) Faculty Objectives

The faculty aims to achieve the following objectives:

1. Conduct scientific and applied studies and researches in the field of computers and information, primarily those that have a direct impact on the integrated development in the community and the establishment of specialized research units in different branches of computers and information .
2. Providing scientific and technical consultations and assistance to the bodies and entities that use computer and information technology and are interested in manufacturing, decision-making and support .
3. Training technical cadres in various sectors of the state on computer and information technology .

4. Raise and deepen awareness in the community in order to use computers and information technology in different sectors and institutions of the state, and raise the efficiency of their use.
5. Conferences organization and scientific meetings held with the aim of improving the educational level and deepen the scientific concept among the specialized cadres.
6. Ability to use skills, technologies and modern information technology necessary to design and build software.
7. Held scientific agreements with the corresponding bodies and institutions at the local, regional and global level, with the aim of exchanging views and conducting researches related to computer and information specialties.
8. Providing and strengthening the means of publishing and scientific research in all fields of specialization.
9. Establishing advanced specialized units in different branches of computer and information sciences.
10. Participating with the specialized agencies to develop and localize the various systems and applications.

Article (2) Faculty Departments

The Faculty of Computers and Information comprises the following departments:

1. Department of Computer Science

    • Supervises the computer science program

2. Department of Information Systems

    • Supervises the information systems program

3. Information Technology Department

    • Supervises the information technology program

4. Software Engineering Department

    • Supervises the software engineering program

Other departments may be established in the future in accordance with the provisions of the Law of Organizing Universities.

Computer Science Department

CS department includes the following scientific fields: Computer programming and computer language concepts and their interpreters - Data structures - Analysis and design of algorithms - Computer operating systems - Computer structure and organization - Data encryption and computer security - Data compression - Intelligent systems - Expert systems - Image processing Multi-agent systems - knowledge base systems - parallel processing and distributed systems - grid and cloud computing - intelligent learning systems - computer education - pattern recognition - human communication methods - computer vision - computer drawing systems - Arabization of computer .

Information System Department

IS department includes the following scientific areas: Information systems analysis and design - Information systems development methodologies - Information systems architectures - Information storage and retrieval systems - Database systems - Information systems - Management information systems - GIS - Multimedia information systems - Distributed information systems –Intelligent information systems - information Engineering - knowledge discovery in database systems - object-oriented databases - the economics of information systems - data mining - data warehousing - information management centers - integrated information systems - systems development methodologies - confirm the quality of software and information systems - applications of information systems in various fields - network information systems.

Information Technology Department

IT department includes the following scientific fields: Computer networks of different types - Information networks and applications - Communication technology - Internet technology - Information and network security –Digital signal processing - Real time System-Digital systems - Computer architecture - Microprocessors and its applications - Embedded systems - Computer systems with potential faults - distributed and parallel computing systems - dynamic systems and robotics - E-learning and digital libraries - E-business - E-commerce.

Software Engineering Department

SWE department includes the following scientific Fields: Software Engineering - Information Engineering - Systems and Software Quality - Knowledge Engineering - Software Design - Software Maintenance - Software Testing - Software Development Methodology - Software Security Systems - Software Crisis - Computer Engineering.

Article (3) Scientific Degrees

Upon the recommendation of the Council of the Faculty of Computers and Information, Kafr Al-Sheikh University is granted a bachelor's degree in Computers and Information in one of the following main specialties:

a. Computer Science.

B. Information Systems.

C. Information Technology.

D. Software Engineering.

The student should choose a major specialization and choose a sub-specialization from among these four disciplines. The main and sub-specialties should not be in the same field. Other major or sub-majors may be established in the future in accordance with the provisions of the Law on Organizing Universities.

Article (4) Faculty conditions of admission

The Faculty of Computers and Information accepts students who have a high school mathematics department, and through the rules governing the coordination of admission to Egyptian universities, which is set by the Supreme Council of Universities and applied by the Office of Coordination of Admission to the universities to students who have a high school and equivalent certificates.

Article (5) The system Of Study

A. The study is based on the credit hours system. The credit hours are a unit of study measurement to determine the weight of the course. The lecture should be one hour, or two, three or four hours of practical exercises or exercises.

B. To obtain a bachelor's degree in any of the disciplines stipulated in Article (3) of this regulation, the student must successfully pass 144 credit hours within eight semesters divided into four levels of study. The student also passes a summer training equivalent to 3 credit hours for two months (8 weeks). This training is after the student passes 70% of the number of credit hours (Ie the student passed the third level).

C. The study in the first and second level is common to all disciplines, and the specialization starts at the third level. Each department shall establish the qualifying conditions for enrollment after being approved by the College Council.

D. Students will be notified of the various courses of study at the college and stipulated in the regulations during the period of progress of the college.

E. Students are distributed according to their preferences according to their specific admission requirements.

F. The college includes four levels of study and students at these levels are referred to with the following names:

•The first level: (Freshman) before completing 36 credit hours.
•The second level: (Sophomore) after completion of 36 credit hours.
•The third level: (Junior) after completing 72 credit hours.
•The fourth Level 4: (Senior) after completion of 108 credit hours.
• Level 4: (Senior) after completion of 108 credit hours.

Article (6) Teaching Language

The Study in the Faculty of Computing and Information in Arabic and English according to the requirements of each course.

Article (7) Dates of study and graduation

The academic year is divided into two semesters as follows:

- The first semester (fall semester) lasts 15 weeks and begins on a date determined by the University Council.
- The second semester (spring semester) lasts 15 weeks and begins on a date determined by the University Council.
- There may be a summer according to the nature of the study in the college for 8 weeks and starts on a date determined by the university council. Each semester will be followed by a period of two weeks.
- Graduation will take place at the end of each semester so the graduation roles will be:
- Graduation at the end of the first semester (January session).
- Graduation at the end of the second semester (June role).
- Graduation at the end of the summer semester (September role).

Article (8) Registration, deletion and addition

a. At the beginning of each semester, the student will register the courses he / she chooses, through the registration application form provided by the College and at the times determined by the College Administration before the start of the study.

b. The College Council shall determine the minimum number of students required to be registered in the course and the conditions under which this course may be opened.

C. A regular student may enroll in courses with a maximum of 18 credit hours and a minimum of 12 credit hours. Students who are observed are not allowed to enroll for more than 12 credit hours

D. After completing the registration process, the student may delete or add one or more courses during a period determined by the College for deletion and addition, in coordination with the student's academic advisor and through a specific form provided by the College.

e. The student is allowed to study the different courses and register at the higher levels based on the selection of the required courses as requirements for the higher courses. The student is not enrolled in a higher course unless he succeeds in his requirements. Subject to the approval of the concerned department council, this requirement may be waived if the student has already registered in the course of the course and has not passed it or has been registered in the course and its previous requirement at the same time.

Article (9) Withdrawal from course

A. The student may, after registering the courses he has chosen, withdraw from one or more courses within a specified period announced by the college administration so that the number of hours registered for the student is not less than the minimum number of students enrolled in the semester (12 credit hours). Of which only a "withdrawn" estimate is calculated.

B. If the student withdraws from one or more courses after the specified period without a compulsory excuse accepted by the College Council, he shall be assessed a "fail" in the courses from which he has withdrawn. If, however, he submits at least one month prior to the exam with a compulsive excuse accepted by the College Council, he should be entitled to a "withdrawn" assessment.

Article (10) Academic Guidance

A. Academic Advisor: The Vice Dean for Education and Student Affairs, in consultation with the department heads of each student, appoints an academic advisor from among the faculty (after training as academic instructors).

B. The academic advisor is committed to follow up the student's performance and to assist him in choosing courses in each semester.

C. The student is fully responsible for the selection of subjects.

Article (11) Attendance and Absence

A. The study at the College of Computer and Information regular study and the Affiliation study is not allowed. The follow-up process is subject to the conditions and regulations determined by the college administration.

B. Entry to the final exam requires a minimum attendance of 75% of the lectures and practical and theoretical exercises in each course, except for open laboratory exercises (see Article 23). If the percentage of the student's absence - without acceptable excuse - exceeds 25% in the course of the course, the College Council shall be deprived of the final examination after his warning. And gives a "zero" grade in the final test of the course. However, if the student submits an excuse accepted by the College Council, he shall be entitled to a "withdrawn" assessment in the course for which the excuse was given.

C. A student who misses the final exam for any course - without an acceptable excuse - gives a grade of "zero" on that exam and calculates the grades of the semester work he has received.

D. If the student submits a compulsory excuse accepted by the College Council not to attend the final exam for any course within two days of the exam, he / she will be awarded an "incomplete" assessment in this course provided that he / she has at least 60% Enter final exams.

In this case, a student who has an "incomplete" assessment will be given the opportunity to take the final exam in the next semester or at the time determined by the College Council. The final grade of the student is calculated on the basis of the grade obtained in the final exam in addition to the previous grade obtained in the quarterly work.

Article 12: Dropout of study

A. student is considered off-study if he is not enrolled in a semester or has withdrawn from all semester courses without an acceptable excuse.

B. student may drop out of study - with acceptable excuse - two consecutive semesters or three consecutive semesters. And is dismissed from the college if he stopped studying for a longer period without an excuse accepted by the College Council and approved by the University Council.

C. The student may apply to stop the enrollment in the college according to the conditions and regulations set by the university.

Article (13): The system of examinations

A. The maximum grade for each course is 100 degrees and distributed as follows:

1- (40 degrees) for the work of the semester and distributed as follows:

i. (25 degrees) for the periodic tests conducted by the professor on a regular basis and the oral test and practical applications or work assigned to students during the semester.
ii. (15 marks) for mid-term exam.

2- (60 degrees) for the end of the semester exam.

B. The College Council shall have the right to set the dates of the mid-term examinations, the final examinations and to announce them to the students in a timely manner.

C. The attached tables are reviewed:

D. Examining the end of the semester for any drastic course of two or three hours.

E. Students are warned - academically - if their cumulative average in any semester reaches less than 2.0. If they cannot raise their cumulative average in the following two quarters, a second warning is given. The College Council may grant the student an exceptional and final opportunity to raise his / her cumulative average. The cumulative rate shall be calculated in accordance with Article (14)

Article (14) Evaluation System

A. The college follows the credit hours system, which is because the basic unit is the course, not the academic year, and the evaluation system is based on the grade in each syllabus according to the following table:

Percentage of score	Grade	Points	Descriptive Grade
90 % And more	+A	4	Excellent
85% - less than 90%	A	3.7	
80% - less than 85%	+B	3.3	very good
75% - less than 80%	B	3	
70% - less than 75%	+C	2.7	Good
65% - less than 70%	C	2.4	
60% - less than 65%	+D	2	Acceptable
50% - less than 60%	D	1.7	
less than 50%	F	Zero	Fail

The student is considered successful in the course if he obtains an average of at least 1.7. In the case that the student receives an assessment, he or she must obtain a cumulative average of more than 2.0; otherwise, it will be placed under academic observation (see Article 17) and is subject to dismissal.

B. Calculation of the cumulative average

The GPA is calculated as follows:

- The number of credit hours for this course to obtain the number of points for each course shall multiply the value of each course (the points shown in the previous table).
- Points are collected for all courses in which the student is enrolled.
- The total number of points is divided by the total number of hours registered for the student to get the cumulative average as follows:

$$\text{Cumulative average (GPA)} = \frac{total\ points\ in\ the\ semeter}{\text{total hours recorded}}$$

C. Calculation of the CGPA: $$CGPA = \frac{All\ Courses\ \text{Recorded by the Student}}{Total\ Hours\ \text{Recorded by the Student}}$$

D. Calculate the general estimate:

The general grade of the student is calculated based on the GPA according to the following table:

evaluation	Cumulative average	Descriptive assessment
+A	4.0	Excellent
A	3.7 to less than 4.0	
+B	3.3 to less than 3.7	Very good
B	3 to less than 3.3	
+C	2.7 to less than 3	Good
C	2.3 to less than 2.7	
+D	2 to less than 2.3	Acceptable
D	1.7 to less than 2	
F	Less than 1.7	Fail

E. The student shall be awarded the honorary degree if he passes all the units of study he studied at a cumulative average of not less than 3.0, if the study period does not exceed four academic years and that he has not failed in any course.

F. A student is considered successful in the general assessment if he has a cumulative average of 2.0 at least.

Article (15): Repayment and return

A. If the student fails in a course, he / she must re-study and take the exam again. If successful in the course after re-examination calculated the actual grades obtained and calculated cumulative rate on this basis.

B. If the student has a cumulative average of less than 2.0, he or she may repeat at least four courses in which he has achieved an acceptable conditional assessment to improve his / her average. The actual grades obtained in the case of success are higher and the cumulative average is calculated on this basis.

Article (16) Academic Record

- The academic record: It is a statement showing the student's progress, including the courses he studies in each semester with its symbols and numbers, the number of its units and the estimates obtained, and the symbols and values of those estimates. The record also shows the quarterly average, the cumulative average and the general estimate. Including a student transferred from another university college.
- "In completed" assessment: an estimate of the temporary monitoring of grades for each course. The student cannot complete his / her requirements on time, after the approval of the department's board and symbolized in the academic record by the symbol (IC).
- "Continuous" assessment: A provision that is temporarily monitored for each course that requires more than one semester to complete, and is marked with the symbol "IP".
- Note: Attendance of the student lectures of a course as a listener requires the approval of the Department Council and that the student is enrolled in the college and symbolized by the symbol (AU).

Article (17) Placing the student under academic observation and dismissing from the college

- If the student is in any semester - except for the semester after joining the college on a cumulative average less than (2.00) it is placed under academic observation during the next semester.
- The student under academic observation must raise his cumulative average to at least 2.0 in a maximum of three semesters in a row. He shall be sent a warning to remind him of the last semester if he completes two semesters without reaching the required rate.
- Not allowed for a student under academic observation to register for more than 12 credit hours during the semester, except for the graduation semester. In addition to the above, it is allowed to the student to register one course with a number of hours if sufficient to graduate.
- This article does not apply to the summer semester, if any. The separation from the college is final as determined by the Supreme Council of Universities.

Article (18) Warning

- A warning is issued to the student in the case of the percentage of his absence in the course to 20% through the lists announced by the faculty, and if the ratio exceeded 25%, it is a decision to deprive the student from entering the exam and calculated for the student in the decision (0.0) zero.

Article 19: Regulatory provisions

A. Each department prepares a complete description of the contents of the courses it is teaching, and presents them to the Education and Student Affairs Committee. Once approved by the College Council, this content becomes binding on faculty members who teach these courses.

B. The Council of the College may, on the proposal of the competent department councils, amend the registration requirements and the scientific content of any course.

C. The Education and Student Affairs Committee of the College shall follow up the students periodically through coordination with the academic advisor, and shall give each student a statement of his or her academic status if the level of his or her level appears. The College Council adopts these follow-up levels and sets out the controls by which the student's status can be monitored and improved.

D. The College Council may organize training courses or refresher studies in subjects within the competence of the various departments.

E. The College Council may approve the holding of intensive summer classes in some courses upon the proposal of the scientific departments and in accordance with the possibilities and circumstances of the college.

F. The college board may hold examinations for students who are close to graduation or who have been awarded an "incomplete" assessment by the end of the three semesters or in March.

Article (20) Application of the Law of Organizing Universities and its Executive Regulations

The provisions of the Law on Organizing Universities and its Executive Regulations shall apply, unless any provision is made in these Regulations.

Article (21) Application of provisions

The provisions of this Regulation shall apply to new students at the beginning of the new year for their approval.

Article (22) Courses

A bachelor's degree in computers and information in one of the specializations of the college is required to study 144 credit hours distributed as follows and at least a cumulative average of 2.0:

a. General Requirements (18) Credit Hours:
   - (10) compulsory hours
   - (8) hours selected by the student from elective courses.

b. College Requirements (70) credit hours:
   - (58) hours are compulsory

- (12) hours selected by the student from elective courses.

c. Major Specialization Requirements (42) Credit Hours:
   - (18) hours required
   - (24) hours selected by the student from elective courses.

d. Projects and training (14) credit hours.

e. (15 credit hours) are selected from the compulsory courses for the specialization chosen by the student as a sub-specialization. These hours are not considered as the necessary hours for graduation (144 credit hours).

Article (23) Hours of theoretical and practical exercises

The hours of theoretical and practical exercises are calculated as follows:

- Theoretical exercises:
  Through these theoretical exercises, the student applies some of the concepts and skills he learned through the lecture and prepares every two or three hours with a credit hour.
- Practical exercises:
  Through these exercises, the student will apply some of the practical and vocational skills that he learned through some specialized labs and what he learned from the lecture.

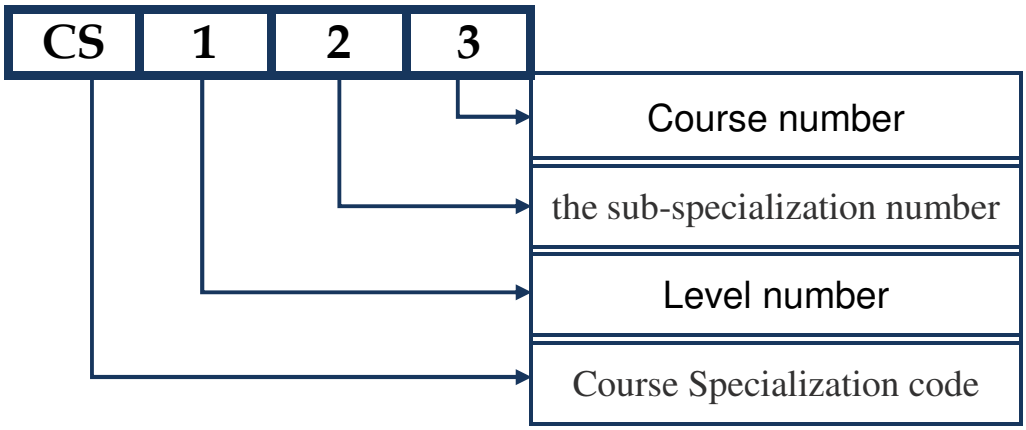
Article (24) Rules of the Code of Courses

- Course - Code consists of a set of characters at the far left representing the code of the specialization or section, as shown in the following table:

Group / Department	Code	التخصص أو القسم
Computer Science	CS	علوم الحاسب
Information Systems	IS	نظم المعلومات
Information Technology	IT	تكنولوجيا المعلومات
Software Engineering	SE	هندسة البرمجيات
Mathematics	MATH	الرياضيات
Physics	PHYS	الفيزياء
Humanities	HUM	الإنسانيات

- The character set follows a three-digit number.
- The number in the number of hundreds represents the level, the number 1 indicates the first level, the second the number 2, the third the third and the fourth the fourth.

- The number in the double digits represents the sub-specialization number of the course according to the sub-disciplinary tables shown below.
- This is followed by a number in the single digits that represents a series of the course within the sub-specialization.
- The following figure illustrates this system:



Sub-specialties numbers

- According to the IEEE and ACM references, the courses' specialties were divided into the subdivisions shown In the following tables:
-

Table 1. Number of computer science subspecialties

Code	Sub-Majors	Code	Sub-Majors
0	Discrete Structures Computational Science	1	Algorithms and Complexity
2	Architecture and Organization Operating Systems	3	Net-Centric Computing
4	Programming Languages	5	Graphics and Visual Computing
6	Intelligent Systems	7	Computer Security
8	Social and Professional Issues	9	

Table 2. Numbers of subspecialties of information systems

Code	Sub-Majors	Code	Sub-Majors
0	Foundations of Information Systems	1	Data and Information Management
2	IS Project Management	3	Systems Analysis and Design
4	IS Strategy, Management and Acquisition	5	Social and Professional Issues

Table 3. Numbers of IT sub-specialties

Code	Sub-Majors	Code	Sub-Majors
0	Information Technology Fundamentals	1	Information Assurance and Security
2	Integrative Programming and Technologies	3	Networking
4	Platform Technologies	5	System Administration and Maintenance
			System Integration and Architecture
6	Social and Professional Issues	7	Web Systems and Technologies
8	Multimedia and Graphics		

Table 4. Subdivision Numbers for Software Engineering

Code	Sub-Majors	Code	Sub-Majors
0	Software Engineering Fundamentals	1	Software Project Management
2	Software Requirements Analysis	3	Software Design & Architecture

Table 5. Numbers of basic sciences and humanities

	Sub-Majors	Code	Sub-Majors
0	Basic Sciences	1	Languages
2	Social Sciences	3	Business, Management and Economics
4	Legal and Law	5	General Subjects

Article (25) General requirements

- (18) credit hours (10 compulsory hours + 8 hours optional)
- In the following tables, the courses are distributed in the following disciplines: computer science (CS), information systems (IS), information technology (IT) and software engineering (SE). These tables show whether the courses are mandatory (R) or optional (E).

Table 6. Human Resources Courses (General Requirements)

Code	Course Name	Credit	R	E
HUM111	English Language I	2	✓	
HUM112	English Language II	2		✓
HUM121	Social Context of Computing	1	✓	
HUM122	Intellectual Property	1		✓
HUM131	Organizational Behavior	2		✓
HUM132	Interpersonal Communication	2	✓	
HUM133	Computing Economics	2		✓
HUM141	Computer Law	2		✓
HUM142	Privacy and Civil Liberties	1		✓
HUM151	Hand Drawing	2		✓
HUM152	History of Computing	2		✓
HUM153	Islamic Culture	1		✓
HUM154	Scientific Thinking	1		✓
HUM231	Business Administration	2	✓	
HUM٢٣٢	Technical Writing	2	✓	
HUM241	Computers and Ethics	1	✓	
		Subtotal	10	8
		Total	18	

Article (26) College Requirements

٧٣credit hours (61 hours compulsory + 12 hours optional)

Basic science courses

In the following table, basic science courses are distributed to the faculty majors.

Table 7. Courses of Basic Sciences

Code	Course Name	Credit	R	E
MATH101	Mathematics I	3	✓	
MATH102	Mathematics II	3	✓	
MATH201	Mathematics III	3	✓	
MATH202	Probability and Statistics	2	✓	
MATH301	Numerical Analysis	3	✓	
CS201	Discrete Structures	3	✓	
CS301	Operation Research	3	✓	
CS302	Simulation and Modeling	3		✓
PHYS101	Physics I	3	✓	
PHYS102	Physics II	3		✓
EE101	Electronics	3	✓	
EE102	Digital Circuits	3		✓
EE201	Digital Signal Processing	3		✓
		Subtotal	25	6
		Total	31	

Basic Computing Courses

In the following table, basic computing courses are distributed to the faculty majors.

Table 8. Basic Computing Courses

Code	Course Name	Credit	CS		IS		IT		SE	
			R	E	R	E	R	E	R	E
CS141	Programming Fundamentals	3	✓		✓		✓		✓	
CS211	Data Structures and Algorithms	3	✓		✓		✓		✓	
CS241	Object-Oriented Programming	3	✓		✓		✓		✓	
CS322	Operating Systems	3	✓				✓		✓	
CS323	Computer Architecture and Operating Systems	3			✓					
CS341	Visual Programming	3		✓		✓		✓		✓
CS351	Computer Graphics	3		✓		✓	✓			✓
CS361	Artificial Intelligence	3	✓			✓		✓		✓
SE 301	Software Engineering	3	✓		✓		✓		✓	
IS201	Foundations of Information Systems	3		✓	✓			✓		✓
IS211	File Organization	3		✓		✓		✓		✓
IS212	Databases	3	✓		✓		✓		✓	
IS231	Systems Analysis and Design	3		✓	✓			✓		✓
IT101	IT Fundamentals	3	✓		✓		✓		✓	
IT251	Data Communications	3	✓		✓		✓		✓	
IT351	Computer Networks	3	✓		✓		✓		✓	
IT271	Web Programming	3	✓		✓		✓		✓	
IT381	Introduction to Multimedia Technology	3		✓		✓		✓	✓	
CS321	Computer Architecture	3	✓				✓		✓	
		Subtotal	36	6	36	6	36	6	36	6
		Total	42		42		42		42	

Article (27): Specialty Requirements

- (٤٢) credit hours (18 hours compulsory + 24 hours optional)
- In the following tables, specialization courses are distributed for each of the Faculty's specializations

Table 9. Computer Science Courses

	Code	Course Name	Credit
Compulsory Courses	CS311	Algorithm Design and Analysis	3
	CS342	Automata and Language Theory	3
	CS٣52	Image Processing	3
	CS431	Parallel Computation	3
	CS441	Compiler Construction	3
	CS471	Introduction to Computer Security	3
		Subtotal	**18**
Elective Courses*	CS353	Advanced Computer Graphics	3
	CS421	Advanced Operating Systems	3
	CS442	Programming Language Design	3
	CS451	Computer Animation	3
	CS452	Computer Vision	3
	CS461	Intelligent Systems	3
	CS462	Machine Learning	3
	CS463	Pattern Recognition	3
	CS472	Cryptography	3
	SE422	Software Quality Assurance and Testing	3
	IS411	Advanced Database	3
	IS412	Distributed and Object Databases	3
	IS414	Data Mining and Business Intelligence	3
	IT431	Wireless and Mobile Computing	3
	IT432	Network Programming	3
	IT482	Virtual Reality	3
	CS422	Advanced Computer Architecture	3
	CS423	Embedded Systems	3
		Subtotal	**24**
		Total	**42**
* The student selects only (8) optional courses			

Table 10. Courses of Information Systems Specialization

	Code	Course Name	Credit
Compulsory Courses	IS311	Geographical Information Systems	3
	IS341	Decision Support Systems	3
	IS342	IS Strategy, Management and Acquisition	3
	IS412	Distributed and Object Databases	3
	IT411	Information Assurance and Security	3
	IT441	Enterprise Architecture	3
		Subtotal	**18**
Elective Courses*	IS321	Advanced Project Management	3
	IS411	Advanced Database	3
	IS413	Web Information Systems	3
	IS414	Data Mining and Business Intelligence	3
	IS415	Database Administration	3
	IS416	Transaction Processing	3
	IS417	Multimedia Databases	3
	IS441	Quality Assurance of Information Systems	3
	IS442	IS Application Development	3
	IS451	Social Information Systems	3
	IT471	E-commerce	3
	IT482	Human Computer Interaction	3
		Subtotal	**24**
		Total	**42**
* The student selects only (8) optional courses			

Table 11. IT courses

	Code	Course Name	Credit
Compulsory Courses	IT311	Network Security	3
	IT331	Network Management	3
	CS352	Image Processing	3
	IT431	Wireless and Mobile Computing	3
	IT441	Enterprise Architecture	3
	IT451	Network Analysis and Design	3
		Subtotal	**18**
Elective Courses*	IT432	Network Programming	3
	IT433	Network Forensics	٣
	IT452	Networked Embedded Systems	3
	IT471	E-commerce	3
	CS431	Parallel Computation	3
	CS451	Computer Animation	3
	CS452	Computer Vision	3
	CS461	Intelligent Systems	3
	IS321	Advanced Project Management	3
	IS411	Advanced Database	3
	IS412	Distributed and Object Databases	3
	IT381	Introduction to Multimedia Technology	3
	IT481	Virtual Reality	3
	IT482	Human Computer Interaction	3
	CS422	Advanced Computer Architecture	3
	CS423	Embedded Systems	3
		Subtotal	**24**
		Total	**42**
* The student selects only (8) optional courses			

Table 12. Courses in Software Engineering

	Code	Course Name	Credit
Compulsory Courses	SE331	Software Design & Architecture	3
	SE332	Software Construction	3
	SE321	Software Requirements Analysis	3
	SE422	Software Quality Assurance and Testing	3
	SE411	Software Project Management	3
	IT482	Web Applications Engineering	3
		Subtotal	**18**
Elective Courses*	SE302	Human Computer Interaction	3
	SE333	Agile Methods	3
	SE311	Open Source Software Development	3
	SE322	Real-Time Software and Systems	3
	SE412	Estimating Software Development. & Maintenance Projects	3
	SE431	Mobile Software Design	3
	CS423	Embedded Systems	3
	SE433	Global Software Development	3
	IS341	Decision Support Systems	3
	CS471	Introduction to Computer Security	3
	SE432	Embedded Systems Software Design	3
		Subtotal	**24**
		Total	**42**
* The student selects only (8) optional courses			

Article (28) Training and self-learning requirements

- (14) Credit Hours (5 Compulsory Hours + 9 Elective)
- The student chooses the graduation projects (9 credit hours) among the alternatives approved by the College Council in this regard.

- Table 13. Project and training courses

Code	Course Name	Credit	CS	IS	IT	SE
IS221	Project Management	2	✓	✓	✓	✓
CS381	Software Development and Professional Practice	3	✓	✓	✓	✓
CS481	Capstone Project I	3	✓			
CS482	Capstone Project II	3	✓			
IS451	Capstone Project I	3		✓		
IS452	Capstone Project II	3		✓		
IT461	Capstone Project I	3			✓	
IT462	Capstone Project II	3			✓	
SE413	Capstone Project I	3				✓
SE414	Capstone Project II	3				✓
		Total	11	11	11	11

Article (29) Levels and requirements of the courses

- First Level Courses

First level courses for freshman students in any of the four disciplines: Computer Science, Information Systems, Information Technology and Software Engineering are as follows:

Table14. First level courses for junior students

1st Level Courses														
Code	Course	Credits	Prerequisites	Type		Teaching Hours			midterm	Year Work grades			Final Exam	Time of exam
				R	E	L	T	P		O	PE	G		
CS141	Programming Fundamentals	3	IT101	✓		2		2	15	10	10	5	60	3
IT101	IT Fundamentals	3	–	✓		2		2	15	10	10	5	60	3
MATH101	Mathematics I	3	–	✓		2	2		15	15		10	60	3
MATH102	Mathematics II	3	MATH101	✓		2	2		15	15		10	60	3
PHYS101	Physics I	3	–	✓		2		2	15	10	10	5	60	3
PHYS102	Physics II	3	–	✓		2		2	15	10	10	5	60	3
EE101	Electronics	3	–	✓		2		2	15	10	10	5	60	3
EE102	Digital Circuits	2	EE101	✓		2		2	15	10	10	5	60	3
HUM111	English Language I	2	–	✓		2			20			20	60	2
HUM112	English Language II	2	HUM111		✓	2			20			20	60	2
HUM121	Social Context of Computing	1	–	✓		1			15	10	10	5	60	3
HUM122	Intellectual Property	1	–		✓	1			15	15		10	60	2
HUM131	Organizational Behavior	2	–		✓	2			15	10	10	5	60	2
HUM132	Interpersonal Communication	2	–	✓		2			15	10	10	5	60	3
HUM133	Computing Economics	2	–		✓	2			15	10	10	5	60	3
HUM141	Computer Law	2	–		✓	2			15	15		10	60	2
HUM142	Privacy and Civil Liberties	1	–		✓	1			15	15		10	60	2
HUM151	Hand Drawing	2	–		✓	1		2	15	10	10	5	60	3
HUM152	History of Computing	2	–		✓	2			15	15		10	60	2
HUM153	Islamic Culture	1	–		✓	1			15	15		10	60	2
HUM154	Scientific Thinking	1	–		✓	1			15	15		10	60	2
			Total	36										

Second level courses

- Second level courses

Second level courses for Sophomore students in any of the four disciplines: Computer Science, Information Systems, Information Technology and Software Engineering are as follows:

Table 15. Second Level Courses

2nd Level Courses														
Code	Course	Credits	Prerequisites	Type		Teaching Hours			midterm	Year Work grades			Final Exam	Time of exam
				R	E	L	T	P		O	PE	G		
CS201	Discrete Structures	3	MATH102	✓		2	2		15	10	10	5	60	3
CS211	Data Structures and Algorithms	3	CS241	✓		2		2	15	10	10	5	60	3
CS241	Object-Oriented Programming	3	CS141	✓		2		2	15	10	10	5	60	3
IS201	Foundations of Information Systems	3	IT101		✓	2		2	15	10	10	5	60	3
IS211	File Organization	3	CS241		✓	2		2	15	10	10	5	60	3
IS212	Databases	3	IS201	✓		2		2	15	10	10	5	60	3
IS221	Project Management	2	IT101	✓		2		2	15	10	10	5	60	3
IS231	Systems Analysis and Design	3	IT101		✓	2	2		15	15		10	60	3
IT251	Data Communications	3	IT101	✓		2	2		15	10	10	5	60	3
IT271	Web Programming	3	CS141, IT251	✓		2		2	15	10	10	5	60	3
MATH201	Mathematics III	3	MATH102	✓		2	2		15	15		10	60	3
MATH202	Probability and Statistics	2	MATH102	✓		2		2	15	15		10	60	3
EE201	Digital Signal Processing	3	MATH201		✓	2		2	15	10	10	5	60	3
HUM231	Business Administration	2	–	✓		2			15	15		10	60	3
HUM232	Technical Writing	2	HUM111	✓		2		2	15	15		10	60	3
HUM241	Computers and Ethics	1	–	✓		1			15	15		10	60	2
			Total	36					15	15		10	60	2

Table16. Third level courses for Computer Science

3rd Level Courses														
Code	Course	Credits	Prerequisites	Type		Teaching Hours			midterm	Year Work grades			Final Exam	Time of exam
				R	E	L	T	P		O	PE	G		
CS301	Operation Research	3	CS201	✓		2		2	15	15		10	60	2
CS302	Simulation and Modeling	3	MATH202		✓	2		2	15	10	10	5	60	3
CS311	Algorithm Design and Analysis	3	CS211	✓		2	2		15	10	10	5	60	3
CS321	Computer Architecture	3	CS141, CS201	✓		2		2	15	10	10	5	60	3
CS322	Operating Systems	3	CS321	✓		2		2	15	10	10	5	60	3
CS342	Automata and Language Theory	3	CS141, CS201	✓		2	2		15	10	10	5	60	3
CS341	Visual Programming	3	CS211		✓	2		2	15	10	10	5	60	3
CS351	Computer Graphics	3	IT101, CS201	✓		2		2	15	10	10	5	60	3
CS352	Image Processing	3	CS211	✓		2		2	15	10	10	5	60	3
CS353	Advanced Computer Graphics	3	CS351		✓	2		2	15	10	10	5	60	3
CS361	Artificial Intelligence	3	IT101, CS201	✓		2		2	15	10	10	5	60	3
CS381	Software Development and Professional Practice	3	CS211, CS391	✓		2		3	15	10	10	5	60	3
SE301	Software Engineering	3	CS211	✓		2	2		15	10	10	5	60	3
IT351	Computer Networks	3	IT251, CS321	✓		2		2	15	10	10	5	60	3
IT381	Introduction to Multimedia Technology	3	CS241		✓	2		2	15	10	10	5	60	2
MATH301	Numerical Analysis	3	MATH102	✓		2	2		15	10	10	5	60	2
			Total	36										

Table17. Fourth level courses for Computer Science

4th Level Courses														
Code	Course	Credits	Prerequisites	Type		Teaching Hours			midterm	Year Work grades			Final Exam	Time of exam
				R	E	L	T	P		O	PE	G		
CS421	Advanced Operating Systems	3	CS322		✓	2		2	15	10	10	5	60	3
CS431	Parallel Computation	3	CS311, CS321	✓		2		2	15	10	10	5	60	3
CS441	Compiler Construction	3	CS211, CS342	✓		2		2	15	10	10	5	60	3
CS442	Programming Language Design	3	CS211		✓	2		2	15	10	10	5	60	3
CS451	Computer Animation	3	CS352		✓	2		2	15	10	10	5	60	3
CS452	Computer Vision	3	CS241, PHYS102		✓	2		2	15	10	10	5	60	3
CS461	Intelligent Systems	3	CS361		✓	2		2	15	10	10	5	60	3
CS462	Machine Learning	3	CS361		✓	2		2	15	10	10	5	60	3
CS463	Pattern Recognition	3	CS361		✓	2		2	15	10	10	5	60	3
CS471	Introduction to Computer Security	3	CS211, IT351	✓		2		2	15	10	10	5	60	3
CS472	Cryptography	3	CS211, IT351		✓	2		2	15	10	10	5	60	3
CS481	Capstone Project I	3	CS381, IS221	✓		1		4	15	10	10	5	60	3
CS482	Capstone Project II	3	CS381, IS221	✓		1		4	15	10	10	5	60	3
SE422	Software Quality Assurance and Testing	3	SE301		✓	2		2	15	10	10	5	60	3
IS411	Advanced Database	3			✓	2		2	15	10	10	5	60	3
IS412	Distributed and Object Databases	3	IS212		✓	2		2	15	10	10	5	60	3
IS414	Data Mining and Business Intelligence	3			✓	2		2	15	10	10	5	60	3
IT431	Wireless and Mobile Computing	3	IT251		✓	2		2	15	10	10	5	60	3
IT432	Network Programming	3	IT351		✓	2		2	15	10	10	5	60	3
IT481	Virtual Reality	3			✓	2		2	15	10	10	5	60	3
CS422	Advanced Computer Architecture	3	CS321		✓	2		2	15	10	10	5	60	3
CS423	Embedded Systems	3	CS321		✓	2		2	15	10	10	5	60	3
			Total	36										

Table18. Third Level Courses Specialization Information Systems

3rd Level Courses														
Code	Course	Credits	Prerequisites	Type		Teaching Hours			midterm	Year Work grades			Final Exam	Time of exam
				R	E	L	T	P		O	PE	G		
CS301	Operation Research	3	CS201	✓		2		2	15	15		10	60	2
CS302	Simulation and Modeling	3	MATH202		✓	2		2	15	10	10	5	60	3
CS323	Computer Architecture and Operating Systems	3	IT101, CS201	✓		2		2	15	10	10	5	60	3
CS341	Visual Programming	3	CS211		✓	2		2	15	10	10	5	60	3
CS351	Computer Graphics	3	IT101, CS201		✓	2		2	15	10	10	5	60	3
CS381	Software Development and Professional Practice	3	CS211, SE301	✓		2		3	15	10	10	5	60	3
SE301	Software Engineering	3	CS211	✓		2	2		15	10	10	5	60	3
IS311	Geographical Information Systems	3	IS201, IS212	✓		2		2	15	10	10	5	60	3
IS321	Advanced Project Management	3	IS221		✓	2		2	15	10	10	5	60	3
IS341	Decision Support Systems	3	IS201	✓		2		2	15	10	10	5	60	3
IS342	IS Strategy, Management and Acquisition	3	IS201	✓		2		2	15	10	10	5	60	3
IT351	Computer Networks	3	IT251	✓		2		2	15	10	10	5	60	3
IT381	Introduction to Multimedia Technology	3	CS241		✓	2		2	15	10	10	5	60	3
MATH301	Numerical Analysis	3	MATH102	✓		2	2		15	10	10	5	60	3
			Total	36										

Table 19. Level 4 Courses Specialization Information Systems

4th Level Courses														
Code	Course	Credits	Prerequisites	Type		Teaching Hours			midterm	Year Work grades			Final Exam	Time of exam
				R	E	L	T	P		O	PE	G		
IS411	Advanced Database	3	IS212		✓	2		2	15	10	10	5	60	3
IS412	Distributed and Object Databases	3	IS212	✓		2		2	15	10	10	5	60	3
IS413	Web Information Systems	3	IS201, IT271		✓	2		2	15	10	10	5	60	3
IS414	Data Mining and Business Intelligence	3	IS201		✓	2		2	15	10	10	5	60	3
IS415	Database Administration	3	IS212		✓	2		2	15	10	10	5	60	3
IS416	Transaction Processing	3	IS212		✓	2		2	15	10	10	5	60	3
IS417	Multimedia Databases	3	IS212, CS241		✓	2		2	15	10	10	5	60	3
IS441	Quality Assurance of Information Systems	3	IS201		✓	2		2	15	10	10	5	60	3
IS442	IS Application Development	3	IS212, IS413		✓	2		2	15	10	10	5	60	3
IS451	Social Information Systems	3	IS413		✓	2		2	15	10	10	5	60	3
IS452	Capstone Project I	3	CS381, IS221	✓		1		4	15	10	10	5	60	3
IS453	Capstone Project II	3	CS381, IS221	✓		1		4	15	10	10	5	60	3
IT411	Information Assurance and Security	3	IT351	✓		2		2	15	10	10	5	60	3
IT441	Enterprise Architecture	3	IT351	✓		2		2	15	10	10	5	60	3
IT471	E-commerce	3	IT271		✓	2		2	15	10	10	5	60	3
IT482	Human Computer Interaction	3	CS341		✓	2		2	15	10	10	5	60	3
			Total	36										

Table 20. Third level courses IT specialization

3rd Level Courses														
Code	Course	Credits	Prerequisites	Type		Teaching Hours			midterm	Year Work grades			Final Exam	Time of exam
				R	E	L	T	P		O	PE	G		
CS301	Operation Research	3	CS201	✓		2		2	15	15		10	60	2
CS302	Simulation and Modeling	3	MATH202		✓	2		2	15	10	10	5	60	3
CS321	Computer Architecture	3	CS141, CS201	✓		2		2	15	10	10	5	60	3
CS322	Operating Systems	3	CS321	✓		2		2	15	10	10	5	60	3
CS341	Visual Programming	3	CS211		✓	2		2	15	10	10	5	60	3
CS351	Computer Graphics	3	IT101, CS201	✓		2		2	15	10	10	5	60	3
CS352	Image Processing	3	CS211	✓		2		2	15	10	10	5	60	3
CS381	Software Development and Professional Practice	3	CS211, SE301	✓		2		2	15	10	10	5	60	3
SE301	Software Engineering	3	IS231	✓		2	2		15	10	10	5	60	3
IS321	Advanced Project Management	3	IS221		✓	2		2	15	10	10	5	60	3
IT311	Network Security	3	IT351	✓		2		2	15	10	10	5	60	3
IT331	Network Management	3	IT351	✓		2		2	15	10	10	5	60	3
IT351	Computer Networks	3	IT251,	✓		2		2	15	10	10	5	60	3
IT361	Field Training	3	IS221	✓		2			15	10	10	5	60	3
IT381	Introduction to Multimedia Technology	3	CS241		✓	2		2	15	10	10	5	60	3
MATH301	Numerical Analysis	3	MATH102		✓	2	2		15	10	10	5	60	3
			Total	30-45										

Table 21. Fourth Level Courses Specialization in Information Technology

4th Level Courses														
Code	Course	Credits	Prerequisites	Type		Teaching Hours			midterm	Year Work grades			Final Exam	Time of exam
				R	E	L	T	P		O	PE	G		
IT431	Wireless and Mobile Computing	3	IT251	✓		2		2	15	10	10	5	60	3
IT451	Network Analysis and Design	3	IT351, MATH202	✓		2		2	15	10	10	5	60	3
IT432	Network Programming	3	IT351		✓	2		2	15	10	10	5	60	3
IT441	Enterprise Architecture	3	IT351	✓		2		2	15	10	10	5	60	3
IT471	E-commerce	3	IT271		✓	2		2	15	10	10	5	60	3
IT433	Network Forensics	3	IT351		✓	2		2	15	10	10	5	60	3
IT452	Networked Embedded Systems	3	IT351,		✓	2		2	15	10	10	5	60	3
IT461	Capstone Project I	3	CS381, IS221	✓		1		4	15	10	10	5	60	3
IT462	Capstone Project II	3	CS381, IS221	✓		1		4	15	10	10	5	60	3
CS451	Computer Animation	3			✓	2		2	15	10	10	5	60	3
CS431	Parallel Computation	3			✓	2		2	15	10	10	5	60	3
CS452	Computer Vision	3	CS241, PHYS102		✓	2		2	15	10	10	5	60	3
CS461	Intelligent Systems	3	CS361		✓	2		2	15	10	10	5	60	3
IS411	Advanced Database	3	IS212		✓	2		2	15	10	10	5	60	3
IS412	Distributed and Object Databases	3	IS212		✓	2		2	15	10	10	5	60	3
IT482	Virtual Reality	3			✓	2		2	15	10	10	5	60	3
CS422	Advanced Computer Architecture	3	CE321		✓	2		2	15	10	10	5	60	3
CS423	Embedded Systems	3	CS321		✓	2		2	15	10	10	5	60	3
			Total	36-39										

Software Engineering Software

Table 22. Third Level Courses for Software Engineering

3rd Level Courses														
Code	Course	Credits	Prerequisites	Type		Teaching Hours			midterm	Year Work grades			Final Exam	Time of exam
				R	E	L	T	P		O	PE	G		
CS3٠١	Operation Research	3	CS201	✓		2		2	15	15		10	60	2
CS3٠٢	Simulation and Modeling	3	MATH202		✓	2		2	15	10	10	5	60	3
CS321	Computer Architecture	3	CS141, CS201	✓		2		2	15	10	10	5	60	3
CS322	Operating Systems	3	CS321	✓		2		2	15	10	10	5	60	3
CS341	Visual Programming	3	CS211		✓	2		2	15	10	10	5	60	3
SE301	Software Engineering	3	CS211	✓		2	2		15	10	10	5	60	3
SE331	Software Design & Architecture	٣	SE301	✓		2		2	15	10	10	5	60	3
SE302	Web Applications Engineering	3	SE301, CS141		✓	2		2	15	10	10	5	60	3
CS381	Software Development and Professional Practice	3	CS211	✓		2		2	15	10	10	5	60	3
IT351	Computer Networks	3	IT251, CS321	✓		2		2	15	10	10	5	60	3
SE332	Software Construction	3	SE331	✓		2		2	15	10	10	5	60	3
SE321	Software Requirements Analysis	3	SE301	✓		2		2	15	10	10	5	60	3
SE333	Agile Methods	3	SE332		✓	2		2	15	10	10	5	60	3
SE311	Open Source Software Development	3	SE331		✓	2		2	15	10	10	5	60	3
SE322	Real-Time Software and Systems	3	SE331		✓	2		2	15	10	10	5	60	3
SE334	Field Training	3	IS221	✓					15	10	10	5	60	3
IS341	Decision Support Systems	3	IS201		✓	2		2	15	10	10	5	60	3
MATH301	Numerical Analysis	3	MATH102		✓	2	2		15	10	10	5	60	3
			Total	36										

Table 23. Fourth Level Courses for Software Engineering

4th Level Courses														
Code	Course	Credits	Prerequisites	Type		Teaching Hours			midterm	Year Work grades			Final Exam	Time of exam
				R	E	L	T	P		O	PE	G		
SE422	Software Quality Assurance and Testing	3	SE301	✓		2		2	15	10	10	5	60	3
SE412	Estimating Software Development. & Maintenance Projects	3	SE321		✓	2		2	15	10	10	5	60	3
SE411	SoftwareProject Management	٣	SE422, SE321	✓		2		2	15	10	10	5	60	3
IT482	HumanComputer Interaction	٣	IT271	✓		2		2	15	10	10	5	60	3
SE431	Mobile Software Design	3	SE331, IT351		✓	2		2	15	10	10	5	60	3
CS423	Embedded Systems	3	CS321		✓	2		2	15	10	10	5	60	3
SE413	Capstone Project I	3	CS381, IS221	✓		1		4	15	10	10	5	60	3
SE414	Capstone Project II	3	CS381, IS221	✓		1		4	15	10	10	5	60	3
SE432	Embedded Systems Software Design	3	CS423		✓	2		2	15	10	10	5	60	3
CS471	Introduction to Computer Security	3	CS211, IT351	✓		2		2	15	10	10	5	60	3
SE433	Global Software Development	3	IT351, SE331		✓	2		2	15	10	10	5	60	3
IT431	Wireless and Mobile Computing	3	IT251		✓	2		2	15	10	10	5	60	3
IT451	Network Analysis and Design	3	IT351, MATH202		✓	2		2	15	10	10	5	60	3
IS441	Quality Assurance of Information Systems	3	IS201		✓	2		2	15	10	10	5	60	3
			Total	36					15	10	10	5	60	3

Annex (1) The scientific content of the courses

مقررات المواد الإنسانية

HUM111 **English Language I** لغة إنجليزية ١

Credits 2 Hours
Prerequisites –
Contents The material reflects the stylistic variety that advanced earners have to be able to deal with. The course gives practice in specific points of grammar to consolidate and extend learners existing knowledge. Analysis of syntax; comprehension; skimming and scanning exercises develop the learner's skills, comprehension questions interpretation and implication. The activities aim to develop listening, speaking and writing skills through a communicative, functional approach, with suggested topics for discussion and exercises in summary writing and composition.

HUM112 **English Language II** لغة إنجليزية ٢

Credits 2 Hours
Prerequisites HUM111
Contents The course aims at enabling the students to further polish and develop their skills in English language through various interactive activities. The need for more articulate written English is reinforced through further in depth study of applied grammar. Again a conversational and situational dialogue based contents are presented to attract students' interest. Pronunciations and comparatively complex grammar are simultaneously introduced. Field related terminology and longer conversations are also presented with emphasis on contrastive grammar and a more articulate pronunciation.

HUM121 **Social Context of Computing** السياق الاجتماعي للحوسبة

Credits 1 Hour
Prerequisites –
Contents Introduction to the social implications of computing – Social informatics – Social impact of IT on society – Social implications of networked communication – Growth of, control of, and access to the Internet – International issues – Online communities & social implications – Philosophical context – Diversity issues – Gender-related issues – Cultural issues – Accessibility issues – Globalization issues – Economic issues in computing –Digital divide

HUM122 **Intellectual Property** الملكية الفكرية

Credits 1 Hour
Prerequisites –
Contents Foundations of intellectual property – Ownership of information – Copyrights, patents, trademarks and trade secrets – Software piracy – Software patents – Transnational issues concerning intellectual property – Fair use – Digital Millennium Copyright Act (DMCA) – International differences – Egyptian Intellectual Property law

HUM131 **Organizational Behavior** سلوكيات الهيئات

Credits 2 Hours
Prerequisites –
Contents Perception, learning, motivation and value; individual differences and work

performance; undestanding yourself; motivating yourself and others, working within groups, achieving success through goal setting, achieving high personal productivity and quality; achieving rewarding and satisfying career; communicating with people; leading and influencing others; building relationships with supervisors, co-workers and customers.

HUM132 **Interpersonal Communication** التواصل الشخصي

Credits 2 Hours
Prerequisites –
Contents Elements of the communication process, barriers to communications, effective writing skills, report writing, and oral presentation skills. Good diction, extempore speaking in the appropriate context will be key skills in this course.

HUM133 **Computing Economics** اقتصاديات الحوسبة

Credits 2 Hours
Prerequisites –
Contents Monopolies and their economic implications; Effect of skilled labor supply and demand on the quality of computing products; Pricing strategies in the computing domain; cost-benefit analysis and break-even analysis; return on investment; analysis of options; time value of money; management of money: economic analysis, accounting for risk; Differences in access to computing resources and the possible effects thereof.

HUM141 **Computer Law** قوانين الحاسبات

Credits 2 Hours
Prerequisites –
Contents History and examples of computer crime – "Cracking" ("hacking") and its effects – Viruses, worms, and Trojan horses – Crime prevention strategies – System use policies & monitoring – Risks and liabilities of computer-based systems – Accountability, responsibility, liability.

HUM142 **Privacy and Civil Liberties** المدنية الخصوصية والحريات

Credits 1 Hour
Prerequisites –
Contents Ethical and legal basis for privacy protection; Privacy implications of computer and information systems; Technological strategies for privacy protection; Freedom of expression in cyberspace; International and intercultural implications.

HUM151 **Hand Drawing** الرسم باليد

Credits 2 Hours
Prerequisites –
Contents Introduction and proportions - Gestalt theory and gestural drawing - Blind contour drawing - Using light and dark; discovering mass drawing; using negative space as a tool to create atmosphere and shape - Exploring different mediums and paper - Conclusion and final portfolio drawing

HUM152 **History of Computing** تاريخ الحوسبة

Credits 2 Hours
Prerequisites –

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

HUM153 **Islamic Culture** الثقافة الإسلامية

Credits 1 Hours
Prerequisites –
Contents Fundamental elements of the Islamic Culture; Islamic culture concept; Islamic culture resources; Islamic culture importance; Islamic culture relation with other cultures; The faith's impact on society.

HUM154 **Scientific Thinking** التفكير العلمي

Credits 1 Hour
Prerequisites –
Contents Personal Development Planning − Learning and personal skills development − Transferable skills development, including time and stress management, note taking, essay writing, literature finding, and exam and revision skills − Develops an understanding of the nature of scientific thinking − Scientific methods are introduced and evaluated − Critical and creative thinking skills − The processes of induction and deduction − Empirical reasoning and the evaluation of evidence − Heuristic strategies for critical and creative thinking − A range of motivating examples on sustainability and personal development.

HUM231 **Business Administration** إدارة الأعمال

Credits 2 Hours
Prerequisites –
Contents Management concepts, level and types of management, planning and organization of work flow, delegation, leadership styles, decision making, stress and time management, and employee relations, decision-making in such areas as investment in operations, productions planning, scheduling and control, reliability and maintenance.

HUM2٣2 **Technical Writing** الكتابة التقنية

Credits 2 Hours
Prerequisites HUM111
Contents General Principles of Good Writing − Design and Usability − Documentation Development Process − Writing Procedures − Aspects of the Language − Obstacles to Readability − Writing Reports − Practices in Technical Writing

HUM241 **Computers and Ethics** الحاسبات والأخلاقيات

Credits 1 Hour
Prerequisites –
Contents Community values and the laws by which we live − The nature of professionalism in computing − Various forms of professional credentialing and the advantages and disadvantages − The role of the professional in public policy − Maintaining awareness of consequences − Ethical dissent and whistle-blowing − Codes of ethics, conduct, and practice (IEEE, ACM, SE, AITP, and so forth) − Dealing with harassment and discrimination − "Acceptable use" policies for computing in the workplace.

MATH101 **Mathematics I** رياضيات ١

Credits 3 Hours
Prerequisites –
Contents Pre-calculus review: sets and functions; limits and continuity – Derivatives: techniques of differentiation; derivatives of the basic and fundamental functions; implicit differentiation; linear approximation and differentials; extreme of functions; optimization problems; velocity and acceleration – Integrals: indefinite integrals; change of variables; definite integrals; the fundamental theorem of calculus – Techniques of integration: integration by parts; trigonometric integrals and substitutions; integrals of rational functions – Numerical integration – Applications of definite integrals.

MATH101 **Mathematics II** رياضيات ٢

Credits 3 Hours
Prerequisites MATH101
Contents Partial fractions – Infinite series: sequences, convergent and divergent series, positive-term series, tests of convergence, alternating series and absolute convergence, power series, power series representations of functions, Maclauran and Taylor series – Differential equations: definition, classifications and terminology, techniques of solution of ordinary first-order linear differential equations - Matrices – Linear equations – Vector spaces, inner product spaces – Linear transformations – Eigen-values and eigenvectors.

MATH٢٠١ **Mathematics III** رياضيات ٣

Credits 3 Hours
Prerequisites MATH102
Contents Laplace transform – Inverse Transform – Fourier series – complex Fourier series – Fourier integrals – Fourier cosine and sine transforms – Fourier transform - Discrete and fast Fourier transforms – Z-transform – Inverse Z-transform – Discrete-time systems and difference equations – Discrete linear systems – Wavelet transform – Applications.

MATH٢٠2 **Probability and Statistics** الاحتمالات والاحصاء

Credits 2 Hours
Prerequisites MATH102
Contents Introduction to probability: Basic concepts; Properties of probability; Conditional probability and independence; Total probability and Bayes' rule; Random variables; Probability distributions.
Introduction to statistical analysis: Sampling and sampling distributions; Point estimation; Methods of moments and maximum likelihood; Interval estimation; Least squared concept; Testing hypotheses; Statistical tests.
Applications: Statistical software packages; Applications of statistics to reliability engineering.

MATH301 **Numerical Analysis** تحليل عددي

Credits 3 Hours
Prerequisites MATH102
Contents Numerical Computing and Computers – Solving Nonlinear Equations – Solving

Sets of Equations – Interpolation and Curve Fitting – Approximation of Functions – Finite Differences – Numerical Differentiation and Numerical Integration – Numerical Solution of ODEs – Boundary-Value Problems – Sample applications using software tools.

CS201 **Discrete Structures** هياكل متقطعة

Credits 3 Hours
Prerequisites MATH102
Contents Introduction to logic and proofs – Fundamental structures: Functions; relations; sets; cardinality and countability – Boolean algebra – Propositional logic: Logical connectives; truth tables; normal forms; validity – Elementary number theory: Factorability; properties of primes; greatest common divisors and least common multiples; Euclid's algorithm; modular arithmetic; the Chinese Remainder Theorem – Basics of counting: Counting arguments; pigeonhole principle; permutations and combinations; binomial coefficients – Predicate logic: Universal and existential quantification; modus ponens and modus tollens; limitations of predicate logic – Recurrence relations: Basic formulae; elementary solution techniques – Graphs and trees: Fundamental definitions; simple algorithms; traversal strategies; proof techniques; spanning trees; applications.

CS301 **Operation Research** بحوث عمليات

Credits 3 Hours
Prerequisites CS201
Contents Linear programming: The Simplex method – Integer programming – Probabilistic modeling – Queuing theory: Petri nets; Markov models and chains – Optimization – Network analysis and routing algorithms – Prediction and estimation: Decision analysis; Forecasting; Risk management; Econometrics and microeconomics; Sensitivity analysis – Dynamic programming – Sample applications – Software tools.

CS302 **Modeling And Simulation** النمذجة والمحاكاه

Credits 3 Hours
Prerequisites MATH202
Contents Definition of simulation and modeling: Purpose including benefits and limitations – Important application areas: healthcare; economics and finance; classroom of the future; training and education; city and urban simulations; simulation in science and in engineering; games; military simulation – Different kinds of simulations – The simulation process – Model building: use of mathematical formula or equation, graphs, constraints – Methodologies and techniques – Use of time stepping for dynamic systems – Theoretical considerations; Monte Carlo methods, stochastic processes, queuing theory – Technologies in support of simulation and modeling – Human computer interaction considerations – Assessing and evaluating simulations in a variety of contexts – Software in support of simulation and modeling; packages, languages.

PHY101 **Physics I** الفيزياء ١

Credits 3 Hours
Prerequisites –
Contents Mechanics: Physics and measurements; Motion in one dimension; Vectors; Motion in two dimensions; Laws of motion; Circular motion and its applications; Work and

energy; Potential energy and conservation of energy; Linear momentum and collision; Rotation of a rigid body; Rolling motion; Law of gravity.
Waves: Oscillatory motion; Wave motion; Sound waves.

PHY102 **Physics II** الفيزياء ٢

Credits 3 Hours
Prerequisites –
Contents Physical optics: Interference, diffraction and polarization.
Magnetic fields: Definitions and properties; Sources of magnetic fields; electromagnetic waves; The four Maxwell's equations.
Selected topics: Introduction to modern physics and applications, Molecules and solids; Semiconductors and semiconductors devices; Superconductivity.

EE101 **Electronics** الإلكترونيات

Credits 3 Hours
Prerequisites –
Contents Electrical circuit laws and theorems: Ohm's Kirchhoff's, mesh, nodal, Thevenin's maximum power transfer theorems for both DC and AC circuits , R, L, C elements. Electronic components and circuits diodes – bipolar junction transistors – field-effect transistors and use of transistors in amplifiers. OP-Amp, digital circuits – physical design of simple gates – flip-flops and memory circuits.

EE102 **Digital Circuits** الدوائر الرقمية

Credits 2 Hours
Prerequisites –
Contents Numbering systems, logic functions and logic gates, Boolean algebra.
Combinational circuits: Simplification of logic circuits using Karnaugh maps and tabulation method. Gate level design, adders, subtractors, encoders and decoders, multiplexers and demultiplexers. MSI Design, Programmable devices (ROM, PAL, PLA, ...).
Sequential circuits: Flip-flops, latches, analysis and design of simple sequential circuits, state tables and state diagrams, counters, registers, RAMs. Integrated circuits and logic families.

EE201 **Digital Signal Processing** معالجة الاشارات الرقمية

Credits 3 Hours
Prerequisites MATH201
Contents Digital processing of signals, sampling, difference equations, discrete-time Fourier transforms, discrete and fast Fourier transforms, digital filter design.

CS141 **Programming Fundamentals** أساسيات البرمجة

Credits 3 Hours
Prerequisites IT101
Contents Fundamental programming constructs: Syntax and semantics of a higher-level language; variables, types, expressions, and assignment − Simple I/O − Conditional and iterative control structures − Functions and parameter passing − Structured decomposition − Algorithms and problem-solving: Problem-solving strategies; the role of algorithms in the problem-solving process; implementation strategies for algorithms; debugging strategies; the concept and properties of algorithms − Fundamental data structures − Machine level representation of data − Human-computer interaction: Introduction to design issues − Software development methodology: Fundamental design concepts and principles; structured design; testing and debugging strategies; test-case design; programming environments; testing and debugging tools.

CS211 **Data Structures and Algorithms** هياكل البيانات والخوارزميات

Credits 3 Hours
Prerequisites CS241
Contents Review of elementary programming concepts − Fundamental data structures: Stacks; queues; linked lists; hash tables; trees; graphs − Basic algorithmic analysis: big "O," little "o," omega, and theta notation − Fundamental computing algorithms: O(N log N) sorting algorithms; hash tables, including collision-avoidance strategies; binary search trees; representations of graphs; depth- and breadth-first traversals − Recursion and divide-and-conquer strategies − Basic algorithmic strategies: Brute-force algorithms; greedy algorithms; divide and conquer; backtracking − Standard complexity classes.

CS241 **Object-Oriented Programming** البرمجة الشيئية

Credits 3 Hours
Prerequisites CS141
Contents Introduction to object-oriented programming − Using an object-oriented language; classes and objects; syntax of class definitions; methods; members − Simple data: variables, types, and expressions; assignment − Control structures: Iteration; conditionals − Message passing: Simple methods; parameter passing – Sub-classing; encapsulation and information hiding; separation of behavior and implementation; class hierarchies; inheritance; polymorphism − Collection classes and iteration protocols − Using APIs: Class libraries; packages for graphics and GUI applications − Object-oriented design: Fundamental design concepts and principles; introduction to design patterns; object-oriented analysis and design; design for reuse .

CS322 **Operating Systems** نظم التشغيل

Credits 3 Hours
Prerequisites **CS321**
Contents Overview: Role and purpose of operating systems; history of operating system development; functionality of a typical operating system; design issues (efficiency, robustness, flexibility, portability, security, compatibility). Basic principles: Structuring methods; abstractions, processes, and resources; device organization;

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

CS323 **Computer Architecture and Operating Systems** معماريات الحاسب ونظم التشغيل

Credits 3 Hours

Prerequisites CS141, CS201

Contents Computer architecture: data representation, digital logic, the internal structure of the CPU, primary and secondary storage, input/output, control unit, and assembly language. Operating systems: processes, inter-process communication, process scheduling, resource allocation, memory management, virtual memory, file systems, and input/output device management.

CS341 **Visual Programming** البرمجة المرئية

Credits 3 Hours

Prerequisites CS211

Contents Graphical user interface (GUI), review of concepts, and anatomy of a windows program using different languages. Available developing tools. Keyboard and mouse input, menus creating, adding menus to programs. Dialog boxes: buttons, text, list boxes, grids and spreadsheets. Graphics files and file handling. Multiple documents interfaces and views (MDI). Exception Handling and Debugging. Object Linking and Embedding (OLE).

CS351 **Computer Graphics** الرسم بالحاسب

Credits 3 Hours

Prerequisites IT101, CS201

Contents This course introduces techniques for 2D and 3D computer graphics, including simple color models, homogeneous coordinates, affine transformations (scaling, rotation, translation), viewing transformation, clipping, illumination and shading, texture maps, rendering, high level shader language, video display devices, physical and logical input devices, hierarchy of graphics software, hidden surface removal methods, Z-buffer and frame buffer, color channels, and using a graphics API.

CS361 **Artificial Intelligence** الذكاء الاصطناعي

Credits 3 Hours
Prerequisites IT101, CS201
Contents Fundamental issues in intelligent systems – History of artificial intelligence – Agents: Definition of agents; successful applications and state-of-the-art agent-based systems; software agents, personal assistants, and information access; multi-agent systems – Modeling the world; the role of heuristics – Search and constraint satisfaction – Knowledge representation and reasoning – Advanced search: Genetic algorithms; simulated annealing; local search – Advanced knowledge representation and reasoning – Structured representation; nonmonotonic reasoning; reasoning on action and change – AI planning systems: Definition and examples of planning systems; planning as search; operator-based planning; propositional planning.

IS201 **Foundations of Information Systems** أساسيات نظم المعلومات

Credits 3 Hours
Prerequisites IT101
Contents Information systems components. Information systems in organizations: Characteristics of IS professionals, IS career paths, Cost/value information, Quality of information, competitive advantage of information, IS and organizational strategy, Value chains and networks. Globalization. Valuing information systems: Investment evaluation, Multi-criteria analysis, Cost-benefit analysis, Identifying and implementing innovations. E-business: B-to-C, B-to-B, Intranets, Internet, extranets, E-government, Web 2.0 Technologies: e.g., wikis, tags, blogs, netcasts, self-publishing, New forms of collaboration: social networking, virtual teams, viral marketing crowd-sourcing. Security of information systems: Threats to information systems, Technology-based safeguards. Business intelligence: Organizational decision making, functions, and levels, Executive, managerial, and operational levels, Systems to support organizational functions and decision making. Information and knowledge discovery: Reporting systems, Online analytical processing, Data, text, and Web mining, Business analytics. Application systems: Executive, managerial, and operational support systems, Decision support systems.

IS211 **File Organization** تنظيم الملفات

Credits 3 Hours
Prerequisites CS241
Contents Introduction to the Design and Specification of File Structures − Fundamental File Processing Operations − Fundamental File Structure Concepts − Managing Files of Records − Secondary Storage and System Software − Organizing Files for Performance. Indexing − Multi-Level Indexing and B-Trees − Indexed Sequential File Access and Prefix B+ Trees. Hashing.

IS212 **Databases** قواعد البيانات

Credits 3 Hours
Prerequisites CS141
Contents Database systems: History and motivation for database systems; components of database systems; DBMS functions; database architecture and data independence. Data modeling: Data modeling; conceptual models; object-oriented model;

relational data model. Relational databases: Mapping conceptual schema to a relational schema; entity and referential integrity; relational algebra and relational calculus. Database query languages: Overview of database languages; SQL; query optimization; 4th-generation environments; embedding non-procedural queries in a procedural language; introduction to Object Query Language. Relational database design: Database design; functional dependency; normal forms; multivalued dependency; join dependency; representation theory.

IS231 **Systems Analysis and Design** تحليل وتصميم النظم

Credits 3 Hours
Prerequisites IT101
Contents Information requirements: Structuring of IT-based opportunities into projects; Project specification; Project prioritization; Analysis of project feasibility. Operational, Tangible costs and benefits (financial and other measures such as time savings), Intangible costs and benefits such as good will, company image: Technical; Schedule; Cultural (organizational and ethnic). Fundamentals of IS project management in the global context. Using globally distributed communication and collaboration platforms. Analysis and specification of system requirements; Data collection methods; Methods for structuring and communicating requirements; Factors affecting user experience; User interface design; System data requirements; Factors affecting security; Ethical considerations in requirements specification. Different approaches to implementing information systems to support business requirements: Packaged systems; enterprise; systems; Outsourced development; In-house development. Specifying implementation alternatives for a specific system. Methods and impact of implementation alternatives on system requirements specification. Different approaches to systems analysis and design: structured SDLC, unified process/UML, agile methods

IT101 **IT Fundamentals** أساسيات تكنولوجيا المعلومات

Credits 3 Hours
Prerequisites –
Contents Introduction: Brief history of computing; the components of a computing system.
Machine level representation of data: Bits, bytes, and words; numeric data representation and number bases; signed and twos-complement representations; fundamental operations on bits; representation of nonnumeric data.
Digital logic: Switching circuits; gates; memory.
Assembly level machine organization: Basic organization of the von Neumann machine; control unit; instruction fetch, decode, and execution; instruction sets and types; assembly/machine language programming; instruction formats.
Hardware realizations of algorithms: Data representation; the von Neumann model of computation; the fetch/decode/execute cycle; basic machine organization.
Operating systems and virtual machines: Historical evolution of operating systems; responsibilities of an operating system; basic components of an operating system.
Computing applications: Word processing; spreadsheets; editors; files and directories.
Introduction to net-centric computing: Background and history of networking and the Internet; demonstration and use of networking software including e-mail, telnet, and FTP.

IT251 **Data Communications** تراسل البيانات

Credits 3 Hours
Prerequisites IT101
Contents Communication models, Data communication, networks, protocol architectures. Data Transmission, Transmission media wired and wireless, transmission impairment. Encoding and modulating baseband, Digital and analog modulation. Flow control and Error control. Multiplexing.

IT351 **Computer Networks** شبكات الحاسب

Credits 3 Hours
Prerequisites IT251 or CS322
Contents Standards bodies. Switched vs. packets networking. OSI model. Internet model (TCP/IP). Nodes & links. LAN, WAN. Bandwidth, throughput. Components and architectures. Routing and switching. Communication protocols. Application, Transport, and network layers protocols.

IT271 **Web Programming** البرمجة العنكبوتية

Credits 3 Hours
Prerequisites CS141, IT251
Contents The fundamental technologies behind the Web. Concepts of Web Programming both client-side and server-side. HTML and CSS Web page development. Fundamentals of Server side scripting language such PHP. Fundamentals of Client side scripting language such as JavaScript.

IT381 **Introduction to Multimedia Technology** مقدمة في تكنولوجيا الوسائط المتعددة

Credits 3 Hours
Prerequisites CS241
Contents Basic knowledge about multimedia and multimedia technology. Basic media such as text, image, animation, graphic, and sound. Current multimedia technology. Roles and uses of multimedia technology in many areas such as education, advertisement, and public relation etc.

CS321 **Computer Architecture** معماريات الحاسب

Credits 3 Hours
Prerequisites CS141, CS201
Contents Register transfer notation; physical considerations (gate delays, fan-in, fan-out). Assembly level organization: Basic organization of the von Neumann machine; control unit; instruction fetch, decode, and execution; instruction sets and types (data manipulation, control, I/O); assembly/machine language programming; instruction formats; addressing modes; subroutine call and return mechanisms; I/O and interrupts. Memory systems: Storage systems and their technology; coding, data compression, and data integrity; memory hierarchy; main memory organization and operations; latency, cycle time, bandwidth, and interleaving; cache memories (address mapping, block size, replacement and store policy); virtual memory (page table, TLB); fault handling and reliability. Interfacing and

communication: I/O fundamentals: handshaking, buffering, programmed I/O, interrupt-driven I/O; interrupt structures: vectored and prioritized, interrupt acknowledgment; external storage, physical organization, and drives; buses: bus protocols, arbitration, direct-memory access (DMA); introduction to networks; multimedia support; raid architectures. Functional organization: Implementation of simple datapaths; control unit: hardwired realization vs. microprogrammed realization; instruction pipelining; introduction to instruction-level parallelism (ILP). Multiprocessor and alternative architectures: Introduction to SIMD, MIMD, VLIW, EPIC; systolic architecture; interconnection networks; shared memory systems; cache coherence; memory models and memory consistency. Performance enhancements: RISC architecture; branch prediction; prefetching; scalability. Contemporary architectures: Hand-held devices; embedded systems; trends in processor architecture.

CS311	**Algorithm Design and Analysis**	تصميم وتحليل الخوارزميات
Credits	3 Hours	
Prerequisites	CS211	
Contents	Review of proof techniques − Basic algorithmic analysis: Asymptotic analysis of upper and average complexity bounds; best, average, and worst case behaviors; big-O, little-o, Ω, and Θ notation; standard complexity classes; empirical measurements of performance; time and space tradeoffs in algorithms; using recurrence relations to analyze recursive algorithms − Algorithmic strategies: branch-and-bound; heuristics; pattern matching and string/text algorithms; numerical approximation − Graph and tree algorithms: Shortest-path algorithms (Dijkstra's and Floyd's algorithms); transitive closure (Floyd's algorithm); minimum spanning tree (Prim's and Kruskal's algorithms); topological sort – Dynamic Programming – Randomized Algorithms – NP-complete problems.	

CS342	**Automata and Language Theory**	نظرية الآليات واللغات
Credits	3 Hours	
Prerequisites	CS141, CS201	
Contents	Introduction: The purpose of automata theory; relationship of automata and languages; the Chomsky hierarchy. Finite automata: Definition of finite automata and their operation; deterministic and nondeterministic automata and their equivalence; two-way finite automata; minimization of deterministic automata. Regular expressions: Relationship of regular expressions and finite automata; Kleene analysis and synthesis theorems; applications of regular expressions. Properties of regular sets: The Myhill-Nerode theorem; the pumping lemma; closure properties; decision algorithms. Context-free grammars: Equivalence and ambiguity of grammars; languages generated by context-free grammars; simplification of context-free grammars; Chomsky and Greibach normal forms; general strategies for top-down and bottom-up parsing. Properties of context-free languages: The pumping lemma for context free languages; closure properties of context-free languages; decision algorithms. Pushdown automata: Languages accepted by pushdown automata; pushdown automata and context-free languages. Linear-bounded automata: Definition and operation; context-sensitive languages; properties of context-sensitive languages. Turing machines: Definitions and introduction to the mechanics of Turing machine operation; the universal Turing machine; the Church-Turing thesis; variations of Turing machines; languages recognized by Turing machines; computable languages; undecidability; the P = NP question.	

CS352	**Image Processing**	معاجة الصور
Credits	3 Hours	
Prerequisites	CS211	
Contents	Scope and applications of image are processing. Perspective transformations (Modeling picture taking, perspective transformations in homogeneous coordinates and with two reference frames). The spatial frequency domain (The sampling theorem, template matching and the convolution theorem, spatial filtering). Enhancement and restoration, image segmentation. Image representation: (Spatial differentiation and smoothing, template matching, region analysis, contour following). Descriptive methods in scene analysis. Hardware and software considerations. Applications.	

CS353 **Advanced Computer Graphics** الرسم بالحاسب المتقدم

Credits 3 Hours
Prerequisites CS351
Contents This course will study advanced topics in computer graphics which includes GPU programming, shader languages, modeling natural phenomena, real-time rendering for games, information visualization, geometric optimization, level-of-detail rendering, bi-directional reflectance distribution functions (BRDFs), environment mapping, bump mapping, subdivision surfaces, higher-order surface modeling.

CS421 **Advanced Operating Systems** نظم التشغيل المتقدمة

Credits 3 Hours
Prerequisites CS321
Contents Parallel and distributed operating systems. Load sharing, scheduling, reliability, recovery, memory management. Distributed file systems, distributed agreement, and object- oriented operating systems.

CS431 **Parallel Computation** الحسابات المتوازية

Credits 3 Hours
Prerequisites CS311, CS321
Contents Introduction to parallel computing − Models of parallel computers − Data and task parallelism − Shared and Distributed memory parallel machine architecture concepts − Interconnection networks − Basics of threaded parallel computation− Parallel algorithmic design − Languages and libraries for threaded parallel programming − Languages and libraries for distributed memory parallel programming − Co-processor techniques including GPU and FPGA − Experimental techniques − Measuring performance and computing speed-up.

CS441 **Compiler Construction** بناء المترجمات

Credits 3 Hours
Prerequisites CS211, CS341
Contents Compiler Functions, Language Elements − BNF Grammars, Regular Expressions, Finite State Machines, Lexical Analyzers − Context Free Grammars, Grammar Ambiguity, Parse Trees, Push Down Automata − Parsing Methods; Top-Down, Recursive Descent, LL, LR − Symbol Table Construction, Type Checking − Code Generation − Handling Recursion and Arrays − Code Optimization Techniques.

CS442 **Programming Language Design** تصميم لغات البرمجة

Credits 3 Hours
Prerequisites CS211
Contents Fundamental issues in language design: General principles of language design; design goals; typing regimes; data structure models; control structure models; abstraction mechanisms. Overview of programming paradigms: Procedural paradigm; object-oriented paradigm; functional paradigm; logic paradigm. Type systems: Data types; type-checking models; semantic models of user-defined types; parametric polymorphism; subtype polymorphism; type-checking algorithms. Models of execution control: Order of evaluation of subexpressions; exceptions and exception handling; parallel composition; functions with delayed evaluation;

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

CS451 **Computer Animation** الحركة بالحاسب

Credits 3 Hours
Prerequisites –
Contents Basics of key-frame animation, camera animation, forward and inverse kinematics, particle systems, rigid body simulation, flocking, autonomous behavior, modeling natural phenomena such as water and gases, animation of articulated structures, facial animation, clothes, scripting system, morphing, motion capture, and deformation.

CS452 **Computer Vision** الرؤية بالحاسب

Credits 3 Hours
Prerequisites CS241, PHYS102
Contents An introduction to the concepts and applications in computer vision. Topics include: cameras and projection models, low-level image processing methods such as filtering and edge detection; mid-level vision topics such as segmentation and clustering; shape reconstruction from stereo, as well as high-level vision tasks such as object recognition, scene recognition, face detection and human motion categorization. Applications such as scene reconstruction and tracking.

CS453 **Game Programming** برمجة الألعاب

Credits 3 Hours
Prerequisites MM301
Contents This course describes the techniques and programming tricks used to build efficient game engines that support landscape visualization, complex scenes, lighting, shadows, motion control, collision, dynamics, image based rendering, and multi-player.

CS461 **Intelligent Systems** النظم الذكية

Credits 3 Hours
Prerequisites CS361
Contents Application Areas of Intelligent Systems – Intelligent System Architecture – Knowledge Engineering and Control –Languages Used in Expert Systems – Bayesian Interference – Fuzzy Logic – Decision Support Systems – Software tools for developing expert systems – Software tool for developing intelligent systems). Robotics: Overview; configuration space; planning; sensing; robot programming; navigation and control.

CS462 **Machine Learning** تعلم الآلة

Credits 3 Hours
Prerequisites CS361
Contents Introduction to machine learning – Definition and examples of machine learning – Supervised learning (of classification and regression functions); K-nearest neighbors, decision trees, naïve Bayes, support vector machines, logistic regression, evolutionary algorithms, Bayesian Networks, hidden Markov model, neural networks, boosting – Unsupervised learning and clustering K-means, hierarchical clustering (agglomerative and divisive), principal component analysis, independent component analysis, Expectation Maximization algorithm – Reinforcement learning – Kernel methods – Sparse kernel machines – Mixture models and the EM algorithm – Combining multiple learners.

CS463 **Pattern Recognition** التعرف بالنماذج

Credits 3 Hours
Prerequisites CS361
Contents Introduction − Statistical Decision Theory − Statistical Decision Theory continued − Parameter Estimation − Parameter Estimation continued − Introduction to Principal Component Analysis and Linear Discriminant Analysis − Face Recognition − Non-parametric Techniques − Decision Trees − Neural Networks − Classifier Combination − Feature Selection − Unsupervised Learning, Clustering, and Multidimensional Scaling − Semi-supervised learning.

CS471 **Introduction to Computer Security** مقدمة أمن الحاسب

Credits 3 Hours
Prerequisites CS211, IT351
Contents Security Goals, Fundamentals (confidentiality, integrity, availability, etc.). Introduction to risk assessment and management. Security standards in government and industry. Computer system protection principles (UNIX and Windows). Access controls, including MAC, DAC, and role-based. Cryptography fundamentals. Authentication, passwords, introduction to protocols, Kerberos. Security operations. Attacks: software attacks, malicious code, buffer overflows, social engineering, injection attacks, and related defense tools. Network attacks: Denial of service, flooding, sniffing and traffic redirection, defense tools and strategies. Attacking web sites: cross-site scripting. IPSec, Virtual Private networks and Network Address Translation. Ethics, SP issues that are related. Introduction to Forensics.

CS472 **Cryptography** التشفير

Credits 3 Hours
Prerequisites CS211, IT351
Contents Introduction − Secret-Sharing − Defining Encryption − Symmetric-Key Encryption − Public-Key Encryption − Hash functions, Digital Signatures − Key Exchange − Secure Communication Protocols − Homomorphic Encryption − Private Information Retrieval − Attribute-based Cryptography − Pairing-based Cryptography − Formal Methods in Cryptography − Private Set Intersection − Signatures.

IS311 **Geographical Information Systems** نظم المعلومات الجغرافية

Credits 3 Hours
Prerequisites IS201, IS212
Contents Fundamentals of Geographic Information Systems concepts to create, edit, and query spatial data. An introduction to map projections, coordinate systems, data capture, attribute tables, data manipulation, remote sensing, aerial and satellite imagery and using Global Position Systems (GPS). Transferring data to GIS data models. Spatial relationships analysis and making decisions from presented information through various geo-processing techniques. Using GIS in many fields. Hands-on experience in GIS techniques using appropriate tools.

IS321 **Advanced Project Management** إدارة المشروعات المتقدمة

Credits 3 Hours
Prerequisites IS221
Contents Managing Project Quality. Managing Project Risk. Managing Project Procurement: Alternatives to systems development; External acquisition; Outsourcing-domestic and offshore; Steps in the procurement process; Managing the procurement process. Project Execution, Control & Closure: Managing project execution; Monitoring progress and managing change; Managing Project Control & Closure; Cost control; Change control; Administrative closure; Personnel closure; Contractual closure; Project auditing.

IS341 **Decision Support Systems** نظم دعم اتخاذ القرار

Credits 3 Hours
Prerequisites IS201
Contents Basic concepts of DSS and their architectures and different components. Characteristics, structures, and uses of DSS in different fields. DSS models. Institutional and ad hoc DSS. DSS operating and evolving. Application of decision support systems in different disciplines. Hardware and software selections of DSS.

IS342 **IS Strategy, Management and Acquisition** إستراتيجية وإدارة واكتساب نظم المعلومات

Credits 3 Hours
Prerequisites IS201
Contents The Strategic Role of Information Systems; Information Systems and Organizations; Information Management, and Decision Making; Ethical and Social Impact of Information Systems; Information Systems Software; Managing Data Resources: Telecommunications, Enterprise-Wide Computing and Networking; Redesigning the Organization with Information Systems; Ensuring Quality with Information Systems; Systems Success and Failure: Implementation, Information and Knowledge Work Systems; Enhancing Management Decision Making; Controlling Information Systems; Managing International Information Systems.

IS411 **Advanced Database** قواعد البيانات المتقدمة

Credits 3 Hours
Prerequisites IS212
Contents Data and database administration: Transaction processing; Using a database management system from an application development environment; Use of database management systems in an enterprise system context; Data / information architecture; Data security management. Basic data security principles. Data

security implementation: Data quality management. Data quality audits. Data quality improvement: Business intelligence. On-line analytic processing. Data warehousing.

IS412 **Distributed and Object Databases** قواعد البيانات الموزعة والشيئية

Credits 3 Hours
Prerequisites IS212
Contents Levels of distribution transparency. Distributed database design, mapping users' transactions to distributed level. Optimization of accesses strategies. The management of distributed transactions. Distributed concurrence control, recovery in distributed database. Distributed database administration. Commercial systems. The SDD 1 system. Object-databases.

IS413 **Web Information Systems** نظم المعلومات الشبكية

Credits 3 Hours
Prerequisites IS201, IT371
Contents Expertise and skills in web technologies. Professional web publishing and web-application development. Server side and client side scripting languages. Using the web technology to manage and maintain information systems. Concepts of the distributed database and developing its web interface. Web master administration.

IS414 **Data Mining and Business Intelligence** استخلاص البيانات وذكاء الأعمال

Credits 3 Hours
Prerequisites IS201
Contents Main concepts and algorithms to data mining. Data warehouses/data marts. Online analytic processing. Data, text, web mining. Applied studies on problems in financial engineering, e-commerce, geo-sciences, bioinformatics and elsewhere. Reporting systems; Business analytics; Organizational decision making, functions, and levels: Executive, managerial, and operational levels; Systems to support organizational functions and decision making. Information visualization: Visual analytics; Dashboards.

IS415 **Database Administration** إدارة قواعد البيانات

Credits 3 Hours
Prerequisites IS212
Contents Different DBA job roles (VP of DBA, developer DBA, production DBA). The changing job role of the DBA. Environment management (network, CPU, disk and RAM). Instance management (managing SGA regions). DBMS table and index management. Instance Architecture. The three security methods (VPD, Grant security/role-based security, grant execute). Creating New Database Users. Auditing User activity. Identifying System and Object Privileges. Granting and Revoking Privileges. Creating and Modifying Roles. Displaying user security Information from the Data Dictionary. Object management. Database maintenance.

IS416 **Transaction Processing** معالجة المعاملات

Credits 3 Hours
Prerequisites IS212

Contents Overview of transaction processing systems and their implementation for applications such as airline reservations, banking, and inventory control. Evolution and history of transaction processing systems. Fault tolerance, processing monitors and their implementation. Lock managers, recovery managers, file management and access paths, and disaster recovery and data replication. Understanding replication including single-master and multi-master replication.

IS417 **Multimedia Databases** قواعد بيانات الوسائط المتعددة

Credits 3 Hours
Prerequisites IS212, CS241
Contents Types of multimedia information; multimedia database applications; characteristics of multimedia objects; components of a multimedia database management system; Multimedia storage and retrieval; Multimedia object storage; file retrieval structures; disk scheduling and server admission; Multimedia information modeling; Metadata for multimedia; multimedia data access; Object-oriented models temporal models, spatial models and multimedia authoring; Querying multimedia databases; Query processing and query languages; multimedia database architecture.

IS441 **Quality Assurance of Information Systems** ضمان جودة نظم المعلومات

Credits 3 Hours
Prerequisites IS201
Contents Quality Assurance in designing information systems. Data quality in information systems. Quality Assurance in Designing the Supply Chain Network. Supply Chain Performance, Metrics, and Quality Attributes. Optimization and Uncertainty of Supply Chain Network. Demand Uncertainty: Forecasting. Managing Uncertainty in the Supply Chain (Safety Inventory). Decision-Support Systems for Supply Chain.

IS442 **IS Application Development** تطوير تطبيقات نظم المعلومات

Credits 3 Hours
Prerequisites IS212, IS413
Contents Database access. Development approaches: Object-oriented; Procedural; Declarative; Rapid application; Structured. Application integration. Prototyping. Development of various applications in information systems.

IS451 **Social Information Systems** نظم المعلومات الاجتماعية

Credits 3 Hours
Prerequisites IS413
Contents Identifying the major social and technical elements of an online community, drawing on relevant social science theories. Analysis of online communities' technology and social support needed to make these social interactions successful. Understanding specific social network design choices and their implications on the community. Guiding an on-line community through the startup phase and the selection and configuration of new social and technical features and activities. Current research in analysis and security of social networks.

IT311 **Network Security** أمن الشبكات

Credits 3 Hours
Prerequisites IT351
Contents Fundamentals of cryptography. Applications of cryptography to networks. Secret-key algorithms; Public-key algorithms; Authentication protocols; Digital Signatures; VPN applications. Network security protocols, Network attack scenarios (DOS, Intrusion, Repudiation, Malicious SW…etc). Firewalls. Intrusion detection. Wired, wireless and mobile network security.

IT331 **Network Management** إدارة الشبكات

Credits 3 Hours
Prerequisites IT351
Contents Management models FCAPS & OAMP. Management layers, Manager/agents, MIB, OID, management communication patterns, polling, event based management. Management protocols SNMP, netflow, netconfig. CLI, Management metrics, SLA. Labs experiment.

IT411 **Information Assurance and Security** ضمان المعلومات وحمايتها

Credits 3 Hours
Prerequisites IT351
Contents Threats to information systems. Technology-based safeguards. Human-based safeguards. Information systems security planning and management. Identification and authentication, authorization rules. Different encryption and decryption techniques, different types of ciphers, characteristics of good ciphers, crypt analysis, public–key system, single–key system and data encryption standards. Computer virus protection, privacy and data protection, designing of secure system, models of security, database security, reliability and integrity, sensitive data.

IT431 **Wireless and Mobile Computing** الحوسبة اللاسلكية والمحمولة

Credits 3 Hours
Prerequisites IT251
Contents Overview of the history, evolution, and compatibility of wireless standards. The special problems of wireless and mobile computing. Wireless local area networks and satellite-based networks. Mobile Internet protocol. Mobile aware adaptation. Extending the client-server model to accommodate mobility. Mobile data access: server data dissemination and client cache management. The software packages to support mobile and wireless computing. The role of middleware and support tools. Performance issues. Emerging technologies.

IT432 **Network Programming** برمجة الشبكات

Credits 3 Hours
Prerequisites IT351
Contents Programming aspects of computer networks. Computer networks and communication protocols, socket programming, inter-process communication, and development of network software.

IT433 **Network Forensics** الأدلة الشرعية في الشبكات

Credits 3 Hours
Prerequisites IT351
Contents Fundamentals of computer and network forensics, forensic duplication and

analysis, network surveillance, intrusion detection and response, incident response, anonymity and pseudonymity, cyber law, computer security policies and guidelines, court report writing and presentation, and case studies.

IT441 **Enterprise Architecture** المعمارية التكنولوجية للشركات

Credits 3 Hours
Prerequisites IT351
Contents Design, selection, implementation and management of enterprise IT solutions. Applications and infrastructure and their fit with the business. Frameworks and strategies for infrastructure management, system administration, data/information architecture, content management, distributed computing, middleware, legacy system integration, system consolidation, software selection, total cost of ownership calculation, IT investment analysis, and emerging technologies. Managing risk and security within audit and compliance standards.

IT451 **Network Analysis and Design** تحليل وتصميم الشبكات

Credits 3 Hours
Prerequisites IT351, MATH202
Contents Introduction to the design and performance analysis of local computer networks. Emphasis is on performance analysis of representative multi-access procedures.

IT452 **Networked Embedded Systems** الأنظمة المدمجة الشبكية

Credits 3 Hours
Prerequisites IT351
Contents Why networked embedded systems. Example networked embedded systems: automobiles, factory automation systems. The OSI reference model. Types of network fabrics. Network performance analysis. Basic principles of the Internet protocol. Internet-enabled embedded systems.

IT471 **E-commerce** التجارة الإلكترونية

Credits 3 Hours
Prerequisites IT371
Contents Electronic commerce economics, business models, value chain analysis, technology architectures for electronic business, supply chain management, consumer behavior within electronic environments, legal and ethical issues, information privacy and security, transborder data flows, information accuracy and error handling, disaster planning and recovery, solution planning, implementation and rollout, site design, Internet standards and methods, design of solutions for the Internet, intranets, and extranets, EDI, payment systems, support for inbound and outbound logistics.

IT482 **Human Computer Interaction** تفاعل الإنسان والحاسب

Credits 3 Hours
Prerequisites CS341
Contents Foundations of human-computer interaction: Motivation; contexts for HCI; human centered development and evaluation; human performance models; human performance models; accommodating human diversity; principles of good design and good designers; engineering tradeoffs; introduction to usability testing.

Human-centered software evaluation: Setting goals for evaluation; evaluation without users; evaluation with users.
Human-centered software development: Approaches, characteristics, and overview of process; functionality and usability; specifying interaction and presentation; prototyping techniques and tools.
Graphical user-interface design: Choosing interaction styles and interaction techniques; HCI aspects of common widgets; HCI aspects of screen design; handling human failure; beyond simple screen design; multi-modal interaction; 3D interaction and virtual reality.
Graphical user-interface programming: Dialogue independence and levels of analysis; widget classes; event management and user interaction; geometry management; GUI builders and UI programming environments; cross-platform design.
HCI aspects of multimedia systems: Categorization and architectures of information; information retrieval and human performance; HCI design of multimedia information systems; speech recognition and natural language processing; information appliances and mobile computing.
HCI aspects of collaboration and communication: Groupware to support specialized tasks; asynchronous group communication; synchronous group communication; online communities; software characters and intelligent agents.

CE421 **Advanced Computer Architecture** معمارية الحاسب المتقدمة

Credits 3 Hours
Prerequisites CE221
Contents Single-threaded execution, traditional microprocessors, DLP, ILP, TLP, memory wall, Parallel architecture and performance issues, Shared memory multiprocessors, Synchronization, small-scale symmetric multiprocessors on a snoopy bus, cache coherence on snoopy buses, Scalable multiprocessors, Directory-based cache coherence, Interconnection network, Memory consistency models, Software distributed shared memory, multithreading in hardware, Chip multiprocessing, Current research and future trends.

CE422 **Embedded Systems** الأنظمة المدمجة

Credits 3 Hours
Prerequisites CE221
Contents Nature of embedded systems, particular problems, special issues; role in information technology; embedded microcontrollers, embedded software; real time systems, problems of timing and scheduling; testing and performance issues, reliability; low power computing, energy sources, leakage; design methodologies, software tool support for development of such systems; problems of maintenance and upgrade.

CE422 **Embedded Systems** الأنظمة المدمجة

Credits 3 Hours

Prerequisites CE221
Contents Nature of embedded systems, particular problems, special issues; role in information technology; embedded microcontrollers, embedded software; real time systems, problems of timing and scheduling; testing and performance issues, reliability; low power computing, energy sources, leakage; design methodologies, software tool support for development of such systems; problems of maintenance and upgrade.

SE301 **Software Engineering** هندسة البرمجيات
Credits 3 Hours
Prerequisites CS211
Contents Software processes: Software life-cycle and process models; process assessment models; software process metrics. Software requirements and specifications. Software design: Fundamental design concepts and principles; software architecture; structured design; object-oriented analysis and design; component-level design; design for reuse. Software validation: Validation planning; testing fundamentals; unit, integration, validation, and system testing; object-oriented testing; inspections. Software evolution: Software maintenance; characteristics of maintainable software; reengineering; legacy systems; software reuse. Software project management. Component-based computing: Fundamentals; basic techniques; applications; architecture of component-based systems; component-oriented design; event handling; middleware.

SE422 **Software Quality Assurance and Testing** ضمان جودة البرمجيات واختبارها
Credits 3 Hours
Prerequisites CS391
Contents Quality: how to assure it and verify it, and the need for a culture of quality − Avoidance of errors and other quality problems − Inspections and reviews − Testing, verification and validation techniques − Process assurance vs. Product assurance − Quality process standards − Product and process assurance − Problem analysis and reporting − Statistical approaches to quality control.

SE331 **Software Design & Architecture Testing** تصميم ومعمارية البرمجيات
Credits 3 Hours
Prerequisites SE301
Contents An in-depth look at software design. Continuation of the study of design patterns , frameworks, and architectures. Survey of current middleware

architectures. Design of distributed systems using middleware. Component based design. Measurement theory and appropriate use of metrics in design. Designing for qualities such as performance, safety, security, reusability, reliability, etc. Measuring internal qualities and complexity of software. Evaluation and evolution of designs. Basics of software evolution, reengineering, and reverse engineering.

بناء البرمجيات

SE332 **Software Construction**

Credits 3 Hours
Prerequisites SE331
Contents General principles and techniques for disciplined low-level software design. BNF and basic theory of grammars and parsing. Use of parser generators. Basics of language and protocol design. Formal languages. State-transition and table-based software design. Formal methods for software construction. Techniques for handling concurrency and inter-process communication. Techniques for designing numerical software. Tools for model-driven construction. Introduction to Middleware. Hot-spot analysis and performance tuning.

تحليل متطلبات البرمجيات

SE321 **Software Requirements Analysis**

Credits 3 Hours
Prerequisites SE3٠1
Contents Domain engineering. Techniques for discovering and eliciting requirements. Languages and models for representing requirements. Analysis and validation techniques, including need, goal, and use case analysis. Requirements in the context of system engineering. Specifying and measuring external qualities: performance, reliability, availability, safety, security, etc. Specifying and analyzing requirements for various types of systems: embedded systems, consumer systems, web-based systems, business systems, systems for scientists and other engineers. Resolving feature interactions. Requirements documentation standards. Traceability. Human factors. Requirements in the context of agile processes. Requirements management: Handling requirements changes.

ادرة مشروعات البرمجيات

SE411 **Software Project Management**

Credits 3 Hours

Prerequisites SE422, SE321

Contents Project planning, cost estimation, and scheduling. Project management tools. Factors influencing productivity and success. Productivity metrics. Analysis of options and risks. Planning for change. Management of expectations. Release and configuration management. Software process standards and process implementation. Software contracts and intellectual property. Approaches to maintenance and long-term software development. Case studies of real industrial projects.

هندسة تطبيقات الويب

SE411 **Web Applications Engineering**

Credits 3 Hours

Prerequisites SE301, CS141

Contents Web Engineering introduces a structured methodology utilized in software engineering to Web development projects. The course addresses the concepts, methods, technologies, and techniques of developing Web sites that collect, organize and expose information resources. Topics covered include requirements engineering for Web applications, design methods and technologies, interface design, usability of web applications, accessibility, testing, metrics, operation and maintenance of Web applications, security, and project management. Specific technologies covered in this course include client-side (XHTML, JavaScript, and CSS) and server-side (Perl and PHP).

الطرق الرشيقة لهندسة البرمجيات

SE333 **Agile Methods**

Credits 3 Hours

Prerequisites SE332

Contents The Agile Methods course will address what agile methods are, how they are implemented (correctly), and their impact on software engineering. A variety of agile methods will be described, but the focus will be on Scrum and Extreme Programming. Issues associated with planning and controlling agile projects, along with the implications of empowered teams on the customer supplier dynamic, will give a fuller picture of how the agile practices are realized. The course will conclude with a discussion of some of the issues facing organizations adopting agile methods.

تطوير البرمجيات مفتوحة المصدر

SE311 **Open Source Software Development**

Credits 3 Hours
Prerequisites SE331
Contents This course provides an overview of the historical and modern context and operation of free and open source software (FOSS) communities and associated software projects. The practical objective of the course is to teach students how they can begin to participate in a FOSS project in order to contribute to and improve aspects of the software that they feel are wrong. Students will learn some important FOSS tools and techniques for contributing to projects and how to set up their own FOSS projects.

نظم و برمجيات الوقت الحقيقى

SE322 **Real-Time Software and Systems**

Credits 3 Hours
Prerequisites SE331
Contents This course provides a comprehensive view of real-time systems with theory, techniques and methods for the practitioner. After successfully completing this course, the student will be able to identify and understand timing issues in system development and propose approaches or solutions to address basic problems in real-time computing. It is the goal of this course to motivate and prepare students to pursue more in-depth study of specific problems in real time computing and systems development.

	SE412
Mobile Software Design	SE431

SE412	**Estimating Software Development. & Maintenance Projects**	تقدير تكاليف تطوير وصيانة مشاريع البرمجيات
Credits	3 Hours	
Prerequisites	SE321	
Contents	The objective of the course is to teach participants how to develop estimates for software development and maintenance projects, how to communicate them to others and how to include them in a contract. Although the orientation is basically quantitative, the course will delve into the cognitive biases and the administrative behaviors that afflict the estimation process. The course will also address the use of parametric models and counting methods.	

SE431	**Mobile Software Design**	تصميم برمجيات الشبكات المتنقلة
Credits	3 Hours	
Prerequisites	SE331, IT351	
Contents	Introduction to principles of software engineering for mobile devices and best practices, including code reviews, source control, and unit tests. Topics include Ajax, encapsulation, event handling, HTTP, memory management, MVC, object-oriented design, and user experience. Languages include HTML5, JavaScript, Objective-C, and PHP. Projects include mobile web apps and native IOS apps.	

SE433	**Global Software Development**	تطوير البرمجيات العالمية
Credits	3 Hours	
Prerequisites	IT351, SE331	
Contents	This course covers a set of topics that are essential to both professionals who will become participants and leaders in globally-distributed projects, as well as researchers interested in studying virtual teams, distributed organizations, and global software development. Software development is increasingly a globally-distributed undertaking. The search for talent across national boundaries and the integration of groups thrown together by mergers and acquisitions are but two of the many forces conspiring to fundamentally change the organizational context of software development. The skills that allow developers and managers to thrive in this milieu are among the most important in today's development organizations.	

SE432 **Embedded Systems Software Design** تصميم برمجيات الشبكات المتنقلة

Credits 3 Hours

Prerequisites CS 423

Contents This course provides an introduction to advanced systems software engineering: the first part covers advanced operating-system-level aspects in scheduling, memory management, and communication; the second part focuses on higher-level aspects such as real-time programming languages, coordination languages, models for real-time and embedded systems and methods for their verification.

CS381	**Software Development and Professional Practice**	تطوير البرمجيات والممارسة المهنية
Credits	3 Hours	
Prerequisites	CS211, CS391	
Contents	Event-driven programming – Foundations of human-computer interaction – Using APIs – Building a graphical user interface – Graphic systems – Professional issues of software processes including software requirements and specifications; Software design; Software validation; Software evolution – Software project management – Methods and tools of analysis – Professional and ethical responsibilities – Risks and liabilities of computer-based systems.	

IS221	**Project Management**	إدارة المشروعات
Credits	2 Hours	
Prerequisites	IT101	
Contents	Managing the system life cycle: requirements determination, design, implementation; system and database integration issues; network management; project tracking, metrics, and system performance evaluation; managing expectations of managers, clients, team members, and others; determining skill requirements and staffing; cost-effectiveness analysis; reporting and presentation techniques; management of behavioral and technical aspects of the project; change management. Software tools for project tracking and monitoring. Team collaboration techniques and tools.	

CS481	**Capstone Project I**	مشروع التخرج ١
Credits	3 Hours	
Prerequisites	CS381, IS221	
Contents	Computer Science Capstone Project I course will provide coverage of some of the material from the body of knowledge, such as: Foundations of human-computer interaction – Graphical user-interface design – Graphical user-interface programming – Software design – Using APIs – Software tools and environments – Software processes – Software requirements and specifications – Software validation – Software evolution – Software project management – Team management – Communications skills. The focus of the course must remain on the project, which gives students the chance to reinforce through practice the concepts they have learned earlier in a more theoretical way.	

CS482	**Capstone Project II**	مشروع التخرج ٢
Credits	3 Hours	
Prerequisites	CS481	
Contents	Computer Science Capstone Project II course gives the student more practical and professional skills in developing a project.	

IS451	**Capstone Project I**	مشروع التخرج ١
Credits	3 Hours	
Prerequisites	CS381, IS221	
Contents	Information Systems Capstone Project I course will provide coverage of some of the	

material from the body of knowledge, such as: Foundations of human-computer interaction – Graphical user-interface design – Graphical user-interface programming – Software design – Using APIs – Software tools and environments – Software processes – Software requirements and specifications – Software validation – Software evolution – Software project management – Team management – Communications skills.
The focus of the course must remain on the project, which gives students the chance to reinforce through practice the concepts they have learned earlier in a more theoretical way.

IS452 **Capstone Project II** مشروع التخرج ٢

Credits 3 Hours
Prerequisites IS451
Contents Information Systems Capstone Project II course gives the student more practical and professional skills in developing a project.

IT461 **Capstone Project I** مشروع التخرج ١

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

IT462 **Capstone Project II** مشروع التخرج ٢

Credits 3 Hours
Prerequisites IT461
Contents Information Technology Capstone Project II course gives the student more practical and professional skills in developing a project.

SE431 **Capstone Project I** مشروع التخرج ١

Credits 3 Hours
Prerequisites CS381, IS221
Contents Software Engendering Capstone Project I course will provide coverage of some of the material from the body of knowledge, such as: Foundations of human-computer interaction – Graphical user-interface design – Graphical user-interface programming – Software design – Using APIs – Software tools and environments – Software processes – Software requirements and specifications – Software validation – Software evolution – Software project management – Team management – Communications skills.
The focus of the course must remain on the project, which gives students the chance to reinforce through practice the concepts they have learned earlier in a more

theoretical way.

SE432	**Capstone Project II**	مشروع التخرج ٢
Credits	3 Hours	
Prerequisites	SE431	
Contents	Software Engendering Capstone Project II course gives the student more practical and professional skills in developing a project.	

References

[1]. **Computing Curricula 2005**, *The Association for Computing Machinery* (ACM), *The Association for Information Systems* (AIS) and *The Computer Society* (IEEE-CS)

[2]. **Computing Curricula 2001 - Computer Science**, *IEEE Computer Society* and *Association for Computing Machinery* (ACM).

[3]. **Computer Science Curriculum 2008: An Interim Revision of CS 2001**, *Association for Computing Machinery* (ACM) and *IEEE Computer Society*.

[4]. **IS 2002: Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems**, *Association for Computing Machinery* (ACM), *Association for Information Systems* (AIS) and *Association of Information Technology Professionals* (AITP).

[5]. **IS 2010: Curriculum Guidelines for Undergraduate Degree Programs in Information Systems**, *Association for Computing Machinery* (ACM) and *Association for Information Systems* (AIS).

[6]. **Information Technology 2008: Curriculum Guidelines for Undergraduate Degree Programs in Information Technology**, *Association for Computing Machinery* (ACM) and *IEEE Computer Society*.

[7]. **Software Engineering 2004: Curriculum Guidelines for Undergraduate Degree Programs in Software Engineering**, *IEEE Computer Society* and *Association for Computing Machinery* (ACM).

[8]. **Computer Engineering 2004: Curriculum Guidelines for Undergraduate Degree Programs in Computer Engineering**, *IEEE Computer Society* and *Association for Computing Machinery* (ACM).