### Introduction

The College of Computer and Information Sciences at Majmaah University was established based on government's interest in the field of Information Technology and a response to the rapid developments taking place in the world. This college is expected to have a positive and bright face in the higher education sector in the Kingdom, and to be an environment to supply different industrial sectors with scientific and practical qualifiers and specialists with up to date development and technical progress at the global level. Since the development of nations is measured by the level of scientific, practical, and technological development of their youth taking into consideration the compatibility with scientific revolution globally, the establishment of Computer and Information Technology College at Majmaah University is to catch up with the rapid global development especially in the computer and information technology domain.

### Vision and mission of Majmaah University

The **vision** of Majmaah University is to construct a high-quality academic environment in order to envision a competitive future for her graduates in a way promoting the achievement of sustainable development.

The **mission** of Majmaah University is to provide advanced educational as well as research services using a competitive academic system based on professional responsibility and effective community partnership.

### Mission and mission of the College of Computer and Information Sciences

**The vision of the College of Computer and Information Sciences** at Majmaah University is to be one of the leading colleges in computer and information sciences that seeking the national and international academic accreditation, and compatible with rapid changes in this field and the need of the labor market.

The **mission of College of Computer and Information Sciences** at Majmaah University is to offer distinguished educational services based on modern developments in computer science and information technology, and prepare highly qualified and competitive graduates enter and engage into labor market successfully.

### **Core Values**

All activities of the College are guided by the following core values, which are following the university core values:

- Mastery & Quality;
- Teamwork;

- Originality;
- Creativity;
- Justice; and
- Initiative

### **Strategic Objectives**

- 1. Serving the educational procedures in the Kingdom by preparing graduates specialized in computer science and technology.
- 2. Provide recognized educational environment that help students to obtain the knowledge in the modern classroom and laboratories.
- 3. Provide linking between the theoretical topics in the computer science and technology and practical applications and projects.
- 4. Develop study plans and curricula that satisfy the changing needs of labor market and its requirements.
- 5. Develop the personal, technical, and leadership skills of the students.
- 6. Provide students with knowledge of the latest technologies in the field of the computer science and technology.
- 7. Support research process and postgraduate study in the faculty in order to maintain quality assurance in the educational process and academic accreditation for the department's programs in the college.
- 8. Provide learning facilities and research resources through the library and the database of scientific journals and manuscripts.
- 9. Obtaining the academic accreditation (nationally and internationally) for all programs in the college.
- 10. Direct the research to help the local society and motivate students to participate in the research.

### **Qualities of the College Graduates**

The objectives of bachelor programs in the College are to support the mission of the College of Computer and Information Sciences and Majmaah University and to produce graduates who have the flowing qualities:

• Teamwork

Function effectively in a multi-disciplinary/multi-cultural team as both a leader and a member. Understand the different roles and issues within a team.

### • Innovation and design

Discover innovative strategies to solve real world problems. Apply creative ideas to design and produce efficient and effective solutions using these strategies.

### • Informed

Have a sound knowledge of Computer and Information Sciences and understand its current issues, locally and internationally. Know how to

apply this knowledge. Understand how this area of study has developed and how it relates to other areas.

### • Independent learners

Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend own knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.

### • Problem solvers

Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough and innovative and aim for high standards.

### • Effective communicators

Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings.

• Responsible

Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.

### **Student Learning Outcomes**

Students learning outcomes are considered as statements that describe what students are expected to know and be able to do by the time of graduation. The students learning outcomes are related to the skills, knowledge, and behaviors that students should obtain during their enrolment in the college academic programs.

The College of Computer and Information Sciences has adopted ACM and ABET students learning outcomes as general learning outcomes which should be included in the learning outcomes of all bachelor programs offered by the College, in addition to any other outcomes identified by the department for achievement of its educational objectives. Following are the nine ABET outcomes (i.e. a-i):

- a) An ability to apply knowledge of computing and mathematics appropriate to the discipline
- b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
- c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
- d) An ability to function effectively on teams to accomplish a common goal
- e) An understanding of professional, ethical, legal, security and social issues and responsibilities
- f) An ability to communicate effectively with a range of audiences
- g) An ability to analyze the local and global impact of computing on individuals, organizations, and society

- h) Recognition of the need for and an ability to engage in continuing professional development
- i) An ability to use current techniques, skills, and tools necessary for computing practice

### **College Departments and Degree Programs**

The College consists of the following four departments:

- Department of Computer Science
- Department of Computer and Network Engineering
- Department of Information Technology
- Department of Information Systems

### **Graduation Requirements for Bachelor's Degree Programs**

College departments offer programs that are leading to Bachelor of Science Degree (B.Sc.) with specific tracks as flowing:

- Computer Science (Software Engineering)
- Computer Science (*Network Security*)
- Computer Engineering (Computer Networks)
- Computer Engineering (*Embedded Systems*)
- Information Technology (Networks and Systems Administration)
- Information Technology (Web and Multimedia Applications)
- Information Systems (Information Security)
- Information Systems (Data Knowledge Management)

The Bachelor's programs in the college are based on a strong background in mathematics and basics computer and information sciences. The students cannot enroll into programs before successfully finishing a preparatory year (29 credit hours) with a GAP above 3 out of 5. All programs include 12 credit hours of the university requirements in Islamic Studies, Arabia Language, and general elective courses. The programs include 42 credit hours of the College requirements. Each department has its own core requirements and special track requirements (refer respective department in this guide for more details). Each student is also required to complete one summer training in industry under the supervision of a faculty member. The Typical study period is five years (10 semesters), including the preparatory year.

### **General Requirements Applied to All College Program**

### Admission

Conditions for admitting a student to the College of Computer and Information Sciences are as follows:

- 1. The student must have obtained a recent Secondary School Certificate (not earlier than five years), or its equivalent.
- 2. The student must be of Saudi nationality. Non-Saudis are treated in accordance with Majmaah University regulations.
- 3. The student must have good behavior and conduct.
- 4. The student must be physically fit and in a good health.
- 5. Admission is based on a combination of the student score in the General Certificate of Secondary Education (GCSE), known as THANAWIA, and scores in two standard national exams organized and administered by the "National Center for Assessment in Higher Education" (QIYAS). These two Exams are:
  - General Aptitude Test, known as QUDRAT.
  - Scientific Track Admission Test, known as TAHSEEL.
- 6. Students who have an initial acceptance to the college before the foundation year must maintain a GPA not less than 3.75 / 5 in order to be eligible to continue in the college.

For the time being, the acceptance of the students into the College of Computer and Information Sciences is based on a weighed score composed of the three above mentioned Exams as follows:

Weighed Score = 0.3 \* THANAWIA + 0.4 \* QUDRAT + 0.3\* TAHSEEL

### Transfer from Other Universities

The student may transfer from other institutions or universities into College of Science and information at Majmaah University after meeting the following conditions:

- 1. The student should have studied at a recognized university inside or outside the Kingdom of Saudi Arabia.
- 2. The student should have earned the secondary school certificate / scientific section, or its equivalent from inside or outside the Kingdom of Saudi Arabia.
- 3. The student must have a record of good conduct.
- 4. The student must be physically fit and healthy.
- 5. The student must successfully pass the interview.
- 6. The student should have a minimum overall general grate of GPA equivalent to 3.5 out of 5 from his/her current institution or university.
- 7. The student has not been dismissed from transferring university due to disciplinary or educational reasons.

- 8. The number of completed credits/hours required to study at Majmaah University should be no less than 60% of the credits/hours required for obtaining the Bachelor Degree at the College of Science and Information at Majmaah University.
- 9. The student must satisfy any other conditions deemed by the Majmaah University or the College of Science and Information at the time of application.
- 10. The transfer student maintains all credits for completed courses at his/her pervious institution or university and have been accepted through equivalence procedures by the college council in his/her academic record but they do not count in the overall GPA.

Transfer of student within Majmaah University

The student may transfer from one college at Majmaah University to one of the majors at College of Science and Information after obtaining the permission of the two college deans. The transfer student must meet the following conditions:

- 1. The student should have earned the secondary school certificate / scientific section, or its equivalent from inside or outside the Kingdom of Saudi Arabia.
- 2. The student must successfully pass the personal interview.
- 3. The student must satisfy any other conditions deemed by the university or the college at the time of transfer.
- 4. The student should have an overall GPA of 3.5 or above. The student should have an overall GPA of 3.5 or above in the foundation year.
- 5. The transfer student maintains the previous credits, grades, and GPA for completed courses at his/her previous major in his/her academic record.

## Transfer of student within the College of Computer and Information Sciences

The student may transfer from one major to another major inside the college after obtaining the acceptance of Department in which student is transferred to and the acceptance of the College of Science and Information Council. The transfer student maintains the previous credits, grades, and GPA for completed courses at his/her previous major in his/her academic record.

### Visiting students

Students wanting to study courses at the College of Science and information at Majmaah University must complete the following:

- 1. Acceptance letter from college council which the student belongs to.
- 2. The student should have studied at a recognized university inside or outside the Kingdom of Saudi Arabia.
- 3. The student should have an overall GPA of 3.5 or above from his/her current institution or university.
- 4. The student must have a record of good conduct.

### Study Load and Courses

- The maximum study load is 19 credit hours per regular semester and 9 credit hours in the summer semester.
- The minimum allowable load is 12 credit hours per regular semester.
- The registered credit hours are decided according to the following:
  - A student having a cumulative average of 2.75 or more may register for up to 19 credit hours.
  - A student who has a cumulative average of less than 2.75 may register for up to 16 credit hours.
  - As an exception, a student who is expected to graduate may register for up to 24 credit hours, if his cumulative average is equal to or more than 3.75.

### Add and Drop

- A student, on the approval of his academic advisor, may add one course or more up to the end of the first week of the semester.
- A student, on the approval of his academic advisor, may drop one course or more up to the end of the fourth week of the semester.
- A student can withdraw from the whole semester up to the tenth week of each semester.
- In some exceptional cases and upon recommendation of the Academic Advisor and approval of the Vice Dean of the College (Academic Affairs), a student may withdraw from one or more courses. Approval for withdrawal may be granted on condition that the student has a minimum number of 12 registered credit hours after the withdrawal.
- The process of registration for students should be done with consulting of academic advisor, and the student is responsible for any deficiencies or errors that occur as a result of his ignorance in the instructions.
- The registration process should be done by the student himself.
- The student is considered as suspended in case he has not registered within the regular registration period.
- In case of electronic registration, the student's schedule should be adopted by the student's academic advisor during the period of add/drop courses. Otherwise, the student is considered as suspended at the end of the second week of the semester.

### Attendance, Absences, and Warnings

Absences are counted from the first day of the semester. The student must regularly attend all lectures and practical lessons. The student will not be allowed to participate in the final examinations if his percentage of attendance is less than (75%) of the lectures and practical lessons allotted for the course.

The student who is deprived of attending the final examination will fail that course and have grade DN.

The student will receive an academic warning if his accumulative average is less than (2.00) and he will be dismissed from the university if he receives three consecutive warnings.

The College Council can lift the depriving of attending the final examination from the student if:

- He/she presents an excuse or reason accepted by the College Council,
- The percentage of attendance is not less than (50%) of the lectures and practical lessons allotted for the course.

### Dismissal from the University

The student is subject to dismissal from university in the following cases:

- 1. If the student receives a maximum of three consecutive academic warnings due to his low accumulative average (less than 2).
- 2. Based on the recommendation of the College Council, the University Council may give the student who can raise his accumulative average to 2.00 or above a fourth chance.
- 3. If the student does not finish the graduation requirements within a maximum of one and a half the duration allotted for his/her graduation, the University Council may give the student an additional chance to finish the graduation requirements within a maximum of double the duration allotted for graduation.
- 4. Upon exceptional conditions, the University Council may give the students to whom sections 2 or 3 applied an exceptional chance not more than two semesters.

### Leave of Absence

Student is allowed to apologize for not continuing study in any semester without being considered a failure if he/she submit the excuse in a period not exceeding five weeks prior to the beginning of the final examination, and the college council has accepted his/her excuse. The duration of absence is counted within the duration required for fulfilling the requirements of graduation. The duration of absence should not be more than two consecutive semesters or three non-consecutive semesters throughout the stay of the student in the university, otherwise, the student record will be closed.

The student can withdraw from one course or more during the semester based on rules and regulation of the university.

If the duration of absence is one semester without any request from the student, the student record will be closed, and the University Council can close his/her record before that.

A visiting student will not be considered as absent during the semesters that he/she studies at different university as visitor.

### **Study Postponement and Suspension**

The student is allowed to apply for postponement before the end of the first week of the semester if he/she presents an excuse acceptable by the dean of the college. The postponement duration should not exceed two consecutive semesters or a maximum of three inconsecutive semesters throughout his/her stay in the university. The postponement duration is not counted within the duration required for fulfilling the requirements of graduation.

### Withdrawal from University

The student can completely withdraw from the university if he/ she finishes the clearance procedures, and returns the student I.D. card. The student must bring his identity documents to restore his file.

### **Evaluation**

- The student evaluation procedure should be in conformity with the teaching policies of the University, and in line with the nature of the course. The instructor of the course should hold periodic tests. In addition, a mid-term test is usually given in the 7th week of the main semester and the 4th week of the summer semester during the class periods. A final test should also be held during the last week of each semester in accordance with the schedule issued by the Admission and Registration Deanship of the University.
- Any student who fails to attend the final test without an acceptable excuse is assigned a grade "Fail". However, any student who is absent from the test for a valid reason may submit his case to the Departmental Council to decide whether or not he would be given the grade of "Incomplete" (IC). The student who is given an IC grade has to complete the requirements of the course during the following semester; otherwise his grade is automatically changed into the grade of "Fail" (F).

• An honors degree is granted to the student who attains a cumulative average of 4.5 or more, at the time of graduation, provided that he has not failed in any course taken at the University.

### **Grade Distribution**

The full marks for every course are100, which are typically distributed as follows:

- 20 Marks for Midterm Exam
- 40 Marks for Final Exam that covers the entire course contents.
- 40 Marks for Semester work such as: verbal and written tests, reports or research work or additional studies, experimental lab, and weekly or monthly homework.

Instructors could alter this distribution given that the grade of the Final Exam does not exceed 60% of the total course grades.

### Examination

The overall marks of any course is calculated as following

- 1. 60 marks out of 100 for student work during the semester that includes at least one written midterm and one or more of the following choices
  - Written midterm
  - Quizzes
  - Oral exams
  - Projects
  - Presentations
  - Class Activities
  - Laboratory work
  - Research
- 2. 40 marks for the final examination that designated during the last week of each semester of the academic year.

### **Examination Procedures**

The final and midterm examination procedures are as follows:

- 1. Course instructor must prepare his examinations in strict secrecy and confidentiality.
- 2. Course instructor is responsible for printing his examination.
- 3. Supervisors and observers are required to be present at the examination hall twenty minutes prior to the examination start time.
- 4. Supervisor is responsible for management of the examination hall.
- 5. The student shall not attend more than two examinations within the same day.

- 6. The student is not permitted to enter the examination room more than half an hour after the examination session begins.
- 7. The student is not permitted to leave the examination room before half an hour from the initial start of the examination.
- 8. Students shall have their Identity Cards in the examination hall.
- 9. students must mark their attendance on the attendance sheet by indicating their name, university ID number, and signature.
- 10. Absolute silence shall be maintained in the examination hall.
- 11. The absence from final examination will result in a mark of zero.
- 12. If the absence from the final examination is because of an excuse approved by the College Council, the student may have make up examination within a period not exceeding the end of the following semester.
- 13. Laptops, programmable calculators, mathematical tables, books, and extra blank sheets are not allowed to be used during the exam without the permission of course instructor.
- 14. Mobile phones are not allowed in the examination room.
- 15. Students shall handover the answer sheets personally to the supervisor /observer or remain on their seats until collecting of answer sheet at the end of the examination.
- 16. Cheating or violating the rules and regulations of the final examination are violations that entail disciplinary action based upon the disciplinary system issued by the university council.
- 17. The supervisor of examination hall is responsible for writing reports regarding any violations and includes all related materials and submitting it to examinations unit.
- 18. The Council of the college (in necessary cases) approves re- marking answer sheets within a duration not exceeding the beginning of the following semester.
- 19. The College Council determine the duration of the final examinations based on the recommendation of the Department Council with minimum of one hour and maximum of the three hours.
- 20. The course instructor must correct the answer sheets of final examination within three business days of examination, and submit the answer sheets, copy of the examination questions and solution manual, and students' grades approved by the dean/vice dean of the college to examination unit.

### **Re-Marking Examination Answer Sheets**

Restrictions of Re-Marking Examination Answer Sheets:

- 1. The student may apply to the department that presents the course to remark his answer sheet which will be referred to the college council within a maximum of one month after the end of the final examination.
- 2. The student may not apply for a request to re-mark his answer sheet beforehand, as his request will be invalid.
- 3. The student must not apply for re-marking the answer sheets for more than one single course during one semester.

- 4. A written form is filled out including the items 1,2,3 stated above in addition to: student's name, I.D. number, course number, course code, course name, the semester, absence rate, accumulative average, warnings, instructor's name, examination date, reason(s) for re-marking request and a pledge from the student regarding the accuracy of information submitted in the form.
- 5. In case of approval, the College Council constitutes a committee including at least three staff members who will re-mark the answer sheet(s) and present a report to the college council who will give a final decision.

### **Excuse of not Attending the Examination**

The rules of acceptance or rejection student's excuse of not attending the examination in Computer and Information Sciences at Majmaah University:

- 1. The student can present his crucial excuse of not attending the midterm examination to the department chair by filling out Midterm Examination Absence Form.
- 2. The student can present his crucial excuse of not attending the final examination to the college dean by filling out Final Examination Absence Form.
- 3. The excuse must be issued by governmental medical clinic/agency.
- 4. The excuse must be submitted by the student or his official representative within one week of its occurrence. All supported document should be included with correspondence absence form.
- 5. The department council has the authority of acceptance or rejection student's excuse of not attending the midterm examination taking into consideration the recommendation of course instructor. Copy of department council decree should be sent to Dean of the college, Examination Unit, and student's academic advisor.
- 6. The college council has the authority of acceptance or rejection student's excuse of not attending the final examination taking into consideration the recommendation of course instructor, and department chairman. Copy of department council decree should be sent to Examination Unit, and student's academic advisor.
- 7. The examinations unit is responsible for announcing the names of the students whose excuse have been accepted or rejected. The unit arranges date and time of alternative exam and its mechanism in accordance with instructors and departments' chairmen in the college.

### Changing the date and time of the examination

Students can present a request to change the date/time of the examination. The dean has the authority of acceptance or rejection students' request taking into

consideration the recommendation of course instructor and department chairman.

### Grade Numerical and Symbolic Notation

Each letter grade has a numeric value represented by points. The points of each course are based on this number value and the credit hour value of that course. The following table shows the letter grades and their related points, course grade, and mark.

Grade	Points	Course Grade	Mark
A+	5.00	Excellent Plus	95 – 100
Α	4.75	Excellent	90 less than 95
B+	4.50	Very Good Plus	85 less than 90
В	4.00	Very Good	80 less than 85
C+	3.50	Good Plus	75 less than 80
С	3.00	Good	70 less than 75
D+	2.50	Pass Plus	65 less than 70
D	2.00	Pass	60 less than 65
F	1.00	Fail	Less than 60
IC		Incomplete	
IP		In process	
W		Withdrawal	
DN		Deprivation	

Courses with a grade of IC, IP,W, and DN carry no grade value. The grade of incomplete (IC) initially carries no grade value for courses that require more than one semester. The Council of the Department which is responsible for that course may allow the student to complete the requirements of any course in the following semester on the basis of a recommendation by the instructor of the course. The student then receives (IC) grade in his academic record and it is not calculated in his semester average nor in his accumulative average unless he fulfills the requirements of that course. If one academic semester passes without changing the (IC) grade in the student's record due to not fulfilling the course, the (IC) grade is replaced by (F) which is calculated in his semester average and in his accumulative average.

The grade of In Process (IP) initially carries no grade value for research courses that require more than one semester. The student then receives (IP) grade in his academic record and it is not calculated in his semester average nor in his accumulative average. If the requirement of that course is not finished within the proposed period, the Department Council which is responsible for that course may replace (IP) grade by (IC) grade.

### Semester and Accumulative Average

Accumulative average is resulted by dividing the sum of the points obtained by the student in all courses he/she studied by the total number of credit hours of these courses.

The result of dividing the sum of points obtained by the student in all the courses that he/she has studied by the number of units representing these courses.

Example:

**First Semester** 

Course	Credit hours	Grade	Points
Islam and society	2	С+	7.00
Programming 1	4	В	16.00
Calculus1	3	D	6.00
Discrete Mathematics	3	D	6.00
Technical English 1	2	С	6.00

First Semester Average:

Sum of points (7+16+6+6) = 41 Sum of credit hours (2+4+3+3+2)=14 Semester average= 38/14= 2.92

### Second Semester

Course	<b>Credit hours</b>	Grade	Points
Islamic Culture	2	А	9.00
Programming 2	4	B+	18.00
Calculus2	3	С	9.00
Physics	3	D	6.00
Technical English 2	2	С+	7.00

Second Semester Average:

Sum of points (9+18+9+6+7) = 49

Sum of credit hours (2+4+3+3+2)=14

Semester average= 49/14= 3.5

Accumulative Average:

Sum of points 49+41=90

Sum of credit hours 14+14=28

Accumulative average= 90/28= 3.21

### **Honor Rank**

The first and second honor rank are granted to students who have accumulative average from 4.75 to 5.00 and from 4.25 to less than 4.75 respectively and meet the following conditions:

- 1. The student should not fail in any course he has studied in the university or any other university.
- 2. The student should fulfill the university requirements within a maximum of the average duration expected for graduation.
- 3. The student should study at Majmaah University a minimum of (60%) of the graduation requirements.

### Graduation

The student graduates from the College of Computer Sciences and Information after successfully completing the graduation requirements, according to the degree plan, provided his cumulative GPA is not less than "Good" (2.75 out of 5.00). In case of having a graduation GPA less than 2.75, the student should repeat a number of suitable courses, determined by the concerned department, to improve his cumulative GPA to 2.75.

### **General Outlines of B.Sc. Degree**

Graduation Requirement for a Bachelor's degree in the College of Computer and Information Sciences is to complete certain number of credit hours that are dived in four categories which are:

REQUIREMENTS	CREDIT HOURS
Preparatory Year Requirements	29
University Requirements	12
College Requirements	42
Departmental Computer Science Department	59

Requirements	Computer & Network Engineering Department	64
	Information Technology Department	57
	Information Systems Department	56
Specific Departmental Track Requirements		12
	Bachelor of Science in Computer Science	155
TOTAI	Bachelor of Science in Computer Engineering	160
IUIAL	Bachelor of Science in Information Technology	153
	Bachelor of Science Information Systems	152



### **Preparatory Year Requirements**

The preparatory year (science track) requirements consist of 29 credit hours presented in the following tables:

Course Code and No.	Curse Title	Credit Hours	Prerequisites
ENG 001	Preparatory English 1	8	
MATH 001	Introduction to Mathematics 1	2	
CS 001	Computer Skills	2	
SKL 001	Learning & Communication Skills	2	

ENG 002	Preparatory English 2	6	ENG 001
ENG 003	English for Science and Engineering	2	
MATH 002	Introduction to Mathematics 2	4	MATH 001
PHY 001	General Physics	3	
	TOTAL	29	

### **University Requirements**

The University general requirements in Islamic studies, Arab language, and general courses from social sciences (12 credit hours) as indicated in the following tables:

Course No.	Course Title	Credit Hours	Note
SALM 101	Introduction to Islamic Culture	2	Student
SALM 102	Islam and Society Building	2	chooses 3
<b>SALM 103</b>	Economic System in Islam	2	courses
<b>SALM 104</b>	Fundamental of Political System is Islam	2	
<b>ARAB 101</b>	Arabic Language Skills	2	Student
<b>ARAB 103</b>	Arabic Writing	2	chooses 1
			course
HAF 101	Principles of Health and Fitness	2	
ENT 101	Business Entrepreneurship	2	
SOCI 101	Societal Issues	2	Student
LHR 101	Human Rights Systems	2	chooses 2
FCH 101	Family and Childhood	2	courses
VOW 101	Volunteering Systems	2	
ENG 101	General English	2	
TOTAL	12		

### **College Requirements**

The college requirements consist of 15 courses of a total of 42 credit hours distributed as shown in the following table:

Course Code and No.	Course Title	Credit Hours	Prerequisites
MATH 112	Calculus 1	3	
MATH 126	Calculus 2	3	MATH 112
MATH 111	Discrete Math	3	

PHYS 104	Physics 1	3	
STA 102	Probabilities and Statistics	3	
ENG 114	Technical English 1	2	
ENG 127	Technical English 2	2	ENG 114
SC 110	Computer Programming 1	4	
SC 120	Computer Programming 2	4	SC 110
SC 210	Data Structure	3	SC 120
IS 231	Database Fundamentals	3	CS 120
CS 240	Operating Systems	3	CS 210
IT 334	Project Management	3	
IT 481	Ethics and Professional Practice	2	
	Seminar	1	Finish 100 CR
TOTAL		42	

### **Departmental Requirements**

Each department has its own core requirements in addition to the specific track requirements. Refer to each department section in guide for detail departmental requirements.

### **Designations of Departments**

Each course is given 3 numerals preceded by the code of the department offering it. The following tables provide a key to these codes and numerals, used in the curriculum.

### **Designations Codes Departments in the College**

Department	Code
Computer Science	CS
Computer and Networks Engineering	CE
Information Technology	IT
Information Systems	IS

### **Designations Codes of Departments from other Majmaah University Colleges**

Department	Code
Accounting	ACC
Arabic Language	ARAB
Chemistry	CHEM
Economics	ECO
English	ENG
Finance	FIN
Islamic Studies	SALM

Management	MGT
Mathematics	MATH
Marketing	МКТ
Physics	PHYS
Statistic	STA

### **Course Numerals**

Hundred Numerals: signify the level of course offering in the program/

First Year Level (Preparatory)	000
Second Year Level	100
Third Year Level	200
Fourth Year Level	300
Fifth Year Level	400

### **Tens Numerals:**

Signify a specific body of knowledge inside the department

### **Unity Numerals**

Signify the relative order of the course within department specific body of knowledge

# **ACADEMIC PROGRAMS**

**Department of Computer Science** 

### Vision

The vision of the Computer Science Department is to provide recognized academic program that meets international standards in field of computer science in order to prepare well trained, qualified and national professionals in this field.

### **Mission Statement**

Prepare qualified national graduates with high skills and enough experience to join and engage into labor market and satisfy its needs and requirements in field of computer science by providing the graduates with latest knowledge, advanced skills, and strong moral values towards working and contributing to develop, serve, and educate the society of the kingdom of Saudi Arabia in all scientific, economic, and social fields.

### **Program Objectives**

The Computer Sciences Program is aimed to ensure that students will be able to integrate theory and practice, recognize the importance of abstraction and appreciate the value of efficient design created to meet clearly developed requirements. The program is aimed also to prepare its graduates to be able to solve problems using algorithms and techniques and to have sufficient understanding of the theoretical underpinnings of Computer science. Specifically, the main objectives are to ensure that students graduate with:

- 1. Robust problem-solving skills.
- 2. Substantial knowledge of a broad class of problem-solving techniques (e.g.; this includes Algorithms, heuristics, and design techniques).
- 3. Substantial understanding of the fundamentals of Computer Science.
- 4. Ability to clearly communicate technical concepts both orally and in writing.
- 5. Ability to readily work with other disciplines.
- 6. Appropriate, occasional innovation of our curriculum so it incorporates ever-changing Computer Science technology.

### **Student Learning Outcomes**

The learning outcomes of the computer sciences program are following the ABET recommendation for the IT academic programs learning outcomes, which are:

- 1. An ability to apply knowledge of computing and mathematics appropriate to the discipline.
- 2. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
- 3. An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.
- 4. An ability to function effectively on teams to accomplish a common goal.

- 5. An understanding of professional, ethical, legal, security, and social issues and responsibilities.
- 6. An ability to communicate effectively with a range of audiences.
- 7. An ability to analyze the local and global impact of computing on individuals, organizations and society.
- 8. Recognition of the need for, and an ability to engage in, continuing professional development.
- 9. An ability to use current techniques, skills, and tools necessary for computing practices..
- 10. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
- 11. An ability to apply design and development principles in the construction of software systems of varying complexity..
- 12. Be prepared to enter a top-ranked graduate program in Computer Science.

### Offered Degrees

The program focuses on the mathematical and theoretical foundation of computing. English will be the language for teaching specialized courses and basic sciences. Students together with some of their colleagues will participate in the implementation of a graduation project during their final year of study. Students can choose between two main tracks of computer science program: (1) Software Engineering; or (2) Networks Security.

1. Bachelor of Science in Computer Science / Software Engineering

Software engineering is a systematic, disciplined, and quantifiable approach to software development including design, implementation, and maintenance of moderately complex and robust software system. The set of mandatory and elective course, senior project and training will provide students with required skills and knowledge in the area of software engineering. Graduates of this program will earn a Bachelor of Science in Computer Science /Software Engineering.

2. Bachelor of Science in Computer Science / Networks Security

The security of computer networks is critical issue for any organization and the need for professionals in this major has been highly increasing. This major prepares students in the areas of computer security, network security, cryptography, and information assurance. The set of mandatory and elective course, senior project and training will provide students with required skills and knowledge in the area of Computer Network Security. Graduates of this program will earn a Bachelor of Science in Computer Science / Networks Security.

### **Career Opportunities**

The offered degrees from Computer Science Department at Majmaah University provide not only a strong theoretical background but also a practical experience gained through training, modern labs, and senior projects. This provides the graduates to obtain wide range opportunities in the industry as one of the following:

- Software Developer
- Software Tester
- System Programmer
- Consultant
- Network Administrator
- Database analyst
- Researcher
- Computer Security Specialist
- Information Security Manager
- Data Security Analyst
- Information Security Manager
- Network Security Specialist
- Security Administrator
- Security Architect
- Information Security Engineer

### **Program Requirements and CURRICULUM**

Units required for the B.Sc. degree in the Department of Computer Science.

REQUIREMENTS	CREDIT HOURS
Preparatory Year Requirements	29
University Requirements	12
College Requirements	42
Departmental Required Core Courses	53
Departmental Elective Courses	12
Departmental Professional Elective Courses	6
Training	1
TOTAL	155

Course Code	Course Title	Credit	Prerequisites
and No.		Hours	
PHY 125	Physics 2	3	PHY 104
MATH 205	Differential Equations	3	MATH 126
MATH107	Linear Algebra	3	MATH 112
	Science Elective	3	
CS311	Computer Organization	3	MATH 111

### Departmental Required Core Courses (58 Cr. hrs)

CS 270	Programming Languages	3	CS 210
CS 310	Computer Graphics	3	CS 120
CS 305	Algorithm Design and Analysis	3	CS 210
CS 320	Artificial Intelligence	3	MATH 111
CS 330	Compilers	3	CS 270
IT 341	Data Transmission and Computer Network	3	CS 240
CS 350	Parallel and Distributed Computing	3	
CS 360	Software Engineering	3	CS 210
MATH 254	Numerical Methods	3	MATH 205
CS 450	Information Security	3	IT 341
CS 408	Database Management Systems	3	IS 231
CS498	Graduation Project 1	2	120 Units
CS499	Graduation Project 2	3	CS 498
	TOTAL	53	

### Departmental Elective Courses (12 Cr. hrs)

The student has to choose four courses from one of the following Tracks

### "SOFTWARE ENGINEERING" Track

Course Code and No.	Course Title	Credit Hours	Prerequisites
CS 430	Design and Architecture of Large Software Systems	3	CS 360
CS 431	Low-Level Design of Software	3	CS 240
CS 432	Software Modeling and Analysis	3	CS 360
CS 433	Software Project Management	3	CS 360
CS 434	Software Evolution (Maintenance)	3	CS 360
CS 435	Software Architectures	3	CS 360
	TOTAL	12	

### " NETWORK SECURITY " Track

Course Code	rse Code Course Title		Prerequisites
and No.		Hours	
CS 440	Coding and Information Theory	3	CS 450
CS 441	Security Management	3	CS 450
CS 442	Computer Security	3	CS 450
CS 443	Formal Methods for Cryptography	3	CS 450
CS 444	Internet Security, tools & techniques	3	CS 450
CS 445	Network Management and Security	3	CS 450
	TOTAL	12	

### Departmental Professional Elective Courses (6 Cr. hrs)

The student has to choose three courses from the attached professional elective courses.

### A TYPICAL PROGRAM FOR COMPUTER SCIENCE STUDENTS

1<sup>st</sup> Year

1 <sup>st</sup> Semester 2 <sup>nd</sup> Semester					
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
ENG001	Preparatory English 1	8	ENG002	Preparatory English 2	6
MATH001	Introduction to Mathematics 1	2	ENG003	English for science and Engineering	2
CS001	Computer Skills	2	MATH002	Introduction to Mathematics 2	4
SKL001	Learning & Communication Skills	2	PHY001	General Physics	3
	TOTAL=14			TOTAL=15	

### 2<sup>nd</sup> Year

3 <sup>rd</sup> Semester		-	- cui	4 <sup>th</sup> S	emester
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
SALM	Elective Islamic Culture (1)	2	ARAB	Elective Arab Course	2
CS110	Programming 1	4	CS120	Programming 2	4
MATH112	Calculus1	3	MATH126	Calculus 2	3
MATH111	Discrete Mathematics	3	ENG127	Technical English 2	2
<b>۱PHY104</b>	Physics 1	3	<b>PHY125</b>	Physics 2	3
ENG114	Technical English 1	2	STAT102	Probability and Statistics	3
TOTAL=17				TOTAL=17	

### 3<sup>rd</sup> Year

5 <sup>th</sup> Semester 6 <sup>th</sup> Semester					
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
SALM	Elective Islamic Culture (2)	2	CS240	Operating Systems	3
CS210	Data Structure	3		Science Elective	3
MATH205	Differential Equations	3	CS312	Computer Organization	3
EE211	Fundamentals of Database	3	CS 270	Programming Languages	3
MATH107	Linear Algebra	3		Elective General Course (1)	2
CS	Elective Professional	2	SALM	Elective Islamic Culture (3)	2

Course 1			
TOTAL=16		TOTAL=17	

### 4<sup>th</sup> Year

7 <sup>th</sup> Semester 8 <sup>th</sup> Semester						
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours	
CS 310	Computer Graphics	3	CS 350	Parallel and Distributed Computing	3	
CS 305	Algorithm Design and Analysis	3	CS 360	Software Engineering	3	
CS 320	Artificial Intelligence	3	MATH 254	Numerical Methods	3	
CS 330	Compilers	3	IT481	Ethics & Professional Practice	2	
IT 341	Data Transmission and Computer Network	3	CS399	Seminar	1	
	Elective General Course (2)	2	IS334	Project Management	3	
	TOTAL=16			TOTAL=15		

### 5<sup>th</sup> Year

9 <sup>th</sup> Semester 10 <sup>th</sup> Semest					
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
CS 450	Information Security	3	CS	Track Course	3
CS	Track Course	3	CS	Track Course	3
CS	Track Course	3	CS 408	Database Management Systems	3
CS	Elective Professional Course 2	2	CS499	Graduation Project 2	3
CS498	Graduation Project 1	2	CS	Elective Professional Course 3	2
CN400	Summer Training	1			
TOTAL=14			TOTAL=14		

### **Course Description**

### PHY 125 Physics (2)

Pre-requisite: PHY104

This course will cover the following topics: The Standards of Length, Mass and Time, Dimensional analysis, and Conservation of Units. The Motion in One and Two Dimensions. The Law of Motion. The Energy and Energy Transfer. The Potential Energy. The Linear Momentum and Collisions. The Rotation of a Rigid Object About a Fixed Axis: Angular Position, Velocity, and Acceleration. Rotational Kinematics, Angular and Linear Quantities, Rotational Kinetic Energy, Calculation of Moments of Inertia, Relationship Between Torque and Angular Acceleration, Work, Power and Energy in Rotational Motion.

### **MATH 205 Differential Equations**

Pre-requisite: MATH 126

This course will cover the following topics:

manipulation of infinite and power series, as well as about representation of a function in terms of a power series. Handling real-valued functions of two and three real variables (limits, continuity, differentiability, and extrema). Calculating double and triple integrals and their applications (area, volumes, surface areas, moments, density...), mainly to physical models.

### MATH107 Linear Algebra

Pre-requisite: MATH 112

This course includes the following topics:

Matrices and Gauss Elimination: Elementary row operations, Transpose of a matrix, Inverse of a square matrix, Linear equation systems and Gauss eliminations.

Determinants: Determinants and their properties, classical adjoint matrix; Cramer's rule.

Vector spaces: Basic definitions, subspaces, linear dependence and independence, bases and dimensions, Rank of a Matrix.

Linear transformations: Basic definitions, the matrix of a transform, Kernel and Range of a linear transformation, Matrices of linear transformations, Coordinates and change of basis.

Eigenvalues and Eigenvectors: Characteristic polynomial, diagonalization of matrices, Applications involving Powers of matrices.

### **CS 312 Computer Organization**

Pre-requisite: MATH 111

### **CS 270 Programming Languages**

Pre-requisite: CS 210

This course covers the following topics:

This course describes a set of formal mathematical tools for defining and implementing the semantics of a language and demonstrates them in the context of important real-world programming languages, with emphasis on theoretical properties of type systems.

### **CS 310 Computer Graphics**

Pre-requisite: CS 120

This course covers the following topics:

This course covers fundamental principles and algorithms underlying computer graphics. Major topics include: graphics models, graphics programming, input and interaction, geometric objects, geometric transformations, viewing shading, From vertices to fragments, discrete techniques, programmable shaders, modeling, curves, surfaces, and advanced rendering.

### CS 305 Algorithm Design and Analysis

Pre-requisite: CS 210

This course covers the following topics:

This course provides techniques to prove the correctness and to analyze the running time of the basic algorithms for those classic problems in various domains; to apply the algorithms and design techniques to solve problems; and to analyze the complexities of various problems in different domains.

### CS 320 Artificial Intelligence

Pre-requisite: MATH 111

This course covers the following topics:

Artificial intelligence (AI) is a research field that studies how to realize the intelligent human behaviors on a computer. The ultimate goal of AI is to make a computer that can learn, plan, and solve problems autonomously. The main research topics in AI include: problem solving, reasoning, planning, natural language understanding, computer vision, automatic programming, and machine learning, and so on.

### **CS 330 Compilers**

Pre-requisite: CS 270

This course covers the following topics:

In this course students will develop a deeper understanding of modern compiler techniques applied to general-purpose programming languages. It will give students a working knowledge of the foundations, tools, and engineering approaches used in developing formal language translators.

### IT 341Data Transmission & Computer Networks

### Pre-requisite CS 240

Introduction to computer networks, Network architecture, OSI reference model, Transmission media, Transmission Impairments, Data encoding; Data Link: Error Detection, Medium Access control Protocols and standards, MAC Addressing, Link layer Switches, LAN standards & Devices: Ethernet and IEEE standards for LANs, Wireless networks; Network Layer: Virtual circuit and Datagram Networks, Router Structure, The Internet Protocol (IP), Routing Algorithms, Broadcasting and Multicasting; Transport Layer: TCP and UDP services, designs, and performance, Principles of Reliable Data Transfer; Application layer: The Web and HTTP, FTP, Electronic Mail, and DNS.

### **CS 350 Parallel Distributed Computing**

### **Pre-requisite:**

### CS 320 Software Engineering

### Pre-requisite: CS 210

This course introduces concepts and techniques relevant to the production of large software systems. Students are taught a programming method based on the recognition and description of useful abstractions. Topics include modularity, specification, data abstraction, object modeling, design patterns, and testing. Students complete several programming projects of varying size, working individually and in groups.

### **MATH 254 Numerical Methods**

Pre-requisite: MATH 205

CS 450 Information Security

Pre-requisite: IT 341

### CS 408 Database Management Systems

### Pre-requisite: IS 231

This course introduces the concepts and principles of database management systems (DBMS). It focuses on terminology and fundamental concepts of relational databases and database management systems. Students will learn SQL and PL/SQL including, triggers and transaction processing. They will understand performance issues and optimization strategies through query rewriting, secondary storage characteristics, and access strategies. This course also exposes student to some of the current challenges facing database professionals (e.g. semi-structured data management, XML databases, information extraction, data integration) as well as some DBMS design and management issues.

### CS 498 Graduation Project 1

Pre-requisite: Completion of 120 credit units

This course will cover the following topics:

The student should take a B.Sc. project in related area to his specialization and with technical merit. This project is for two semesters, it is counted as two credits for the first semester and three credits for the second semester. At the end of the semester the student submits a report describing his project and the parts he completed in the first semester and proposed parts in the 2nd semester. The projects are oriented toward providing experience in the establishment of objectives, criteria, analysis, construction, testing, and evaluation; solution of open-ended problems; design methodology.

### CS 499 Graduation Project 2

### Pre-requisite: CN 498

This course will cover the following topics:

The student should take a B.Sc. project in related area to his specialization and with technical merit. This project is for two semesters, it is counted as two credits for the first semester and three credits for the second semester. At the end of the semester the student submits a report describing his project.

The projects are oriented toward providing experience in the establishment of objectives, criteria, analysis, construction, testing, and evaluation; solution of open-ended problems; design methodology.

#### **CS 430 Design and Architecture of Large Software Systems** Pre-requisite: CS 360

This course presents principles of problem analysis and solution design as applied to the development cycle of a software system (from system requirements specifications to design, implementation, and system test). In addition, this course will explore methods for understanding and debugging existing software systems. Topics include:

Software Design: Key design principles and heuristics.

Design Patterns: history, principles and expectations..

Software Architecture: Classical architectural styles such as pipe and filter, data abstraction or OO based, event-based, etc.

Frameworks: as reusable chunks of architecture, the framework lifecycle, development using frameworks.

Major approaches to automated evaluation and analysis: dynamic analysis (testing, debugging, model inference, and visualization) and static analysis, and their application and limitations. Construction of tools to support such analysis.

### CS 431 Low-Level Design of Software

Pre-requisite: CS 240

This course is designed to teach the disciplined process of software development, from formal specification through to working systems. Topics include:

Description of the complete software system development process (the waterfall model) - requirements analysis, precise specification (informal), design,

implementation, testing and debugging, verification (informal), documentation, opportunities for team-work, working to standards.

Design - motivation, top-down step-wise refinement, solving a simpler problem first, inclusion of testing in design, possibility of software reuse, importance of simplicity and readability.

Analysis of design - dataflow diagrams, informal analysis.

Low-level design - appropriate use of constructs in the language.

Reasoning about correctness (informal). Implementation - bottom-up testing of functions, top-down implementation with stubbing.

Abstract data types and modules - identification and specification, interfaces - information hiding, component re-use, libraries.

### CS 432 Software Modeling and Analysis

Pre-requisite: CS 360

This course presents an integrated set of techniques for software analysis and design based on object-oriented concepts and the UML notation.

Topics include introduction to object concepts, fundamentals of object oriented analysis and design process, use-case analysis, object modeling using behavioral techniques, design patterns, design quality and metrics

### CS 433 Software Project Management

### Pre-requisite: CS 360

This course addresses the main issues related to software project management such as project definition, scope management, planning, organization, resources, scheduling, control, quality, cost estimation, time estimation, and, risk management. Students are also introduced to project management tools such as Work Breakdown Structure, Gantt charts, PERT, and the critical path method. Topics covered also include project management ethics, and effective project manager skills such as people and leadership skills. Students should get exposed to a software package used for this purpose.

### CS 434 Software Evolution (Maintenance)

#### Pre-requisite: CS 360

This course introduces the concept of software as an evolving and complex entity. Deliver knowledge about technical and business issues connected to legacy systems. Topics include: relationships between evolving entities, models of software evolution, working with legacy systems, program comprehension, high level reverse engineering , system and process re-engineering , program migration (technical and business), refactoring, impact analysis, and introduction to data reverse engineering

### **CS 435 Software Architectures**

### Pre-requisite: CS 360

This course introduces basic concepts and principles about software architecture. It starts with an overview of architectural structures and styles. Practical approaches and methods for creating and analyzing software architecture are presented. The emphasis is on the interaction between quality attributes and software architecture. It includes: Architectural styles and patterns, Methods for constructing and evaluating architectures Component-based development. Design patterns and object-oriented frameworks. Architecture and video games

#### **CS 440 Coding and Information Theory**

Pre-requisite: CS 450

To gain familiarity with the fundamentals of coding methods (including encryption and decryption, error detection and correction, optimal codes) and information theory (including the idea of information, channels, channel capacity, information entropy, and sampling theory). Topics include: information measures: entropy, relative entropy and mutual information, asymptotic equipartition property, entropy rates of stochastic processes, data compression, channel capacity, differential entropy and the Gaussian channel, rate distortion theory, and network information theory

### **CS 441 Security Management**

### Pre-requisite: CS 450

This course will cover a variety of topics that will prepare students who wish to develop skills in information security management. It is a survey course that will

cover a full range of information security topics, ranging from technical areas like cryptology and network security to a policy area like risk management. Technical subjects will be explored as well as other less technical topic areas where managers are required to lead an information security group and make sound business decisions surrounding information systems and security.

### **CS 442 Computer Security**

### Pre-requisite: CS 450

This very dense course will cover many facets of computer security including cryptography, network security, application security, and web security. Traditional topics such as buffer overflows, intrusion detection, packet analysis, and malware will be discussed. Topics also include privacy, incident handling, forensics and anti-forensics, legal issues, politics, and security in emerging technologies.

### CS 443 Formal Methods for Cryptography

### Pre-requisite: CS 450

The aim of this course is to facilitate understanding of the inherent strengths and limitations of cryptography, especially when used as a tool for information security. Armed with this knowledge, one should be able to make more informed decisions when building secure systems.

The course covers various aspects of symmetric and asymmetric cryptography. While some topics will be dealt with in more detail, the course will attempt to provide a broad coverage of possibly all the core areas of cryptography. The students will be expected to implement and analyze some simple cryptographic schemes and read various articles. To understand the principles of encryption algorithms; conventional and public key cryptography. To have a detailed knowledge about authentication, hash functions and application level security mechanisms.

### CS 444 Internet Security, tools & techniques

### Pre-requisite: CS 450

This course aims to introduce security issues arising primarily from computer networks. Topics include node and service authentication, address spoofing, hijacking, SYN floods, smurfing, sniffing, routing tricks, and privacy of data en route. Buffer overruns and other exploitation of software development errors. Hardening of operating systems. Intrusion detection. Firewalls. Ethics.

### CS 445 Network Management and Security

#### Pre-requisite: CS 450

Students will learn fundamentals of basic network management concepts and methods. Real-world examples will be used to illustrate concepts, protocols and methods that are fundamentals to address network management issues.

# Department of Information Systems

### Vision

To be a pioneer in providing education and research in the area of information system based on the international standards of academic quality.

### **Mission Statement**

Prepare specialized and trained cadres in the area of information systems theoretically and practically and enable them to design, analyze and develop information systems in order to meet the labor market needs and requirements based on international standards of quality, and to contribute in serving the community in related fields.

### **Program Objectives**

The educational objectives of the B.S. in Information Systems defines the skills, knowledge and attributes that will be needed and achieved by the graduates for successful career and professional accomplishments. The main objectives are:

- 1. Provide students with the basic scientific and applied skills in the field of information systems through academic study and practical training.
- 2. Develop the skills of cooperative and self-education, and enabling the student with interpersonal and communication skills and teamwork.
- 3. Developing human resources to meet the needs of the nation and the labor market in the field of information systems.

### **Student Learning Outcomes**

The learning outcomes of the information systems program is following the ABET recommendation of the IS academic programs learning outcomes, which are:

- 1. An ability to apply knowledge of computing and mathematics appropriate to the discipline.
- 2. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
- 3. An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
- 4. An ability to function effectively on teams to accomplish a common goal.
- 5. An understanding of professional, ethical, legal security, and social issues and responsibilities.
- 6. An ability to communicate effectively with a range of audiences.
- 7. An ability to analyze the local and global impact of computing on individuals, organizations, and society.
- 8. Recognition of the need for and an ability to engage in continuing professional development.
- 9. An ability to use current techniques, skills, and tools necessary for computing practice.
- 10. An understanding of processes that support the delivery and management of information systems within a specific application environment.

### **Offered Degrees**

The program reflects important organizational functions such as financial resource management and human resource management and emerges for management of information technology and information resources. The curriculum of the bachelor of Information Systems requires five academic years. English will be the language for teaching specialized courses and basic sciences. Students together with some of their colleagues will participate in the implementation of a graduation project during their final year of study. Students can choose between two main tracks of information systems program: (1) Information Security; or (2) Data Knowledge Management.

1. Bachelor of Science in Information Systems / Information Security

The Bachelor of Science in information security is structured to provide students with security expertise within the context of a broad education. A solid education in security requires not only a strong focus in systems implementation in particular (e.g., need for robust implementation and software validation), but must also incorporate some aspects of engineering and technology management. Security experts should be able to develop the best security solution possible, actual implementations of the design phase. At Majmaah University, graduates of this program will earn a Bachelor of Science in Information Systems / Information Security.

2. Bachelor of Science in Information Systems / Database and Knowledge Management

Database and knowledge management is critical issue for any organization in order to build high performance teams and to maintain a high performance systems. At Majmaah University, graduates of this program will earn a Bachelor of Science in Information Systems / Database and Knowledge Management

### **Career Opportunities**

The offered degrees from Information Systems Department at Majmaah University provide not only a strong theoretical background but also a practical experience gained through training, modern labs, and senior projects. This provides the graduates to obtain wide range opportunities in the industry as one of the following:

- System Programmer
- Systems Analyst
- System Administrator
- Systems Developer
- Systems Consultant
- Systems Analysts and Designer
- Database Analyst
- Data Analyst
- Database Designer
- Database Manager
- database administrator
- Researcher
- Information Security Specialist
- Information Security Manager
- Data Security Analyst

# **Program Requirements and CURRICULUM**

Units required for the B.Sc. degree in the Department of Information Systems.

REQUIREMENTS	CREDIT HOURS
Preparatory Year Requirements	29
University Requirements	12
College Requirements	42
Departmental Required Core Courses	50
Departmental Elective Courses	12
Departmental Professional Elective Courses	6
Training	1
TOTAL	152

# Departmental Required Core Courses (50 Cr. hrs)

<b>Course Code</b>	Course Title	Credit	Prerequisites
and No.		Hours	
BUS101	Introduction to Business Administration	3	
IS211	Fundamentals of Information Systems	3	
IS232	Database Management Systems	3	IS 231
IS241	Systems Analysis & Design	3	CS 210
ACC101	Accounting Fundamentals	3	
IT341	Data Transmission & Computer Networks	3	CS 240
IS314	Software Requirements Engineering	3	IS 241
IS324	Decision Support Systems	3	STAT 102 IS 223
MKT110	Introduction to Marketing	3	BUS 101
IS332	Information Systems Applications Development	3	IS 241 IS 232
IS 343	Information Security	3	IT 341
IS 390	Electronic Business	3	IT 341 IS 231
ECO212	Introduction to Finance	3	
IS 443	Enterprise Resource Planning	3	IS 231
IS 452	Knowledge-Based Systems	3	IS 324
IS 498	Graduation Project 1	2	120 Units
IS 499	Graduation Project 2	3	IS 498
	TOTAL	50	

# Departmental Elective Courses (12 Cr. hrs)

The student has to choose four courses from one of the following Tracks

Course Code	Course Title	Credit	Prerequisites
and No.		Hours	
IS 432	Network Security	3	IS 231
IS 438	Information Systems Governance	3	IS 231
			IS 223
IS 435	Development of Secure Applications	3	IS 232
IS 481	<b>Risk Management and Evaluation</b>	3	IS 231
IS 485	Selected Topics in Information Security	3	IS 452
	TOTAL	12	

# **Information Security'' Track**

#### Data and Knowledge Management Track

Course Code and No.	Course Title	Credit Hours	Prerequisites
IS 424	Data Warehouse	3	IS 424
IS 441	Data Mining & Knowledge Discovery	3	IS 441
IS 463	Database Management Systems Lab	3	IS 463
IS 466	Semi-Structure Data	3	IS 466
IS 473	Selected Topics in Data and Knowledge Management	3	IS 473
	TOTAL	12	

# Departmental Professional Elective Courses (6 Cr. hrs)

The student has to choose three courses from the attached professional elective courses.

# A TYPICAL PROGRAM FOR INFORMATION SYSTEMS STUDENTS

1 <sup>st</sup> Year	
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1 <sup>st</sup> Semester	1 <sup>st</sup> Semester 2 <sup>nd</sup> Semester					
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours	
ENG001	Preparatory English 1	8	ENG002	Preparatory English 2	6	
MATH001	Introduction to Mathematics 1	2	ENG003	English for science and Engineering	2	
CS001	Computer Skills	2	MATH002	Introduction to Mathematics 2	4	
SKL001	Learning & Communication Skills	2	PHY001	General Physics	3	
	TOTAL=14			TOTAL=15		

# 2<sup>nd</sup> Year

3 <sup>rd</sup> Semester		-	I Cui	4 <sup>th</sup> S	emester
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
SALM	Elective Islamic Culture (1)	2	ARAB	Arab	2
CS110	Programming 1	4	CS120	Programming 2	4
MATH112	Calculus1	3	MATH126	Calculus 2	3
MATH111	Discrete Mathematics	3	ENG127	Technical English 2	2
<b>۱PHY104</b>	Physics 1	3		Elective General Course	2
ENG114	Technical English 1	2	IS211	Fundamentals of Information Systems	3
	TOTAL=17			TOTAL=16	

3<sup>rd</sup> Year

5 <sup>th</sup> Semester				6 <sup>th</sup> 5	Semester
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
	Elective Islamic Culture (2)	2	BUS101	Introduction to Business Administration	3
CS 210	Data Structure	3	CS240	Operating Systems	3
IS	Elective Professional Course 1	2	IS232	Database Management Systems	3
IS 231	Fundamental of Database	3	IS241	Systems Analysis & Design	3

STAT 102	Probability and Statistics	3	MKT110	Introduction to Marketing	3
ACC 101	Accounting Fundamentals	3			
	TOTAL=16			TOTAL= 15	

# 4<sup>th</sup> Year

7 <sup>th</sup> Semester 8 <sup>th</sup> Semester					
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
IT481	Ethics & Professional Practice	2	FIN 212	Introduction to Finance	3
IT 341	Data Transmission & Computer Networks	3	IS 334	Project Management	2
IS 314	Software Requirements Engineering	3	IS 399	Seminar	1
IS 324	Decision Support Systems	3	343 IS	Information Security	3
IS 332	Information Systems Applications Development	3	IS390	Electronic Business	3
	Elective General Course	2	IS443	Enterprise Resource Planning	3
	TOTAL=16			TOTAL=16	

5<sup>th</sup> Year

5 Tear					
9 <sup>th</sup> Semester				10 <sup>th</sup> S	Semester
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
IS	Elective Professional Course 2	2	SALM	Elective Islamic Culture (3)	2
IS	Track Course	3	IS	Track Course	3
IS452	Knowledge-Based Systems	3	IS	Track Course	3
IS	Track Course	3	IS499	Graduation Project 2	3
IS498	Graduation Project 1	2	IS	Elective Professional Course 3	2
IS400	Summer Training	1			
	TOTAL=14			TOTAL=13	

## **Course Description**

#### **BUS 101Introduction to Business Administration**

#### Pre-requisite: N/A

This course aims to develop the administrative skills of students, and to provide them with basic knowledge in the management science. It focuses on teaching the functions of management (planning, organizing, directing and control), and teaching the functions of the organization (human resources, marketing, financing and operations)

# **IS 211 Fundamentals of Information Systems**

#### Pre-requisite: N/A

This course introduces students to the fundamentals of information systems. Topics include: Definition of Information Systems, Enterprise-wide computing and networking, and E-Business. Conceptual foundations; The decision-making process, Concepts of information, Information system requirements, and the strategic role of information systems. Ethical issues related to the use of information systems will also be covered

#### **IS 232Database Management Information Systems**

#### Pre-requisite IS 231

This course covers the following topics: DBMS architecture and administration; centralized and client-server approaches, system catalog, and data dictionary, transaction management; concepts, characteristics, and processing, recovery techniques, concurrency control techniques: serializability, deadlock, locking schemes, time-stamp ordering, multi-version, and optimistic techniques, DB security, distributed databases, distributed DBMS, data fragmentation and replication, and distributed transactions management.

# IS 241 Systems Analysis And Design

#### Pre-requisite CS 210

This course is concerned with the fundamental knowledge, methods and skills needed to analyse, design and implement computer-based systems. It addresses the role of the systems analyst, and the techniques and technologies used. The structured software development life cycle approach, modelling techniques (e.g., Entity-Relationship Models) and development phases are comprehensively discussed and reviewed. In modelling techniques, process models (e.g., Data Flow Diagrams), information models, system architecture models, and object oriented models are thoroughly described.

# **ACC 101Accounting Fundamentals**

#### Pre-requisite: N/A

The course aims at providing an understanding of accounting by focusing on the accounting system and principles and practices of financial accounting and preparing of financial reports in merchandising and services proprietorships, in addition, the course introduces the principles of financial reports analysis.

## IT 341Data Transmission & Computer Networks

## Pre-requisite CS 240

Introduction to computer networks, Network architecture, OSI reference model, Transmission media, Transmission Impairments, Data encoding; Data Link: Error Detection, Medium Access control Protocols and standards, MAC Addressing, Link layer Switches, LAN standards & Devices: Ethernet and IEEE standards for LANs, Wireless networks; Network Layer: Virtual circuit and Datagram Networks, Router Structure, The Internet Protocol (IP), Routing Algorithms, Broadcasting and Multicasting; Transport Layer: TCP and UDP services, designs, and performance, Principles of Reliable Data Transfer; Application layer: The Web and HTTP, FTP, Electronic Mail, and DNS.

# **IS 314 Software Requirements Engineering**

# Pre-requisite IS 241

This course covers requirements engineering in depth including the requirements engineering process, elicitation of requirements, functional and non-functional requirements, system services and constraints, quality of requirements, requirements traceability matrix, metrics for non-functional requirements, and software requirements specifications.

# **IS 324 Decision Support Systems**

## Pre-requisite IS 231, and IS 223

The Decision Support System (DSS) is a system consists of a number of mechanisms to operate the Data to support the managers when making decisions based on computerized methods; and it provides them with suggestions and solutions to the multi parameters problems.

Therefore, the decision support systems(DSS) course will give students an overview of the importance of the DSS in both public and private sectors; and this course's focus is on the capabilities of the computerized DSS to support the decision making operations.

Also, it identifies the nature and sources of data, data collection and data problems. Then, it identifies the classification of models, decision analysis of a few alternatives, optimization and Mathematical Programming.

# **MKT 110 Introduction to Marketing**

# Pre-requisite: BUS 101

A survey of marketing activities in business and non-profit organizations. The course explains marketing principles, concepts, and activities in domestic and international markets and how these activities are affected by the cultural, social, economic, competitive, technological, and legal environments surrounding marketers. It also explains the role played by the marketing function in achieving organizational objectives and in sustaining the national economy. Discussion includes planning, implementation, and control of marketing programs using the four marketing mix elements: product, price, place, and promotion.

#### **IS 332 Information Systems Applications Development**

# Pre-requisite: IS 241, and IS 232

This course is intended to provide students with the chance to develop smallsized information systems using the most current systems analysis and design tools and methodologies; and application development and user interface environments. Projects should reflect real-life problems and be developed as small team projects.

# **IS 343 Information Security**

#### Pre-requisite: IT 341

Security fundamentals, policies, procedures, and mechanisms. Identification, authentication models, access control models. Data models, concepts and mechanisms for software, hardware, operating system and database security. Basic cryptography (symmetric and asymmetric) and its applications. Security in computer networks and distributed systems. Attacks types and how to prevent them. Prevention and control of viruses and other rogue programs. In addition, the basics of physical security, incidence response, disaster recovery, business continuity, and forensics.

# **IS 390 Electronic Business**

#### Pre-requisite : IT 341, and IS 231

Difference between e-business and e-commerce; e-commerce types: B2B, B2C, and, C2C; e-marketplaces; e-retailing, online advertising, e-procurement, exchanges, and portals; e-supply chains and collaborative commerce; mobile commerce and pervasive computing; auctions; e-commerce security; electronic payment systems, order fulfillment, and other support services; e-business strategy, launching a successful online business; legal, ethical, and social impacts of e-business; building e-commerce applications and infrastructure; egovernment, e-learning, and other e-business applications; local and global implications of e-business

# **ECO 212 Introduction to Finance**

#### Pre-requisite: ACC 101

The objective of this course is to provide students with the essential principles of finance. The main topics covered in this course include: financial environment, financial statements, taxes and cash flow, interest rates and time value of money, financial reports and their analysis, and risk and return.

# **IS 443Enterprise Resources Planning**

#### Pre-requisite: IS 231

The course will cover the following topics: cost analysis, support of information services, personnel issues; recruitment, orientation, training, career planning, human factors and performance, how to break-ice with facility management and security issues, introduce standards and procedures of the information centre. The course also will cover the management of the enterprise's resources and data processing security. Also, it covers the management of systems

implementation and application's installation strategies. Moreover, it will cover the system documentation, training, and supporting the users, maintaining information systems. Types of maintenance. Data processing aspects. Software project sizing and cost estimation.

#### IS 452 knowledge-Based Systems

#### Pre-requisite: IS 324

This course introduces students to the basic concepts in knowledge-based systems and provides practical experience through project work. The standard architecture for knowledge-based system design will be provided. The topics covered include: knowledge representation and problem solving; knowledge acquisition and machine learning; knowledge level modeling, expert systems lifecycles. One of them is the expert system which is concerned with represented knowledge to perform tasks and utilizes reasoning methods to derive appropriate new knowledge and it is usually restricted to a specific problem domain The course will also show how to incorporate real-world knowledge into the systems they design.

#### IS 498 Graduation project 1

#### Pre-requisite: 120 credits

The student should take a B.Sc. project in related area to his specialization and with technical merit. This project is for two semesters, it is counted as two credits for the first semester and three credits for the second semester. At the end of the semester the student submits a report describing his project. The projects are oriented toward providing experience in the establishment of objectives, criteria, analysis, construction, testing, and evaluation; solution of open-ended problems; design methodology.

# **IS 499 Graduation project 2**

#### Pre-requisite: IS 498

The student should take a B.Sc. project in related area to his specialization and with technical merit. This project is for two semesters, it is counted as two credits for the first semester and three credits for the second semester. At the end of the semester the student submits a report describing his project. The projects are oriented toward providing experience in the establishment of objectives, criteria, analysis, construction, testing, and evaluation; solution of open-ended problems; design methodology.

#### **IS 432 Network Security**

#### Pre-requisite: IS 231, and IT 341

The course will cover the concepts of the network security and its rules and levels to the access control. It also presents the principles, polices, and responsibilities of the Networks security. Moreover, this course will cover the encryption system for public keys and signatures: like Email and Web Pages protections. It also reviews the strength and weakness points of the networks, the basic skills of access control, Intrusion Detection, privacy, and other Security Tools; like the firewall which protects the networks from the unauthorized access.

#### **IS 438 Information Systems Governance**

#### Pre-requisite: IS 390

The term "Governance" specifies the ability of an organization to be able to control and regulate its own operation so as to avoid conflicts of interest related to the division between beneficiaries (shareholders) and people involved in the company. IS Governance refers to the management of the Information Systems set up by a company to achieve its objectives.

This course show to students how information and information systems relate in the total enterprise for business strategy and success in the marketplace, then addresses the role of corporate governance and the role of IS in this area. This course uses business data analysis and develops a problem solving approach to IT strategy and governance. Students will use knowledge of business practice, and IS to uncover, explore and then resolve business problems and develop an understanding of their application

# **IS 435 Development of Secure Applications**

#### Pre-requisite: IS 343, and IS 332

The application layer is becoming more and more important. Many applications are developed in-house, thus security becomes dependent on developers and development methodology.

Not even the most sophisticated firewalls and security features can maintain the security of applications that have security holes and vulnerabilities. An attacker can exploit vulnerabilities to get in thought a "back door" without being authenticated and often gain full access rights.

Development of Secure Applications course is a practical and theoretical course in the development of secure software, providing students the knowledge on how to avoid security holes when designing and developing applications.

# IS 481 Risk Management and Evaluation

#### Pre-requisite: IS 314and IS 334

The risk management and evaluation course looks at risk from different perspectives and analyses the possibilities for managing it in each situation. It focuses primarily on operational, project, and reputation risk management. It shows the students the importance of risk management. Also, it covers the awareness of risk as we currently live in a less stable economic and political environment.

Finally, the main purpose of this risk management course is to provide students with a solid understanding of business risk and how to manage it.

# **IS 485 Selected Topics in Information Security**

Pre-requisite: IS 343

This course focuses on current and selected research topics in Information security. It is a challenge to assure security in information systems. The course is structured as a research seminar where the lecturer is responsible to update the content of the course to the recent Information Security topics and students will present research papers to their peers. Topics may include personal information attacks, searches on encrypted data, broadcast encryption, private information retrieval, covert channels and anonymous communication, information hiding, among others.

## IS 424 Data Warehouse

#### Pre-requisite: IS231

This course provides an introduction to data warehouse design .This course cover the basic issues involved in planning, designing, and building, populating, and maintaining a data warehouse. Tasks include business modeling, entity relationship diagramming using STAR techniques, dimensional and physical modeling, and warehouse meta data management. Also, students will study to how to use methods and tools for accessing and analysing warehouse data, and hence able to do the implementation and organizational issues surrounding a data warehouse project.

# IS 441 Data Mining & Knowledge Discovery

#### Pre-requisite: IS231, and IS 223

Data mining is concerned with the extraction of novel knowledge from large amounts of data. This course introduces and studies the concepts, issues, tasks and techniques of data mining. The data mining is a powerful new technology with great potential to help companies focus on the most important information in their data warehouses. Topics include data preparation and feature selection, association rules, classification, clustering, evaluation and validation, scalability, and data mining applications.

#### IS 463 Database Management Systems Lab

#### Pre-requisite: IS232

This course covers the following topics: Selection of DBMS, Architecture of the chosen DBMS, DB creation, Indexing, Integrity Constraints triggers and assertions, Security management, Installation issues, Performance Management, Tuning, DB Backups, and Recovery issues. Other features of the DBMS: Integration with web technologies, DB connectivity tools, Data distribution, fragmentation, and replication issues, Management issues of the DBA activity.

#### IS 466 Semi-Structure Data

#### Pre-requisite: IS231

This course will cover the Semi-Structured Data and its use in Web based applications. Semi-structured data focuses on describing and querying data that comes in a format less tightly structured than that found in relational databases. Such data is dominant on the Web, from HTML pages and weblog feeds; and it is a key component of Web based applications from Web sites to Web Services. The course also will cover the Web based applications in order to give students a good foundation in the variety of architectures and design patterns used to build interoperable Web based programs.

# IS 473 Selected Topics in Data and Knowledge Management

#### Pre-requisite: IS452

This course focuses on current and selected research topics in Data and Knowledge Management. The course is structured as a research seminar where the lecturer is responsible to update the content of the course to the recent Data and Knowledge Management topics and students will present research papers to their peers. Topics may include Data sources and collection ways, Data quality, Multimedia and object-oriented databases, Document management, Knowledge representation, Knowledge integration, Knowledge services.

# Department of Information Technology

# Vision

The vision of the information Technology Department is to provide recognized education and creative research to be pioneer in the field of information technology.

# **Mission Statement**

Presenting set of courses that adopting the required variety in information technology and how to apply and develop it in order to meet the labor market needs and requirements.

# **Program Objectives**

The educational objectives of the B.S. in Information Technology program define the skills, knowledge and attributes that will be needed and achieved by the graduates for a successful career and professional accomplishments three to four years after graduation. The program will produce graduates who:

- 1. Have a technical and basic business education with an appropriate combination of theoretical knowledge and practical skills, which will enable them to enter into and advance in the profession of information technology, management information systems, and business administration.
- 2. Possess the necessary foundation to continue their formal education and obtain advanced degrees in information technology, management information systems, business administration or other related fields.
- 3. Can engage effectively in oral, written, and graphical communications and are comfortable in both interpersonal and public settings.
- 4. Have the knowledge and skills that enable them to participate in life-long learning and to adapt to an ever-changing, global technological and business environment.
- 5. Have a well-rounded education that enables them to conduct themselves as responsible professionals and global citizens, who are aware of ethical issues and societal needs and problems.

# **Student Learning Outcomes**

The learning outcomes of the information technology program is following the ABET recommendation for the IT academic programs learning outcomes, which are:

- 1. An ability to apply knowledge of computing and mathematics appropriate to the discipline.
- 2. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
- 3. An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
- 4. An ability to function effectively on teams to accomplish a common goal.
- 5. An understanding of professional, ethical, legal, security, and social issues and responsibilities.

- 6. An ability to communicate effectively with a range of audiences.
- 7. An ability to analyze the local and global impact of computing on individuals, organizations, and society.
- 8. Recognition of the need for and an ability to engage in continuing professional development.
- 9. An ability to use current techniques, skills, and tools necessary for computing practice.
- 10. An ability to use and apply current technical concepts and practices in the core information technologies.
- 11. An ability to identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computerbased systems.
- 12. An ability to effectively integrate IT-based solutions into the user environment
- 13. An understanding of best practices and standards and their application.
- 14. An ability to assist in the creation of an effective project plan.

# **Offered Degrees**

The program of Information Technology is concerned with preparing graduates who can meet the needs of the users within the organization through the selection, application design, integration, and administration of computing technologies. The curriculum of the bachelor of information technology requires five academic years. English will be the language for teaching specialized courses and basic sciences. Students together with some of their colleagues will participate in the implementation of a graduation project during their final year of study. Students can choose between two main tracks of information technology program: (1) Networks and Systems Administration; or (2) Web and Multimedia Applications.

1. Bachelor of Science in Information Technology /Network and Systems Administration

The Network and Systems Administration program develops the knowledge and skills of the students to perform management, administration, development, implementation, and design of different networks and systems. At Majmaah University, graduates of this program will earn a Bachelor of Information Technology /Network and Systems Administration.

2. Bachelor of Science in Information Technology /Web and Multimedia Application

The Web and Multimedia Application program prepares students for developing ,designing, maintaining, and managing web and multimedia applications through set of mandatory and elective courses course, senior project and training in this domain. At Majmaah University, graduates of this program will earn a Bachelor of Science in Information Technology /Web and Multimedia Application

# **Career Opportunities**

The offered degrees from Information Technology Department at Majmaah University provide not only a strong theoretical background but also a practical experience gained through training, modern labs, and senior projects. This provides the graduates to obtain wide range opportunities in the industry as one of the following:

- Systems Analyst
- System Administrator
- Systems Developer
- Systems Consultant
- Systems Integrator
- Systems Designers
- Network Administrator
- Database analyst
- Researcher
- Internet and Web Developer
- Web Designer
- Database Administrator
- Interface Specialist

# **Program Requirements and CURRICULUM**

Units required for the B.Sc. degree in the Department of Information Technology.

REQUIREMENTS	CREDIT HOURS
Preparatory Year Requirements	29
University Requirements	12
College Requirements	42
Departmental Required Core Courses	51
Departmental Elective Courses	12
Departmental Professional Elective Courses	6
Training	1
TOTAL	153

# Departmental Required Core Courses (51 Cr. hrs)

Course Code and No.	Course Title	Credit Hours	Prerequisites
MATH107	Linear Algebra	3	MATH 112
CS101	Information Management	3	-
IT200	Information Technology Fundamentals	3	
CS311	Computer Organization	3	MATH 111
IT311	Database Lab	2	IS 231
IS241	Systems Analysis & Design	3	CS 210
CS360	Software Engineering	3	CS 210
IT210	Visual Programming	3	CS 120

IT321	Multimedia & Web Design	3	IS 231
IT331	Human Computer Interactions	3	CS 210 IT 210
IT332	Systems Integration	3	CS 360
IT333	Intelligent Systems	3	CS 210
IT341	Data Transmission & Computer Networks	3	IS 240
IT432	Systems Administration and Maintenance	3	CS 360
IT342	Computer Networks Lab	2	IT 341
IS445	Information Security	3	IT 341
IT498	Graduation Project 1	2	120 Units
IT499	Graduation Project 2	3	IT 498
	TOTAL	51	

# Departmental Elective Courses (12 Cr. hrs)

The student has to choose four courses from one of the following Tracks

		lucii	
Course Code and No.	Course Title	Credit Hours	Prerequisites
IT421	Information Administration and Storage Technology	3	IS 231
IT 422	Infrastructure Environment and Network Servers	3	IT 341
IT 423	Database Management Systems	3	IS 231
IT 424	Global Information Management	3	IS 334
IT 425	Enterprise Architecture and Systems Design	3	CS 360
IT 426	Mobile & Wireless Networks	3	IT 341
IT 427	Concepts of Multimedia Processing & Transmission	3	IT 321 IT 341
IT 428	Selected Topics in Networks	3	>100
IT 429	Selected Topics in System Administration	3	>100
	TOTAL	12	

# "NETWORKS AND SYSTEMS ADMINISTRATION " Track

# "WEB AND MULTIMEDIA APPLICATIONS" Track

Course Code and No.	Course Title	Credit Hours	Prerequisites
IT423	Database Management Systems	3	IS 231
IT 451	Web Site Management	3	IS 334 IT 341
IT 452	Web Development Using Content Management Systems	3	IT 321
IT 453	Digital Technology Applications	3	IT 321 IT 341
IT 454	Information Visualization	3	IT 201 IT 331
IT 455	Advanced Web Applications Development	3	IT 321
IT 456	Mobile Applications	3	IT 321

IT 446	Selected Topics in Web Technologies	3	>100
IT 447	Selected Topics in Multimedia	3	>100
	TOTAL	12	

# Departmental Professional Elective Courses (6 Cr. hrs)

The student has to choose three courses from the attached professional elective courses

# A TYPICAL PROGRAM FOR INFORMATION TECHNOLOGY STUDENTS

1 <sup>st</sup> ]	Year
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1 <sup>st</sup> Semester	1 <sup>st</sup> Semester 2 <sup>nd</sup> Semester				
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
ENG001	Preparatory English 1	8	ENG002	Preparatory English 2	6
MATH001	Introduction to Mathematics 1	2	ENG003	English for science and Engineering	2
CS001	Computer Skills	2	MATH002	Introduction to Mathematics 2	4
SKL001	Learning & Communication Skills	2	PHY001	General Physics	3
TOTAL=14				TOTAL=15	

# 2<sup>nd</sup> Year

3 <sup>rd</sup> Semester		-	i cui	4 <sup>th</sup> 5	Semester
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
SALM	Elective Islamic Culture (1)	2	ARAB	Arab	2
CS110	Programming 1	4	CS120	<b>Programming 2</b>	4
MATH112	Calculus1	3	MATH126	Calculus 2	3
MATH111	Discrete Mathematics	3	ENG127	Technical English 2	2
۱PHY104	Physics 1	3	IT200	Information Technology Fundamentals	3
ENG114	Technical English 1	2	STAT102	Probability and Statistics	3
TOTAL=17				TOTAL=17	

3<sup>rd</sup> Year

5 <sup>th</sup> Semester	•			6 <sup>th</sup> S	Semester
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
	Elective Islamic Culture (2)	2	IT301	Information Management	3
CS 210	Data Structure	3	CS240	Operating Systems	3
IS	Elective Professional Course 1	2	CS312	Computer organization	3
IS 231	Fundamental of Database	3	IT311	Database Lab	2

MATH 107	Linear Algebra	3	CS360	Software Engineering	3
IT210	Visual Programming	3		Elective General Course 1	2
	TOTAL=16			TOTAL=16	

# 4<sup>th</sup> Year

7 <sup>th</sup> Semester	7 <sup>th</sup> Semester 8 <sup>th</sup> Semester				
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
	Elective General Course 2	2	IS241	Systems Analysis & Design	3
IT321	Multimedia & Web Design	3	IS 334	Project Management	3
IT 331	Human Computer Interactions	3	IT 432	Systems Administration and Maintenance	3
IT 332	Systems Integration	3	IT 342	Computer Networks Lab	2
IT 341	Data Transmission & Computer Networks	3	IS 445	Information Security	3
IT 481	Ethics & Professional Practice	2	IT399	Seminar	1
TOTAL=16				TOTAL=15	

# 5<sup>th</sup> Year

9 <sup>th</sup> Semester	9 <sup>th</sup> Semester 10 <sup>th</sup> Semester				
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
IT	Elective Professional Course 2	2	SALM	Elective Islamic Culture (3)	2
IT	Track Course	3	IT	Track Course	3
IT333	Intelligent Systems	3	IT	Track Course	3
IT	Track Course	3	IT499	Graduation Project 2	3
IT498	Graduation Project 1	2	IT	Elective Professional Course 3	2
IT400	Summer Training	1			
	TOTAL=14			TOTAL=13	

# **Course Description**

# MATH107 Linear Algebra

Pre-requisite: MATH 112 This course includes the following topics: Matrices and Gauss Elimination: Elementary row operations, Transpose of a matrix, Inverse of a square matrix, Linear equation systems and Gauss eliminations. Determinants: Determinants and their properties, classical adjoint matrix; Cramer's rule. Vector spaces: Basic definitions, subspaces, linear dependence and independence, bases and dimensions, Rank of a Matrix. Linear transformations: Basic definitions, the matrix of a transform, Kernel and Range of a linear transformation, Matrices of linear transformations, Coordinates and change of basis.

Eigenvalues and Eigenvectors: Characteristic polynomial, diagonalization of matrices, Applications involving Powers of matrices.

# **CS101 Information Management**

Pre-requisite: N/A

# IT200 Information Technology Fundamentals

Pre-requisite: N/A

This course is introducing the fundamentals of Information Technology. Course coverage will include both theoretical understanding of Information technologies, and hands-on experience with applications. The course will teach the terms and concepts of information technology and explain technologies underlying all areas of IT that are needed in the world of work.

# **CS 311 Computer Organization**

#### Pre-requisite: MATH 111

This course provides students with basic knowledge in: Basic computer organization, Data representation, Integer and floating-point arithmetic, Instruction sets and instruction formats, Addressing modes, Machine and Assembly language programming, Assembler function and design, Processor organization, ALU design, Micro-programmed CPU, Datapath and control unit, Interrupts, Memory system and cache memory.

#### IT 311 Database Lab

#### Pre-requisite: IS 231

This course covers the following topics: Selection of DBMS, Architecture of the chosen DBMS, DB creation, Indexing, Integrity Constraints triggers and assertions, Security management, Installation issues, Performance Management, Tuning, DB Backups, and Recovery issues. Other features of the DBMS:

Integration with web technologies, DB connectivity tools, Data distribution, fragmentation, and replication issues, Management issues of the DBA activity.

#### IS 241 Systems Analysis & Design

#### Pre-requisite: CS 210

This course is concerned with the fundamental knowledge, methods and skills needed to analyze, design and implement computer-based systems. It addresses the role of the systems analyst, and the techniques and technologies used. The structured software development life cycle approach, modeling techniques (e.g., Entity-Relationship Models) and development phases are comprehensively discussed and reviewed. In modeling techniques, process models (e.g., Data Flow Diagrams), information models, system architecture models, and object oriented models are thoroughly described.

#### **CS360 Software Engineering**

#### Pre-requisite: CS 210

This course introduces concepts and techniques relevant to the production of large software systems. Students are taught a programming method based on the recognition and description of useful abstractions. Topics include modularity, specification, data abstraction, object modeling, design patterns, and testing. Students complete several programming projects of varying size, working individually and in groups. Topics to be covered

#### **IT210 Visual Programming**

#### Pre-requisite: CS 120

This course gives students the basis for developing visual applications. Using a selected visual programming language, the following topics are studied: Data structures review (vectors, linked lists, files). OO design and programming techniques, exception handling, modular programming, model View Control (MVC), GUI design rules, architecture, event handling, multithreading, swing components and model, networking (Client Server Model), and access to databases.

#### IT321Multimedia & Web Design

#### Pre-requisite: IS 231

This course explores advanced and modern concepts and technologies used in the development of electronic business applications. It introduces multimedia and web computer graphics. Focuses on development of web-enabled multimedia applications from practical business perspective. Introduces and discusses technological, aesthetic, and human factors.

#### **IT331Human Computer Interactions**

#### Pre-requisite: CS 210and IT 210

This course helps to build competence, knowledge, and skills in the field of Human-Computer Interaction Design. The course covers the following topics: Introduction to Human-Computer Interaction (HCI) and Human Cognitive Systems; Understanding Users; Interaction Frameworks, Paradigm and Styles; Evaluation of User Interfaces using Heuristic Evaluation and Usability Testing. The course covers also the underlying Design Principles and Designing Interaction including: Interaction Design Process, User-Centered Design and Prototyping, Conceptual and Physical Design, Interface Design Standards, Task Analysis and Discovery, Design Principles. Different Features of Interaction and User Interfaces will also be presented: Color, Interface Components (e.g. Windows, Icons, Menus, Pointers etc.), Icons, Text, Speech, Touch, Augmented Reality, and Haptics. Students participate in group projects on the design, development and evaluation of user interfaces.

#### **IT332 Systems Integration**

#### Pre-requisite: CS 360

This course focuses on the integration of information systems in organizations, the process by which different computing systems and software applications are linked together functionally or physically. It examines the methods and strategies for combining a set of interdependent systems into a unified and functioning integrated system, where two or more applications are seamlessly interacting and exchanging data. The course will demonstrate the use of tools and techniques in systems integration as well as prove practices for integration projects.

# **IT333 Intelligent Systems**

#### Pre-requisite: CS 210

This course introduces Artificial Intelligence (AI) with emphasis on its use to solve real world problems. Students will get the basic and conceptual understanding of fundamental topics of Artificial Intelligence including knowledge representation and reasoning, searching, machine learning and rule based systems. Students will be able to acknowledge AI based technologies, review the incorporation of AI techniques by companies to improve traditional business applications. An exposure to PROLOG or another AI language would be beneficial for students. On completion of this module, students should relate what they have learned to what impact AI is making to society.

# IT 341Data Transmission & Computer Networks

#### Pre-requisite CS 240

Introduction to computer networks, Network architecture, OSI reference model, Transmission media, Transmission Impairments, Data encoding; Data Link: Error Detection, Medium Access control Protocols and standards, MAC Addressing, Link layer Switches, LAN standards & Devices: Ethernet and IEEE standards for LANs, Wireless networks; Network Layer: Virtual circuit and Datagram Networks, Router Structure, The Internet Protocol (IP), Routing Algorithms, Broadcasting and Multicasting; Transport Layer: TCP and UDP services, designs, and performance, Principles of Reliable Data Transfer; Application layer: The Web and HTTP, FTP, Electronic Mail, and DNS.

#### IT432 Systems Administration and Maintenance

Pre-requisite: CS 360

This course aims to give students the fundamentals of operating Systems administration and maintenance. Focus will be on installation, maintenance and managing of several systems for multi-user environments.

#### **IT342 Computer Networks Lab**

#### Pre-requisite: IT341

This course provides students with hands on training regarding the design, configuration, troubleshooting, modeling and evaluation of computer networks. This course covers: Peer-to-Peer and Server-based networks, Transmission media, MAC & IP addressing, Address Resolution Protocol (ARP), basic troubleshooting tools, IP routing Protocols such as RIP, IGRP, and OSPF, Transport protocols: TCP and UDP, Virtual LANs, Wireless networks, and Network security.

Students will also be introduced to the network modeling and they will have the opportunity to build some simple networking models and evaluate their design approaches and expected network performance.

#### **IS 343 Information Security**

#### Pre-requisite: IT 341

This course covers the following topics: Security models, mechanisms and policies for usage, availability, integrity and secrecy. Operating system mechanisms and models for mandatory controls, data models, concepts and mechanisms for database and software security, basic cryptography (private and public) and its applications, security in computer distributed systems, networks, control and prevention of viruses, and other malicious programs. In addition to that, incidence response, disaster recovery, physical security, and forensics are discussed.

#### IT 498 Graduation project 1

#### Pre-requisite: 120 credits

The student should take a B.Sc. project in related area to his specialization and with technical merit. This project is for two semesters, it is counted as two credits for the first semester and three credits for the second semester. At the end of the semester the student submits a report describing his project. The projects are oriented toward providing experience in the establishment of objectives, criteria, analysis, construction, testing, and evaluation; solution of open-ended problems; design methodology.

**IT 499 Graduation project 2** Pre-requisite: IS 498 The student should take a B.Sc. project in related area to his specialization and with technical merit. This project is for two semesters, it is counted as two credits for the first semester and three credits for the second semester. At the end of the semester the student submits a report describing his project. The projects are oriented toward providing experience in the establishment of objectives, criteria, analysis, construction, testing, and evaluation; solution of open-ended problems; design methodology.

# IT421 Information Administration and Storage Technology

## Pre-requisite: IS 231

This course is concerned with the understanding of information storage technologies that prepares students to learn the concepts and technologies of information architectures, benefits and features of Intelligent Storage Systems, such as, long-term archiving solutions, storage networking technologies, business continuity solutions; replication and backup, information security, storage virtualization, and storage resource management.

# IT422 Infrastructure Environment and Network Servers

#### Pre-requisite: IT 341

This course provides students with the knowledge and skills to manage and maintain network infrastructure servers. The course is concerned with the creation of plans for managing the server lifecycle, evaluating and developing baselines for managing and monitoring server roles, and analyzing the configuration and implementation of different server roles. The course will also focus on maintaining and analyzing network server security

# **IT423 Database Management Systems**

# Pre-requisite: IS 231

This course covers the following topics: DBMS architecture and administration; centralized and client-server approaches, system catalog, and data dictionary, transaction management; concepts, characteristics, and processing, recovery techniques, concurrency control techniques: serializability, deadlock, locking schemes, time-stamp ordering, multi-version, and optimistic techniques, DB security, distributed databases, data fragmentation and replication, distributed transactions management, object-oriented databases, and new emerging DB technologies and applications.

# **IT424 Global Information Management**

# Pre-requisite: IS 334

This course covers the following topics:

business/IT alignment, strategic planning, demand management, IT governance frameworks, IT service management (ITSM), ITIL, COBIT, the Balanced Scorecard, and other metrics and controls to enable technologies. Using case examples from global companies.

#### IT425 Enterprise Architecture and Systems Design

#### Pre-requisite: CS 360

This course introduces systems development in an enterprise systems environment. The course focuses on enterprise architecture, designing the system processes, developing a database, using data and processes residing within enterprise systems, designing user interfaces, designing the network (if applicable), designing and developing user.

# IT426 Mobile & Wireless Networks

#### Pre-requisite: IT 341

This course covers the basic concepts of wireless communications and wireless network architectures. The following topics are included: standards of wireless communications, band-pass transmission for mobile radio, characterization of Wireless Channels, fading dispersive channels receiver techniques, cellular communications fundamentals, mobility management in wireless networks and multiple access techniques.

#### IT427 Concepts of Multimedia Processing & Transmission

#### Pre-requisite: IT 321, and IT 341

This course is concerned with the fundamentals of signal and image processing. It includes topics such as algorithms for signal processing, multimedia applications, voice recognition and coding, CD, DVD and streaming video technology.

#### **IT428 Selected Topics in Networks**

#### Pre-requisite: > 100 credit hours

This course intends to introduce special topics of current trends in Networks. The course is designed to enable students to study a variety of topics that are new and emerging in the discipline and are not covered in any core or elective courses of the department. Each semester, the contents of the course could cover a new topic or a mix of many topics and could be taught by one or more faculty members.

#### **IT429 Selected Topics in System Administration**

#### Pre-requisite: > 100 credit hours

This course intends to introduce special topics of current trends in Systems Management. The course is designed to enable students to study a variety of topics that are new and emerging in the discipline and are not covered in any core or elective courses of the department. Each semester, the contents of the course could cover a new topic or a mix of many topics and could be taught by one or more faculty members.

#### IT423 Database Management Systems

Pre-requisite: IS 231

This course covers the following topics: DBMS architecture and administration; centralized and client-server approaches, system catalog, and data dictionary, transaction management; concepts, characteristics, and processing, recovery techniques, concurrency control techniques: serializability, deadlock, locking schemes, time-stamp ordering, multi-version, and optimistic techniques, DB security, distributed databases, data fragmentation and replication, distributed transactions management, object-oriented databases, and new emerging DB technologies and applications.

## IT 451 Web Site Management

Pre-requisite: IS 334, and IT 341

This course covers the following topics: website design, it's role and importance, Introduction to managing websites, Setting up website files, defining folders and locating files, using Style Sheets Templates, Updating websites, Putting updated files onto the internet, Creating website, FTP files, Content Management System (CMS) and its use, Implementing CMS into a company website, Use of CMS for all employees, Web use of blogging and articles, information propagation

#### IT 452Web Development Using Content Management Systems

#### Pre-requisite: IT 321

This course provides both a survey of the current content management systems and in-depth hands-on experience with one of the most used environments (e.g. Joomla). The course includes the basics related to content management and knowledge management on the web, and the guidelines of creating a personal web development project in an area of interest that mostly covers the design and content authoring, installation and maintenance aspects. It also provides an overview of the integrated media design including graphics, animation, text, sound, and video. This course will include hands on experience with existing technologies, e.g., Joomla! (http://www.joomla.org/)

# **IT 453 Digital Technology Applications**

Pre-requisite: IT 321, and IT 341

In this course, digitizing video and audio for use in multimedia and web applications are studied, with a special emphasis on advanced skills and knowledge in digital audio and video digitizing, compression, and production from traditional media

# **IT 454 Information Visualization**

Pre-requisite: IT 201, and IT 331

This course is about the organization and visualization of digital information. Data organization and representation are studied to enhance the technical aspects of information. Graphics principles, visualization principles, and statistical analysis of data are considered for information presentation. Several software tools are used for presenting information. Students will be able to design a website or a presentation to visualize a data for information retrieval.

# **IT 455 Advanced Web Applications Development**

#### Pre-requisite: IT 321

In this course, Web application development topics are covered, including ASP.NET C#, JSP/Java Servlets, ADO.NET, AJAX, Java Beans. Hands-on experiences and technical foundations are combined with the Project-centered approach to implement real-world E-Commerce Web applications. Also, development life cycle for Web applications and secure Web transactions software is reviewed.

# **IT 456 Mobile Applications**

#### Pre-requisite: >100

In this course, students will study the following topics: trends in the mobile industry, how to make a mobile application? why is it so hard to make mobile applications, easy ways to make mobile applications, how to test mobile applications, mobile business plans, how to get mobile applications out there.

# IT 446 Selected Topics in Web Technologies

#### Pre-requisite:

This course intends to introduce special topics of current trends in Web Applications. The course is designed to enable students to study a variety of topics that are new and emerging in the discipline and are not covered in any core or elective courses of the department. Each semester, the contents of the course could cover a new topic or a mix of many topics and could be taught by one or more faculty members

# Department of Computer Engineering

# Vision

The vision of the Computer Engineering Department is be distinguished by providing recognized academic program that meets the quality and accreditation requirements and preparing qualified, professionally and scientifically skilled specialists in computer engineering domain.

# **Mission Statement**

The Department of Computer Engineering aims to scientifically and practically prepare qualified cadres in the field of computer engineering that is suitable for labor market needs and requirements and to prepare the graduates to be leaders, creators, and explorers for new areas of computer engineering domain based on the quality and accreditation requirements.

# **Program Objectives**

The Computer Engineering Program is aimed to prepare its graduate to become intellectual professional in industry, government, and academia. The Educational objectives of the B.S. in Computer Engineering program defines the skills, knowledge and attributes that will be needed and achieved by the graduates for a successful career and professional accomplishments. Graduate of the Computer Engineering program will:

- 1. Be engaged in professional practice at or beyond the entry level or enrolled in high quality graduate programs building on a solid foundation in engineering, mathematics, the sciences, humanities and social sciences, and experimental practice as well as modern engineering methods;
- 2. Be innovative in the design, research and implementation of systems and products with strong problem solving, communication, teamwork, leadership, and entrepreneurial skills.
- 3. Proactively function with creativity, integrity and relevance in the ever changing global environment by applying their fundamental knowledge and experience to solve real-world problems with an understanding of societal, economic, environmental, and ethical issues.

# **Student Learning Outcomes**

The learning outcomes of the computer engineering program are following the ABET recommendation for the IT academic programs learning outcomes, which are:

- 1. An ability to apply knowledge of mathematics, science, and engineering
- 2. An ability to design and conduct experiments, as well as to analyze and interpret data
- 3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- 4. An ability to function on multidisciplinary teams.
- 5. An ability to identify, formulate, and solve engineering problems.
- 6. An understanding of professional and ethical responsibility.

- 7. An ability to communicate effectively.
- 8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- 9. A recognition of the need for, and an ability to engage in life-long learning
- 10. A knowledge of contemporary issues.
- 11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

# **Offered Degrees**

The program focuses on analyzing, designing, implementing and testing both core parts (software and hardware) of modern computing and computer networks, through learning the scientific foundation for hardware, software, and computer networks, and applying it in engineering exercises. The curriculum of the computer engineering program requires five academic years. English will be the language for teaching specialized courses and basic sciences. Students together with some of their colleagues will participate in the implementation of a graduation project during their final year of study. Students can choose between two main tracks of Computer Engineering: (1) Computer Networks; or (2) Embedded Systems.

1. Bachelor of Engineering in Computer Engineering / Computer Networks

Computer Networks specialization is considered one of the fastest growing disciplines in engineering fields. The importance of this field of study has become very important as a result of the latest advancements in LAN/WAN networks, wired and wireless networks, and the area of network management and network security. At Majmaah University, graduates of this program will earn a Bachelor of Engineering in Computer Engineering / Computer Networks.

2. Bachelor of Engineering in Computer Engineering / Embedded Systems

Embedded systems applications have become one of the most important engineering applications that are involved in integration of hardware components with programmable, and flexible software components for specific application. This area will prepare students with the concepts of new computing principles and their applications to embedded systems, designing real time embedded systems both from hardware and software, and realization of systems that embed intelligence within a wide verity of systems interacting in real time with the environment.. At Majmaah University, graduates of this program will earn a Bachelor of Engineering in Computer Engineering / Embedded Systems.

# **Career Opportunities**

The offered degrees from Computer Engineering Department at Majmaah University provide not only a strong theoretical background but also a practical experience gained through training, modern labs, and senior projects. As a consequence of covering both hardware and software, the graduates benefit from broader career opportunities in the industry as one of the following:

- Embedded Image Processing Systems Engineer
- Real Time Systems Engineer
- Software Developer
- Systems Programmer
- Software Tester
- Researcher
- Software Engineer
- System Development Engineer
- Computer Security Specialist
- Network Engineer
- Network Administrator
- Computer Analyst
- Computer Applications Engineer
- Embedded Systems Engineering
- Embedded System Designer
- Principle Embedded Software Engineer

# Program Requirements and CURRICULUM

Units required for the B.Sc. degree in the Department of Computer Engineering.

REQUIREMENTS	CREDIT HOURS
Preparatory Year Requirements	29
University Requirements	12
College Requirements	42
Departmental Required Core Courses	58
Departmental Elective Courses	12
Departmental Professional Elective Courses	6
Training	1
TOTAL	160

# Departmental Required Core Courses (58 Cr. hrs)

Course Code and No.	Course Title	Credit Hours	Prerequisites
CN 211	Logic Design	3	MATH 111
PHY 125	Physics 2	3	PHY 104
PHY 126	Physics Lab	1	CO/P 125
CN 213	Logic Design Lab	1	MATH 111/CN 211
MATH107	Linear Algebra	3	MATH 112
EE 211	Fundamental of Electric Circuits	3	PHY 104
EE 212	Electric Circuits Lab	1	EE 211
MATH 205	Differential Equations	3	MATH 126

CHEM	General Chemistry	4	
CN311	Computer Organization	3	MATH 111
CN 341	Signals and Systems	3	MATH 205
EE 311	Electronics Fundamentals	3	EE 211
EE 312	Electronics Lab	1	Co/P EE 311
CN 342	Introduction to Data Transmission	3	CN341
CN 343	Data Transmission Lab	1	Co/P CN 342
CN312	Computer Architecture	3	CN 311
CN445	Computer Networks	3	CN 342
CN446	Computer Networks Lab	1	Co/P CN445
MATH 254	Numerical Methods	3	MATH 205
CN471	Introduction to Digital Control	3	MATH 107
CN472	Digital Control Lab	1	Co/P CN471
CN411	Embedded Systems	3	CN 312
CN498	Graduation Project 1	2	120 Units
CN499	Graduation Project 2	3	CN 498
	TOTAL	58	

# Departmental Elective Courses (12 Cr. hrs)

The student has to choose four courses from one of the following Tracks

# **"COMPUTER NETWORKS''** Track

Course Code and No.	Course Title	Credit Hours	Prerequisites
CN 451	Modeling & Simulation	3	>120
CN 452	Advanced Topics in Switching and Routing	3	CN445 + CN446
CN 453	Optical Networks	3	CN 445
CN 454	High-Speed Networks	3	CN 445
CN 455	Network Programming	3	CN 445
CN 456	Wireless Sensor Networks	3	CN 445
CN 457	Mobile & Wireless Networks	3	CN 445
CN 458	Computer Networks Security	3	CN 445
CN 459	Selected Topics in Computer Networks	3	CN 345
CN 470	Digital Signal Processing	3	CN 341
	TOTAL	12	

# " EMBEDDED SYSTEMS " Track

Course Code and No.	Course Title	Credit Hours	Prerequisites
CN 421	Hardware Description Languages	3	CN 212
CN 422	Introduction to VLSI Design	3	EE311
CN 423	Introduction to Computer Arithmetic	3	CN 312
CN 424	Introduction to VLSI Testing	3	CN 422
CN 425	System Programming	3	CN312 + CS240
CN 429	Selected Topics in Embedded Systems	3	CN 312
CN 451	Modeling & Simulation	3	>120
CN 458	Computer Networks Security	3	CN 445
CN 470	Digital Signal Processing	3	CN 341

TOTAL	12	

# Departmental Professional Elective Courses (6 Cr. hrs)

The student has to choose three courses from the attached professional elective courses.

# A TYPICAL PROGRAM FOR COMPUTER ENGINEERING STUDENTS

1<sup>st</sup> Year

1 <sup>st</sup> Semester	L <sup>st</sup> Semester 2 <sup>nd</sup> Semester				
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
ENG001	Preparatory English 1	8	ENG002	Preparatory English 2	6
MATH001	Introduction to Mathematics 1	2	ENG003	English for science and Engineering	2
CS001	Computer Skills	2	MATH002	Introduction to Mathematics 2	4
SKL001	Learning & Communication Skills	2	PHY001	General Physics	3
TOTAL=14				TOTAL=15	

# 2<sup>nd</sup> Year

3 <sup>rd</sup> Semester		-	i cui	4 <sup>th</sup> 5	Semester
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
SALM	Elective Islamic Culture (1)	2	CS120	Programming 2	4
CS110	Programming 1	4	CN211	Logic Design	3
MATH112	Calculus1	3	MATH126	Calculus 2	3
MATH111	Discrete Mathematics	3	ENG127	Technical English 2	2
<b>۱PHY104</b>	Physics 1	3	PHY125	Physics 2	3
ENG114	Technical English 1	2	PHY126	Physics Lab	1
			ARAB120	Elective Arab Course	2
	TOTAL=17			TOTAL=18	

3<sup>rd</sup> Year

5 <sup>th</sup> Semester 6 <sup>th</sup> Semester					
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
CN213	Logic Design Lab	1	CS240	<b>Operating Systems</b>	3
CS210	Data Structure	3	CHEM101	<b>General Chemistry</b>	4
MATH107	Linear Algebra	3	CN311	Computer Organization	3
EE211	Fundamentals of Electric Circuits	3	CN341	Signals & Systems	3
EE212	Electric Circuit Lab.	1	EE311	Electronics Fundamentals	3
MATH205	Differential	3	EE312	Electronics Lab.	1

	Equations			
STAT102	Probability and Statistics	3		
	TOTAL=17		TOTAL=17	

# 4<sup>th</sup> Year

7 <sup>th</sup> Semester	7 <sup>th</sup> Semester 8 <sup>th</sup> Semester					
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours	
SALM	Elective Islamic Culture (2)	2	IT481	Ethics & Professional Practice	2	
IS231	Fundamental of Database	3	-SALM	Elective Islamic Culture (3)	2	
CN312	Computer Architecture	3	IS334	Project Management	3	
CN342	Introduction to Data Transmission	3	CN445	Computer Networks	3	
CN343	Data Transmission Lab	1	CN446	Computer Networks Lab	1	
CN	Elective Professional Course 1	2	CN399	Seminar	1	
	Elective General Course (1)	2	MATH254	Numerical Methods	3	
				Elective General Course (2)	2	
TOTAL=16				TOTAL=17		

# 5<sup>th</sup> Year

9 <sup>th</sup> Semester	9 <sup>th</sup> Semester 10 <sup>th</sup> Semester				
Course Code and No.	Course Title	Credit Hours	Course Code and No.	Course Title	Credit Hours
CN	Elective Professional Course 2	2	CN	Track Course	3
CN	Track Course	3	CN	Track Course	3
CN471	Introduction to Digital Control	3	CN	Track Course	3
CN472	Digital Control Lab	1	CN499	Graduation Project 2	3
CN411	Embedded Systems	3	CN	Elective Professional Course 3	2
CN498	Graduation Project 1	2			
CN400	Summer Training	1			
	TOTAL=14			TOTAL=13	

# **Course Description**

#### **CN 211 Logic Design**

Pre-requisite: MATH 111 This course covers the following topics:

Binary Numbers, Octal and Hexadecimal Numbers, Number Base Conversions, Complements, Signed Binary Numbers, Binary Codes; Boolean Algebra and Logic Gates, Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms. Digital Logic Gates, Integrated Circuits, Transistor equivalent of Digital Logic Gates; Gate-Level Minimization, The Map Method, Four-Variable Map, Five-Variable Map, Product of Sums Simplification, Don't-Care Conditions, NAND and NOR Implementation, Exclusive-OR Function; Combinational Logic, Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers; Sequential circuits: Latches and Flip flops, Sequential circuits analysis and design, Finite state machines, Registers and Counters.

#### PHY 125 Physics (2)

#### Pre-requisite: PHY104

This course will cover the following topics: The Standards of Length, Mass and Time, Dimensional analysis, and Conservation of Units. The Motion in One and Two Dimensions. The Law of Motion. The Energy and Energy Transfer. The Potential Energy. The Linear Momentum and Collisions. The Rotation of a Rigid Object About a Fixed Axis: Angular Position, Velocity, and Acceleration. Rotational Kinematics, Angular and Linear Quantities, Rotational Kinetic Energy, Calculation of Moments of Inertia, Relationship Between Torque and Angular Acceleration, Work, Power and Energy in Rotational Motion.

#### CN 213 Logic Design Lab

#### Pre-requisite: CN 211

This lab help students get a hands on familiarity with the concepts they come across in the logic design course. Experiments are designed in such a way that students become well aware of the concepts they learn in the theory sessions: Logic Gates, Boolean Functions, NAND & NOR Implementations, Combinational circuits analysis and design, Adders, subtracters, decoders, and multiplexers, Flip-Flops, Sequential circuits analysis and design, Counters and shift registers.

#### MATH107 Linear Algebra

Pre-requisite: MATH 112

This course includes the following topics:

Matrices and Gauss Elimination: Elementary row operations, Transpose of a matrix, Inverse of a square matrix, Linear equation systems and Gauss eliminations.

Determinants: Determinants and their properties, classical adjoint matrix; Cramer's rule.

Vector spaces: Basic definitions, subspaces, linear dependence and independence, bases and dimensions, Rank of a Matrix.
Linear transformations: Basic definitions, the matrix of a transform, Kernel and Range of a linear transformation, Matrices of linear transformations, Coordinates and change of basis.

Eigenvalues and Eigenvectors: Characteristic polynomial, diagonalization of matrices, Applications involving Powers of matrices.

# **EE 211 Fundamentals of Electric Circuits**

Pre-requisite: PHY 104

This course includes the following topics:

Matrices and Gauss Elimination: Elementary row operations, Transpose of a matrix, Inverse of a square matrix, Linear equation systems and Gauss eliminations.

Determinants: Determinants and their properties, classical adjoint matrix; Cramer's rule.

Vector spaces: Basic definitions, subspaces, linear dependence and independence, bases and dimensions, Rank of a Matrix.

Linear transformations: Basic definitions, the matrix of a transform, Kernel and Range of a linear transformation, Matrices of linear transformations, Coordinates and change of basis.

Eigenvalues and Eigenvectors: Characteristic polynomial, diagonalization of matrices, Applications involving Powers of matrices.

## **EE 212 Electric Circuits Lab**

Pre-requisite: N/A

This course will cover the following topics:

Basic circuit elements and concepts; Basic laws of circuit theory: Ohm's law, Kirchoff's law; Circuit theorems: superposition principle, Thevenin and Norton theorems; maximum power transfer theorem Techniques of circuit analysis: Nodal and mesh analysis; Sinusoidal sources and the concept of phasor in circuit analysis; Introduction to concept of average, reactive, complex power and power factor.

# **MATH 205 Differential Equations**

Pre-requisite: MATH 126

This course will cover the following topics:

manipulation of infinite and power series, as well as about representation of a function in terms of a power series. Handling real-valued functions of two and three real variables (limits, continuity, differentiability, and extrema). Calculating double and triple integrals and their applications (area, volumes, surface areas, moments, density...), mainly to physical models.

# **CHEM 101 General Chemistry**

### Pre-requisite: N/A

This course will cover the following topics: stoichiometry (chemical calculations), reactions in aqueous solutions, properties of gases and gas laws, energy changes of chemical and physical transformation, Fist law of Thermodynamic. Properties of Solutions, Chemical Kinetics, Chemical Equilibrium, Acids and Bases, ionic Equilibrium, Buffer Solutions.

## **CN 311 Computer Organization**

Pre-requisite: CN 211

This course covers the following topics:

Basic computer organization, Data representation, Integer and floating-point arithmetic, Instruction sets and instruction formats, Addressing modes, Machine and Assembly language programming, Assembler function and design, Processor organization, ALU design, Micro-programmed CPU, Datapath and control unit, Interrupts, Memory system and cache memory.

## **CN 341 Signals & Systems**

Pre-requisite: MATH 205

This course will cover the following topics:

Mathematical description and classification of various signals and systems: introduction to mathematical software packages, continuous linear timeinvariant systems, convolution and correlation, Fourier series and transforms, Laplace transform, applications to communication systems:

modulation/demodulation of AM, double sideband suppressed carrier, single sideband, and FM/PM systems.

## **EE 311 Electronics Fundamentals**

Pre-requisite: EE 211

This course will cover the following topics:

Intrinsic and doped semiconductors, drift and diffusion currents. PN junction diode: basic structure, I-V characteristics, large and small-signal models. Bipolar junction transistor (BJT): basic structure, modes of operation, dc biasing, dc and small-signal models, single stage BJT amplifiers. Field-effect transistors (FET): structure and operation of enhancement and depletion MOSFETs, I-V characteristics, dc biasing. Introduction to JFET.

### **EE 312 Electronics Lab**

CO/requisite: EE 311

This course will cover the following topics:

Students will conduct various experiments related to Electronics Fundamentals course. Intrinsic and doped semiconductors, drift and diffusion currents. PN junction diode: basic structure, I-V characteristics, large and small-signal models. Bipolar junction transistor (BJT): basic structure, modes of operation, dc biasing, dc and small-signal models, single stage BJT amplifiers. Field-effect transistors (FET): structure and operation of enhancement and depletion MOSFETs, I-V characteristics, dc biasing. Introduction to JFET.

# **CN 312 Computer Architecture**

Pre-requisite: CN 311

This course will cover the following topics:

Fundamentals of computer design, Performance evaluation, Instruction set principles, Processor organization and design, Pipelining, Instruction and arithmetic pipelines, Dynamic and speculative execution, Precise exception, CISCS, RISC, and VLIW processors, Memory Hierarchy, Virtual memory, Multilevel caches, Storage and I/O, Introduction to Multicore, multiprocessors, and clusters, New trends in computer architecture

## **CN 342 Introduction to Data Transmission**

Pre-requisite: CN 341

This course will cover the following topics:

Introduction to communication systems; Network architecture and the OSI reference model; Transmission media; Transmission Impairments; Data encoding; Data Synchronization; Data Link Control; Multiplexing; Spread Spectrum.

## CN 343 Data Transmission Lab

Co/requisite: CN 342

This course will cover the following topics:

Transmission media characteristics and impairments; Digital modulation techniques: PCM, DPCM, and DM; Basic Shift Keying methods using: amplitude, phase, and frequency; Multiplexing techniques using analog and digital signals; Basic modem structure; Fiber optics communication.

# **CN 445 Computer Networks**

Pre-requisite: CN 342

This course will cover the following topics:

Introduction to computer networks, Network architecture and the OSI reference model; Data Link: Error Detection, Medium Access control Protocols and standards, MAC Addressing, Link layer Switches, LAN standards & Devices: Ethernet and IEEE standards for LANs, Wireless networks; Network Layer: Virtual circuit and Datagram Networks, Router Structure, The Internet Protocol (IP), Routing Algorithms, Broadcasting and Multicasting; Congestion control Algorithms: Leaky Bucket, Traffic Shaping; Internetworking Protocols: fragmentation and reassembly, Internet Network layer; Transport Layer: TCP and UDP services, designs, and performance, Principles of Reliable Data Transfer; Application layer: The Web and HTTP, FTP, Electronic Mail, and DNS.

# **CN 446 Computer Networks Lab**

CO-requisite: CN 445

This course will cover the following topics:

This course provides students with hands on training regarding the design, configuration, troubleshooting, modeling and evaluation of computer networks. This course covers: Peer-to-Peer and Server-based networks, Transmission media, MAC & IP addressing, Address Resolution Protocol (ARP), basic troubleshooting tools, IP routing Protocols such as RIP, IGRP, and OSPF, Transport protocols: TCP and UDP, Virtual LANs, Wireless networks, and Network security.

Students will also be introduced to the network modeling and they will have the opportunity to build some simple networking models and evaluate their design approaches and expected network performance.

# MATH 254 Numerical Methods

Pre-requisite: MATH 205

### **CN 471 Introduction to Digital Control**

## Pre-requisite: MATH 107 + CN 341

This course will cover the following topics:

Continuous Systems: Review of mathematical representation of systems (transfer functions) modeling and parameter identification, system analysis in time domain, system stability, steady state error and compensator design. Discrete Systems:

System modeling and parametric identification; Difference equations; review of Z transform; Review of sampling and reconstruction; Stability analysis; steady state error; Design of discrete-time control systems.

# **CN 472 Digital Control Lab**

### Pre-requisite: N/A

This course will cover the following topics:

Experiments and lectures introduce the students to the practical aspects of digital control techniques. Topics include the analyze of the open loop systems and how to design a controller (PID and two position controller - analogue and digital) that increases tracking performances. To check the effectiveness of the controller, students perform simulation using (MATLAB/SIMULINK) software. The last step is the implementation of the digital control via personnel computer using C/C++ or software acquired with experiments.

## **CN 498 Graduation Project 1**

Pre-requisite: Completion of 120 credit units

This course will cover the following topics:

The student should take a B.Sc. project in related area to his specialization and with technical merit. This project is for two semesters, it is counted as two credits for the first semester and three credits for the second semester. At the end of the semester the student submits a report describing his project and the parts he completed in the first semester and proposed parts in the 2nd semester. The projects are oriented toward providing experience in the establishment of objectives, criteria, analysis, construction, testing, and evaluation; solution of open-ended problems; design methodology.

# **CN 499 Graduation Project 2**

### Pre-requisite: CN 498

This course will cover the following topics:

The student should take a B.Sc. project in related area to his specialization and with technical merit. This project is for two semesters, it is counted as two credits for the first semester and three credits for the second semester. At the end of the semester the student submits a report describing his project. The projects are oriented toward providing experience in the establishment of objectives, criteria, analysis, construction, testing, and evaluation; solution of open-ended problems; design methodology.

# **CN 421 Hardware Description Languages**

### Pre-requisite: CN 212

Programmable Logic Devices (PLDs): architecture, features, timing parameters, configuration. Hardware Description Languages (HDLs): History, purpose, categories, vendors and associated CAD tools. VHDL: constructs, modeling for

simulation, synthesis and verification, coding styles, effect of style on synthesis, synthesis of combinational and sequential logic, capabilities to deal with hierarchy, subprograms, test benches.

In the lab experiments, students will develop, design, analyze, simulate and implement logic digital circuits. Students will have hand-on experience in utilizing the basic structures of VHDL, VHDL simulation and VHDL synthesis, and FPGA implementation.

## **CN 422 Introduction to VLSI Design**

#### Pre-requisite:EE311

Large-scale MOS design: MOS transistors, static and dynamic MOS gates, stick diagrams, programmable logic array design, MOS circuit fabrication, design rules, resistance and capacitance extraction, power and delay estimates, scaling, MOS combinational and sequential logic design, register and clocking schemes, memory, data-path, and control unit design. Elements of computer-aided circuit analysis and layout techniques.

### **CN 423 Introduction to Computer Arithmetic**

#### Pre-requisite: CN 312

Standard and unconventional number representations, design of fast twooperand and multi-operand adders, high-speed multiplication and division algorithms, floating-point numbers, algorithms, and hardware algorithms. Implementation of pipelined, digit-serial and fault-tolerant arithmetic processors.

## **CN 424 Introduction to VLSI Testing**

### Pre-requisite: CN 422

Provide students with basic knowledge on VLSI Testing Problem, and its complexity. Topics include VLSI Testing process, Combinational Circuit Test Generation, Sequential Circuit Test Generation, Statistical Algorithms and Fault Analysis, Design for Testability, Built-in-Self-Test, Self-Checking-Circuits, Fault-Tolerant-Design.

## **CN 425 System Programming**

Pre-requisite:CN312 + CS240

Overview of systems programming. Basic OS Concepts. Standard I/O library. Files and Directories. System Data Files and Information. Process control. Signals. Event driven programming. I/O redirection and pipes. Inter-process Communication. Thread/Socket Programming.

## **CN 429 Selected Topics in Embedded Systems**

### Pre-requisite: CN 312

This course intends to introduce special topics of current trends in Embedded Systems. The course is designed to enable students to study a variety of topics that are supposed to be new and emerging in the discipline and are not covered in any core or elective courses of the department. Each semester, the contents of the course could cover a new topic or a mix of many topics and could be taught by one or more faculty members

## CN 451 Modeling & Simulation

Pre-requisite: Competition of 120 credits

Probability theory: Random variables, Transformation of random variable. Probability density functions. Markov chains: stochastic processes, Poisson and Exponential processes. Queuing Systems: Little's theorem, M/M/1, M/M/1/K, and M/G/1.

Computer simulation: Random number generators, Validation tests, Generating random variables, Event-driven simulation. Simulation languages and software simulation.

# **CN 452 Advanced Topics in Switching and Routing**

Pre-requisite: CN445 + CN446

Routing and switching fundamentals, Structure of simple Local Area Networks (LANs). Routing and switching devices. Internetworking. Exterior Gateway Protocols and Interior Gateway Protocols. Distance-vector and link-state routing protocols. Virtual Local Area Networks (VLANs). Access Control Lists (ACLs). MPLS networks. Quality of Service. Traffic Engineering. Constraint-based routing (CR). CR-LDP. RSVP-TE. Analyze, plan, and manage of an enterprise network. In support of these techniques, lab activities will include subneting, packet-sniffing, and switch/router configuration.

# **CN 453 Optical Networks**

## Pre-requisite: CN 445

Optical fiber transmission medium: fiber modes, signal degradation, attenuation, dispersion. Passive and Active Optical Components. Optical Modulation and Demodulation. Optical communications: signal encoding, network structure, SDH and SONET, WDM, routing and wavelength assignment; DWDM Networks: Topologies, bandwidth management, wavelength management, interoperability.

# **CN 454 High-Speed Networks**

### Pre-requisite: CN 445

Introduction to high speed networks; Design and performance issues of high speed networks. Network Control and Management Protocols in High Speed Networks; Switches, High performance switches; Examples of high speed networks: protocol layers, configuration, and frame structures; Broadband Wireless networks. Photonic networks. Case studies. Future directions.

# **CN 455 Network Programming**

Pre-requisite: CN 445 Introduction: TCP/IP and OSI models; Transport layer protocols: TCP, UDP, Standard Internet Services; Concurrent Servers: I/O Multiplexing, TCP Sockets, UDP Sockets, TCP and UDP Client/Server Applications; Name and Address Conversions; Web programming

# **CN 456 Wireless Sensor Networks**

### Pre-requisite: CN 445

Wireless Sensor Networks Concepts and applications. Design and analysis. Deployment: Localization and calibration, Coverage and connectivity. Wireless Communications: Link quality, shadowing and fading effects. Medium Access: Scheduling sleep cycles, Energy-efficiency. Data Gathering. Routing and Querying. Collaborative Signal Processing and Distributed Computation. Reliability, fault-tolerance and security. Future trends

## **CN 457 Mobile & Wireless Networks**

#### Pre-requisite: CN 445

Fundamentals of wireless and mobile networks. Transmission Fundamentals. Wireless Channel Impairments. Antenna and Propagation. Signal encoding techniques. Spread Spectrum Communications. Error Control. Wireless Media access control protocols. Quality of service. Cellular wireless and data networks: Wireless LANs. Bluetooth. WiMAX. Mobile networks. LTE. Satellite communications. Privacy, Security and Authentication for Wireless Networks.

#### **CN 458 Computer Networks Security**

#### Pre-requisite: CN 445

Overview, Security Concepts, Attacks, Services; Block Ciphers; Block Cipher Operation; Public-Key Cryptography and RSA; Cryptographic Hash Functions; User Authentication Protocols; Transport-Level Security; Wireless Network Security; IP Security; Intruders; Malicious Software; Firewalls.

#### **CN 459 Selected Topics in Computer Networks**

### Pre-requisite: CN 445

This course intends to introduce special topics of current trends in computer networks. The course is designed to enable students to study a variety of topics that are new and emerging in the discipline and are not covered in any core or elective courses of the department. Each semester, the contents of the course could cover a new topic or a mix of many topics and could be taught by one or more faculty members.

## **CN 470 Digital Signal Processing**

#### Pre-requisite: CN 341

History and overview; sampling theorem, aliasing; sampled signals, periodic signals, non-periodic signals; impulse response and convolution; digital spectra analysis; discrete Fourier transform, fast Fourier transform; z-transform; digital filters, FIR and IIR filter design; windowing; effect of finite word length in digital signal processors; application in audio and image processing.