



Yarmouk University

**Faculty of Information Technology and Computer
Sciences**

**Study Plan and Course Description for BSc in
Computer Science**

Computer Science (CS)

2016/2017

Table of Content

Topic	Page
Overview about Computer Science Department	4
Competences and learning outcomes for the undergraduate program in Computer Science	5
Study Plan for a bachelor's degree at the faculty of Information Technology and Computer Sciences	7
Study Plan Bachelor's degree in the Department of Computer Science	11
Mandatory requirements track plan for a bachelor's degree majoring in Computer Science	13
Elective requirements track plan for a bachelor's degree majoring in Computer Science	14
Description of courses offered by the Department of Computer Science	15
Mapping Matrix between Faculty mandatory courses and learning outcomes	27
The contents of the plan compared with the accreditation standards	30

Course Short Names in the Study Plan

SE	Software Engineering
CS	Computer Science
CIS	Computer Information Systems
MIS	Management Information Systems
NIS	Network and Information Security
AL	Arabic
EL	English
PS	National Education
MILT	Military
STAT	Statistics
MATH	Mathematics
BA	Business Administration
MARK	Marketing

Introduction about Computer Science Department

The Department of Computer Sciences was established in 1978 and started offering a B.Sc. degree in Computer Sciences in 1980 as the first department of computer science in the hashmaite kingdom of Jordan. At the beginning of the academic year 2002/2003 the Faculty of Information Technology and Computer Sciences was established, and the Department of Computer Sciences was moved to this new faculty. The curriculum has been modified accordingly to keep pace with changes and developments taking place locally and internationally in order to raise the level of academic graduate and to provide him with the skills and techniques that qualify him to be competitive in the market.

In year 2000/2001 the Master's program in Computer Sciences and Information Systems was established. The curriculum was modified in 2003 and the new curriculum was adopted at the beginning of the academic year 2003/2004. The name of the program becomes Master's in Computer Sciences.

The department is continuously trying to update and introduce computer science courses in order to be able to meet international standards and as a result a new study plan is adopted starting from the academic year of 2016/2017 to catch with the dynamic changes in the region and internationally. The department founds several laboratories that serve as a teaching tool to all university students including some special purpose labs such as parallel processing and multimedia labs. The department played an important role in providing logistic, strategic and tutoring to all university department and governmental and private sectors companies and organizations in all computing domains.

Vision

The vision of the department is to become one of the top "Computer Sciences" departments in the region to make local and regional companies eager to employ our students. The department is also aspires to provide high quality educational programs supported with the best high technology. Finally, the department aspires to play an active role in the development of Jordan's economy through the use of information and communication technology.

Mission

The department mission is to provide our students with quality education and the needed technical skills in computer sciences to be able to provide the society with the required services, to graduate students according to the needs of Jordan, neighboring countries and other parts of the world including developed countries, to build ties with the local community in order to be able to satisfy their needs, and finally to provide consultation services to the industry sector and local corporations.

Goals

The utmost goal of the department is to elevate the level of the graduated students and by providing them with the skills and technologies that are necessary for him/her to be an added-value to regional and international markets. Moreover, the department goal is to provide faculty members with the latest technologies to be able to teach prosperity topics in computer science. The department is looking forward to open new programs in the near future with the given inputs and increase the grants for students to continue higher educations as well as finding new specialized labs.

Competences and Learning Outcomes for Bachelor degree in Computer Science

At the completion of the degree requirements in computer science, the student is expected to:

1. Acquire the necessary skills to analyze, develop, design and evaluate mathematical and practical problems using modern methods and techniques using high-level programming languages
2. Design, execute, identify and define the necessary computing requirements to resolve programming issues, such as data structures, data types and the proper algorithms that are required for the application implementation
3. Identify the most appropriate solutions to solve computational problems of medium difficulty. And find out the reasons for the accuracy and the efficiency of the solution.

4. To be able to design sequential circuits within the computer to evaluate the design of the processor to understand its component and the various methods to control them. This will help the student to demonstrate knowledge, understanding and ability to assess the structure of the basic computer hardware and components.
5. To gain knowledge of the fundamental concepts of data communications and computer networks
6. To gain knowledge of the fundamental needs and methods of artificial intelligence algorithms and employ, demonstrate the knowledge and ability to apply the basic principles and basic techniques of intelligent systems in practical application.
7. To gain knowledge of the fundamental concepts of distributed computing and their importance, characteristics, functions, structure and how to program and developed various systems
8. To gain knowledge to the software development with a focus on the special analysis and design aspects and building models with demonstrate knowledge and the ability to apply the principles, methodologies and life cycles of software engineering and learn about the possibilities of their use and the benefits that can be derived from its application in various business software and services, telecommunications information technology models
9. To gain knowledge of the fundamentals of databases and how to build and deal with them in addition to the knowledge on the underlying theoretical and mathematical principles
10. To gain knowledge of the concepts of the computation theory to be able to represent the formal languages
11. Analyze and identify factors affecting information security to guarantee the existence of data and information privacy and security, including the software, hardware and tools used, and the ability to recognize such factors in any implemented application.

Study Plan for a bachelor's degree at the faculty of Information Technology and Computer Sciences

The study plan leads to a degree in Bachelor of Computer Sciences/ Faculty of Information Technology and Computer Sciences in accordance to the regulations for awarding the Bachelor Degree in Yarmouk Univ. No (2) in 1991 issued in accordance with bylaws for awarding scientific Degrees in Yarmouk Univ. No (118) in 2003.

1. The study plan of computer science is provided by the following departments of Information Technology and Computer Sciences faculty:–
 - **Computer Science Department**
 - **Computer Information Systems Department**
 - **Management Information Systems Department**
 - **Network and Information Security Department**
 - **Software Engineering Department**
2. The minimum number of credit hours required to award a Bachelor degree in the faculty is (134) credit hours
3. Withheld of the regulations for awarding the Bachelor Degree in Yarmouk Univ. No (2) in 1991 issued in accordance with bylaws for awarding scientific Degrees in Yarmouk Univ. No (118) in 2003
4. The acceptance of students follows the university regulations and rules in each semester in accordance with bylaws for student acceptance in Yarmouk University.
5. In each department, the study plan must include the following requirements:

A. University Requirements

There are (27) credit hours that are:

- A.1. Mandatory Requirements:** There are (12) credit hours as in the following table:

Course Code	Course Name	Credit Hours	Prerequisite
AL 101	Arabic Language 1	3	
EL 101	English Language Skills	3	
PS 102	National Education	3	
MILT 100	Military science	3	
EL 099	English Language Skills- Comprehensible	Comprehensible	
AL 099	Arabic Language- Comprehensible	Comprehensible	
COMP 099	Computer Skills- Comprehensible	Comprehensible	

A.2. Elective Requirements: The student should choose (15) credit hour outside his faculty from the table below.

رمز المساق	المساقات الإنسانية	عدد الساعات
Hum 101	الثقافة الإعلامية	3
Hum102	المواطنة والانتماء	3
Hum 103	الإسلام فكر وحضارة	3
Hum 104	الفن والسلوك	3
Hum 105	إسهام الأردن في الحضارة الإنسانية	3
Hum 106	مقدمة في دراسة الثقافات الإنسانية	3
Hum 107	حقوق الإنسان	3
Hum 108	مهارات التفكير	3
رمز المساق	المساقات العلمية	عدد الساعات
Sci 101	البيئة والصحة العامة	3
Sci 102	تكنولوجيا المعلومات والمجتمع	3
Sci 103	اللياقة البدنية للجميع	3
Sci 104	مهارات التواصل الفعال	3
Sci 105	الطاقة المتجددة	3
Sci 106	الإدارة وتنمية المجتمع	3
Sci 107	البحث العلمي	3

B. Faculty Requirements: There are mandatory (22) credit hours as in the table below.

Course No.	Course Name	Credit Hours	Weekly Hours		Prerequisite
			Theoretical	Practical	
CS 110	PROGRAMMING IN A SELECTED LANGUAGE	3	3	0	with CS 110L
CS 110L	PROGRAMMING IN A SELECTED LANGUAGE Lab	1	0	2	with CS 110
MATH 101	تفاضل وتكامل 1	3	3	0	---
CIS 103	مقدمة في تكنولوجيا المعلومات	3	3	0	---
CIS 260	نظم قواعد البيانات	3	3	0	CS 210
STAT 111	مبادئ الاحتمالات (1)	3	3	0	---
MIS 106 *	مهارات الاتصال لتكنولوجيا المعلومات	3	3	0	---
CS 130	FUNDAMENTALS OF OPERATING SYSTEMS	3	3	0	CS 110 ، CIS 103

*The course is cannot be combined with SCI 104.

C. Department Requirements: There are (86) credit hours as department requirements that the department council specify and distributed as in the table below.

Distribution of credit hours to computer science degree

Course Group	Mandatory	Elective	Total
University Requirements	12	15	27
Faculty Requierments	22	-	22
Department Requirements	61	24	85
Total			134

Number of knowledge areas in computer science study plan for bachelor degree

Knowledge Area	المدلول (حقل المعرفة)	الرقم
Basic Courses	مبادئ أساسية	0
Programming Languages	لغات برمجة	1
Computer Hardware	الكيان المادي للحاسوب	2
Computer Software and Architecture	برمجيات ومعمارية الحاسوب	3
Computer Mathematics	رياضيات الحاسوب	4
Data Structures and Algorithms	هيكلية البيانات والخوارزميات	5
Computer Systems and Networks	أنظمة الحاسوب والشبكات	6
Artificial Intelligence	الذكاء الاصطناعي	7
Computer Applications	تطبيقات حاسوبية	8
Project and Special Topics	مشروع وموضوعات خاصة	9

Study Plan for a bachelor's degree in Computer Science

The degree in Bachelor of Computer Sciences/ Faculty of Information Technology and Computer Sciences is awarded after the completion of the following requirements:

- A. The fulfillment of the conditions stated in the regulations for awarding the Bachelor Degree in Yarmouk Univ. No (2) in 1991 issued in accordance with bylaws for awarding scientific Degrees in Yarmouk Univ. No (118) in 2003.
- B. University course requirements as stated earlier. (27 Cr.Hr.)
- C. Faculty of Information Technology and Computer Sciences course requirements as stated earlier. (22 Cr. Hr.):
- D. Department course requirements: (85 Cr. Hr.):

Department Requirements (85) credit hours distributed as follow:

A. Mandatory Courses (61) credit hours:

Course No.	Course Name	Credit Hours	Weekly Contacts		Prerequisite
			Theoretical	Practical	
CS 210	OBJECT-ORIENTED PROGRAMMING	3	3	0	CS 110
CS 210L	OBJECT-ORIENTED PROGRAMMING LAB	1	0	3	With CS 210
CS 142	Discrete Structures	3	3	0	MATH 101
CS 220	COMPUTER LOGIC DESIGN	3	3	0	CS 142 ,CS 130
CS 225	COMPUTER ORGANIZATION LAB	1	0	3	CS 220
CS 250	DATA STRUCTURES	3	3	0	CS 210
CS 250L	DATA STRUCTURES LAB	1	0	3	With CS 250
CS 342	THEORY OF COMPUTATION	3	3	0	CS 142
CS 351	ANALYSIS AND DESIGN OF ALGORITHMS	3	3	0	CS 250 ,CS 142
NIS 220	DATA COMMUNICATIONS AND NETWORKS	3	3	0	CS 130
NIS 220L	DATA COMMUNICATIONS AND NETWORKS	1	0	3	With NIS 220

	LAB				
NIS 320	Wireless Networks	3	3	0	NIS 220 ،Stat 111
NIS 430	Networks Security	3	3	0	NIS 220
CS 376	ARTIFICIAL INTELLIGENCE	3	3	0	CS 351
CS 432	COMPUTER ARCHITECTURE	3	3	0	CS 220
CS 498	practical training	3	3	0	Completion of 90 CH and department acceptance
CS 499	Graduation Project	3	3	0	MIS 106، Completion of 98 CH
SE 201	مدخل الى هندسة البرمجيات	3	3	0	CIS 103 ،CS 110 ، CS 110L
SE 210	التحليل والتصميم الكينوني	3	3	0	SE 201
CIS 211	برمجة تطبيقات الانترنت	3	3	0	CS 110 ،CIS 103
MATH 102	تفاضل وتكامل (2)	3	3	0	MATH 101
MATH 241	جبر خطي (1)	3	3	0	MATH 101
MATH 322	تحليل عددي لطلبة علوم الحاسوب	3	3	0	MATH 101

B. Elective Courses (24) credit hours distributed as follow:

B.1. The student selects (18) credit hours from the following courses, (12 credit hours must be from the computer science department)

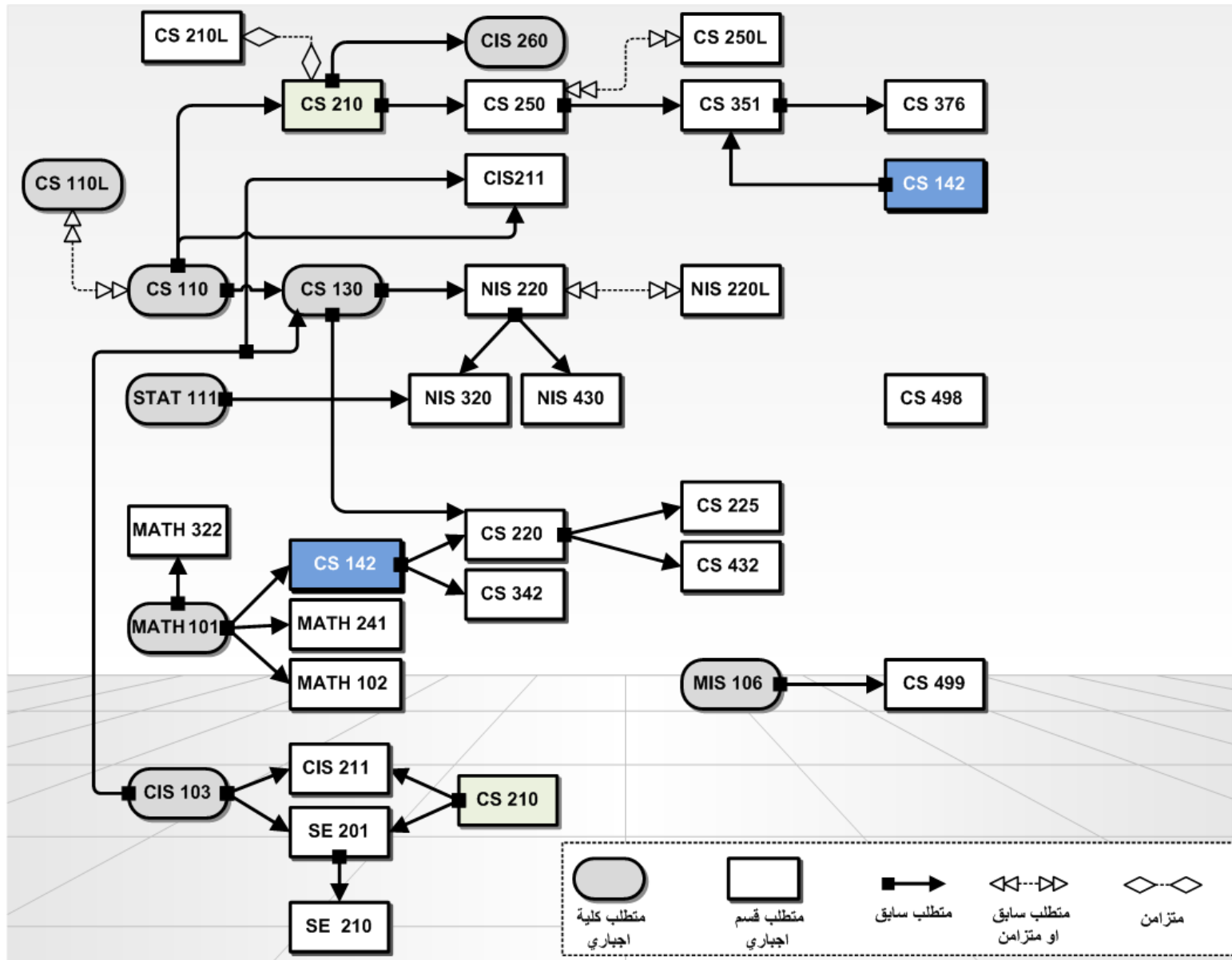
Course No.	Course Name	Credit Hours	Weekly Contacts		Prerequisite
			Theoretical	Practical	
CS 310	ADVANCED PROGRAMMING	3	3	0	CS 210
CS 315	Game Programming	3	3	0	CS 210
CS 331	Operating Systems	3	3	0	CS 130
CS 380	Computer Graphics	3	3	0	CS 250 ،MATH 241
CS 411	Smart Phones Apps Development	3	3	0	CS 130 ،CS 210
NIS 422	Distributed Systems	3	3	0	NIS 220
CS 470	Expert Systems	3	3	0	CS 376
CS 492	Special Topics	3	3	0	Completion of 75 CH and

					Department Acceptance
MIS 222	ريادة الاعمال في تكنولوجيا المعلومات	3	3	0	MIS 106
MIS 421	الجوانب القانونية في ادارة المعلومات	3	3	0	MIS 330 ,NIS 220
SE 350	ادارة المشاريع البرمجية	3	3	0	SE 201, MIS 360
CIS 281A	نظم متعددة الوسائط	3	3	0	CIS 103, CS 210
CIS 360	تطوير تطبيقات قواعد البيانات	3	3	0	CS 211, CIS 260
CIS 467	التنقيب عن المعلومات	3	3	0	CIS 260

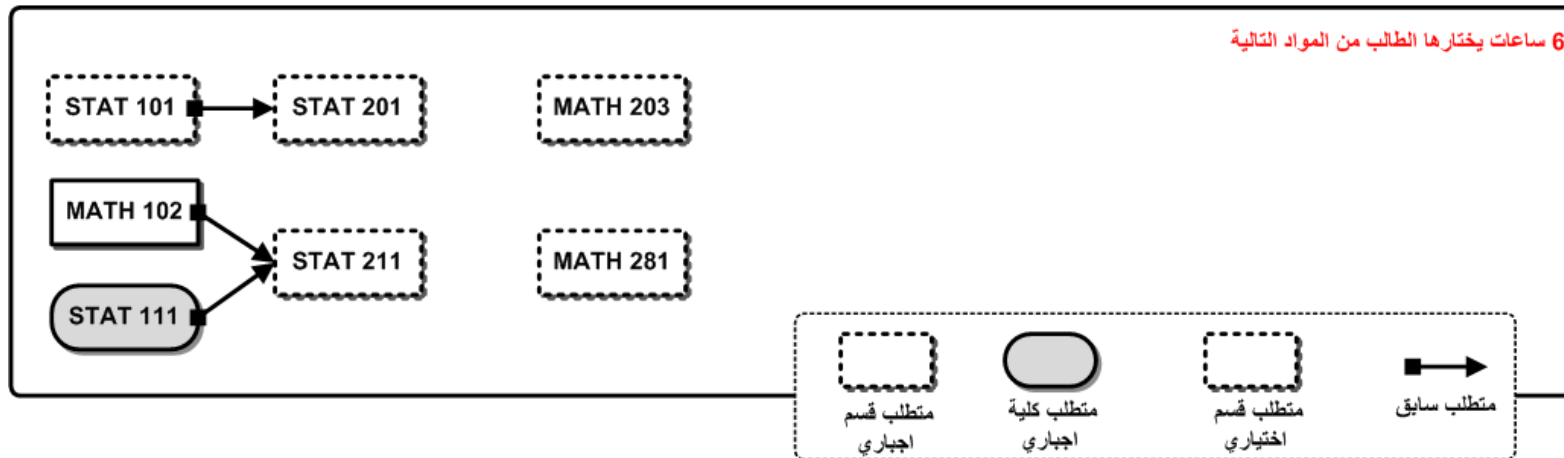
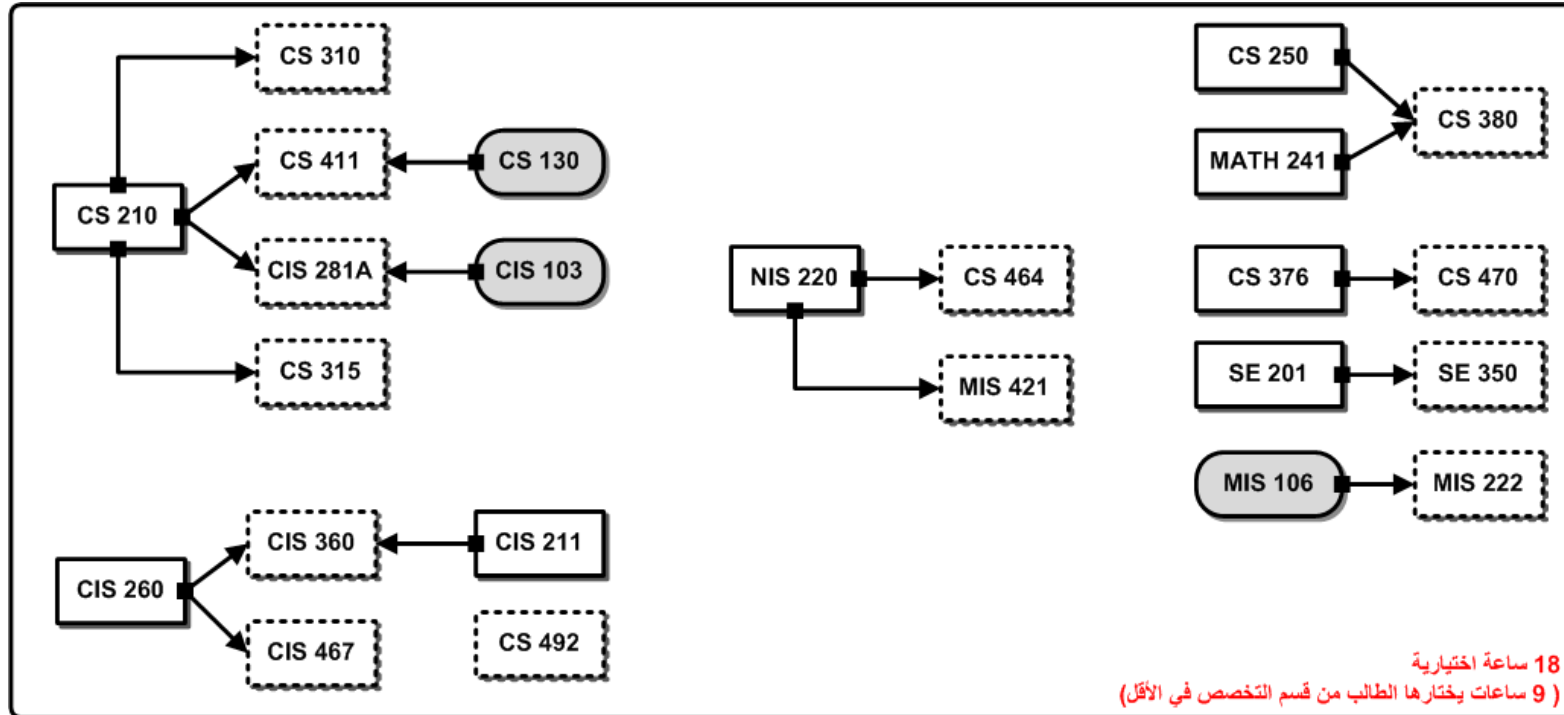
B.2. (6) credit hours selected from the following courses

Course No.	Course Name	Credit Hours	Weekly Contacts		Prerequisite
			Theoretical	Practical	
STAT 101	مبادئ الإحصاء (1)	3	3	0	---
STAT 201	مبادئ الإحصاء (2)	3	3	0	STAT 101
STAT 211	مبادئ الاحتمالات (2)	3	3	0	STAT 111, MAT
MATH 203	معادلات تفاضلية عادية (1)	3	3	0	---
MATH 281	البرمجة الخطية ونظرية الألعاب	3	3	0	---

Mandatory requirements track plan for a bachelor's degree majoring in Computer Science



Elective requirements track plan for a bachelor's degree majoring in Computer Science



Description of Courses Offered by the Department of Computer Science (CS)

Course	Credit Hours	Corequisite
CS 110	3	CS110L
<p>The main objective of this course is to introduce students to the basic concepts of a selected programming language (such as C++) and the ability to write simple correct programs. Topics to be covered include: I/O, data types, function definition, visibility and storage classes, parameter passing, loops, arrays, pointers, strings, files, introducing classes and objects, constructors and destructors, function prototypes, private and public access, and class implementation. The practical part of this course is covered in the lab through exercises, practical assignments, and tutorials.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Understand Programming Principles and program's development phases • Understand simple computer algorithms and how to program them • Understand problem solving methods • Write a C++ program and use comments • Apply Arithmetic and Logical operations in C++ • Apply if-statement in C++ • Apply C++ loops • Apply C++ library functions • Write a C++ global function • Use C++ Arrays • Use C++ Pointers 		

Course	Credit Hours	Co-requisite
CS110L	1	CS110
<p>The objective of this course is to provide students with the opportunity to implement the programming concepts and techniques taught in CS110. Exercises and case studies will be prepared in conjunction with the material covered in CS110</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Implement and execute programs in C++ • Implement and execute simple and med-size programs • Implement and use control-statements, library functions, global functions, arrays and pointers 		

Course	Credit Hours	Prerequisite
CS130	3	CS110 , CIS103
<p>The objective of this course is to provide students with the basic knowledge and skills of operating, managing, and maintaining microcomputer systems. Hands-on experience with windows environment is a major concern in this course. It covers a range of topics including: operating system concepts, functions, and components, a general overview of OS services, process management, CPU scheduling, memory management, virtual memory and file system, installing, partitioning, configuring and upgrading Windows, common errors and problems and how to solve them, networking capabilities of Windows. Windows commands, system programs, and Windows facilities are covered in the practical component.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Understands the data structures and algorithms of the fundamental parts in a modern operating system. • Understand and practice the working mechanism of some operating system parts • Understand the relationship between the hardware and the operating system • Understand storage architecture and the different types of data storages • Understand processing mechanism and memory usage • Calculate physical and logical address and apply them • Learn associated memory and use it • Divide the program into subparts and compare between the user and the actual program perspectives • Learn virtual memory 		

Course	Credit Hours	Prerequisite
CS142	3	MATH101
<p>Discrete mathematics involves the study of objects and ideas that can be divided into separate or discontinuous parts. The main goal of this course is to provide the students the knowledge may need in studying the computer science. The topics covered include: problem solving, proof techniques, reasoning communication, filtering, the applications of graph theory in computer science, probabilities, recursion sets, logic, functions and relations, real number system and algebraic structures.</p>		
<p>Learning Outcomes</p>		
<p>Upon successful completion of the course, the student will be able to perform the following:</p> <ul style="list-style-type: none"> • Get sharp and inquisitive mathematical thinking in solving variety of problems. • Use Discrete Mathematics in the applications of computer science problems. • Apply discrete mathematics in computer science problems • Understand the use of mathematical probabilities and number theory in problem solving. • Use algebraic structures in analyzing algorithms and their data structures. • Understand the mathematical properties of the graphs, trees and other discrete structures. 		

Course	Credit Hours	Prerequisite
CS210	3	CS110
<p>The objective of this course is to provide students with knowledge and needed skills in order to design and develop object-oriented programs. Topics to be covered include: the object-oriented approach, classes, method, object inheritance, replacement and refinement, static and dynamic binding, polymorphism, visibility and dependency, files and storage issues and case studies. The course should use an object oriented language as in CS110. The course is supplemented by a lab component covered in CS210L concurrently.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Understands the concept of OOP in solving complex programming tasks. • Apply OOP methods and paradigm in the analysis, designing and implemented computer applications • Manipulate OOP approach in designing data structures and algorithms 		

Course	Credit Hours	Co-requisite
CS210L	3	CS210
<p>The objective of this course is to provide students with the opportunity to implement the programming concepts and techniques taught in CS210. Exercises and case studies will be prepared in conjunction with the material covered in CS210.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Implementing programs using object oriented concepts that includes a set of classes designed around the course concepts. • Use OOP concepts such as abstraction, polymorphism, inheritance, exception handling and templates. • Use input and output methods for data and from files • Use programming comments and implement data structure programs. 		

Course	Credit Hours	Prerequisite
CS220	3	CS142 , CS130
<p>The objective of this course is to introduce students to the basic concepts in digital logic and how the electronic circuits work inside the computer. Topics to be covered include: Binary Systems, Conversion, Boolean expression and its simplification methods, Combinational logic circuits, MSI and LSI, flip-flops and sequential logic circuits, registers, counters, memory units. The course has a lab CS225 taken concurrently with it.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Understand numerical systems • Apply Boolean operators and reduce Boolean expression • Use Boolean algebra to simplify and optimize logical functions • Analyze and design logical circuits in digital computer systems • Analyze and design combinational circuits un digital computer systems • Design and using flip–flops, registers and counters. 		

Course	Credit Hours	Prerequisite
CS225	3	CS220
<p>This course is intended to cover the practical aspects related to computer organization, architecture, and logic. Students are trained to write simple assembly programs to explore and analyze microcomputer organization and architecture.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Understand the basic concepts of computer architecture and machine language • Solve problems by writing assembly language using MASM and the main concepts of the course 		

Course	Credit Hours	Prerequisite
CS250	3	CS210
<p>The objective of this course is to introduce students to various types of data structures, their logical and physical representations, and their related operations. Topics to be covered include: data structure operations, dense lists and matrix representations, linked lists and their different variations, string storage representation and manipulation, queues and stacks and their applications, tree structures and their different variations, graphs and networks. The course is supplemented by a lab component covered in CS250L concurrently.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Use Big–O notation to calculate the speed of an algorithm • Construct, change and update linear and nonlinear data structures including Stack, Queue Linked Lists and Graphs • Exploit linear and nonlinear data structures • Select the right data structure for solving traditional computer problems 		

Course	Credit Hours	Prerequisite
CS250L	3	CS250
<p>This course focuses on the practical part of using object oriented paradigm to implement data structures with C++. This facilitates students understanding and practice the logical and actual implementation of data structures and algorithms and their operations such as arrays, stacks, queues, linked list, trees, graphs, ... etc..</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Select the appropriate data structure for different problems • Use linear data structures including Stacks, Queues, arrays, and linked lists • Use and implement search based data structures and algorithms including binary search trees • Use and implement priority queues • Apply and implement graphs and search them using BFS and DFS and Dijkstra's algorithm 		

Course	Credit Hours	Prerequisite
CS310	3	CS210
<p>This course is intended to teach students a popular high level programming language based on the demands of the job market. Topics to be covered include: syntax rules and structures, special programming features of the language in comparison with other languages, how data is processed using this language, compilation and implementation issues, files and storage mechanisms, other facilities provided by the language. The practical part of the course will include case studies, exercises and a project.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Writing and running simple programs in the selected language • Design and writing applications with graphical user interface • Design programs with event handling • Use and apply arrays • Apply object oriented concepts such as classes, composition and inheritance. • Use access specifiers in classes (access permission: public, private, protected, package) • Defining class methods and use it (methods: get, set, equal, toString, clone) • Use arrays of objects • Use and apply database connections using SQL 		

Course	Credit Hours	Prerequisite
CS315	3	CS210
<p>This course is intended to provide students with the necessary knowledge and skills in design 2D systems. The course covers subjects such as, implement games of different characteristics or contains object collider and animation. Student will be exposed to advanced concepts in C++ such as Lists and exception handling. The course will cover materials such as: different storage properties and load and save game sessions to resume later on in addition to multimedia. The practical part will have each student to design his own game according to the learned concepts.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Determine and compare different animation techniques • Configure simple interactive game • Analysis the requirements of an interactive game environment • Implementing interactive 2d and 3d models • Implement sound in the game • Create a simple 2D world or 3D world that includes imported models • Assess 2D and 3D worlds 		

Course	Credit Hours	Prerequisite
CS331	3	CS130
<p>This course builds on the knowledge and skills gained from the course CS130. Its objective is to provide students with more advanced concepts, techniques, and in-depth knowledge in issues that have not been covered in the introductory course. Topics to be covered include: operating system types, operating system structures, systems calls, inter-process communication, communication in client/server systems, multithreading, process synchronization, deadlocks, advanced topics in storage management and virtual memory, file system structure and implementation, mass storage structure management, RAID technology. The practical part of the course involves case studies and a practical component in some operating systems not covered in CS130 such as Linux or UNIX.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Describe and compare different operating system architectures • Understand and analysis computer processing, resource allocation and process scheduling, etc (virtual memory, process scheduling, input and output units and files) • Detailed understanding of process scheduling and threading • Understand different process allocation methods and synchronization • Understand privacy and security issues 		

Course	Credit Hours	Prerequisite
CS342	3	CS142
<p>The objective of this course is to introduce students to formal languages and their representation, automata, and theory of computation. Topics to be covered include: formal languages and their representation, different grammars, finite automata: deterministic and non-deterministic, regular languages, regular expressions, context-free languages, push-down automata, Turing machines and computability, universal Turing machine, computability and complexity.</p>		
<p>Learning Outcomes</p>		
<p>Upon successful completion of the course, the student will be able to perform the following:</p> <ul style="list-style-type: none"> • 1. Understand the proof techniques and distinguish between different types of automata (DFA, NFA, etc). • 2. Develop new programming languages, under certain conditions and restrictions, based on computational concepts. • Understand the concepts of languages, regular languages, context-free languages and Push-Down automata. 		

Course	Credit Hours	Prerequisite
CS351	3	CS142 , CS250
<p>The objective of this course is to provide students with the knowledge and skills in complexity analysis and design of computer algorithms. Topics to be covered include: sorting algorithms, search algorithms, divide and conquer, greedy method, trees, graphs, dynamic programming, backtracking, branch and bound, Lower bound theory, NP-complete problems. The practical part of the course will include writing programs for solving problems using techniques taught in this course</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Understand the general framework for analyzing an algorithm • Apply pseudocode to write computer problems • Compare between algorithms by their growth • Describe different types of algorithms such as divide-and-conquer, greedy and dynamic programming • Identify different implementation techniques and solutions 		

Course	Credit Hours	Prerequisite
CS376	3	CS351
<p>The objective of this course is to provide students with the basic concepts, knowledge and skills required in utilizing Artificial Intelligence techniques in solving practical problems. Topics to be covered include: knowledge representation methods like propositional logic and predicate calculus, blind search strategies (breadth-first and depth-first), heuristic search strategies (hill-climbing, best-first and A*), backward and forward reasoning, applications: expert systems, natural language processing, pattern recognition, image processing, and planning. The practical part of the course involves programming exercises and case studies related to the topics covered.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Using AI methods for solving practical applications • Using and applying mathematical and logical skills for knowledge representation and searching problems • Use functional languages such as Prolog • Use and apply inference rules and predicate logic • Understand informed and uninformed searching algorithms • Use and apply AI method for natural language processing and machine learning 		

Course	Credit Hours	Prerequisite
CS380	3	CS250, MATH241
<p>The objective of this course is to provide students with the basic concepts, technical and mathematical knowledge and skills required to design and implement computer graphics. Topics to be covered include: graphics hardware, software utilities, two and three dimensional transmutation and viewing, graphics arts and animations. Students are expected to be design programs using programming graphics tools and libraries such as Open GL to perform practical assignments.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Understand computer graphics in IT • Understand basic concepts and mathematical skills necessary to design computer graphics • Use computer graphics packages and libraries such as Open GL to draw basic shapes • Apply the theoretical part practically • Apply new computer graphic techniques 		

Course	Credit Hours	Prerequisite
CS432	3	CS220
<p>The objective of this course is to introduce students to the basic concepts and various techniques of computer architecture. Topics to be covered include: ALU design, IEEE 754 format for floating-point numbers, coprocessors, design of hardwired CU and micro-programmed CU, the characteristics of instruction sets, pipelines techniques, the architecture of RISC and CISC machine, (cache) high speed memories, I/O channels and I/O processors, parallel processing.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Understand the interaction mechanisms between hardware and software in different layers which provides basic computational concepts • Apply different measurement techniques to compare between different computer systems • Identify different tools and techniques in designing computer systems • Understand processing techniques and their swaps • Design a computer system 		

Course	Credit Hours	Prerequisite
CS411	3	CS130 , CS210
<p>The objective of this course is to provide the basic concepts of mobile computation and applications from three different perspectives: mobile phone technologies, app implementations and user interaction. The course includes fundamental techniques, networking and systems requirements to design and execute mobile computing systems and applications and some scenarios of low-processing devices and limited resources, error tolerance, continuity and graphical user interface.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Understand fundamental concepts in smart phones application programing • Understand the basic concepts and characteristics of smart phones • Implement smart phone applications • Understand the different methods to acquire additional resources such as databases, maps, data security in different smart phones (maps, SMS, emails etc,,) • Understand professional and ethical issues that are related to data privacy and security and user usages. 		

Course	Credit Hours	Prerequisite
CS470	3	CS376

The objective of this course is to provide students with the knowledge and skills required for developing expert systems and applying them in real-life application problems. Topics to be covered include: knowledge acquisition, knowledge representation techniques, inference methods, reasoning under uncertainty, design of expert systems, and introduction to an expert system programming tool, expert systems case studies. In the practical part of the course students are expected to design a small expert system using an expert system programming tool.

Learning Outcomes

After Completing this course the student should:

- Apply different techniques to transform human knowledge into an expert system
- Apply and implement knowledge representation techniques
- Design and implement a knowledge base
- Implement an expert system that incorporates a set of control rules
- Assess creation techniques of expert systems
- Apply CLIPS in programming an expert system

Course	Credit Hours	Prerequisite
CS492	3	Passed in 75 CH at least and deptmental approval

In this course a topic in computer science is selected not covered in the list of courses described above to be taught to students, with the approval of the department board.

Learning Outcomes

After Completing this course the student should undertand an important computer science topic specified by the department and not covered by other courses in the study plan.

Course	Credit Hours	Prerequisite
CS498	3	

This course aims to provide an opportunity for students to practice the knowledge they have gained from the university, which include analysis, design, programming databases and building data and algorithms, operating systems, and web programming, networks and communications, etc., It's an opportunity for students to gain knowledge in information and communications technology industry. Students will have the opportunity to develop their professional skills through interaction and communication with their colleagues.

Learning Outcomes

After Completing this course the student should:

- understand, analyze and design databases programs according to business requirements
- Apply algorithms to solve various problems with high efficiency
- develop team–work skills
- develop interaction skills and communicate with co–workers

Course	Credit Hours	Prerequisite
CS499	3	MIS106
<p>The objective of this course is to give students an opportunity to utilize the knowledge and skills gained in other courses in a real-life application problem. The student is supposed to analyze the problem, design a software solution to it, coding the solution in a programming language, and writing the documentation in the form of a project report using a standard way.</p>		
<p>Learning Outcomes</p>		
<p>After Completing this course the student should:</p> <ul style="list-style-type: none"> • Identify a related problem from computer science. • Analysis the problem and have an initial solutions. • Work independently and work in a team with colleagues and supervisors. • Effective planning of the various activities of the project life cycle. • Create and illustrate the functional requirements and preliminary design of the system 		

- Mapping Matrix between Faculty mandatory courses and learning outcomes

Course No.	Course Name	Learning Outcomes										
		1	2	3	4	5	6	7	8	9	10	11
CS 110	PROGRAMMING IN A SELECTED LANGUAG	X		X								
CS 110L	PROGRAMMING IN A SELECTED LANGUAG Lab	X	X	X								
MATH 101	تفاضل وتكامل 1	X	X	X			X					
CIS 103	مقدمة في تكنولوجيا المعلومات					X	X	X	X			
CIS 260	نظم قواعد البيانات						X			X		
STAT 111	مبادئ الاحتمالات (1)			X							X	
MIS 106	مهارات الاتصال لتكنولوجيا المعلومات		X	X			X					
CS 130	FUNDAMENTALS OF OPERATING SYSTEMS			X	X			X				X

- Mapping Matrix between department mandatory courses and learning outcomes

Course No.	Course Name	Learning Outcomes										
		1	2	3	4	5	6	7	8	9	10	11
CS 210	OBJECT-ORIENTED PROGRAMMING	X	X	X								
CS 210L	OBJECT-ORIENTED PROGRAMMING Lab	X	X	X								
CS 142	Discrete Structures		X	X								
CS 220	COMPUTER LOGIC DESIGN			X	X							
CS 225	COMPUTER ORGANIZATION LAB	X	X									
CS 250	DATA STRUCTURES		X						X			
CS 250L	DATA STRUCTURES Lab		X						X			
CS 342	THEORY OF COMPUTATION			X							X	
CS 351	ANALYSIS AND DESIGN OF ALGORITHMS		X	X					X			
CS 432	COMPUTER ARCHITECTURE				X							
CS 498	Practical Training						X		X			

CS 499	Graduation Project								X	X		
NIS 220	DATA COMMUNICATIONS AND NETWORKS					X		X				
NIS 220L	DATA COMMUNICATIONS AND NETWORKS Lab					X						
NIS 320	Wireless Networks					X		X				
NIS 430	Network Security					X						X
CS 376	ARTIFICIAL INTELLIGENCE						X				X	
SE 201	مدخل الى هندسة البرمجيات		X				X					X
SE 210	التحليل والتصميم الكينوني		X				X					X
CIS 211	برمجة تطبيقات الانترنت	X						X				
MATH 102	تفاضل وتكامل (2)		X									
MATH 241	جبر خطي (1)		X									
MATH 322	تحليل عددي لطلبة علوم الحاسوب		X									

- Mapping Matrix between department–elective courses and learning outcomes

Course No.	Course Name	Learning Outcomes										
		1	2	3	4	5	6	7	8	9	10	11
CS 310	ADVANCED PROGRAMMING	X	X	X								
CS 315	Game Programming		X	X			X		X			
CS 331	OPERATING SYSTEMS				X							
CS 380	COMPUTER GRAPHICS						X					
CS 411	Smart Phones Apps Development		X	X			X					
NIS 422	DISTRBUTED COMPUTING							X				
CS 470	EXPERT SYSTEMS						X		X			
CS 492	SPECIAL TOPICS								X			

Study guidelines for computer science student

First Year

Second Term			First Term		
C.H.	Course Category	Course No.	C.H.	Course Category	Course No.
3	Faculty Requirement/ Mandatory	MIS 106	3	Faculty Requirement/ Mandatory	CS 110
3	University Requirement/ Elective	---	1	Faculty Requirement/ Mandatory	CS 110L
3	Faculty Requirement/ Mandatory	CS 130	3	Faculty Requirement/ Mandatory	MATH 101
3	University Requirement/ Mandatory	---	3	Faculty Requirement/ Mandatory	CIS 103
3	University Requirement/ Elective	---	3	University Requirement/ Mandatory	---
3	Department Requirement/ Mandatory	CS 142	3	University Requirement/ Elective	---
18		Total	16		Total

Second Year

Second Term			First Term		
C.H.	Course Category	Course No.	C.H.	Course Category	Course No.
3	Department Requirement/ Mandatory	CS 250	3	Department Requirement/ Mandatory	CS 210
1	Department Requirement/ Mandatory	CS 250L	1	Department Requirement/ Mandatory	CS 210L
3	University Requirement/ Elective	---	3	Department Requirement/ Mandatory	CS 220
1	Department Requirement/ Mandatory	CS 225	3	University Requirement/ Mandatory	---
3	University Requirement/ Elective	---	3	Department Requirement/ Mandatory	MATH 102
3	Department Requirement/ Mandatory	CIS 211	3	Faculty Requirement/ Mandatory	STAT 111
3	Department Requirement/ Mandatory	SE 210			
17		Total	16		Total

Third Year

Second Term			First Term		
C.H.	Course Category	Course No.	C.H.	Course Category	Course No.
3	Department Requirement/ Mandatory	NIS 320	3	Department Requirement/ Mandatory	SE 210
3	Department Requirement/ Mandatory	CS 376	3	Department Requirement/ Mandatory	CS 351
3	Department Requirement/ Mandatory		3	Department Requirement/ Mandatory	NIS 220
3	Department Requirement/ Elective	CS 342	2	Department Requirement/ Mandatory	NIS 220L
3	Department Requirement/ Elective	---	3	University Requirement/ Elective	---
3	Department Requirement/ Elective	---	3	Department Requirement/ Elective	---
18		Total	17		Total

Fourth Year

Second Term			First Term		
C.H.	Course Category	Course No.	C.H.	Course Category	Course No.
3	Department Requirement/ Mandatory	CS 499	3	Department Requirement/ Mandatory	NIS 430
3	Department Requirement/ Elective	---	1	Department Requirement/ Mandatory	CS 432
3	Department Requirement/ Mandatory	---	3	Department Requirement/ Mandatory	CS 498
3	Department Requirement/ Elective	---	3	Department Requirement/ Elective	---
3	Department Requirement/ Elective	---	3	Department Requirement/ Mandatory	MATH 322
3	Department Requirement/ Mandatory		3	Department Requirement/ Mandatory	MATH 241
18		Total	16		Total

The contents of the plan compared with the accreditation standards

المحور	اسم ورمز المساق في الخطة المعدلة	نوع المساق	عدد الساعات	حالة المساق
المحور الأول: علوم الحاسبات والخوارزميات				
رياضيات متقطعة	CS 142 هياكل متقطعة	قسم	3	موجود
تراكيب البيانات	CS 250 هيكلية البيانات	قسم	3	موجود
	CS 250L مختبر هيكلية البيانات	قسم	1	موجود
الخوارزميات	CS 351 تحليل وتصميم الخوارزميات	قسم	3	موجود
نظرية الحاسبات	CS 342 النظرية الاحتمالية	قسم	3	موجود
المطلوب للاعتماد	12	المجموع	13	مكتمل
المحور الثاني: البرمجة				
برمجة كينونية	CS 210 البرمجة الكينونية	قسم	3	موجود
	CS 210L مختبر البرمجة الكينونية	قسم	1	موجود
برمجة مرئية	CS 110 البرمجة بلغة مختارة	كلية	3	موجود
	CS 110L مختبر البرمجة بلغة مختارة	كلية	1	موجود
برمجة تطبيقات الانترنت	CIS 211 برمجة تطبيقات الانترنت	قسم	3	موجود
المطلوب للاعتماد	12	المجموع	11	مكتمل
المحور الثالث: مكونات الحاسوب الرئيسية				
تصميم المنطق الرقمي	CS 220 تصميم منطق الحاسوب	قسم	3	موجود
تصميم وتنظيم الحاسوب	CS 225 مختبر هيكلية الحاسوب	قسم	1	موجود
معمارية الحاسوب	CS 432 معمارية الحاسوب	قسم	3	موجود
برمجيات النظم (نظم تشغيل)	CS 130 اساسيات نظم التشغيل	كلية	3	موجود
المطلوب للاعتماد	12	المجموع	10	مكتمل
المحور الرابع: شبكات				
شبكات الحاسوب	NIS 220 تراسل البيانات والشبكات	قسم	3	موجود
	NIS 220L مختبر تراسل البيانات والشبكات	قسم	1	موجود
الشبكات اللاسلكية	NIS 320 الشبكات اللاسلكية	قسم	3	موجود
أمن الشبكات	NIS 430 أمن الشبكات	قسم	3	موجود
المطلوب للاعتماد	9	المجموع	10	مكتمل
المحور الخامس: تطبيقات وعلوم المعلومات				
هندسة البرمجيات	SE 201 مدخل الى هندسة البرمجيات	قسم	3	موجود
قواعد البيانات	CIS 260 نظم قواعد البيانات	كلية	3	موجود
تحليل وتصميم النظم	SE 210 التحليل والتصميم الكينوني	قسم	3	موجود
المطلوب للاعتماد	9	المجموع	9	مكتمل
المجالات المساندة				
الاحصاء	STAT 111 مبادئ الاحتمالات	كلية	3	موجود
تحليل عددي	MATH 322 تحليل عددي لطلبة علوم الحاسوب	قسم	3	موجود
المطلوب للاعتماد	6	المجموع	6	مكتمل