1.	School	King Abdullah II School for Information Technology
2.	Department	Computer Science
3.	Program title (Arabic)	البكالوريوس في علم الحاسوب
4.	Program title (English)	B.Sc. in Computer Science

5. Components of Curriculum:

The curriculum for the bachelor's degree in computer science consists of (132) credit hours distributed as follows

Number	Type of requirement	credit hours
First	University Requirements	**27**
Second	School Requirements	**24**
Third	Department Requirements	**81**
Total		**132**

6. Numbering System:

A- Department number

Number	Department
1	Computer Science (CS)
2	Computer Information Systems (CIS)
3	Business Information Systems (BIS)
4	Information Technology (IT)
5	Artificial Intelligence (AI)

B- Course number

Domain number	Domain title	Domain number	Domain title
0	General	5	Applications
1	Programming Languages	6	Computer Networks and Communications
2	Information Systems and Management	7	Systems Development
3	Hardware Components and Theoretical Constructs	8	Specialized Topics
4	Computational Sciences and Algorithms	9	Special Topics and Project

C- Course number consists of 7 digits

School		Department		Level	Serial number	
1	**9**	**0**	**1**	**X**	**X**	**X**

Study Plan- Bachelors

First: University Requirements (27) credit hours distributed as follows:

	Preparation Program Requirements				
	All students admitted to the university must apply for a degree examination in Arabic and English and the computer is prepared or approved by the university to determine their level. Based on the results of the examinations, either the student will study one or more of the requirements of the preparatory program. **(0 - 15 Credit Hours)**				
No.	**Course Title**	**Course No.**	**Credit Hours**	**Prerequisites**	**Notes**
1	**Community Service**	**0300150**	**0**	**-**	**-**
2	**Computer Skills Placement Test**	**1902098**	**0**	**-**	**-**
3	**Basics of Computing**	**1932099**	**3**	**1902098**	**Pass/Fail**
4	**Arabic Placement Test**	**3201098**	**0**	**-**	**-**
5	**Basics of Arabic**	**3201099**	**3**	**3201098**	**Pass/Fail**
6	**Arabic Languages Skills**	**3201100**	**3**	**3201099**	**Pass/Fail**
7	**English Placement Test**	**3202098**	**0**	**-**	**-**
8	**Basics of English**	**3202099**	**3**	**3202098**	**Pass/Fail**
9	**English Language Skills**	**3202100**	**3**	**3202099**	**Pass/Fail**
	Compulsory Requirements **(18 Credit Hours)**				
No.	**Course Title**	**Course No.**	**Credit Hours**	**Prerequisites**	**Notes**
1	**Military Sciences**	**2220100**	**3**		
2	**National Culture**	**3400100**	**3**		
3	**Ethics and Humans Values**	**3410100**	**3**		
4	**Entrepreneurship Innovation and Scientific Research**	**3410101**	**3**	3410100/1932099	
5	**Life And Practical Skills**	**3410102**	**3**	3410100/1932099	
6	**Introduction to Philosophy and Critical Thinking**	**3400103**	**3**	3410100/1932099	

Study Plan- Bachelors

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C- Electives
(9 Credit Hours)

Elective courses: (9) credit hours to be chosen from the first, second and third groups mentioned below. The student has to choose one course from each of the groups.

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(First Group)

No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Islam and Contemporary Issues	0400101	3	-	-
2	Arab-Islamic Civilization	2300101	3	-	-
3	Jordan: History and Civilization	2300102	3	-	-
4	Great Books	3400107	3	-	-
5	Jerusalem	3400108	3	-	-

Electives
(Second Group)

No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Environmental Culture and Development	0310102	3	-	-
2	Islamic Culture	0400102	3	-	-
3	Health Culture	0720100	3	-	-
4	Legal Culture	1000102	3	-	-
5	Physical Fitness Culture	1100100	3	-	-

Electives
(Third Group)

No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Electronic Commerce	1600100	3		
2	Social Media	1900101	3		
3	Appreciation of Arts	2000100	3		
4	Foreign Language	2200103	3		
5	Special Subject	3400106	3		

Study Plan- Bachelors

Second: School courses: distributed as follows:
    A. Obligatory school courses: (24) credit hours
    B. Elective school courses: (0) credit hours

    A. Obligatory school courses: (24) credit hours:

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theoretical	Practical		
1901101	Discrete Mathematics	3	-	3	-
1931102	Computer Skills for Scientific Faculties	3	-	3	Pass Qualifications Exam or 1932099
1904101	Fundamentals of Information Technology	3	-	3	-
1904120	Web Applications Development	3	-	3	1931102
1902110	Object-Oriented Programming	3	-	3	1931102
1901242	Data Structures	3	-	3	1902110
1902224	Database Management Systems	3	-	3	1902110
1915101	Linear Algebra for Computational Sciences	3	-	3	0301101
1902390	Seminar-Road to Software Industry	2	-	0	Pass 45 hours

    B. Elective school courses: (0) credit hours:

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theoretical	Practical		

Third: Specialty courses: (81) credit hours distributed as follows:

    A. Obligatory specialty courses: (69) credit hours
    B. Elective specialty courses: (12) credit hours

Study Plan- Bachelors

A. Obligatory specialty courses: (69) credit hours:

Course No.	Course Name	Contact Hours		Credit Hours	Pre Required
		Theoretical	Practical		
0301101	Calculus-1	3	-	3	-
0301102	Calculus-2	3	-	3	0301101
0301131	Principles of Statistics	3	-	3	-
0302108	Physics for Computer Science	2	-	2	-
0302116	Physics for Computer Science – Lab	-	3	1	0302108 or simultaneously
1901212	Advanced Programming in Special Languages	3	-	3	1901242
1901204	Logic Design	3	-	3	0302108 + 0302116 + 1901101
1901241	Theory of Computation	3	-	3	1901101 + 1931102
1901243	Data Structures Lab	-	4	2	Simultaneously with 1901242
1901301	Computer Ethics	1	-	1	1902372
1901322	Computer Organization	3	-	3	1901204
1901341	Theory of Algorithms	3	-	3	1901242
1901351	Numerical Analysis	3	-	3	1915101+ 1931102
1901353	Modeling and Simulation	3	-	3	1901242 + 0301131
1901359	Computer Graphics	3	-	3	1901242
1901363	Computer Networks	3	-	3	1901242
1901473	Operating Systems	3	-	3	1901242
1901476	Systems Programming and Compilers Construction	3	-	3	1901241 + 1901322
1901471	Design And Implementation of Programming Languages	3	-	3	1901241
1901444	Computational Problems and Techniques	3	-	3	1901341
1901468	Parallel and Distributed Systems	3	-	3	1901341 + 1901322 + 1901363
1901496	Project-1	-	-	0	Pass 90 hours
1901497	Project-2	-	-	3	1901496
1901498	Training	6 Weeks		0	Pass 90 hours
1902372	Software Engineering	3	-	3	1902224
1905320	Artificial Intelligence	3	-	3	1901242
1911322	Information Security and Privacy	3	-	3	1901363 + 1902224

Study Plan- Bachelors

B. Elective specialty courses: (12) credit hours:

Course No.	Course Name	Contact Hours		Credit Hours	Pre-required
		Theoretical	Practical		
1901364	Advanced Networking	3	-	3	1901363
1901442	Network Programming	3	-	3	1901363
1901372	Design Patterns and Clean Code	3	-	3	1902372 + 1901212
1901446	Computer Systems Performance	3	-	3	0301131 + 1901322
1901443	Graph Theory	3	-	3	1901341
1901469	Mobile Wireless Networks	3	-	3	1901363
1901494	Special Topics	3	-	3	1901242
1931460	Fundamentals of IoT	3	-	3	1901473+ 1901363
1931461	Cloud Computing Concepts	3	-	3	1901473+ 1901363
1902310	Mobile Development Frameworks	3	-	3	1904120 + 1902110
1902324	Database Technologies and applications	3	-	3	1902224
1902454	Digital Image Processing	3	-	3	1901359
1904254	Advanced Web Development	3	-	3	1904120
1911351	Security of Web Applications	3	-	3	1902224 + 1904120
1911361	Network Security	3	-	3	1901363
1915251	Applied Statistics	3	-	3	0301131
1915342	Bioinformatics	3	-	3	1901444
1915370	Machine Learning and Neural Network	3	-	3	1901444

Study Plan- Bachelors

Fourth: Courses offered by other faculties and departments (Physics, Math, CIS, IT, AI)

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theoretical	Practical		
0301101	Calculus-1	3	-	3	-
0301102	Calculus-2	3	-	3	0301101
0301131	Principles of Statistics	3	-	3	-
0302108	Physics for Computer Science	2	-	2	
0302116	Physics for Computer Science - Lab	-	3	1	0302108 or simultaneously
1904101	Fundamentals of Information Technology	3	-	3	-
1904120	Web Applications Development	3	-	3	1931102
1902110	Object-Oriented Programming	3	-	3	1931102
1902224	Database Management Systems	3	-	3	1902110
1915101	Linear Algebra for Computational Sciences	3	-	3	0301101
1902390	Seminar-Road to Software Industry	2	-	0	Pass 45 hours
1902372	Software Engineering	3	-	3	1902224
1905320	Artificial Intelligence	3	-	3	1901242
1902310	Mobile Development Frameworks	3	-	3	1904120 + 1902110
1902324	Database Technologies and applications	3	-	3	1902224
1902454	Digital Image Processing	3	-	3	1901359
1904254	Advanced Web Development	3	-	3	1904120
1911322	Information Security and Privacy	3	-	3	1901363 + 1902224
1911351	Security of Web Applications	3	-	3	1902224 + 1904120
1911361	Network Security	3	-	3	1901363
1915251	Applied Statistics	3	-	3	0301131
1915342	Bioinformatics	3	-	3	1901444
1915370	Machine Learning and Neural Network	3	-	3	1901444

Fifth: Advisory Study Plan

(First) Year

(First) Semester			(Second) Semester		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
0301101	Calculus-1	3	1904120	Web Applications Development	3
1901101	Discrete Mathematics	3	1902110	Object-Oriented Programming	3
1931102	Computer Skills for Scientific Faculties	3	1915101	Linear Algebra for Computational Sciences	3
1904101	Fundamentals of Information Technology	3	0302108	Physics for Computer Science	2
	Univ. Req	3	0302116	Physics for Computer Science -Lab	1
	Univ. Req	3		Univ. Req	3
				Univ. Req	3
Total		**18**	**Total**		**18**

(Second) Year

(First) Semester			(Second) Semester		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
0301102	Calculus-2	3	1901212	Advanced Programming in Special Languages	3
1901242	Data Structures	3	0301131	Principles of Statistics	3
1901243	Data Structures Lab	2	1901351	Numerical Analysis	3
1902224	Database Management Systems	3	1901241	Theory of Computation	3
1901204	Logic Design	3		Univ. Req	3
	Univ. Req	3		Univ. Req	3
Total		**17**	**Total**		**18**

Study Plan- Bachelors

(Third) Year

(First) Semester			(Second) Semester		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
1901353	Modeling and Simulation	3	1901359	Computer Graphics	3
1901301	Computer Ethics	1	1905320	Artificial Intelligence	3
1901322	Computer Organization	3	1902372	Software Engineering	3
1901363	Computer Networks	3	1902390	Seminar-Road to Software Industry	0
1901341	Theory of Algorithms	3		Elective Course	3
	Elective Course	3		Univ. Req	3
Total		**16**	**Total**		**15**

(Fourth) Year

(First) Semester			(Second) Semester		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
1901444	Computational Problems and Techniques	3	1901468	Parallel and Distributed Systems	3
1901471	Design And Implementation of Programming Languages	3	1901476	Systems Programming and Compilers Construction	3
1901473	Operating Systems	3	1911322	Information Security and Privacy	3
1901496	Project-1	0	1901497	Project-2	3
	Elective Course	3	1901498	Training	0
	Univ. Req	3		Elective Course	3
Total		**16**	**Total**		**14**

Study Plan- Bachelors

Course Description

A. Obligatory School Courses Description:

Course Number 1901101	Course Title Discrete Mathematics	Credit Hours 3
Prerequisite: (None)		
Course Description This course studies the mathematical elements of computer science and their applications. Topics include propositional logic; predicate logic; mathematical reasoning; techniques of proof; mathematical induction; set theory; number theory; matrices; sequences and summations; functions, relations and their properties, elementary graph theory, and tree (graph theory). In each subject, its characteristics, forms, ways of representing it, the operations used in it, and ways of linking these subjects together are studied. Homework will be assigned.		

Course Number 1931102	Course Title Computer Skills for Scientific Faculties	Credit Hours 3
Prerequisite: (Pass Qualifications Exam or 1932099)		
Course Description This course studies the fundamental concepts of programming using C++. Topics includes: basic structures of programming tools, like: variable names, data types, input and output statements, and output formatting. Files. Selection statements structures. Repetition statements structures. Functions. Enumeration datatype and strings data type. Arrays; 1D and 2D. The lectures will be provided in the lab through active teaching methodologies individually or within groups.		

Study Plan- Bachelors

Course Number 1904101	Course Title Fundamentals of Information Technology	Credit Hours 3
Prerequisite: (None)		

Course Description

This course will introduce the fundamental knowledge of information technologies, and it works as an introductory course for computer-related courses. It is a combination between a theoretical and a practical course. In particular, the course provides students with a grounding knowledge on several areas of information technologies including cutting edge technologies, careers in IT, basic concepts of cloud computing and web technologies, and a general perceptive of project management. Students are also going to be introduced practically to hardware maintenance, software diagnostics and technical support. In addition, critical thinking methodologies and techniques will be discussed, including numbering systems, flowcharts and related case studies. Operating systems such as LINUX/UNIX with, memory allocation, and an introduction to networks and security, and block chain concepts. The final part is concerned with technical applications needed such as excel, advanced excel, technical writing, report generating and type writing. Technical sections will be taught on lab sessions and group works. Active learning methodologies will be applied through role playing, presentations and problem solving exercises.

Course Number 1904120	Course Title Web Applications development	Credit Hours 3
Prerequisite: (1931102)		

Course Description

This course aims to improve students' ability in Front-End Web applications development using client-side programming such as HTML 5, Cascading Style Sheet (CSS3), JavaScript. In addition, the students will learn the fundamental concepts of front-end web development frameworks such as Bootstrap and React front-end frameworks. The course will cover the Bootstrap framework, which is the most popular CSS framework for creating responsive mobile-first websites. This course will teach you how to create pages of a website using the Bootstrap v5 framework. In addition, the course also covers the basic concepts of the React framework such as Communicating with Props, Class-Based Components, State in React Components, Lifecycle Methods, Handling User Input with Forms and Events, Making API Requests with React, and Single Page Application Development. This course uses active teaching methodologies, such as weekly lab applied sessions, group work and technical projects.

Course Number 1902110	Course Title Object-Oriented Programming	Credit Hours 3
Prerequisite: (1931102)		

Course Description

The course aims to cover the fundamental concepts of OOP, such as Encapsulation and Information-Hiding, Inheritance, Polymorphism, and Abstraction. The course uses Java Programming language starting from the basic Java syntax based on Eclipse IDE. It focuses on the understanding and practical mastery of OOP principles and Java components, such as classes, objects, input/output, scanner objects (to read either from the keyboard or a file), loops, decision-making, array and multidimensional array, data abstraction, methods, method overloading, objects garbage-collector, an introduction to exception-handling, etc. Finally, it presents an introduction to JavaFX and its hierarchy based on Java inheritance OOP concepts, for developing rich client applications. Lectures will be given in the lab for practical application. This course is assessed through exams, practical tests and assignments.

Course Number 1901242	Course Title Data Structures	Credit Hours 3
Prerequisite: (1902110)		

Course Description

This Course introduces the students to the concepts of data structures. Topics includes: Pointers, and pointer operations. Array implementation of lists, stacks, and queues. Dynamic implementation of lists (singly, doubly, circular), stack operations and queue operations (and their implementation as linked lists). STL, like: vectors, pairs, maps, sets, lists, stacks, queue. Recursion. Tree dynamic, like binary search trees, segment, red-black, AVL trees. Hash Table and Collision resolution. Weekly lab assignments will be given to the students and to be discussed thourhg active teaching methodologies, in addition to problem solving tasks.

Course Number 1902224	Course Title Database Management Systems	Credit Hours 3
Prerequisite: (1902110)		

Course Description

The course aims to provide students with an overview of database management system architecture and environment, an understanding of the basic database design and implementation techniques, and a practical experience of designing and building relational databases. Furthermore, it enables applying conceptual design methodologies for databases and learning about the architecture and environments of the database management system. Students will practice using database tools to create and manage database schemas systems and formulate DDL, DML commands and run SQL queries. Advanced SQL topics such as creating database functions, database Stored Procedures and database Triggers will be covered. Also, students will learn how to manage database privileges and design suitable security and integrity constraints for database schemas. Furthermore, the course will provide the students with practice project to connect a relational DB using a programming language, in addition to practice using basic Oracle Forms and Oracle Reports. This course will use a combination of traditional lectures, active teaching methodologies, and hands-on lab lectures.

Course Number 1915101	Course Title Linear Algebra for Computational Sciences	Credit Hours 3
Prerequisite: (0301101)		

Course Description

The course uses linear algebra as one of the most important tools in applied mathematics, data science, and artificial intelligence to help students learn how to handle vectors and matrices, solve matrix-vector equations, perform Eigen value and Eigen vector and diagonalization analyses and use principal component analysis to do dimension reduction on real-world datasets. It covers topics such as: solving systems of linear equations; matrices and matrix operations; homogeneous and non-homogeneous systems; Gaussian elimination; elementary matrices and a method for finding A^{-1}; determinants; Euclidean vector spaces; linear transformations from Rn to Rm and their properties; general vector spaces; subspaces; basis; dimension; row space; column space; null space of a matrix; rank and nullity; and inner product spaces. All analysis will be performed in python or any similar popular programming language. Lectures will be given in the lab for practical application. This course is assessed through exams, practical tests and assignments.

Course Number 1902390	Course Title Seminar-Road to Software Industry	Credit Hours 3
Prerequisite: (Passing 45 Hours)		

Course Description

IT students increasingly demand and require coverage of emerging technologies to prepare themselves for subsequent employment and research. Industry and professional bodies are also concerned that IT education does not always prepare students adequately for the world of work. This professional practice seminar course aims to contribute to solving these two issues by providing real-world experiences, inspiring students to choose their career path, and exposing them to the trends, methods, and techniques that are of current interest in software industry through a weekly seminar series. Professionals from software companies are invited to present different aspects of their companies and to share their first-hand experience with students. This course can enhance IT education and motivate students by covering leading-edge technologies and practices. After each seminar, students will submit a personal evaluation and short reports relevant to the seminar's presentation. Attendance and participation in 8 seminars, including the evaluation of each seminar and the short reports are the minimum requirements to pass the course.

B- Obligatory Specialty Courses Description:

Course Number 0301101	Course Title Calculus-1	Credit Hours 3
Prerequisite: (None)		

Course Description

Functions: domain, operations on functions, graphs of functions; trigonometric functions; limits: meaning of a limit, computational techniques, limits at infinity, infinite limits; continuity; limits and continuity of trigonometric functions; the derivative: techniques of differentiation, derivatives of trigonometric functions; the chain rule; implicit differentiation; differentials; Roll's Theorem; the mean value theorem; the extended mean value theorem; L'Hopital's rule; increasing and decreasing functions; concavity; maximum and minimum values of a function; graphs of functions including rational functions (asymptotes) and functions with vertical tangents (cusps); antiderivatives; the indefinite integral; the definite integral; the fundamental theorem of calculus ; the area under a curve; the area between two curves; transcendental functions: inverse functions, logarithmic and exponential functions; derivatives and integrals; limits (the indeterminate forms); hyperbolic functions and their inverses; inverse trigonometric functions.

Course Number 0301102	Course Title Calculus-2	Credit Hours 3
Prerequisite: (0301101)		

Course Description

Techniques of integration: integration by substitution; integration by parts, integrating powers of trigonometric functions, trigonometric substitutions, integrating rational functions, partial fractions, rationalization, miscellaneous substitution; improper integrals; application of definite integral: volumes, length of a plane curve, area of a surface of revolution polar coordinates and parametric equations: polar coordinates, graphs in polar coordinates, area in polar coordinates; infinite series: sequences, infinite series, convergence tests, absolute convergence, conditional convergence; alternating series; power series: Taylor and Maclurine series, differentiation and integration of power series.

Course Number 0301131	Course Title **Principles of Statistics**	Credit Hours 3
Prerequisite: (None)		

Course Description

Describing statistical data by tables, graphs and numerical measures, Chebychev's inequality and the empirical rule, counting methods, combinations, permutations, elements of probability and random variables, the binomial, the Poisson, and the normal distributions, sampling distributions, elements of testing hypotheses, statistical inference about one and two populations parameters

Course Number 0302108	Course Title **Physics for Computer Science**	Credit Hours 2
Prerequisite: (None)		

Course Description

This course is designed for first year computer science students. An introduction to physical quantities and their applications for motion, forces, and fields is offered. Potentials and energy concepts are used to define electrical currents and their interactions with resistors and capacitors. The acquired knowledge is then used to develop the basics of circuit theory (using resistors and capacitors networks). AC- circuits concepts are treated briefly (RC-circuit). The pn-junction will be defined and their use as diodes and transistors with some applications is treated. Characteristics of diodes and transistors will be studied and explained.

Course Number 0302116	Course Title **Physics for Computer Science-Lab**	Credit Hours 1
Prerequisite: (0302108 or simultaneously)		

Course Description

This laboratory is designed for first year computer science students. The lab is designed to give students a hand-on experience on the subjects covered in 0302108 course. The Laboratory and the course are to be taken simultaneously. The students are also trained on scientific reporting and error estimation and propagation. The laboratory also enhances the teamwork skills and collaboration between students.

Course Number 1901212	Course Title **Advanced Programming in Special Languages**	Credit Hours 3
Prerequisite: (1901242)		

Course Description

This course aims to equip the students with the knowledge and skills necessary to build robust visual programs which include defensive programming techniques (error handling, exceptions, assertions, debugging aids), current programming trends (functional and/or scripting), and code testing and tuning strategies. In addition to problem-solving, this course discusses techniques to access Web data and APIs. The course is delivered using C++, Java, PHP, Python, and/or the like. This course will be given in the lab and there will be weekly assignments individually and within groups through active teaching methodologies.

Course Number 1901204	Course Title **Logic Design**	Credit Hours 3
Prerequisite: (1901101 + 0302108 + 0302116)		

Course Description

This introduces students to logic design. It includes the main concepts of Logic Design; Boolean Algebra; basic definitions; basic theorems and properties; Boolean functions; canonical and standard forms; digital logic gates; minimization methods; combinational logic; sequential logic. numbering systems: binary codes, Boolean algebra; gate-level minimization: algebraic simplifications, Karnaugh maps, don't-care conditions; NAND and NOR Implementation; Combinational Logic: adders and subtractors, decoders and encoders, multiplexers and demultiplexors, ROMS and PLAs, sequential logic, flip flops, registers, counters, and serial adder.

Course Number 1901241	Course Title **Theory of Computation**	Credit Hours 3
Prerequisite: (1901101+ 1931102)		

Course Description

This is an introduction to the theory of computation. Topics include: sets; relations; closure and languages; finite automata: deterministic and nondeterministic; closure and pumping lemma; regular languages and expressions; Context-free grammar: regular languages and context-free languages, pushdown automata, closure, turing machines, combining Turing machines and machine schemas; introduction to P and NP classes.

Course Number 1901243	Course Title Data Structures Lab	Credit Hours 2
Prerequisite: (Simultaneously with 1901242)		
Course Description This course explores how different data structures are implemented and their main applications, so the student can analyze any problem and identify the computer requirements appropriate to its solution. It includes the implementation of Pointers and pointer operations, including pointers in objects. Implementation of Linked list: singly, doubly, circular. Practical implementation of Linked Stacks and using Stack to calculate arithmetic expressions. Practical implementation of Linked Queues. Practical implementation of the STL data structures. Practical implementation of recursive functions on Binary Search Trees, and other types of trees. The student's assessment will be based on projects implemented during the lab session through active teaching methodologies.		

Course Number 1901301	Course Title Computer Ethics	Credit Hours 1
Prerequisite: (1902372)		
Course Description In this course students will examine personal and contemporary organizational ethical issues and challenges in the design, development, and use of computing technologies in a global environment. Topics include the basis for computer ethics, reliability and safety of computer systems, protecting software and other intellectual property, computer crime and legal issues, professional codes of ethics; and responsibility of individuals for their actions, act with transparency and accountability, understanding the implications of their actions towards individuals, organizations, and society. There will be some case studies.		

Course Number 1901322	Course Title Computer Organization	Credit Hours 3
Prerequisite: (1901204)		

Course Description

This introduces students to computer organization. Topics include: concepts of computer architecture; hardware components of a computer; instruction set: instruction formats, encoding of instructions, types; execution unit: registers design, combinational shifters, ALU, division and multiplication algorithms; control unit: register transfer language, hardwired and micro programmed control unit; memory unit: RAM, cache memory, associative memory, virtual memory; input/output processors; introduction to multiprocessor systems and parallel processing. There will be assignments.

Course Number 1901341	Course Title Theory of Algorithms	Credit Hours 3
Prerequisite: (1901242)		

Course Description

The main goal of this course is to introduce complexity analysis of algorithms with an emphasis on efficient design techniques for solving various computational problems. Topics include complexity analysis including big O, big omega, and big theta notations. Recurrence equations and recursive algorithms. Algorithm design techniques include sequential, divide-and-conquer, greedy, and dynamic programming. Sorting algorithms include insertion sort, merge sort, heap sort, and quicksort. Searching algorithms include breadth-first search and depth-first search. Graph-based algorithms including Kruskal's algorithm. Optimization problems include minimum spanning tree and multistage graph problems. The assessment of this course is through exams, quizzes, and assignments.

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Course Number 1901351	Course Title Numerical Analysis	Credit Hours 3
Prerequisite: (1931102 +1915101)		

Course Description

This an introductory course to numerical analysis. Students will be introduced to: computer arithmetic representation, error analysis; finding roots of a function, iterative methods; solution of linear systems of equations; solution of nonlinear systems; interpolation techniques; numerical integration, curve fitting; differentiation; optimization techniques. There will be weekly practice in the lab using a programming language.

Course Number 1901353	Course Title Modeling and Simulation	Credit Hours 3
Prerequisite: (0301131 + 1901242)		

Course Description

This is an introductory course to modelling and computer simulation. The topics include: fundamentals concepts of models for computer simulation; the steps to develop a computer model and simulation; random variables: probability distributed function, cumulative distribution function, variates; Monte Carlo methods; simulation modeling: discrete-event simulation, continuous simulation; verification and validation of simulation models: input analysis, output analysis; queuing theory models; develop, test and debug simulation programs; sample simulation applications. There will be weekly practice in the lab using programming language or simulation software tools.

Course Number 1901359	Course Title Computer Graphics	Credit Hours 3
Prerequisite: (1901242)		

Course Description

This an introductory course to graphics systems and overview of computer graphics applications. Topics includes: graphics output primitives and its attributes; geometric transformations; three-dimensional object representations; graphical user interface and its attributes; introduction to OpenGL programming in C++ and its applications. Overview of well-known computer graphics software through a course project that covers 3D computer graphics. The lectures taught in the lab through active teaching methodologies individually or within groups.

Course Number 1901363	Course Title Computer Networks	Credit Hours 3
Prerequisite: (1901242)		

Course Description

This course explores key concepts and essential technologies of computer networks and broad range of topics in networking. It includes general overview, networks applications, network classifications and topologies, network layers, channel performance measures, transmission media, communication network protocols and architecture; Data link layer: framing, error detection and correction, CSMA/CD, LAN IEEE standards; Network layer: IP service model, IP addressing, subnetting, host configuration DHCP, ARP Protocol, ICMP protocol; Transport layer: UDP protocol, TCP protocol, TCP reliable transfer and sliding window, TCP flow and congestion control; Application layer: DNS protocol, NAT protocol, HTTP protocol, persistent and non-persistent HTTP connection. Weekly practice in the lab through active teaching methodologies.

Course Number 1901473	Course Title Operating Systems	Credit Hours 3
Prerequisite: (1901242)		

Course Description

This course introduces students to management of computer resources. It includes: definition and role of the operating systems, history of operating systems and development, functionality and structuring methods of a typical operating system; concepts of process versus thread, scheduling, dispatching and context switching, concurrent execution: the "mutual exclusion" problem and some solutions; deadlocks: causes, conditions, and methods for resolution; memory management; virtual memory management; mass-storage structure. The course will involve regular assignments and instructions on Linux Operating System to map different theoretical parts with Linux. Students will get introduced to using a Linux machine, will learn key important Linux configurations, and will perform Linux performance evaluations for different system resources. The lectures taught in the lab through active teaching methodologies individually or within groups.

Course Number 1901476	Course Title Systems Programming and Compilers Construction	Credit Hours 3
Prerequisite: (1901322 + 1901241)		

Course Description

This is an introduction to systems programming and compilers. It includes: introduction to system programming; assemblers: basic function; machine-dependent and machine-independent features, design options; loaders and linkers: basic functions, types of loaders, Macro processor: basic functions, features, design options; advanced concepts in: virtual machines, runtime environments, memory garbage collection. Introduction to compiling: lexical analysis, specification and recognition of tokens, finite automata; syntax analysis: grammars, top-down and bottom-up passing, syntax-directed translation; semantic routines; storage-allocation strategies; code generation; error recovery. Weekly practice in the lab.

Course Number 1901471	Course Title Design and Implementation of Programming Languages	Credit Hours 3
Prerequisite: (1901241)		

Course Description

This course introduces the students to the design and implementation of programming languages. It includes: design and basic approaches to language implementation; informal semantics and implementation of various constructs from typical higher-level languages; Languages: data, operations, control structures, storage management and operating environment; case studies covering different paradigms: imperative, logic, functional and object-oriented programming languages. Weekly practice in the lab.

Course Number 1901444	Course Title Computational Problems and Techniques	Credit Hours 3
Prerequisite: (1901341)		

Course Description

The main goal of this course is to enable the students to solve classical computational problems, such as 0-1 knapsack, rod cutting, matrix chain multiplication, N-queens, and sudoku, using various computational techniques. The students will be introduced to the theoretical concepts for the computational problems and techniques and their implementations. The course covers various computational techniques such as complete search, iterative (all subsets and all permutations), backtracking, greedy approach, dynamic programming, and divide-and-conquer (binary search technique). Also, the course covers two-pointers and range queries including static (partial and prefix sums) and dynamic (segment tree) with their implementations and usage. Weekly problems will be presented in the lab either individually or within groups.

Course Number 1901468	Course Title Parallel and Distributed Systems	Credit Hours 3
Prerequisite: (1901341 + 1901322 + 1901363)		

Course Description

This course introduces the students to parallel and distributed systems. Topics include cost versus Performance, Scope of Parallel Computing, Issues in Parallel Computing, a Taxonomy of Parallel Architectures, Dynamic Interconnection Networks, Static Interconnection Networks, Evaluating Static Interconnection Networks, Characterization of Distributed Systems, DS System Models, Interprocess Communication, Remote Invocation, Operating System Support, clock synchronization, Distributed Mutual Exclusion Cloud Computing, IoT, Blockchain and Cryptocurrency, particle assignment will be required.

Study Plan- Bachelors

Course Number 1901496	Course Title Project-1	Credit Hours 0
Prerequisite: (Pass 90 hours)		
Course Description The project includes theoretical and practical aspects of Computer Science; the first stage of the graduation project, includes project proposal, analysis and preparation, and project design stages. A report at the end of each stage should be delivered to the department and the supervisor.		

Course Number 1901497	Course Title Project- 2	Credit Hours 3
Prerequisite: (1901496)		
Course Description It includes the second stage of the graduation project, which covers the implementation, testing and evaluation stages, and completing the project in its final version. A documentation of the whole project should be delivered to the department and the supervisor. Finally, the project should be submitted for presentation and final examination.		

Course Number 1901498	Course Title Training	Credit Hours 0
Prerequisite: (Pass 90 hours)		
Course Description The student must be trained in an institution, for at least 6 weeks. The student must provide a report from the institution/enterprise that shows the efficiency of this training according to the regulations of the Dean's Council of the Faculty's Departments or get a certificate in one of the information technology fields from a recognized institute.		

Study Plan- Bachelors

Course Number 1902372	Course Title Software Engineering	Credit Hours 3
Prerequisite: (1902224)		

Course Description

This course aims is to present software engineering as a body of knowledge. The course is designed to present software engineering concepts and principles in parallel with the Software Development Life Cycle (SDLC). The course will begin with an introduction to software engineering, giving students a definition of this body of knowledge, as well as a discussion of the main methodologies of software engineering including agile methods i.e., XP. Students will then learn about the five major phases of the SDLC: requirements gathering and analysis, design, coding/implementation, validation, and evolution. This includes software modelling using Unified Modelling Language (UML), a standardized general-purpose modelling language used to create visual models of object-oriented software, for requirements gathering and analysis, and design. Students will also learn about project management and quality management for the purpose of delivering high-quality software that satisfies customer needs and is within budget and schedule. Delivery will be by in-class lectures, recorded lectures, practical sessions in the lab, case studies from different domains (i.e., healthcare domain), and assignments. Assignments will include a term project illustrative of professional practice in developing computer information systems. One or two guest speakers with many years of experience in software engineering will be invited to share their first-hand experience with students.

Course Number 1905320	Course Title Artificial Intelligence	Credit Hours 3
Prerequisite: (1901242)		

Course Description

The aim of the course is to enable students to solve problems using explicit knowledge and reasoning techniques and to develop expert systems for simple problems. Students will be able (1) to express knowledge of a simple domain in propositional and/or first-order predicate calculus, (2) to design and develop expert solutions to simple problems where AI techniques can be employed, and (3) to write simple programs in Prolog that reason about the available knowledge to achieve their goals. Furthermore, students will learn some simple blind and heuristic search algorithms such as depth-first, breadth-first, best-first, hill climbing, and simulated annealing and techniques on how to control search using production systems. They will also have the ability to decide the appropriate search techniques (blind or heuristic) for some problems. The students will also be given some grounding in the principal techniques of data mining and be introduced to some applications of data mining. Students will be introduced to some learning techniques to help obtain a clear picture of the concepts of machine learning. This course will use a combination of lectures, class discussions, reading and writing assignments, case studies analysis, and hands-on work.

Course Number 1911322	Course Title Information Security and Privacy	Credit Hours 3
Prerequisite: (1901363 + 1902224)		

Course Description

This course provides an introduction to information security and privacy. The course covers topics related to cryptography such as symmetric and asymmetric encryptions, hash functions, digital signatures, key management, and public key infrastructures. Also, the course covers topics related to network security as packet sniffing, spoofing, TLS, IPSec, Firewalls, wireless networks security. Furthermore, topics related to Authentication, Authorization, Web security and Steganography will be covered. Risk analysis and ethics, and their applications to the development of a secure healthcare systems as a case study will be presented. Practical hands-on will be provided.

C. Elective Specialty Courses Description:

Course Number 1901364	Course Title Advanced Networking	Credit Hours 3
Prerequisite: (1901363)		
Course Description This course explains and discusses advanced concepts of computer networks. Topics includes: VLANs, routing protocol; advanced TCP, silly window syndrome, adaptive timeout; network analysis, architecture, and design. network performance metrics measurements, polices and monitoring network management, SNMP protocol, SIM protocol, MIB protocol; asynchronous transfer Mode (ATM). Assessment will be through exams, assignments, and quizzes.		

Course Number 1901442	Course Title Network Programming	Credit Hours 3
Prerequisite: (1901363)		
Course Description This course discusses the practical aspects of network programming using a modern programming language. Topics the course covers span: internet addressing; data streams; user datagram protocol: datagram packet, datagram socket, sending and receiving UDP packets, building a UDP Client/Server application; transmission control protocol: TCP sockets, server sockets; building a TCP Client/Server application; multi-threaded applications, synchronization; implementing application protocols. Hands-on lab exercises will be offered in each class meeting. The lectures will be taught in the lab through active teaching methodologies individually or within groups.		

Course Number 1901372	Course Title Design Patterns and Clean Code	Credit Hours 3
Prerequisite: (1902372 + 1901212)		

Course Description

This course introduces the students to the different design patterns and clean code concepts. Topics include foundation of Object-oriented programming design principles, SOLID principles, creational, structural and behavioral design patterns, code refactoring, clean code design, model-view-controller (mvc) pattern, unit testing, real-life examples of good and bad object-oriented software. Practical assignments will be provided.

Course Number 1901446	Course Title Computer Systems Performance	Credit Hours 3
Prerequisite: (Prerequisite 0301131, 1901322)		

Course Description

This course explores the concepts of performance evaluation, performance metrics, and benchmarking for Computer Systems. It discusses the characteristics of a good performance metric, and contrasts different techniques for data summarization. The course discusses the basics of error quantification in experiments, and sheds light on comparing alternatives. Measurement tools and techniques are also covered, in addition to the basics analytical modelling. Practical lab exercises and/or assignments on benchmarking and code profiling will be offered.

Course Number 1901443	Course Title Graph Theory	Credit Hours 3
Prerequisite: (1901341)		

Course Description

This course explores the concepts of a graph. Topics include graph properties and types including computer representation of graphs; Euler graph and Hamiltonian graph; Planar graph and bipartite graph; Graph isomorphism; Handshaking theorem; Shortest path algorithm such as Dijkstra's algorithm; NP-complete graph problems such as graph coloring (vertex coloring, edge-coloring, chromatic index, and number), maximum independent set, minimum vertex cover, traveling salesman problem; and Enumeration including generating counting methods for selections and arrangements. Hands-on lab exercises will be offered.

Course Number 1901469	Course Title Mobile Wireless Networks	Credit Hours 3
Prerequisite: (1901363)		
Course Description This introduces wireless networks and their basic operations. Topics include different types of wireless technologies and systems, the basics of how they operate, key commercial systems; Wi-Fi wireless networks, Bluetooth wireless technology, cellular Mobile IP and mobile routing; Transport layer over wireless networks; mobile wireless network applications; Introduction to mobile location-based services. Assessment will be through exams, assignments, and quizzes.		

Course Number 1901494	Course Title Special Topics	Credit Hours 3
Prerequisite: (1901242)		
Course Description Selected Topics in advanced areas of computer Science; There will be report and documentation on contemporary state of the art topics in Computer Science. Weekly practice in the lab.		

Course Number 1931460	Course Title Fundamentals of IoT	Credit Hours 3
Prerequisite: (1901473, 1901363)		
Course Description This course introduces the fundamentals of the Internet of Things (IoT) and discusses how the Internet of Things IoT works. Topics include: IoT, IoT networking, IoT smart objects, IoT networking protocols, and smart object connections; IoT data networks, connection types, IoT security, and popular applications of IoT networks. Simulation-based hands-on exercises and project will be offered.		

Course Number 1931461	Course Title Cloud Computing Concepts	Credit Hours 3
Prerequisite: (1901473, 1901363)		

Course Description

This course explores the fundamentals Cloud Computing technologies. It covers topics such as virtualization, containerization, clustering, cloud resource management, and cloud storage; popular cloud frameworks spanning batch and data stream processing; solutions to issues relevant to load management, fault-tolerance, distributed systems, and security in the Cloud. Hands-on weekly lab exercises using one or more cloud infrastructure technologies will be offered.

Course Number 1902310	Course Title Mobile Development Frameworks	Credit Hours 3
Prerequisite: (1904120 + 1902110)		

Course Description

This course aims to provide students with a foundational understanding of the technologies, methods, and skills required to design and develop applications for current and emerging mobile computing devices. In this course, students learn to develop mobile applications to solve business problems. Topics covered include different software platforms, tools for native and cross-platform app development (i.e., React Native, Flutter, Xamarin, Sencha), user interface, and database handling for mobile applications. Students are required to consider the impact of user characteristics, device capabilities, networking infrastructure, and deployment environment, to develop mobile applications that can meet the requirements of stakeholders. During the weekly practical tutorials, students use different frameworks, with a focus on the React Native and Flutter, in learning how to design and develop a range of mobile applications. At the end of this course, students will be able to independently make a mobile app for android and iOS that makes use of database, user authentication, app notifications, design principles, and user experience. The course hosts several experts in the field of development and IT operations from the local market to cover the practical side of the course and to share their first-hand experience with students.

Course Number 1902324	Course Title Database Technologies and applications	Credit Hours 3
Prerequisite: (1902224)		

Course Description

This course aims to introduce the students to emerging topics in database systems. The course is specially designed with an emphasis on advanced and emerging concepts in database systems such as Big data management, data management with cloud platforms, NoSQL databases, and Graph databases. The course will allow students to focus on topics that are state-of-the-art research and recent technologies in the field of database and information systems.

Course Number 1902454	Course Title Digital Image Processing	Credit Hours 3
Prerequisite: (1901359)		

Course Description

This course aims to introduce the basic concepts, techniques, and algorithms of digital image processing. It explains the fundamental techniques of the following: acquisition of the digital images (equipment, sampling, quantization, and color representation), enhancement of digital images in spatial and in frequency domains (smoothing, sharpening, edge detection, thresholding, histogram equalization, morphological operations, etc.), conversion the digital image into Fourier and other transforms, feature identification, image compression, application to models of human and machine vision. In addition, students will be able to apply the image processing techniques to solve real-world problems in any domain. Specifically, students are required to work through a case study in the healthcare domain and show how to deploy the image processing techniques to perform enhancement, segmentation, analysis, diagnosis, etc. into the medical images. This course is given in the lab because it requires practical demonstrations on using the state-of-the-art Matlab-Image processing software package.

Course Number 1904254	Course Title Advanced Web Development	Credit Hours 3
Prerequisite: (1904120)		

Course Description

This course is designed to introduce a variety of technologies and techniques typically used in development of contemporary web-based systems, and to enable students to achieve a level of fluency in using these in a thoughtful and considered manner. Two web programming techniques will be introduced. The first is to use web-based embedded scripting language (PHP) on a web server (Apache) and a server-side database (MySQL), and the second is to use Ajax to manage asynchronous client-server communication and XML/JSON as data exchange languages. This course uses active teaching methodologies, such as weekly lab applied sessions, group work and technical projects.

Course Number 1911351	Course Title Security of Web Applications	Credit Hours 3
Prerequisite: (1902224 + 1904120)		

Course Description

This course introduces students to a foundation in the theories and practice relating to web application security. Topics covered: web applications vulnerabilities and attacks, building secure web applications, concepts associated with deploying and securing a typical HTTP environment as well as defensive techniques that can be employed. Teaching of this course will be based on active learning methodology such that students will work in groups to discuss and analyze the vulnerability in web applications.

Course Number 1911361	Course Title Network Security	Credit Hours 3
Prerequisite: (1901363)		

Course Description

This course introduces students to many facets of network security and forensics and is a lab-based course. Topics covered: the areas of ARP related attacks, MAC table related attacks, VLAN related attacks, DNS related attacks, DHCP related attacks, and some concepts related to network forensics such as intrusion detection, evidence collection, network auditing, network security policy design and implementation as well as preparation for and defense against attacks. The issues and facilities available to both the intruder and data network administrator will be examined and evaluated with appropriate laboratory exercises to illustrate their effect.

Study Plan- Bachelors

Course Number 1915251	Course Title Applied Statistics	Credit Hours 3
Prerequisite: (0301131)		

Course Description

This course is an introduction to practical applied statistics with R, a programming language and software environment for statistical computing, and with RStudio, an integrated development environment for R. Topics include introduction to R programming, summarizing data, probability and statistics in R, simple and multiple linear regression, categorical predictors and interactions, model diagnostics, collinearity, variable selection and model building, selected data analyses. The course graphically introduces those concepts utilizing R as a programming environment for applying statistical/probabilistic methods and techniques. This course is a practical course and will contain small projects and programming assignments for specific problems using R programming language.

Course Number 1915342	Course Title Bioinformatics	Credit Hours 3
Prerequisite: (1901444)		

Course Description

This course explores how the integration of computer science, statistics and mathematics knowledge can be used to tackle complex life sciences problems. It covers several topics like: general genomics, cells and DNA sequence features; sequence alignment; sequence motifs; search sequence databases; phylogenetic trees; Hidden Markov Models, and microarray data analysis: normalization and clustering; other emerging topics. The students will present case studies in one of the related topics.

Course Number 1915370	Course Title Machine Learning and Neural Network	Credit Hours 3
Prerequisite: (1901444)		

Course Description

This course will help students to develop basic understanding of principles of learning theory, theoretical and mathematical foundations of the machine learning and derive practical solutions using predictive analytics. In addition, it explains what machine learning is and how it is related to statistics and data analysis. The class will cover topics in regression, classification, mixture models, neural networks, basic deep learning, ensemble methods and reinforcement learning, hidden Markov models, and Bayesian networks, generative/discriminative learning, parametric/non-parametric learning, support vector machines, unsupervised learning, expectation maximization, dimensionality reduction, and kernel methods. The course will also discuss recent applications of machine learning, autonomous navigation, bioinformatics, speech recognition, and text and web data processing. Delivery will combine traditional lectures with other active teaching methodologies, such as group discussions, group solving problems, analysis of cases and debates, case study from different domains, and assignments.

Study Plan- Bachelors