Al-Balqa' Applied University

Curriculum for the Bachelor Degree in Computer Science (CS)

The curriculum for the B.Sc. degree in Computer Science (CS) consists of (132) credit hours distributed as follows:-

Course No.	Requirements	Credit Hours (Cr.H.)
1	University Requirements • Compulsory • Elective	 21 6
2	Faculty Requirements	20
3	Specialization Requirements • Compulsory • Elective	 67 12
4	Supportive Specialization Requirements	6
Total		**132**

Curriculum for the Bachelor Degree in Computer Science (CS)

First : University Requirement (24 Cr .H.)
A: Compulsory Requirements (21 Cr.H.):

Course No.	Course Title	Cr.H.	Weekly Hours		Prerequisite
			Lecture	Lab.	
35003101	Arabic (1)	3	3	--	--
35003102	Arabic (2)	3	3	--	35003101
35004101	English (1)	3	3	--	--
35004102	English (2)	3	3	--	35004101
35005101	Computer Skills (1)	3	2	3	--
35001101	Military Sciences	3	3	--	--
35002100	National Education	3	3	--	--

B: Elective University Requirements : (6 Cr.H.)

The student is allowed to select (6 Cr.H.) from the university elective courses offered by faculties other than the faculty of Agricultural Technology.

Course No.	Course Title	Cr.H
36001101	Communication skills	3
36002102	Introduction to Psychology	3
36003103	Jordanian Society	3
36004104	Sport for All	3
36005105	Islamic Culture	3
36006106	Administration and Economic Concepts	3
36007107	Agriculture in Jordan	3
36008108	Environment and Society	3
36012109	Orthodox Caliphs	3

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Second: Faculty Requirements (20 Cr. H.)

Course No.	Course Title	Cr. H.	Weekly Hours		Prerequisite
			Lecture	Lab.	
30202101	Calculus (1)	3	3	0	-
30202102	Calculus (2)	3	3	0	30202101
30201104	General Physics for IT	3	3	0	-
30201114	General Physics Lab for IT	1	0	3	30201104*
30801203	Object Oriented Programming	3	3	0	30801101
30801204	Object Oriented Programming Lab	1	0	3	30801203*
30202131	Probability & Statistics	3	3	0	30202102
30801101	Computer Skills (2)	3	2	3	35005101

* : or parallel

Third: Specialization Requirements (79 Cr. H.)

A. Compulsory Requirements (67 Cr. H.)

Course No.	Course Title	Cr. H.	Weekly Hours		Prerequisite
			Lec.	Lab.	
30801205	Java Programming	3	3	0	30801203
30801206	Java Programming Lab	1	0	3	30801205*
30801210	Computation Theory	3	3	0	30202252
30801211	Data Structures (1)	3	3	0	30801203
30801212	Data Structures Lab (1)	1	0	3	30801211*
30801213	Compiler Design	3	3	0	30801210
30801220	Digital Logic	3	3	0	30801101
30801221	Digital Logic Lab	1	0	3	30801220
30801240	Database Systems (1)	3	3	0	30801203
30801241	Database Systems Lab (1)	1	0	3	30801240*
30801307	Visual Programming	3	3	0	30801205
30801308	Visual Programming Lab	1	0	3	30801307*
30801309	Web Applications Programming	3	3	0	30801205
30801310	Web Applications Programming lab	1	0	3	30801309*
30801314	Algorithms Theory (1)	3	3	0	30801211

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Course No.	Course Title	Cr. H.	Weekly Hours		Prerequisite
			Lec.	Lab.	
30801322	Operating Systems	3	3	0	30801211
30801330	Computer Networks	3	3	0	30801220
30801331	Computer Networks Lab	1	0	3	30801330*
30801332	Wireless Networks Security	3	3	0	30801330
30801342	System Analysis and Design	3	3	0	30801240
30801343	Software Engineering	3	3	0	30801342
30801350	Artificial Intelligence	3	3	0	30801314
30801423	Computer Organization & Architecture	3	3	0	30801322
30801453	Expert Systems	3	3	0	30801350
30801470	Graduation Project	3	-	-	90 Cr. H.
30801471	Field Training	6	-	-	90 Cr. H.

* : or parallel

B. Elective Specialization Requirements (12) Cr. H. to be selected from the following list:

Course No.	Course Title	Cr. H.	Weekly Hours		Prerequisite
			Lec.	Lab.	
30801324	Microprocessor Systems	3	2	3	30801220
30801344	Database Systems (2)	3	3	0	30801240
30801345	Information Retrieval Systems	3	3	0	30801240
30801347	Image Processing	3	3	0	30801307
30801348	Multimedia	3	3	0	30801307
30801416	Algorithms Theory (2)	3	3	0	30801314
30801452	Neural Networks and Genetic Algorithms	3	3	0	30801350
30801360	Operations Research	3	3	0	30202102
30801317	Data Structures (2)	3	3	0	30801211
30801462	Simulation and Modeling	3	3	0	30801322
30801472	Special Topics in Computer Science	3	3	0	30801309

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Fourth: Supportive Specialization Requirements (6 Cr. H.)

Course No.	Course Title	Cr. H.	Weekly Hours		Prerequisite
			Lec.	Lab.	
30202252	Discrete Mathematics	3	3	0	30202102
30202204	Linear Algebra and Numerical Analysis	3	3	0	30202102

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First Year					
First Semester			**Second Semester**		
Course No.	**Course Title**	**C.H.**	**Course No.**	**Course Title**	**C.H.**
30201104	General Physics for IT	3	30202102	Calculus (2)	3
30201114	General Physics Lab for IT	1	30801101	Computer Skills (2)	3
30202101	Calculus (1)	3	35002100	Patriotic Education	3
35003101	Arabic (1)	3	35004102	English (2)	3
35005101	Computer Skills (1)	3	30202131	Probability and Statistics	3
35005101	English (1)	3			
Total		**16**	**Total**		**15**

Second Year					
First Semester			**Second Semester**		
Course No.	**Course Title**	**C.H.**	**Course No.**	**Course Title**	**C.H.**
30202252	Discrete Mathematics	3	30801205	Java Programming	3
30801203	Object Oriented Programming	3	30801206	Java Programming Lab	1
30801204	Object Oriented Programming Lab	1	30801211	Data Structures (1)	3
30801210	Computation Theory	3	30801212	Data Structures Lab (1)	1
30801220	Digital Logic	3	30801213	Compiler Design	3
30801221	Digital Logic Lab	1	30801240	Database Systems (1)	3
35003102	Arabic (2)	3	30801241	Database Systems Lab (1)	1
			--	University Elective	3
Total		**17**	**Total**		**18**

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Third Year					
First Semester			Second Semester		
Course No.	Course Title	C.H.	Course No.	Course Title	C.H.
30202204	Linear Algebra and Numerical Analysis	3	30801307	Visual Programming	3
30801309	Web Applications Programming	3	30801308	Visual Programming Lab	1
30801330	Computer Networks	3	30801314	Algorithms Theory (1)	3
30801331	Computer Networks Lab	1	30801322	Operating Systems	3
30801309	Web Applications Programming lab	1	30801343	Software Engineering	3
30801342	System Analysis and Design	3	30801453	Expert Systems	3
30801350	Artificial Intelligence	3			
Total		**17**	**Total**		**16**

Forth Year					
First Semester			Second Semester		
Course No.	Course Title	C.H.	Course No.	Course Title	C.H.
--	University Elective	3	--	Specialization Elective	3
30801423	Computer Organization & Architecture	3	--	Specialization Elective	3
30801471	Field Training	6	--	Specialization Elective	3
35001101	Military Science	3	30801332	Wireless Networks Security	3
--	Specialization Elective	3	30801470	Graduation Project	3
Total		**18**	**Total**		**15**

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Course Description

30801314 Algorithms Theory (1) 3(3-0)

Definition of algorithms, algorithm analysis, techniques for measuring program performance, introduction to complexity analysis, asymptotic notations, divide and conquer algorithms (merge sort, quick Sort, binary search, strassen matrix multiplications, selection problem, writing recurrences, solving recurrences using master method), graph algorithms (basic terminologies, graph representations, graph traversal algorithms, topological sort algorithms, minimum spanning tree, Prim's and Kruskal's algorithms).

30801350 Artificial Intelligence 3(3-0)

Goals of artificial intelligence (AI), history of AI, propositional calculus, predicate calculus, first-order logic, inference, soundness, completeness, unification algorithm, resolution, structures and strategies for state space search, data driven and goal driven search, breadth first search, depth first search, depth first iterative deepening search, heuristic search and games theory, greedy best first search, A* search algorithm, using heuristic search in games, Min-Max algorithm, alpha-beta pruning, planning, the language of planning problem.

30801213 Compiler Design 3(3-0)

Basic concepts, review of grammars, compiler components, lexical analysis, symbol table handling, parsing techniques, error handling and recovery, syntax-directed translation, type checking, run-time organization, intermediate code generation, code generation, code optimization.

30801360 Operations Research 3(3-0)

Introduction to the field of operational research, methods of operations research, models and modeling, general problem formulation, graphical solution of two dimensional LPs, simplex method, simplex algorithm, simplex algorithm software programs, duality, sensitivity analysis, network programming, integer programming, nonlinear programming, transportation problem, assignment problem.

30801317 Data Structures (2) 3(3-0)

Advanced data structures, binary search tree (BSTs), balanced BSTs, AVL trees, splay trees, one-dimensional and multi-dimensional range searching techniques, Hash tables and hashing function, priority queues, string data structures, graphs.

30801210 Computation Theory 3(3-0)

Types and representations of formal languages, grammars that generate formal languages, machines which accepts formal languages. regular languages and regular expressions, regular grammar, finite automata (deterministic and non-deterministic), Moore's and Mealy's machines, context free languages, context free grammars, deterministic and non-deterministic pushdown automata, context sensitive languages, context sensitive grammars, phrase structure language, phrase structure grammar, turing machine, Chomsky machine, Chomsky normal form, parsing tree, Chomsky hierarchy computer.

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Course Description

30801330 Computer Networks 3(3-0)

Open system interconnection (OSI) reference model, TCP/IP reference model, physical layer, data link layer, network layer, transport layer, session layer, presentation layer, applications layer, LAN architectures, WAN architectures, network design, network management and network security.

30801331 Computer Networks Lab 1(0-3)

Practical applications to cover the theoretical topics discussed in computer networks course.

30801423 Computer Organization & Architecture 3(3-0)

Internal structure and operation of modern computer systems, Design and operation of the system bus, Design and operation of Arithmetic, Logic, and Shift Units, Control Unit: microprogrammed vs. hardwired control, CISC and RISC architectures, Pipelining, cache memory and memory hierarchies, Interrupts and I/O structures.

35005101 Computer Skills (1) 3(0-6)

Components of computers, basic concepts of information technology (IT), the use of personal computers and common computer applications at adequate level of competence, hardware and software of computers, commonly used software general applications (operating systems, word processing, spreadsheets, presentation and database software), brief introduction to communication (Internet, e-mail, world-wide-web, etc.).

30801101 Computer Skills (2) 3(2-3)

Basics of programming, algorithm development using top-down design with syntax and semantics of the C++ programming language, creating, compiling and executing C++ programs, primitive data types, operations, control structures, procedures and functions, arrays and classes.

30801211 Data Structures (1) 3(3-0)

Introduction to data structures, problem specification and program design, analysis, testing, verification, and correctness of algorithms, logical and physical representation of data, data structure operations, linked lists, queues, stacks, searching and sorting, tree data structures, this course is taught based on C++ programming language.

30801212 Data Structures Lab (1) 1(0-3)

Review of C++ programming language and programming environment, primitive and user-defined data types, classes, stacks, queues, linked lists, searching and sorting, binary trees, binary search trees.

30801240 Database Systems (1) 3(3-0)

Basic concepts and terminology, database, database administrator, database management systems, characteristics of the database approach, the three level-schema architecture, data independence, the entity relationship model, notations and concepts, the relational model (concepts, constraints and operations), relational algebra, ER to relational mappings, the SQL language, functional dependencies and normalization.

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Course Description

30801241 Database Systems Lab (1) 1(0-3)

Oracle database architecture, review of the ER model, ER diagrams, creating tables, modifying tables, primary keys, unique fields, linking tables and foreign keys, SQL language, populating tables and the INSERT statement, the SELECT statement, the UPDATE statement, the DELETE statement, stored procedures, database views, user management.

30801220 Digital Logic 3(3-0)

Numbering systems, boolean algebra, logic algebra, basic logic gates, minimization of logic functions, combinational logic: adders, subtractors, encoders and decoders, multiplexers and demultiplexers, sequential logic: flip-flops, counters, registers and clocked sequential circuits.

30801221 Digital Logic Lab 1(0-3)

Review of the binary numbering system, the basic logic operations, logic gates, the AND, OR, NOT, XOR, and XNOR gates, combinational logic design, gates minimization, combinational logic design using, decodes, multiplexers.

30801453 Expert Systems 3(3-0)

Theory and application of expert systems, knowledge representation, and analysis of the architecture, knowledge and problem-solving style of each system in order to classify and compare them, applications of expert systems in computer configuration, fault diagnosis, computer-aided instruction, data interpretation, planning and prediction, process control.

30801471 Field Training 6(-)

Through this course, students are to apply, in the real world, what they have learned during the first three years of their study in the University.

30801205 Java Programming 3(3-0)

Introduction to Java, the Java programming environment, variables, primitive data types, expressions, control constructs, strings in Java, arrays and vectors, Hash tables, files and I/O in Java, The Java AWT, components, events, layout managers, improved GUI libraries, threads, synchronization, Java intervals, Sockets, writing a server and a client.

30801206 Java Programming Lab 1(0-3)

The Java syntax, compiling and running Java programs, printing output to console, primitive data types, mathematical expressions and mathematical operators, datatype promotion and casting, logical operators, relational operators, control statements, the ternary operator, looping.

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Course Description

30801203 Object Oriented Programming 3(3-0)

Object-oriented (OO) programming environment, OO building blocks, input/output, loops, decisions, functions, arrays and strings, data structures, encapsulation, advanced variables, object oriented programming, useful OO features, classes and objects, inheritance, polymorphism, method overloading, handling exceptions, thread programming and multithreading, this course is taught based on C# language.

30801204 Object Oriented Programming Lab 1(0-3)

Practical applications to cover the theoretical topics discussed in Object Oriented Programming course.

30801322 Operating Systems 3(3-0)

Basic concepts and mechanisms of modern operating systems, history of operating systems, computer and operating system structures, basic issues in concurrency, thread management, deadlock control, synchronization, scheduling, memory management, process management.

30801470 Graduation Project 3(-)

The student is expected to put into action his knowledge gained from the different courses in this study plan through a graduation project.

30801343 Software Engineering 3(3-0)

Principles and practices of software engineering, software quality concepts, process models, software requirements' analysis, design methodologies, software testing and software maintenance, hands-on experience in building a software system using the waterfall life cycle model in the lab environment, software development life cycle deliverables, the requirements, specification and design documents, the system code, test plan, and user manuals.

30801342 System Analysis and Design 3(3-0)

Overview, system concepts, system development life cycle, system analysis, preliminary investigation & information gathering, feasibility study & cost/benefit analysis, structured analysis, system design, introducing system design, system design activities, system implementation, system testing and quality assurance, implementation and software maintenance.

30801307 Visual Programming 3(3-0)

Introduction to programming languages, object-oriented programming languages, event-driven programming, properties and methods, construction of forms, form controls, toolboxes, designing and implementing user's menus and toolbars, sounds and multimedia, visual developing environment, database and Internet connectivity.

30801308 Visual Programming Lab 1(0-3)

Practical applications to cover the theoretical topics discussed in visual programming course.

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Course Description

30801309 Web Applications Programming 3(2-3)

An introduction to a language that is specialized in Internet applications, web-based forms, validation, basic GUI-components, web-based database connectivity, this course is taught based on ASP,NET, ADO.NET, XML technologies.

30801310 Web Applications Programming Lab 1(0-3)

Practical applications to cover the theoretical topics discussed in Web application programming course.

30801332 Wireless Networks Security 3(3-0)

Wireless technology, wireless PANs (infrared and Bluetooth), wireless LANs (IEEE 802.11:802.11a, 802.11b and 802.11g), wireless WANs (1st, 2nd and 3d generation), mobile technology (cellular telephony and satellite systems), wireless application protocol in digital cellular telephony (WAP).

30801416 Algorithms Theory (2) 3(3-0)

Algorithm analysis, recurrences, solving recurrences (master method and iteration method), greedy algorithms, dynamic programming, string matching, NP-completeness.

30801344 Database Systems (2) 3(3-0)

Advanced concepts in the design and implementation of database systems, query optimization, concurrency control, recovery, transaction processing, distributed databases, web and semi-structured data.

30801347 Image Processing 3(3-0)

Human visual system, illumination modeling, image acquisition, image enhancement in spatial and frequency domains, color image processing, image compression and analysis, image segmentation, morphological image processing, object recognition, image Restoration.

30801345 Information Retrieval Systems 3(3-0)

Basic concepts of information retrieval (IR) systems, introduction to IR, modeling (boolean, vector, probabilistic models), retrieval performance evaluation (recall and precision), reference collections, query languages, query operations, text operations, indexing and searching.

30801324 Microprocessor Systems 3(2-3)

Evaluation of microprocessor systems, their characteristics and applications, machine instructions, addressing modes, micro-programming and assembly languages, Pins functions, asynchronous and synchronous data transfer, serial transmissions interface adapters, assembly language using MASM.

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30801348 Multimedia 3(3-0)

Introduction to multimedia systems, a survey of multimedia hardware and software, multimedia programming, multimedia and the Internet, text encoding, formatting, storage and distribution, still images, image sensors, optical illusion, image resolution, pixel neighborhood relations, video coding, digital broadcasting, video compression standards, animation, digital audio signals, and video conferencing.

30801452 Neural Networks and Genetic Algorithms 3(3-0)

Introduction to Artificial Neural Network (ANN) and Genetic Algorithms (GAs), theory and applications of ANNs and Gas, historical background of ANNs, neurons, comparison between artificial neuron and natural neurons in human brain, a model of single neuron, network structure, activation functions, perceptron NN, the perceptron learning rule, back-propagation NNs, evolutionary algorithms and GAs, applications of GAs, computational model of GAs, GA operations, termination criteria, solving some problems using ANNs and GAs.

30801462 Simulation and Modeling 3(3-0)

Simulation models, discrete and trace-driven simulations, data collection and analysis, random number generators, analysis of simulation output, optimization of simulators, analytic modeling, queuing theory, workload characterization.

30801472 Special Topics in Computer Science 3(3-0)

Students are introduced to advanced selected topics in different areas of computing not covered in other courses. The topics covered vary from year to year, depending on the students and staff.

30202204 Linear Algebra and Numerical Analysis 3(3-0)

Systems of linear equations, matrices and matrix operations, homogeneous and nonhomogeneous systems, Gaussian elimination, elementary matrices and a method for finding inverse, determinants, vectors in 2-Space and 3-Space Euclidean vector spaces, error analysis, solving of equations in one variable, interpolating and polynomial approximation, curve fitting, numerical differentiation and integration.

30201104 General Physics for IT 3(3-0)

Vectors, equations of motion, Newton's laws and applications, work, work and energy, electric force, electric field, electric flux, Gausses law and applications, potential difference and equipotential surfaces, electric potential due to point charges, energy stored in a system of point charges, capacitors, combination of capacitors, energy stored in a charged capacitor, electric current, resistance and Ohm's law, electrical energy and power, electromotive force, combination of resistances, Kirchhoff's laws, RC circuit, magnetic field, magnetic force on a charged particle, magnetic force on a current carrying conductor, Biot- Savart law, Amperes law, applications.

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30201114	**General Physics Lab. For IT**	**1(0-3)**

Significant figures and errors, measurements and uncertainty, vectors (equilibrium of forces), friction, conservation of energy, Galvanometer, Ammeter and Voltmeter, electric field mapping, Ohm's law, electric equivalent of heat, potentiometer, Kirchhoff's rules, parallel plate capacitor, RC circuit.