



جامعة الإمام محمد بن سعود الإسلامية
كلية علوم الحاسب والمعلومات

بكالوريوس علوم الحاسب

Bachelor of Computer Science

الخطة الدراسية ووصف المقررات

Study Plan and Course Descriptions

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Curriculum Plan for Bachelor of Computer Science Program

1. Curriculum Structure

Program Structure	Required/ Elective	No. of courses	Credit Hours	Percentage
Institution Requirements	Required	10	20	12%
	Elective	3	6	3.6%
College Requirements	Required	9	31	18.6%
	Elective	-	0	0%
Program Requirements	Required	23	77	46%
	Elective	3	9	5.4%
Capstone Course/Project	Required	2	8	4.8%
Field Experience/ Internship	Required	2	16	9.6%
Others	-	-	0	0%
Total		52	167	

2. Program Study Plan

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution, College or Department)
Level 1	CS 1110	Introduction to Computer Science	Required	None	3	Department
	CS 1180	Computer Science Ethics	Required	None	2	Department
	MATH 1112	Applied Calculus 1	Required	None	4	College
	PHY 1103	General Physics	Required	None	3	College
	ENG 1040	English 1	Required	None	3	College
Level 2	CS 1140	Introduction to Computer Programming	Required	CS 1110, CS 1180	4	Department
	CS 1100	Discrete Structures 1	Required	CS 1110, CS 1180	3	Department
	MATH 1113	Applied Calculus 2	Required	MATH 1112	4	College
	PHY 1104	Applied Physics	Required	PHY 1103	3	College
Level 3	CS 1141	Object-Oriented Programming	Required	CS 1140	4	Department
	CS 1120	Digital Logic Design	Required	CS 1100	4	Department
	MATH 1114	Applied Calculus 3	Required	MATH 1113	4	College
	ENG 1041	English 2	Required	ENG 1040	3	College
Level 4	CS 1242	Data Structures	Required	CS 1141, CS 1100	4	Department
	CS 1201	Discrete Structures 2	Required	CS 1100	3	Department
	STA 1011	Introduction to Probability and Statistics	Required	MATH 1114	3	College
		University Requirement Course 1	Elective	None	2	Institution

		University Requirement Course 2	Elective	None	2	Institution
Level 5	CS 1221	Computer Architecture	Required	CS 1242, CS 1120, PHY 1104	4	Department
	CS 1250	Software Engineering 1	Required	CS 1242	3	Department
	CS 1211	Design and Analysis of Algorithms	Required	CS 1242, CS 1201	3	Department
		Elective Course	Elective	None	2	College/ Institution
		University Requirement Course 3	Elective	None	2	Institution
Level 6	CS 1222	Operating Systems	Required	CS 1221	4	Department
	CS 1251	Software Engineering 2	Required	CS 1250	3	Department
	MATH 1227	Linear Algebra	Required	MATH 1114	4	College
		University Requirement Course 4	Elective	None	2	Institution
		University Requirement Course 5	Elective	None	2	Institution
Level 7	CS 1330	Computer Networks	Required	CS 1222	4	Department
	CS 1360	Artificial Intelligence	Required	CS 1211, MATH 1227, STA 1011	4	Department
	CS 1370	Principles of Database	Required	CS 1251	3	Department
		University Requirement Course 6	Elective	None	2	Institution
		University Requirement Course 7	Elective	None	2	Institution
Level 8	CS 1352	Human Computer Interaction	Required	CS 1370	3	Department
	CS 1372	Information Security	Required	CS 1330, MATH 1227	4	Department
	CS 1361	Machine Learning	Required	CS 1360	3	Department
		Elective Course	Elective	None	2	College/ Institution
		University Requirement Course 8	Elective	None	2	Institution
Level 9	CS 1343	Compilers	Required	CS 1211, CS 1352	4	Department
	CS 1323	Distributed Systems	Required	CS 1330	3	Department

	CS1344	Application Development	Required	CS 1352	3	Department
		Elective Course	Elective		2	College/ Institution
		University Requirement Course 9	Elective		2	Institution
Level 10	CS 1481	Professional Development Seminar	Required	CS 1352, CS 1361, CS1344	2	Department
	CS 14xx	CS Elective Course	Elective		3	Department
	CS 14xx	CS Elective Course	Elective		3	Department
	CS 14xx	CS Elective Course	Elective		3	Department
		University Requirement Course 10	Elective		2	Institution
Level 11	CS 1492	Graduation Project 1	Required	CS 1481, CS 1343, CS 1323	4	Department
	CS 1490	Practical Training 1	Required	CS 1481, CS 1343, CS 1323	8	Department
Level 12	CS 1493	Graduation Project 2	Required	CS 1492	4	Department
	CS 1491	Practical Training 2	Required	CS 1490	8	Department

Core Courses

Level 1

Credit Hours	Course Name	Course Code
3	Introduction to Computer Science	CS1110

This is an introductory course in the first semester of the bachelor programs given by the College of Computer and Information Sciences. It exposes the students to the breadth of the subject. In addition, it gives the students a foundation in problem solving.

Credit Hours	Course Name	Course Code
2	Computer Science Ethics	CS1180

The course introduces main concepts, perspectives and methodological frameworks relating to computing ethics. It presents ethical concepts and theories and addresses the required tools for evaluating computing practices issues.

Level 2

Credit Hours	Course Name	Course Code
4	Introduction to Computer Programming	CS1140

The course introduces students to structured programming techniques. Topics include different control statements (sequence, selection, and repetition), fundamental data types, and data structures (arrays). Upon successful completion of the course, students will solve computer problems by using structured programming techniques and adequate tools (text editor, compiler, and debugger).

Credit Hours	Course Name	Course Code
3	Discrete Structures 1	CS1100

This course will introduce the student to a body of mathematical concepts essential for the mastery of some of the higher-level computer science courses. Topics include: set theory, functions and relations, propositional and predicate logic, proof techniques, machine level representation of data.

Level 3

Credit Hours	Course Name	Course Code
4	Object-Oriented Programming	CS1141

This course will introduce the student to the concepts of object-oriented programming. Programming topics include data hiding/encapsulation and abstraction using classes and objects, inheritance, polymorphism, generic programming using generic classes and methods, and exception handling.

Credit Hours	Course Name	Course Code
4	Digital Logic Design	CS1120

This course focuses on: Underlying computer hardware including gates, Boolean expressions, combinational circuits analysis and design, flip flops and sequential circuits analysis and design. Understanding the function of a computer system at the machine level, the way the instructions are executed and the way the arithmetic and logic operations are performed. Designing and analyzing the main functional units of a computer such as control unit and data path of a simple CPU.

Level 4

Credit Hours	Course Name	Course Code
4	Data Structures	CS1242

This course provides the students with understanding of the concepts on data representation and organization used in development of computer applications. This includes basic and advanced data structures such as Linked Lists, Stacks, Queues, Binary Trees, Binary Search Trees, Hash Tables and Graphs. The students are trained to use the programming concepts such as abstraction and encapsulation to implement the data structures using Java language. The course will also introduce basic knowledge of algorithm analysis and, space and time complexity. Various sorting and searching algorithms will be introduced as well.

Credit Hours	Course Name	Course Code
3	Discrete Structures 2	CS1201

This course will introduce the student to a body of mathematical concepts essential for the mastery of some of the higher-level computer science courses. Topics include counting methods, discrete probability, graph theory, basic automata and computability theory.

Level 5

Credit Hours	Course Name	Course Code
4	Computer Architecture	CS1221

This course covers the evolution of computer architecture and the factors influencing the design of hardware of computer architecture and its performance. Topics include instruction set Architectures; performance, performance measures and performance evaluation for computer architectures. Processor micro-architecture, pipelining and pipelining hazards; Cache and main memory organizations; Secondary memory and Redundant Array of Independent Disks (RAID); main concepts of parallel architectures.

Credit Hours	Course Name	Course Code
3	Software Engineering 1	CS1250

-This course provides the students with understanding to methods & techniques for software development: Software development activities (requirements specification, design, architecture implementation,

validation, testing, and quality assurance) and Software development models (Plan-driven, Incremental, Prototype and Agile, etc.).

Credit Hours	Course Name	Course Code
3	Design and Analysis of Algorithms	CS1211

This course applies design and analysis techniques to numeric and nonnumeric algorithms which act on data structures. Design is emphasized so that the student feels comfortable with developing new algorithms. Analysis of algorithms is concerned with the resources an algorithm must use to reach a solution. Only theoretical techniques of analysis are covered. Topics include introduction to algorithm, asymptotic complexity, sorting and searching, divide and conquer, data structures, graph algorithms, dynamic programming, and Np-Completeness.

Level 6

Credit Hours	Course Name	Course Code
4	Operating Systems	CS1222

This course aims to provide a clear description of the theoretical concepts that underlie operating systems. It also aims to familiarize students with the practical side of the OS by programming and simulating different aspects Threading, scheduling, Synchronization, memory management, etc.).

Credit Hours	Course Name	Course Code
3	Software Engineering 2	CS1251

This course covers the remaining topics in software engineering for the software development life cycle (SDLC) along with more detail practical topics in requirements, design, verification and validation, implementation, and evaluation with focus on software quality assurance, project management and maintenance. Also, introduced different advanced topics in software engineering, such as software tools where there are used in different software development process to evaluate the software product and its quality.

Level 7

Credit Hours	Course Name	Course Code
4	Computer Networks	CS1330

This course introduces fundamental concepts in the design and implementation of computer communication networks and their protocols. This includes layered network architectures, applications, transport, congestion, routing, data link protocols and local area networks concepts. An emphasis will be placed on the protocols used in the Internet. A top-down approach will be emphasized during the course starting from the application layer down to the data link layer.

Credit Hours	Course Name	Course Code
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4**Artificial Intelligence****CS1360**

This course covers in depth the central topics of Artificial Intelligence. Namely, a large part of this course will be devoted to searching strategies in problem solving, knowledge representation and reasoning. Some selected topics will also be covered such as reasoning under uncertainty and machine learning.

Credit Hours

Course Name

Course Code

3**Principles of Database****CS1370**

This course introduces the basic concepts of databases and database management systems. And provides the students with a clear understanding of the different steps in the data design validation and implementation. Topics of this course should complement the topics covered in Software Engineering course which focuses on the functional design.

Level 8

Credit Hours

Course Name

Course Code

3**Human Computer Interaction****CS1352**

This course presents different interaction models, frameworks and styles. Moreover, it includes the interaction design process and highlights the range of design rules that can help to increase the usability of software products. In addition, it includes the evaluation techniques under two broad headings: expert analysis and user participation. Furthermore, it discusses how to design a system to be universally accessible, regardless of age, gender cultural background, or ability.

Credit Hours

Course Name

Course Code

4**Information Security****CS1372**

This course provides students with an academic overview of Information security covering its main domains with more focus on cryptography, network security, and governance. By completion of this course, students should appreciate the significance of information security in the IT realm in general, and be able to demonstrate in depth knowledge in crypto and network security in specific.

Credit Hours

Course Name

Course Code

3**Machine Learning****CS1361**

This course provides a broad introduction to machine learning models. It will familiarize students with a broad cross-section of predication and clustering models and algorithms for machine learning and prepare students for industry application of machine learning techniques.

Level 9

Credit Hours	Course Name	Course Code
4	Compilers	CS1343

This course aims to cover the main technologies associated with implementing programming languages: scanning, lexical analysis, syntax analysis, type checking, and brief overview of optimization, run-time data organization and code-generation.

Credit Hours	Course Name	Course Code
3	Distributed Systems	CS1323

This course aims to provide an understanding of the essential principles of distributed systems. Topics covered include distributed computing definition and challenges, Architectural Models, Interposes communication, Distributed Objects and Remote Invocation, Operating System Support, Web services and distributed algorithms.

Credit Hours	Course Name	Course Code
3	Application Development	CS1344

This course explains to students the concepts of web, mobile, and game applications development.

Level 10

Credit Hours	Course Name	Course Code
2	Professional Development Seminar	CS1481

The course format is face-to-face weekly class meetings with face-to-face class discussions. Most class meetings include a short instructor lecture of no more than 10-15 minutes followed by small group topic discussions, consisting of groups of no more than 4-5 students. Additionally, the course utilizes group discussions, a group research project, a group research presentation and a unit on preparing for professional interviews which includes a unit on technical resume preparation and technical and situational interview preparation.

Level 11

Credit Hours	Course Name	Course Code
4	Graduation Project 1	CS1492

The project is a significant computer science project requiring extensive research and development, conducted under the general guidance of an approved faculty member, and conforming to departmental project guidelines. The course will allow the student to choose a topic from many computer science areas and an advisor so that he can continue his project in the next project course.

Level 12

Credit Hours	Course Name	Course Code
4	Graduation Project 2	CS1493

The project is a significant computer significant computer science project requiring extensive research and development, conducted under the general guidance of an approved faculty member, and conforming to departmental project guidelines. The course will allow the student to complete “CS1492: Graduate Project 1” course from previous semester. As its name suggests “Graduate Project 2” is a semester long assignment chosen by a student or a group of students on a topic related to the CS curriculum and involves out-of-class research and a development of a computer system. The course is designed to make a comprehensive assessment of the skills the students is expected to have once graduated and how well he is equipped with the know-how, self-discipline, and attitudes required for a typical professional environment. The final report should objectively and clearly discuss the problem statement, the system requirements, the potential solutions and/or approaches, arguments about the choice of the solution.

Elective Courses

Credit Hours	Course Name	Course Code
3	Cloud Computing	CS1431

Cloud computing enables ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources such as networks, servers, storage, and applications that can be provisioned and managed seamlessly. In this course, students will be exposed to Cloud Computing concepts and architecture in addition to economical and technical constraints. Cloud development, management, performance, and security issues will be also addressed.

Credit Hours	Course Name	Course Code
3	Selected Topics in Cyber Security and Networks	CS1432

The course covers selected topics in the field of cybersecurity and computer networks. The course content will be continuously improved to reflect recent advances in the field of study and provide students with highly demanded relevant skills and knowledge required for industry and labor market.

Credit Hours	Course Name	Course Code
3	Web Application Development	CS1445

This course explains to students Internet concepts, technologies, and tools and introduces their usage for creating web sites and developing web applications.

Credit Hours	Course Name	Course Code
3	Mobile Application Development	CS1446

This course introduces mobile software development for students who have Java programming skills. Students will learn to build mobile apps for phones and tablets using the Android Java SDK. Students will explore the emerging mobile ecosystem, location-aware software, and advanced programming topics including threads, sensors, APIs and databases.

Credit Hours	Course Name	Course Code
3	Game Application Development	CS 1447

This course teaches students effective and structured procedures used to design and develop game software. It provides students with the foundation in game design and development necessary for use in the workforce or for further study in the field of game development and creation.

Credit Hours	Course Name	Course Code
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3**Selected Topics in Platform based Application Development****CS1448**

The course presents essential and advanced knowledge relating to Platform based Application Development. Students will have the ability to work on research related topics and understand the latest trends in industry. They will also work on improving current solutions to problems in both academia and industry. This course is a research-based course. The topics and papers are reviewed, determined, and finalized before the beginning of each semester.

Credit Hours

Course Name

Course Code

3**Natural Language Processing****CS1462**

This course introduces the basic concepts of Natural Language Processing (NLP) including the NLP levels (i.e., morphological, lexical, syntactic, and semantic analysis levels) and the techniques and methods for addressing each one of these four levels. Examples include the methods for POS text tokenization and segmentation, POS tagging, syntactic parsing, and disambiguation. The course covers various topics of language modelling as an approach to utilize pre-trained language models for many other downstream tasks such as Information Extraction, Dialog, and text generation systems, and relating these concepts to other CS fields such as Machine & Deep Learning and AI. In addition, the course offers practical application of those concepts through assignments and projects.

Credit Hours

Course Name

Course Code

3**Optimization and Metaheuristics****CS1463**

This course presents an overview of the main metaheuristics used to solve hard optimization problem. Many real-life applications in several disciplines as engineering, operational research, bioinformatics, robotics, etc. involve hard optimization problems. This course aims to introduce the fundamentals of metaheuristic optimization, as well as some popular metaheuristic algorithms, such as genetic algorithms, simulated annealing, tabu search and others.

Credit Hours

Course Name

Course Code

3**Digital Image Processing****CS1464**

This course is an introduction to image processing related algorithms. Image processing is an elective course that will introduce you to an exciting topic in computer science. It should be fun and not too much of a struggle for you. Make sure that you have had the prerequisites. Depending on your level of programming experience and/or mathematics background, the course may be challenging for you. If you do not understand the material, ask for help immediately.

Credit Hours

Course Name

Course Code

3**Neural Networks and Deep Learning****CS1465**

This course aims to introduce concepts of Deep Learning and its role in Artificial Intelligence. It covers the underlying concepts in machine learning. The course addresses the regularization and optimization of Deep Neural Networks (DNNs). The course also covers the anatomy of several DNN architectures and their applications, such as Convolutional Neural Networks, Sequence to Sequence Models, Attention Models, Autoencoders, Variational Autoencoders, and Deep Boltzmann Machines.

Credit Hours	Course Name	Course Code
3	Selected Topics in Artificial Intelligence	CS1466

This course introduces latest trends in industry related to the field of Artificial Intelligence (AI). The course has a mix of traditional lectures and papers/notices study about recent developments in the AI fields. The students will learn recent development of topics in a select field of AI. Professors responsible for teaching this course will continuously update its content according to recent trends in AI and the research interest of the AI research team in the department.

Credit Hours	Course Name	Course Code
3	Advanced Databases	CS1471

This course covers the fundamental of advanced database management systems that are essential to handle massive amount of data. The course focus on topic related to storing, accessing, and querying persistent large data. It covers in depth the use of indexes to answer efficiently queries over stored data, and data information retrieval.

Credit Hours	Course Name	Course Code
3	Operating Systems Security	CS1473

The course first introduces the security goals, the trust model, and the threat model for a secure operating system. Second, it describes discretionary access control and mandatory access control mechanisms along with the concept of the reference monitor. Then, it presents Multics security fundamentals including the multi-level security, protection rings, and segment descriptor words as a first attempt to build a secure operating system. The course also presents security mechanisms in ordinary operating systems such as Unix and Windows and shows how they are far from being secure operating systems. Then it introduces information flow secrecy and integrity models as a basis for verifiable security goals. It also describes the concept of security kernel to build a secure operating system. Then it describes the attempt to add security features for commercial operating systems along with two case studies Solaris trusted Extensions and Security Enhanced Linux. Also, it presents secure capability systems and secure virtual machine systems. Last, it presents the system assurance with the aim to verify that a system enforces a desired set of security goals.

Credit Hours	Course Name	Course Code
3	Network Security	CS1474

This course aims to provide an academic overview of network security covering its main domains with more focus on formal modelling, analyzing, detecting, and mitigating network attacks. By completion of this course, students should appreciate the significance of network security in the IT realm in general and be able to demonstrate in depth knowledge in network attacks and how defend IT systems in specific.

Credit Hours	Course Name	Course Code
3	Software Security	CS1475

The course details secure programming techniques to defend against software vulnerabilities such as buffer overflow and code injection. It also covers how to avoid mistakes and pitfalls when using cryptographic libraries. The course also explores secure software development through the use of secure design, secure coding, program analysis, and advanced testing.

Credit Hours	Course Name	Course Code
3	Digital Forensics	CS1476

This course provides a broad introduction to the digital forensics profession, the investigator's office and laboratory, data acquisition, Windows forensics, Linux forensics, processing crime and incident scenes, recovering graphics files, cloud forensics, digital forensics analysis and validation, E-mail and social media investigations, mobile device forensics and the internet of anything, virtual machine forensics, network forensics, current digital forensics tools, report writing for high-tech investigations, expert testimony in digital investigations and ethics for the expert witness.

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