College of Computing

Bachelor of Science in Computer Science

1. Overview

This program is designed to grant students the Bachelor of Science in Computer Science upon completing the four-year program.

2. Tracks in CS Degree

The program offers the possibility of enrolling in intensive courses in one of the two available tracks (shown beneath) to obtain the necessary knowledge of BS CS. The intensive track will assist students in their chosen track to acquire the mastered information technology skills before commencing their future careers. Three tracks offered in the degree:

1. General Computer Science Track
2. Cybersecurity Track

3. University Graduation Requirements

To graduate with a Bachelor of Science in Computer Science, students must complete a four- year program consisting of 139 credit hours. The distribution of courses is as follows:

4. Degree Requirements

Program Structure	Required/ Elective	No. of courses	Credit Hours	Percentage
Institution Requirements	**Required**	**12**	**34**	24.5%
	Elective	**1**	**3**	0.02%
College Requirements	**Required**	**15**	**37**	26.5%
	Elective			
Program Requirements	**Required**	**22**	**50**	36%
	Elective	**5**	**15**	11%
Capstone Course/Project				
Field Experience/ Internship				
Others				
Total		**55**	**139**	**100%**

4.1 University Requirements

To complete a bachelor's degree program in the College of Computing, 37 credits of general education are required: 34 compulsory and 3 free electives, as follows:

A) The compulsory courses:

Course Code	Course Title	Pre-Requisites	Credits
ARAB 101	Basic Academic Arabic		3
ARAB 201	Advanced Academic Arabic	ARAB 101	3
ENGL 100	General English		3
ENGL 101	Basic Academic English I		3
ENGL 102	Basic Academic English II	ENGL 101	3
ENGL 203	Advanced Academic English I	ENGL 102	3
ENGL 206	Technical Writing	ENGL 102	3
MATH 100	Mathematics I		3
STAT 100	Introduction to Probability and Statistics	MATH 100	3
IT 100	Information Technology		3
SOCS 101	Islamic Civilization I		3
PHE 101	Physical and Health Education		1
Total			**34**

B) Free Elective Course - 3 credit hours selected from the following list:

Course Code	Course Title	Pre-Requisites	Credits
FREN 101	Basic French I		3
CIT 101	Future Technologies		3
SOCS 201	Islamic Civilization II	SOCS 101	3
SOCS 202	World Civilization		3
SOCS 203	History of the Kingdom of Saudi Arabia		3
ASTR 150	Introduction to Astronomy		3
CHEM 150	Chemistry and Society		3

4.2 College Requirements

The College of Computing requires the following 37 credits for the bachelor's degree:

Course Code	Course Title	Pre-Requisite Courses	Credits
CSC 100	Introduction to Computing	IT 100	3
MATH 101	Calculus I	MATH 100	3
MATH 102	Calculus II	MATH 101	3
STAT 230	Probability and Statistics	STAT 100	3
PHYS 101	General Physics I	MATH 100	3
PHYS 101L	General Physics I Lab	PHYS 101	1
CEN 220	Logic Design	CSC100	3
CEN 220L	Logic Design Lab	CEN 220	1
CSC 102	Computer Programming I	CSC 100	3
CSC 102L	Computer Programming I Lab	CSC 102	1
CSC 212	Algorithms and Data Structure	CSC 102	3
CEN 221	Computer Organization and Assembly Language	CSC 212	3
CEN 221L	Computer Organization and Assembly Lang. Lab	CEN 221	1
CEN 320	Computer Architecture	CEN 221	3
CSC 492	Computing Ethics		3
Total			**37**

In addition to the college compulsory requirements, students may elect to enroll in zero credits professional certificate program consisting of the following courses:

Course Code	Course Title	Pre-Requisite Courses	Credits
TECH 101	Professional Certificate I		0
TECH 102	Professional Certificate II	TECH 101	0
TECH 103	Professional Certificate III	TECH 102	0
TECH 104	Professional Certificate IV	TECH 103	0

4.3 Program Specialization Requirements

Program specialization requirements consist of 65 credit hours; 50 compulsory credit hours and 15 elective credit hours distributed as follows:

4.3.1 Compulsory Specialization Requirements: (50) credit hours:

Course Code	Course Title	Credits	Pre-Requisites
MATH 211	Discrete Mathematics	3	MATH 102
MATH 215	Linear Algebra and Numerical Techniques	3	MATH 102
CSC 201	Computer Programming II	3	CSC 102
CSC 201L	Computer Programming II Lab	1	CSC 201 (co)

CSC 212L	Algorithms and Data Structure Lab	1	CSC 212 (co)
CSC 356	Design and Analysis of Algorithms	3	CSC 212
CSC 357	Theory of Computation	3	MATH 211
CSC 358	Programming Languages	3	CSC 212
CSC 360	Internet Programming and Web Design	3	CSC 201
CSC 360L	Internet Programming and Web Design Lab	1	CSC 360 (co)
CSC 372	Operating Systems	3	CSC 358
CSC 372L	Operating Systems Lab	1	CSC 372 (co)
CSC 382	Software Engineering*	3	CIT 350
CSC 387	Artificial Intelligence	3	MATH 211
CIT 472	Human-Computer Interaction	3	CSC 382
CIT 350	Database Systems	3	CSC 212
CIT 350L	Database Systems Lab	1	CIT 350 (co)
CEN 340	Computer Networks	3	CEN 221
CEN 340L	Computer Networks Lab	1	CEN 340 (co)
CSC 398	Internship	1	ENGL 206
CSC 498	Final Year Project I	1	Senior Standing
CSC 499	Final Year Project II	3	CSC 498
Total		**50**	

*International Certificate

4.3.2 Elective Specialization Requirements – (15 credit hours) could be selected from the following list:

To be selected from one of the following lists according to the program track:

General Computer Science Track Elective Requirements

Course Code	Course Title	Credits	Pre-Requisites
CSC 262	Introduction to Multimedia Concepts	3	CSC 212
CSC 359	Parallel Computing	3	CEN 340
CSC 374	Compiler Construction	3	CSC 357, CSC 358
CSC 378	Database Management System	3	CIT 350
CSC 380	Graphical User Interface	3	CSC382
CSC 386	Advanced Computer Graphics	3	CSC 386
CIT 388	Computer Vision	3	CSC 387
CSC 391	Scientific Visualization	3	CSC 385, CSC 356
CSC 385	Computer Graphics	3	MATH 212
CSC 397	Selected Topics in Computer Science	3	Advisor consent
CSC 475	Computer Arabization	3	CSC 387
CSC 487	Computer Security*	3	CEN 340
CIT 114	Programming with Python	3	CSC 100
CIT 241	Fundamentals of E-Commerce	3	CSC 102
CIT 470	Project Management	3	CSC 382

Cybersecurity Track Elective Requirements

Course Code	Course Title	Credits	Pre-Requisites
CSC 481	Introduction to Computer Security*	3	CSC 356
CSC 487	Advanced Computer Security*	3	CEN 340
CEN 343	Cryptography and Computer Security*	3	CEN 340
CEN 441	Information Theory	3	
CEN 442	Coding Theory	3	STAT 230, MATH 215
CEN 451	Internet Engineering*	3	CEN 340
CSC 489	Selected Topics In Cybersecurity	3	Advisor consent
CIT 356	Machine Learning, I	3	
CIT 372	Cloud Computing and Security	3	CEN 343
CIT 475	Information Security*	3	CEN 340
CIT 476	Machine Learning II	3	CIT 356

* *Aljahiziah Exam*

Fahad Bin Sultan University
College of Computing
Department of Computer Science

Proposed Sequence of the BSC Program Study Plan

Study Plan ***(139 Credits)***

Year I

First Semester **(16 Credit Hours)**

Course	Title	Credits	Prerequisites
ENGL 100	General English	3	
ENGL 101	Basic Academic English I	3	
MATH 100	Mathematics I	3	
IT 100	Information Technology	3	
SOCS 101	Islamic Civilization I	3	
PHE 101	Physical and Health Education	1	
	Total Credits	**16**	

Second Semester **(19 Credit Hours)**

Course	Title	Credits	Prerequisites
STAT 100	Introduction to Probability and Statistics	3	MATH 100
CSC 100	Introduction to Computing	3	IT 100
PHYS 101	General Physics I	3	MATH 100
PHYS 101L	General Physics I Lab	1	PHYS 101 (co)
ENGL 102	Basic Academic English II	3	ENGL 101
MATH 101	Calculus I	3	MATH 100
	Free Elective	3	
	Total Credits	**19**	

Year II

Third Semester **(17 Credit Hours)**

Course	Title	Credits	Prerequisites
MATH 102	Calculus II	3	MATH 101
ENGL 206	Technical Writing	3	ENGL 102
CEN 220	Logic Design	3	CSC 100
CEN 220L	Logic Design Lab	1	CEN 220 (co)
CSC 102	Computer Programming I	3	CSC 100
CSC 102L	Computer Programming I Lab	1	CSC 102(co)
	CS Specialization Elective	3	
	Total Credits	**17**	

Fourth Semester **(17 Credit Hours)**

Course	Title	Credits	Prerequisites
ARAB 101	Basic Academic Arabic	3	
MATH 211	Discrete Mathematics	3	MATH 102
STAT 230	Probability and Statistics	3	STAT 100
CSC 212	Algorithms and Data Structure	3	CSC 102
CSC 212L	Algorithms and Data Structure Lab	1	CSC 212 (co)
CEN 221	Computer Organization and Assembly Language	3	CEN 220
CEN 221L	Computer Organization and Assembly Language Lab	1	CEN 221 (Co)
	Total Credits	**17**	

Year III

Fifth Semester

(17 Credit Hours)

Course	Title	Credits	Prerequisites
ARAB 201	Advanced Academic Arabic	3	ARAB 101
CEN 221	Computer Organization and Assembly Language	3	CSC 212
CEN 221L	Computer Organization and Assembly Lang. Lab	1	CEN 221 (Co)
CIT 350	Database Systems	3	CSC 212
CIT 350L	Database Systems Lab	1	CIT 350(co)
CSC 356	Design and Analysis of Algorithms	3	CSC 212
CSC 387	Artificial Intelligence	3	MATH 211
	Total Credits	**17**	

Sixth Semester **(19 Credit Hours)**

Course	Title	Credits	Prerequisites
ENGL 203	Advanced Academic English I	3	ENGL 102
MATH 215	Linear Algebra and Numerical Techniques	3	MATH 102
CEN 320	Computer Architecture	3	CEN 221
CSC 360	Internet Programming and Web Design	3	CSC 201
CSC 360L	Internet Programming and Web Design Lab	1	CSC 360 (co)
CSC 382	Software Engineering	3	CIT 350
	CS Specialization Elective	3	
	Total Credits	**19**	

Summer Semester **(1 Credit Hour)**

Course	Title	Credits	Prerequisites
CIT 398	Internship	1	ENGL 206
	Total Credits	**1**	

Year IV

Seventh Semester **(17 Credit Hours)**

Course	Title	Credits	Prerequisites
CEN 340	Computer Networks	3	CEN 221
CEN 340L	Computer Networks Lab	1	CEN 340
CSC 357	Theory of Computation	3	MATH 211
CSC 358	Programming Languages	3	CSC 212
CSC 498	Final Year Project I	1	Senior standing
	CS Specialization Elective	3	
	CS Specialization Elective	3	
	Total Credits	**17**	

Eight Semester **(16 Credit Hours)**

Course	Title	Credits	Prerequisites
CSC 372	Operating Systems	3	CSC 358
CSC 372L	Operating Systems Lab	1	CSC 372 (co)
CIT 472	Human-Computer Interaction	3	CSC 382
CSC 492	Computing Ethics	3	Advisor consent
CSC 499	Final Year Project II	3	CSC 498
	CS Specialization Elective	3	
	Total Credits	**16**	

Total Program Credits	**139**	

Course Descriptions

➢ *A) Required Courses:*

CSC 100 Introduction to Computing (3, 0, 0)

This course provides students with fundamental topics in hardware, software, networking, and computers through both lecture and lab exercises. The course covers a range of business issues, programming, security, and the Microsoft Office Professional for Windows software suite which includes Word, Excel, and PowerPoint are utilized. Additionally, this course covers the fundamentals of algorithms and number systems.

Prerequisite: IT 100

CSC 102 Computer Programming I 3(3, 0, 0)

Introduction to computer science with emphasis on problem-solving, programming and algorithm design; use of a high-level programming language for solving problems and emphasizing program design and development; topics include basic programming constructs, expressions, conditional statements, loop statements, functions, classes and objects, data types, arrays, and strings.

Prerequisite: CSC 100

CSC 102L Computer Programming I Lab 1(0, 0, 2)

Laboratory experiments to cover CSC 102 material.

Co-requisite: CSC 102

CSC 201 Computer Programming II 3(3, 0, 0)

Introduction to the following object-oriented programming concepts: Object-oriented design; abstraction, encapsulation and information hiding; classes; separation of behavior and implementation; class hierarchies; inheritance; and polymorphism; constructor and accessory concepts; overloading principles.

Prerequisite: CSC 102

CSC 201L Computer Programming II Lab 1(0, 0, 2)

This Lab complements the contents of CSC 201.

Co-requisite: CSC 201

CSC 212 Algorithms and Data Structures 3(3, 0, 0)

This course covers basic data structures and related algorithms. It includes detailed studies of data structures and data abstraction such as queues, linked lists, hashing techniques, trees, the data structure for representing graphs with an emphasis on algorithm design and programming techniques in large programs; introduction to programming complexity and verification as well as fundamental algorithms and their implementation for sorting, searching, merging, hashing, graph-theoretic models, and recursive procedures.

Prerequisite: CSC 102

CSC 212L Algorithms and Data Structures Lab 1(0, 0, 2)

This course is meant to help students explore the use of a variety of data structures and useful such as queues, linked lists, hashing techniques, trees, and graphs. In addition, the course covers techniques for implementing fundamental algorithms for sorting, searching, merging, hashing, and recursive procedures.

Co- requisites: CSC 212

CSC 356 Design and Analysis of Algorithms **3(3, 0, 0)**

Techniques for designing and analyzing efficient algorithms and advanced data structures: asymptotic analysis, divide and conquer, greedy algorithms, dynamic programming, and optimization algorithms. This course includes an introduction to NP-Completeness; application to searching, sorting, graphs, matrices, and set manipulation.

Prerequisite: CSC 212

CSC 357 Theory of Computation **3(3, 0, 0)**

Introduction to formal languages and computational models: finite automata, pushdown automata, Turing machines, undesirability, recursive, recursively enumerable functions, and an introduction to Computability and Complexity; applications to compiler design and text processing.

Prerequisites: MATH 211 and CSC 212

CSC 358 Programming Languages **3(3, 0, 0)**

Comparative study of the design and implementation of advanced programming language features in imperative, scripting, object-oriented, functional, logic, and visual languages. Formal methods for syntactic and semantic description of imperative programming languages are examined. Statement types, data types, variable binding, method binding, and backtracking mechanisms; functional programming language (Haskell or LISP) or logic programming language (Prolog or LISP) with associated Lab.

Prerequisite: CSC 212

CSC 360 Internet Programming and Web Design **3(3, 0, 0)**

Hands-on approach in understanding how medium-sized interactive client/server Web applications are built using different types of integrated Web technologies; implementation of a database-driven website, relevant technologies involved in each tier of the web architectural model; accessibility of Web agents and end-users, Web caching and proxy techniques, and security issues and strategies of Web-based applications; operational concepts of the internet and the web, static and client content, dynamically served content, and n-tiered architecture.

Prerequisites: CSC 201

CSC 360L Internet Programming and Web Design Lab **1(0, 0, 2)**

Laboratory experience to complement CSC 360 material.

Co-requisites: CSC 360

CSC 372 Operating Systems **3(2, 0, 0)**

An overview of operating systems: operating system principles, scheduling and resource management, virtual memory, file systems, concurrent processing and synchronization, Deadlocks, Disk Scheduling; Programming under UNIX with the emphasis on concurrency and Inter-Process Communication (IPC).

Prerequisites: CSC 358

CSC 372L Operating Systems Lab **1(0, 0, 2)**

Lab experience to complement CSC 372.

Co-requisite: CSC 372

CIT 350 Database Sytems

3(3, 0, 0)

An introduction to data modeling and various relational models (with relational algebra, and calculus) in a database system; the entity-relationship model, SQL and integrity constraints, file organization and index files; and normalization.

CIT 350L Database Systems Lab **1(0, 0, 2)**

Lab course to complement CSC 377.

Co-requisite: CIT 350

CIT 472 Human-Computer Interaction 3(3, 0, 0)

Formal methods for facilitating human-computer communication: information processing characteristics important to facilitate human-computer interaction, and formal models of human-computer interaction; dialogue techniques, response times and display rates, information presentation, interaction devices, computer training, help systems, information search and visualization, and hypermedia, Usability evaluation – Other forms of input/output.

Prerequisites: CSC 358

CSC 382 Software Engineering 3(3, 0, 0)

Overall process of software development: principles of software requirements, analysis, implementation, testing, and maintenance; professional practices, risks and liabilities; a brief survey of available tools and techniques of analysis, planning, design and structure charts, system and information flow diagrams, testing and quality control; basic modeling and design, particularly using UML; project in software engineering techniques.

Prerequisites: CIT 350

CEN 340 Computer Networks 3(3, 0, 0)

Foundation in computer networks - a top-down view of the layered architectural elements of communication systems, focusing on the Internet and TCP/IP; client/server systems, packet switching, protocol stacks, queuing theory, application protocols, socket programming, remote service calls, reliable transport (Error detection and recovery, multimedia networking with quality of service and multicasting), UDP, TCP, and security.

Prerequisite: CEN 221

CEN 340L Computer Networks Lab 1(0, 2, 0)

Lab experience to complement CEN 340.

Co-requisite: CEN 340

CSC 387 Artificial Intelligence 3(3, 0, 0)

Introduction to the automation of intelligent capabilities, including intelligent agents, constrains satisfaction problems, knowledge representation and reasoning (search and logical inference), interpreting, behavior modeling and learning; expert systems, knowledge acquisition, and machine learning will also be stressed; programming projects using an Artificial Intelligence programming Language.

Prerequisites: MATH 211

CSC 398 Internship 1(0, 1, 0)

This is an eight to twelve-week professional training field in computer science.

Pre-requisite: ENGL 206

CSC 492 Computing Ethics 3(3, 0, 0)

Critical examination of ethical problems and research methods associated with computer technology; discussion of these problems conducted within the framework of classical philosophical ethical theories; legal and quasi-legal (i.e., policy and regulative) issues; topics addressed include the process of ethical decision-making, privacy and confidentiality, computer crime, professional codes and responsibilities, software piracy, the impact of computers on society, and proliferation of Computers in our World (Education, Medicine, e-government, e-learning. etc.)

Prerequisite: Advisor consent

CSC 498 Final Year Project I 1 (0, 1, 0)

A significant teamwork project experience to integrate much of the material learned in lead-up courses including

applications of computer science in various domains. This course involves project selection, literature survey, preparation of the necessary materials for the specific project to be accomplished in CSC 499.

Prerequisite: Senior standing

CSC 499 Final Year Project II **3 (0, 3, 0)**

Continuation of CSC 498: significant project team experience that integrates material learned in lead-up courses, including computer science applications in various domains.

Prerequisite: CSC 498

➢ *B) Elective Courses*

CSC 262 Introduction to Multimedia Concepts **3(3, 0, 0)**

Concepts of multimedia: principles of graphics, sound, video, and animation; scripting techniques; contemporary multimedia programs to develop and create an interactive multimedia project.

Prerequisite: CSC 212

CSC 359 Parallel Computing **3(3, 0, 0)**

Essentials of parallel computers and associated programming methodology; basic architecture of parallel computers including shared memory, message passing, meshes, and hyper-cubes; basic techniques of parallel computations, portioning and divide-conquer; basic algorithms such as searching algorithms, numerical algorithms, etc.

Prerequisites: CEN 221 and CSC 356

CSC 374 Compiler Construction **3(3, 0, 0)**

An understanding of how compilers work: a simple compiler, context-free grammars, lexical analysis, top-down parsing, bottom-up parsing, semantic analysis, and code generation; programming projects.

Prerequisites: CSC 357 and CSC 358

CSC 378 Database Management Systems **3(3, 0, 0)**

Essentials of database management system with an emphasis on relational ones: query and transaction processing, concurrency control, recovery, distributed transactions and database security; web deployed database systems – data mining – data warehousing, OLAP – Object Oriented. ***Prerequisite: CIT 350***

CSC 380 Graphical User Interface **3(3, 0, 0)**

Concepts and techniques used in the design and implementation of interactive systems: interface design guidelines, human factors, technical methods of user interface design, and the design and execution of usability studies; application of various techniques through the design, creation, and testing of an interactive software application.

Prerequisite: CSC 358

CSC 385 Computer Graphics **3(3, 0, 0)**

Fundamentals of computer graphics with emphasis on 2-D graphics using an application-based approach: graphics output primitives, their attributes, colors, transformations, anti-aliasing, texture mapping, and curves and surfaces; 2D graphics algorithms, essentials of user interface and window management systems, and graphics hardware; programming using OpenGL.

Prerequisites: MATH 215

CSC 386 Advanced Computer Graphics **3(3, 0, 0)**

Basic concepts of 3D computer graphics using an application-based approach: 3D object representations and manipulations; 3D transformation and viewing; hidden-surface and hidden-line removal; shading models; rendering; texture mapping; ray-tracing; animation techniques; programming using OpenGL.

Prerequisite: CSC 385

CIT 388 Computer Vision **3(3, 0, 0)**

Introduction to the basic techniques of automated (computer) processing, analysis, and understanding of image/video data: geometry and physics of image formation, image enhancement, feature extraction, video imagery, multi-view imagery analysis.

Prerequisites: CSC 387

CSC 391 Scientific Visualization **3(3, 0, 0)**

Techniques in scientific data visualization with an object-oriented approach: basic data representation, visualization schemes for scalar, vector and other types of data, basic algorithms for the generation of ISO-surface and volume visualization; applications include 3D medical imaging, financial applications, modeling, algorithms visualization and others.

Prerequisites: CSC 385 and CSC 356

CSC 397 Selected Topics in Computer Science **3(3, 0, 0)**

This course includes a presentation on a selected topic of interest to the instructor and/or students. Topics will be chosen from state-of-the-art innovations in computer science.

Prerequisite: Advisor consent

CSC 475 Computer Arabization **3(3, 0, 0)**

Issues and techniques in Computer Arabization: System Arabization level such as font and code page manipulation – keyboard, screen and printer Arabization, Arabic text-editing, morphology, information retrieval, language comprehension, spell and grammar checking, world-wide-web browsers, and computer-aided education; foundations of applications in Speech Recognition – Neural network - Pattern Recognition for Arabic Language - Machine Translation.

Prerequisites: CSC 385

CSC 481 Introduction to Computer Security **3(3, 0, 0)**

Introduction to cryptography and the security of networks and databases: classical encryption; modern encryption techniques; public-key encryption; elliptic curve cryptography; message authentication, message digest functions; and methods for relational database security, including access control, system and network attacks and defenses – intrusion detection and preventions– risk assessment and management.

Prerequisite: CEN 340

CSC 487 Advanced Computer Security **3(3, 0, 0)**

Advanced mechanisms and implementation of computer security and data protection; Policy, encryption and authentication, access control and integrity models and mechanisms; network security; secure systems; programming and vulnerabilities analysis. Study of an existing operating system.

Pre-requisite: CSC 481

CSC 489 Selected topics in cybersecurity

3(3, 0, 0)

The course "Selected Topics in Cybersecurity" offers an exploration of advanced and emerging areas within the field of cybersecurity. It provides an opportunity for students to delve into specific topics of interest and relevance to the changing landscape of cybersecurity. The course focuses on in-depth study, analysis, and practical applications of selected topics, allowing students to gain specialized knowledge and skills in those areas. The main topics include Threat Intelligence and Cyber Threat Hunting, Cloud Security and Virtualization, Secure Software Development, Machine Learning for Cybersecurity, Internet of Things (IoT) Security, Blockchain Security, Cybersecurity Governance and Compliance, Data Privacy and Protection

Pre-requisite: Advisor consent