



جامعة فهد بن سلطان  
FAHAD BIN SULTAN UNIVERSITY

Fahad Bin Sultan University  
College of Computing

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# College of Computing

Bachelor of Science in Computer Science

(Cybersecurity Track)

## 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
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:

### Degree Requirements

Program Structure	Required/ Elective	No. of courses	Credit Hours	Percentage
Institution Requirements	Required	13	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		2	4	
Field Experience/ Internship		1	1	
Others				
<b>Total</b>		<b>55</b>	<b>139</b>	<b>100%</b>

## University Requirements

University Requirements consist of 37 credit hours distributed as follows:

### University Compulsory Requirements (34 Cr.)

Course Code	Course Title	Pre-Requisite Courses	Credit Hours
ENG 100	General English		3
ENGL 206	Technical Writing	ENGL 102	3
MATH 110	Mathematics I		3
PHE 101	Physical and Health Education		1
ENGL 101	Basic Academic English I		3
SOCS 101	Islamic Civilization I		3
ENGL 102	Basic Academic English II	ENGL 101	3
ARAB 101	Basic Academic Arabic		3
ARAB 201	Advanced Academic Arabic	ARAB 101	3
ENGL 203	Advanced Academic English I	ENGL 102	3
MATH 120	Mathematics II	MATH 110	3
IT 100	Information Technology		3
<b>Total</b>			<b>34</b>

### A Free Elective Course: 3 credit hours from the following list:

Course Code	Course Title	Pre-Requisite Courses	Credit Hours
FREN 101	Basic French I		3
CIT 101	Future Technologies		3
PHED 101	Physical Education I		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 & Society		3

### 3.1 College Requirements

College Requirements consist of 37 credit hours distributed as follows:

Course Code	Course Title	Pre-Requisite Courses	Credit Hours
CSC 100	Introduction to Computing		3
MATH 101	Calculus I		3
PHYS 101	General Physics I		3
PHYS 101L	General Physics I Lab	PHYS 101	1
MATH 102	Calculus II	MATH 101	3
STAT 230	Probability and Statistics	MATH 201	3
CEN 220	Logic Design	MATH 211(co)	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
CSC 492	Computing Ethics		3
CEN 320	Computer Architecture	CEN 221	3
<b>Total</b>			<b>37</b>

### 3.2 Program Specialization Requirements

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

#### 3.2.1. Compulsory Specialization Requirements: (50) credit hours:

Course Code	Course Title	Pre-Requisite Courses	Credit Hours
CSC 201	Computer Programming II	CSC 102	3
CSC 201L	Computer Programming Ii Lab	CSC 201	1
CSC 212L	Algorithms and Data Structure Lab	CSC 212	1
CSC 356	Design And Analysis Of Algorithms	CSC 212	3
CSC 357	Theory of Computation	CSC 212 + MATH 211	3
CSC 358	Programming Languages	CSC 212	3
CSC 360	Internet Programming and Web Design	CSC 356 + CEN 221	3
CSC 360L	Internet Programming and Web Design Lab	CSC 360	1
CSC 372	Operating Systems	CSC 358 + CEN 221	3
CSC 372L	Operating Systems Lab	CSC 372	1
CSC 377	Database Systems	CSC 356 / CEN 330	3
CSC 377L	Database Systems Lab	CSC 377	1
CSC 382	Software Engineering*	CSC 372 + CSC 377	3
CSC 387	Artificial Intelligence	CSC 356 and 358	3
CSC 379	Human-Computer Interaction		3
Math 211	Discrete Mathematics		3
MATH 215	Linear Algebra and Numerical Techniques	MATH 102	3
CSC 384	Computer Networks	CEN 221 + CSC 356	3
CSC 384L	Computer Networks Lab	CSC 384	1
CSC 498	Final Year Project I		1
CSC 499	Final Year Project II	CSC 498	3
CSC 398	Internship	ENGL 206	1
<b>Total</b>			<b>50</b>

\*International Certificate

**3.2.2. Elective Specialization Requirements – Cybersecurity track elective requirements (15 credit hours) could be selected from the following list:**

Course Code	Course Title	Pre-Requisite Courses	Credit Hours
CSC 481	Introduction to Computer Security*	CSC 356	3
CSC 487	Computer Security*		3
CIT 475	Information Security*		3
CEN 343	Cryptography and Computer Security*		3
CEN 441	Information Theory	CEN 240	3
CEN 442	IoT/ Coding Theory	STAT 230 and MATH 215	3
CEN 451	Internet Engineering*	CEN 340	3
	Selected topics in cybersecurity		3

\*International Certificate    \*\* Aljahiziah Exam

## Proposed sequence of the BCS Program Study Plan

Year I

First Semester

(16 Credit Hours)

Course	Title	Credits	Prerequisites
ENG 100	General English	3	
ENGL 101	Basic Academic English I	3	
MATH 110	Mathematics I	3	
IT 100	Information Technology	3	
SOCS 101	Islamic Civilization I	3	
PHE 101	Physical and Health Education	1	
	<b>Total Credits</b>	<b>16</b>	

Second Semester

(16 Credit Hours)

Course	Title	Credits	Prerequisites
MATH 120	Mathematics II	3	MATH 110
CSC 100	Introduction to Computing	3	IT 100
PHYS 101	General Physics I	3	
ENGL 102	Basic Academic English II	3	ENGL 101
PHYS 101L	General Physics I Lab	1	PHYS 101
MATH 101	Calculus I	3	
	<b>Total Credits</b>	<b>16</b>	

Year II

Third Semester

(17 credit hour)

Course	Title	Credits	Prerequisites
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)
ENGL 206	Technical Writing	3	ENGL 102
MATH 102	Calculus II	3	SOCS 101
	CS Specialization Elective	3	MATH 101
	<b>Total Credits</b>	<b>17</b>	

Fourth Semester

(17 credit hours)

Course	Title	Credits	Prerequisites
CSC 212	Algorithms and Data Structure	3	CSC 102
CSC 212L	Algorithms and Data Structure Lab	1	CSC 212 (co)
CSC 201	Computer Programming II	3	CS C 102
CSC 201L	Computer Programming II Lab	1	CSC 201
STAT 230	Probability and Statistics	3	
ARAB 101	Basic Academic Arabic	3	
MATH 211	Discrete Mathematics	3	
	<b>Total Credits</b>	<b>17</b>	



**Year III**

**Fifth semester**

**(17 credit hours)**

Course	Title	Credits	Prerequisites
CEN 320	Computer Architecture	3	
CEN 221	Computer Organization and Assembly Language	3	CSC 212
CEN 221L	Computer Organization and Assembly Lang. Lab	1	CEN 221 (Co)
ARAB 201	Advanced Academic Arabic	3	ARAB 101
CSC 372	Operating Systems	3	
CSC 372L	Operating Systems Lab	1	CSC 372 (co)
CSC 387	Artificial Intelligence	3	MATH 211
	<b>Total Credits</b>	<b>17</b>	

**Sixth semester**

**(19 credit hours)**

Course	Title	Credits	Prerequisites
CSC 357	Theory of Computation	3	MATH 211
CSC 382	Software Engineering	3	
ENGL 203	Advanced Academic English I	3	ENGL 102
CSC 377	Database Systems	3	
CSC 377L	Database Systems Lab	1	CSC 377 (co)
MATH 215	Linear Algebra and Numerical Techniques	3	MATH 102
	CS Specialization Elective		
	<b>Total Credits</b>	<b>19</b>	

**Summer semester**

**( 4 credit hours)**

Course	Title	Credits	Prerequisites
CIT 398	Internship	1	
	<b>Total Credits</b>	<b>1</b>	

Year IV

Seventh Semester

(17 credit hours)

Course	Title	Credits	Prerequisites
CSC 360	Internet Programming and Web Design	3	CSC 356
CSC 360L	Internet Programming and Web Design Lab	1	CSC 360 (co)
CSC 356	Design and Analysis of Algorithms	3	CSC 212
CSC 498	Final Year Project I	1	
	CS Specialization Elective	3	
	CS Specialization Elective	3	
CSC 358	Programming Languages	3	
	<b>Total Credits</b>	<b>17</b>	

Eighth semester

(19credit hours)

Course	Title	Credits	Prerequisites
CSC 379	Human-Computer Interaction	3	
CSC 384	Computer Networks	3	CSC 365
CSC 384L	Computer Networks Lab	1	CSC 384 (co)
CSC 499	Final Year Project II	3	CSC 498
	CS Specialization Elective	3	
CSC 492	Computing Ethics	3	
	Free Elective	3	
	<b>Total Credits</b>	<b>19</b>	
<b>Total Program Credits</b>		<b>139</b>	

## Course Descriptions

### A. Program Specialization Core Courses

#### CSC 100 Introduction to Computing

3(3, 0, 0)

This course is an introduction to computers and their applications. Common applications are considered in word processing, spreadsheets, presentation, and database systems. This course also includes an introduction to number systems, concepts of Algorithms, and an introduction to the Internet and the World Wide Web. This course provides an introduction to programming.

*Prerequisite: None*

#### CSC 101 Introduction to Computing for Engineers

3(3, 0, 0)

This course includes the following topics: an overview of electrical engineering as a profession; an introduction to the use of different CAD tools (e.g., SPICE, MATLAB, LabVIEW and basic laboratory instruments) in areas of Electrical Engineering such as circuits, electromagnetic fields, energy, machines, signal processing, communications, and control.

#### CSC 102/ELEE 230 Computer Programming I

3(3, 0, 0)

Introduction to computer science with an 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: None*

#### CSC 102L Computer Programming I Lab

1(0, 0, 2)

Laboratory experiments to cover CSC 102 material.

*Pre- or 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.

*Pre- or 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.

*Prerequisite: CSC 212*

#### CSC 356/CEN 432 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 the 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 382*

**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/CEN360 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 an emphasis on concurrency and Inter-Process Communication (IPC).

*Prerequisites: CEN 221 and CSC 356*

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

Lab experience to complement CSC 372.

*Co-requisite: CSC 372*

**CSC 377/CEN 430/CIT 350 Database Systems 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.

**CSC 377L/CIT 350L Database Systems Lab 3(3, 0, 0)**

Lab course to complement CSC 377.

**CSC 379/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 and CSC*

**CSC 382/CEN 330 Software Engineering**

**3(3, 0, 0)**

The 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: CSC 372 and CSC 377*

**CSC 384/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 and CSC 356*

**CSC 384L/CEN 440L Computer Networks Lab**

**1(0, 2, 0)**

Lab experience to complement CSC 384.

*Co-requisite: CEN 221, CSC 356*

**CSC 387 Artificial Intelligence**

**3(3, 0, 0)**

Introduction to the automation of intelligent capabilities, including intelligent agents, constraints 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: CSC 356 and 358*

**CSC 398/CIT398/CEN 398 Internship/Practicum**

**1(0, 1, 0)**

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

*Pre-requisite: ENGL 206*

**CSC 492/COEN 400 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: Senior standing*

**CSC 498/CIT498/CEN498 Final Year Project in Computer Science 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/CIT499/CEN499 Final Year Project in Computer Science 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. Program Specialization Elective Courses**

**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: CSC 356*

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

Principles, 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: Consent of the instructor*

**CEN 434 Cryptography and Computer Security****3(3, 1, 0)**

Overview of encryption and computer security; classical encryption techniques, block ciphers and the data encryption standard, finite fields, advanced encryption standard, confidentiality using symmetric encryption, public-key cryptography, key management, hash and MAC algorithms, digital signatures; authentication applications, intruders, and malicious software.

*Prerequisite: Senior standing*

**CEN 441 Information Theory****3(3, 1, 0)**

This course introduces the theory of error-correcting codes. The course will focus on results of asymptotic or algorithmic significance. Topics include: construction and existence results for error-correcting codes; limitations on the combinatorial performance of error-correcting codes; BCH codes, Reed-Solomon codes; low density parity check codes; algebraic geometric codes; Turbo codes; and decoding algorithms; unique and soft decoding; applications in computer engineering such as: computer storage, compact disk player, satellite communications, bandwidth-limited systems.

*Prerequisites: STAT 230 and MATH 215*

**CEN 442 Coding Theory****3(3, 1, 0)**

This course introduces the theory of error-correcting codes. The course will focus on results of asymptotic or algorithmic significance. Topics include: construction and existence results for error-correcting codes; limitations on the combinatorial performance of error-correcting codes; BCH codes, Reed-Solomon codes; low density parity check codes; algebraic geometric codes; Turbo codes; and decoding algorithms; unique and soft decoding; applications in computer engineering such as: computer storage, compact disk player, satellite communications, bandwidth-limited systems.

*Prerequisites: STAT 230 and MATH 215*

**CEN 451 Internet Engineering****3(3, 1, 0)**

Examining major protocols used in Internet: IP, ICMP, TCP, UDP; new technologies introduced on the Internet: IP Multicast, Mobile IP, IPv6, VPNs, and quality of service; routing on the Internet; network security and firewall design; overview of the application protocols: SMTP, HTTP, RTP, and SNMP.

**CIT 475 Information 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: Senior Standing.*

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

Principles, 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: Consent of the instructor*

**CSC 412 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: Consent of the instructor*