جامـعـة الفيصل
Alfaisal University

جامعة الفيصل
Alfaisal University

Bachelor of Software Engineering

College of Engineering, Alfaisal University

Effective: Fall 2019 with tracks

Revised: April 23, 2021

Curriculum Structure and Study Plan

The Bachelor of Software Engineering curriculum is composed of **133** Credit Hours (CRHs) divided as follows:

I.   **General Education Requirements (44 CRHs)**
1. Mathematics & Statistics (15 CRHs)
2. Basic Sciences (12 CRHs)
3. Humanities (17 CRHs)

II.   **Core Requirements (89 CRHs)**
1. Software Engineering Courses (69 CRHs)
2. College of Engineering Courses (8 CRHs)
3. Technical Electives (12 CRHs)
4. Summer Internship (0 CRHs)

I.   General Education Requirements (44 CRHs)

1. Mathematics & Statistics (15 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect.	Lab	Tut		
MAT 101	Calculus I	3	3	0	0		
MAT 112	Calculus II	3	3	0	0	MAT 101	
MAT 212	Linear Algebra	3	3	0	0	MAT 112	
MAT 224	Numerical Methods	3	3	0	0	MAT 212	
STA 212	Probability and Statistics for Engineers	3	3	0	0	MAT 112	

2. Basic Sciences (12 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect	Lab	Tut		
CHM 102	Introduction to Chemistry	3	3	0	1		
CHM 102 L	Introduction to Chemistry Lab	1	0	2	0		CHEM 102
PHU 103	Mechanics and Waves for Engineers	3	3	0	1		MAT 101
PHU 103 L	Mechanics and Waves for Engineers Lab	1	0	2	0		PHU 103
PHU 124	Electromagnetism and Optics for Engineers	3	3	0	1	PHU 103, MAT 101	
PHU 124 L	Electromagnetism and Optics for Engineers Lab	1	0	2	0	PHU 103, MAT 101	PHU 124

3. Humanities (17 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect	Lab	Tut		
ENG 101	Freshman English I	3	3	0	0		
ENG 112	Freshman English II	3	3	0	0	ENG 101	
ENG 222	Technical Writing	3	3	0	0	ENG 112	
ISL 101	Islamic Studies I	2	2	0	0		
ISL 112	Islamic Studies II	2	2	0	0	ISL 101	
ARB 101	Arabic Language and Literature I	2	2	0	0		
ARB 112	Arabic Language and Literature II	2	2	0	0	ARB 101	

II. Core Requirements (89 CRHs)

1. Software Engineering Courses (69 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect	Lab	Tut		
SE 100	Programming for Engineers	3	3	0	0		
SE 100 L	Programming for Engineers Lab	1	0	2	0		SE 100
SE 117	Software Practice and Society	3	3	0	0		
SE 120	Object-Oriented Programming I	3	3	0	0	SE 100	
SE 120 L	Object-Oriented Programming I Lab	1	0	2	0	SE 100	SE 120
SE 201	Introduction to Software Engineering	3	3	0	0	SE 120	
SE 212	Discrete Structures for Software Engineers	3	3	0	0	SE 120	
SE 214	Algorithms and Data Structures	3	3	0	0	SE 120	
SE 214 L	Algorithms and Data Structures Lab	1	0	2	0	SE 120	SE 214
SE 220	Object-Oriented Programming II	3	0	0	0	SE 120	
SE 220 L	Object-Oriented Programming II Lab	1	0	2	0	SE 120	SE 220
SE 225	Software Requirements	3	3	0	0	SE 201	
SE 225 L	Software Requirements Lab	1	0	2	0	SE 201	SE 225
SE 310	Software Design and Architecture	3	3	0	0	SE 225	
SE 312	Database Management Systems	3	3	0	0	SE 214	
SE 312 L	Database Management Systems Lab	1	0	2	Tut	SE 214	SE 312
SE 314	Operating Systems	3	3	0	0	SE 214	
SE 314 L	Operating Systems Lab	1	0	2	0	SE 214	SE 314
SE 322	Internet of Things Application Development	3	3	0	0	SE 100, EE 305	
SE 324	Web Application Development	3	3	0	0	SE 312	

SE 324 L	Web Application Development Lab	1	0	2	0	SE 312	SE 324
SE 328	Mobile Application Design and Development	3	3	0	0	SE 225, SE 312	
SE 328 L	Mobile Application Design and Development Lab	1	0	2	0	SE 225, SE 312	SE 328
SE 330	Introduction to Cybersecurity	3	3	0	0	EE 305	
SE 412	Software Testing and Quality Assurance	3	3	0	0	SE 310	
SE 414	Software Project Management	3	3	0	0	SE 310	
SE 423	Software Construction and Processes	3	3	0	0	SE 412	
SE 495	Software Engineering Capstone Project I	3	0	6	0	SE 310, SE 324	
SE 496	Software Engineering Capstone Project II	3	0	6	0	SE 495	

2. College of Engineering Courses (8 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect	Lab	Tut		
EE 210	Digital Logic Design	3	0	0	0	PHU 124	
EE 210 L	Digital Logic Design Lab	1	0	2	0	PHU 124	EE 210
EE 305	Computer Networks	3	3	0	0	SE 100, EE 210, STAT 212	
EE 305 L	Computer Networks Lab	1	0	2	0	SE 100, EE 210, STAT 212	EE 305

3. Technical Electives (12 CRHs)

Select from the following courses:

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect	Lab	Tut		
SE 435	Undergraduate Research in Software Engineering	3	0	6	0	Department approval*	
SE 440	Special Topics in Software Engineering	3	3	0	0	SE 324	
SE 441	Telecommunications Software Design	3	3	0	0	EE 305	
SE 442	Social Networks for Software Engineers	3	3	0	0	SE 324	
SE 443	Cloud Computing for Software Engineers	3	3	0	0	SE 324, EE 305	
SE 444	Artificial Intelligence	3	3	0	0	SE 214, SE 324	
SE 445	Information and Software Security	3	3	0	0	STA 212, SE 324	
SE 446	Introduction to Big Data	3	3	0	0	SE 312, SE 314	
SE 447	Introduction to Machine Learning	3	3	0	0	SE 312, SE 314	
SE 448	Blockchain Development	3	3	0	0	SE 324	
SE 449	Data Analytics	3	3	0	0	SE 312, SE 314	
SE 450	Cryptography and Data Privacy	3	3	0	0	STA 212, SE 330	
SE 451	Secure Software Engineering	3	3	0	0	SE 310, SE 330	
SE 452	Network Security	3	3	0	0	EE 305, SE 330	
SE 453	Security Risk Management & Control	3	3	0	0	SE 330	
SE 454	Ethical Hacking and Systems Defense	3	3	0	0	SE 330	

*Department approval, a GPA of at least 3.0/4.0, and a signed research contract

4. <u>Summer Internship (0 CRHs)</u>

Course Code	Course-Title	Credit Hours (CRHs)	Pre-Requisite Course Code	Co-Requisite Course Code
SE 390	**Software Engineering Summer Internship**	**0**	**SE 324**	

Typical Study Plan-Software Engineering Program

4-Year Curriculum: *133 Credit Hours Total*

Each course below follows the following format:
Course code, Course Title, and Course Credit Hours (Lecture contact hours – Lab contact hours – Tutorial contact hours)

<table>
<tr><th colspan="4"><i>1st Year</i></th></tr>
<tr><td rowspan="9" align="center">Fall</td><td>Course Code</td><td>Course-Title</td><td>CRHs</td></tr>
<tr><td>SE 100</td><td>Programming for Engineers</td><td>3 (3-0-0)</td></tr>
<tr><td>SE 100 L</td><td>Programming for Engineers Lab</td><td>1 (0-2-0)</td></tr>
<tr><td>CHM 102</td><td>Introduction to Chemistry</td><td>3 (3-0-1)</td></tr>
<tr><td>CHM 102 L</td><td>Introduction to Chemistry Lab</td><td>1 (0-2-0)</td></tr>
<tr><td>MAT 101</td><td>Calculus I</td><td>3 (3-0-0)</td></tr>
<tr><td>PHU 103</td><td>Mechanics and Waves for Engineers</td><td>3 (3-0-1)</td></tr>
<tr><td>PHU 103 L</td><td>Mechanics and Waves for Engineers Lab</td><td>1 (0-2-0)</td></tr>
<tr><td>ENG 101</td><td>Freshman English I</td><td>3 (3-0-0)</td></tr>
<tr><td colspan="3" align="right">Total</td><td>18</td></tr>
<tr><td rowspan="8" align="center">Spring</td><td>Course Code</td><td>Course-Title</td><td>CRHs</td></tr>
<tr><td>SE 117</td><td>Software Practice and Society</td><td>3 (3-0-0)</td></tr>
<tr><td>SE 120</td><td>Object-Oriented Programming I</td><td>3 (3-0-0)</td></tr>
<tr><td>SE 120 L</td><td>Object-Oriented Programming I Lab</td><td>1 (0-2-0)</td></tr>
<tr><td>MAT 112</td><td>Calculus II</td><td>3 (3-0-0)</td></tr>
<tr><td>PHU 124</td><td>Electromagnetism and Optics for Engineers</td><td>3 (3-0-1)</td></tr>
<tr><td>PHU 124 L</td><td>Electromagnetism and Optics for Engineers Lab</td><td>1 (0-2-0)</td></tr>
<tr><td>ENG 112</td><td>Freshman English II</td><td>3 (3-0-0)</td></tr>
<tr><td colspan="3" align="right">Total</td><td>17</td></tr>
</table>

2nd Year			
Fall	**Course Code**	**Course-Title**	**CRHs**
	SE 201	Introduction to Software Engineering	3 (3-0-0)
	SE 214	Algorithms and Data Structures	3 (3-0-0)
	SE 214 L	Algorithms and Data Structures Lab	1 (0-2-0)
	SE 220	Object-Oriented Programming II	3 (3-0-0)
	SE 220 L	Object-Oriented Programming II Lab	1 (0-2-0)
	MAT 212	Linear Algebra	3 (3-0-0)
	ENG 222	Technical Writing	3 (3-0-0)
		Total	**17**
Spring	**Course Code**	**Course-Title**	**CRHs**
	SE 212	Discrete Structure for Software Engineers	3 (3-0-0)
	SE 225	Software Requirements	3 (3-0-0)
	SE 225 L	Software Requirements Lab	1 (0-2-0)
	EE 210	Digital Logic Design	3 (3-0-0)
	EE 210 L	Digital Logic Design Lab	1 (0-2-0)
	MAT 224	Numerical Methods	3 (3-0-0)
	STA 212	Probability and Statistics for Engineers	3 (3-0-0)
		Total	**17**

<table>
<tr><td colspan="4" align="center">**3rd Year**</td></tr>
</table>

	Course Code	Course-Title	CRHs
Fall	SE 310	Software Design and Architecture	3 (3-0-0)
	SE 312	Database Management Systems	3 (3-0-0)
	SE 312 L	Database Management Systems Lab	1 (0-2-0)
	SE 314	Operating Systems	3 (3-0-0)
	SE 314 L	Operating Systems Lab	1 (0-2-0)
	EE 305	Computer Networks	3 (3-0-0)
	EE 305 L	Computer Networks Lab	1 (0-2-0)
	ISL 101	Islamic Studies I	2 (2-0-0)
		Total	**17**
Spring	Course Code	Course-Title	CRHs
	SE 322	Internet of Things Application Development	3 (3-0-0)
	SE 324	Web Application Development	3 (3-0-0)
	SE 324 L	Web Application Development Lab	1 (0-2-0)
	SE 328	Mobile Application Development	3 (3-0-0)
	SE 328 L	Mobile Application Development Lab	1 (0-2-0)
	SE 330	Introduction to Cybersecurity	3 (3-0-0)
	ARB 101	Arabic Language and Literature I	2 (2-0-0)
			16

	Course Code	Course-Title	CRHs
Summer	SE 390	Software Engineering Summer Internship	0
		Total	**0**

<table>
<tr><td colspan="4" align="center">**4th Year**</td></tr>
</table>

	Course Code	Course-Title	CRHs
Fall	SE 412	Software Testing & Quality Assurance	3 (3-0-0)
	SE 414	Software Project Management	3 (3-0-0)
	SE 4 _ _	Technical Elective	3 (3-0-0)
	SE 4 _ _	Technical Elective	3 (3-0-0)
	SE 495	Software Engineering Capstone Project I	3 (0-6-0)
	ISL 112	Islamic Studies II	2 (2-0-0)
		Total	**17**
Spring	Course Code	Course-Title	CRHs
	SE 423	Software Construction and Processes	3 (3-0-0)
	SE 4 _ _	Technical Elective	3 (3-0-0)
	SE 4 _ _	Technical Elective	3 (3-0-0)
	SE 496	Software Engineering Capstone Project II	3 (0-6-0)
	ARB 112	Arabic Language and Literature II	2 (2-0-0)
		Total	**14**

Software Engineering Tracks:

I. Bachelor of Software Engineering – AI & Big Data Track

The world is growing at an exponential rate and so is the size of the data collected across the globe. Current and future sources of data are devices which utilize the Internet of Things (IoT) technology in addition to social networks and business applications. Big data infrastructure and analytics are emerging as key concepts to sorting, managing analyzing this massive amount of generated data from connected objects and applications which helps to take the initiative to improve decision making. Thus, data is becoming more meaningful and contextually relevant, breaking new grounds for new computing concepts such as Machine Learning (ML) and Artificial Intelligence (AI). These concepts will introduce a new approach to shift the traditional computing concepts related to data from just collecting structured data to understanding it, to turning this massive amount of data into knowledge, conclusions, and intelligent actions.

In this track, students will be able to study new emerging technologies in the area of Artificial Intelligence and Big Data. Students enrolled in the Software Engineering program are eligible to register in this track.

Track Course Requirements (15 CRHs):

The following are the core courses required in the AI and Big Data track:

- SE 322 – Internet of Things Application Development (Prerequisite(s): SE 100, EE 305)
- SE 444 – Artificial Intelligence (Prerequisite(s): SE 214, SE 324)
- SE 446 – Introduction to Big Data (Prerequisite(s): SE 312, SE 314)
- SE 447 – Introduction to Machine Learning (Prerequisite(s): SE 312, SE 314)

One additional course may be taken from the following list of track electives:

- SE 440 - Special Topics in Software Engineering (Prerequisite(s): SE 324)
- SE 443 – Cloud Computing for Software Engineers (Prerequisite(s): SE 324, EE 305)
- SE 448 – Blockchain Development (Prerequisite(s): SE 324)
- SE 449 – Data Analytics (Pre-requisite(s): SE 312, SE 314)
- SE 450 – Cryptography and Data Privacy (Prerequisite(s): STA 212, SE 330)
- SE 451 – Secure Software Engineering (Prerequisite(s): SE 310, SE 330)
- SE 452 – Network Security (Prerequisite(s): EE 305, SE 330)
- SE 453 – Security Risk Management & Control (Prerequisite(s): SE 330)
- SE 454 – Ethical Hacking and Systems Defense (Prerequisite(s): SE 330)

II. Bachelor of Software Engineering – Cybersecurity Track

Security is a forefront concern for software vendors and customers and an indispensable quality attribute of software given the high level of interconnectivity of systems running critical software functions and storing confidential data. There is a multitude of attacks that attempt to exploit software systems to gain illegitimate access to functionalities and data. Despite the continuous exposure to threat, software systems cannot simply seize operations as a countermeasure and they are expected to be available and deliver business value to its stakeholders reliably. The Software Engineering Department, part of the College of Engineering at Alfaisal University has approved a cybersecurity track. This track will equip students with the necessary skills and respond to challenges in cybersecurity, data privacy, network security, socio-technical issues in addition to learning how to develop secure systems by practicing proper secure software engineering principles. Students in the Bachelor of Software Engineering program at Alfaisal University are eligible to opt for this track

Track Course Requirements (15 CRHs):

The following are the core courses required in the <u>Cybersecurity track</u>:

- SE 330 – Introduction to Cybersecurity (Prerequisite(s): EE 305)
- SE 450 – Cryptography and Data Privacy (Prerequisite(s): STA 212, SE 330)
- SE 452 – Network Security (Prerequisite(s): EE 305, SE 330)
- SE 454 – Ethical Hacking and Systems Defense (Prerequisite(s): SE 330)

One additional course may be taken from the following list of track electives:

- SE 440 - Special Topics in Software Engineering (Prerequisite(s): SE 324)
- SE 443 – Cloud Computing for Software Engineers (Prerequisite(s): SE 324, EE 305)
- SE 444 – Artificial Intelligence (Prerequisite(s): SE 214, SE 324)
- SE 445 – Information and Software Security (Pre-requisite: STA 212, SE 324)
- SE 446 – Introduction to Big Data (Prerequisite(s): SE 312, SE 314)
- SE 447 – Introduction to Machine Learning (Prerequisite(s): SE 312, SE 314)
- SE 448 – Blockchain Development (Prerequisite(s): SE 324)
- SE 451 – Secure Software Engineering (Prerequisite(s): SE 310, SE 330)
- SE 453 – Security Risk Management & Control (Prerequisite(s): SE 330)

Course Descriptions

In this section, we give the course descriptions of Software Engineering courses of the program.

Each course below follows the following format:
Course code: Course Title Course Credit Hours (Lecture contact hours – Lab contact hours – Tutorial contact hours)
Course Description
Pre-requisites
Co-requisites

Core Courses

SE 100: Programming for Engineers   **3 (3-0-0)**
Fundamentals of computers and computing. Introduction to a typical object-oriented programming language. Basic data types and operators. Console input/output. Logical expressions and control structures. Methods and arrays. Introduction to Classes.
Pre-requisites: None
Co-requisites: None

SE 100 L: Programming for Engineers Lab   **1 (0-2-0)**
Laboratory experiments dealing with Object Oriented Programming.
Pre-requisites: None
Co-requisites: SE 100

SE 117: Software Practice and Society   **3 (3-0-0)**
The significant role played by technology in our time and the resulting tensions between software technology and society are often viewed as defining aspects of modernity. This course will be to explore the extent to which interactions between software technology and society have always been central and to consider the extent to which many of today's debates concerning that relationship have been prefigured in earlier cultures.
Pre-requisites: None
Co-requisites: None

SE 120: Object-Oriented Programming I   **3 (3-0-0)**
Advanced object-oriented programming; inheritance; polymorphism; abstract classes and interfaces, container and collection classes, packages, object-oriented design, software modeling, event-driven programming. Design and implement simple GUI applications. Write simple multithreaded applications. Use API in writing applications.
Pre-requisites: SE 100
Co-requisites: None

SE 120 L: Object-Oriented Programming I Lab   **1 (0-2-0)**
Laboratory experiments dealing with advanced Object Oriented Programming.
Pre-requisites: SE 100
Co-requisites: SE 120

SE 201: Introduction to Software Engineering   **3 (3-0-0)**
Introduction to software engineering and software processes. Construction techniques and principles. Concepts of programming languages: syntax and semantics. Analysis and design models. An introduction to software requirements and testing methods. An introduction to software project management.
Pre-requisites: SE 120
Co-requisites: None

SE 212: Discrete Structures for Software Engineers   3 (3-0-0)

Logic, sets and functions, algorithms, mathematical reasoning, counting, relations, graphs, trees, Boolean Algebra, computation, modeling.
Pre-requisites: SE 120
Co-requisites: None

SE 214: Algorithms and Data Structures   3 (3-0-0)

Survey of important computer algorithms and related data structures used in object-oriented software engineering. Design, performance analysis and implementation of such algorithms, stressing their practical use and performance certification of large software applications. Understand how to "seal" designs to guarantee performance goals and insure that all error conditions are caught.
Pre-requisites: SE 120
Co-requisites: None

SE 214 L: Algorithms and Data Structures Lab   1 (0-2-0)

Laboratory experiments dealing with Algorithms and Data Structures.
Pre-requisites: SE 120
Co-requisites: SE 214

SE 220: Object-Oriented Programming II   3 (3-0-0)

Extensions of object-oriented and advanced programming concepts such as GUI, Even-driven programming, Binary I/O, and Multi-Threading are essential in implementing high-grade projects.
Pre-requisites: SE 120
Co-requisites: None

SE 220 L: Object-Oriented Programming II Lab   1 (0-2-0)

Laboratory experiments dealing with advanced Object Oriented Programming.
Pre-requisites: SE 120
Co-requisites: SE 220

SE 225: Software Requirements   3 (3-0-0)

Requirements engineering process. Methods, tools and techniques for eliciting, organizing and documenting software requirements. Analysis and validation techniques, including need, goal, and use case analysis. Requirements documentation standards. Traceability. Requirements management. Handling requirements changes. Students participate in a group project on software requirements.
Pre-requisites: SE 201
Co-requisites: None

SE 225 L: Software Requirements Lab   1 (0-2-0)

Laboratory experiments dealing with software requirements.
Pre-requisites: SE 201
Co-requisites: SE 225

SE 310: Software Design and Architecture   3 (3-0-0)

The course gives students an understanding of the concept of software architecture and how this phase in the development between requirement specification and detailed design plays a central role for the success of a software system. The students will get knowledge of some well-known architecture patterns, and be able to design, construct and evaluate architectures for software systems. In addition, the students should get some understanding of how the developers' experiences and the technical and organizational environment will influence on the choice of architecture.
Pre-requisites: SE 225
Co-requisites: None

SE 312: Database Management Systems 3 (3-0-0)
The focus is to teach database fundamentals required in the development and evolution of most software applications by providing a basic introduction to the principles of relational database management systems such as Entity-Relationship approach to data modeling, relational model of database management systems and the use of query languages.
Pre-requisites: SE 214
Co-requisites: None

SE 312 L: Database Management Systems Lab 1 (0-2-0)
Laboratory experiments dealing with database management systems.
Pre-requisites: SE 214
Co-requisites: SE 312

SE 314: Operating Systems 3 (3-0-0)
Theory and construction of operating systems, including real-time and embedded systems aspect from an engineering point of view, stressing performance measurement and metrics. Quality of Service issues leading to certification that an operating system will satisfy hard real-time constraints.
Pre-requisites: SE 214
Co-requisites: None

SE 314 L: Operating Systems Lab 1 (0-2-0)
Laboratory experiments dealing with Operating Systems.
Pre-requisites: SE 214
Co-requisites: SE 314

SE 322: Internet of Things Application Development 3 (3-0-0)
This course is designed to provide students with focused technical knowledge and skills to build Internet of Things (IoT) systems and applications. The course will cover the design of a microcontroller-based embedded system for Arduino Raspberry Pi platforms. In addition, it will cover IoT paradigms, IoT design considerations, constraints and development process for IoT applications in different sectors.
Pre-requisites: SE 100, EE 305
Co-requisites: None

SE 324: Web Application Development 3 (3-0-0)
The course focuses on learning fundamentals of Web-based programming techniques, Web application development and client-server database integration. It provides in-depth coverage of introductory programming principles, various markup languages (e.g., XHTML, Dynamic HTML and XML), several scripting languages (e.g., JavaScript, PHP, Ruby/Ruby on Rails and Perl), Ajax, Web services, Web servers (e.g., IIS and Apache) and relational databases (e.g., MySQL/Apache Derby/Java DB)
Pre-requisites: SE 312

SE 324 L: Web Application Development Lab 1 (0-2-0)
Laboratory experiments dealing with web application development.
Pre-requisites: SE 312
Co-requisites: SE 324

SE 328: Mobile Application Development   **3 (3-0-0)**
This project-oriented course examines the principles of mobile application design and development. Students will learn application development on the Android platform. Topics will include memory management; user interface design; user interface building; input methods; data handling; network techniques and URL loading; and, finally, specifics such as GPS and motion sensing. Students are expected to work on a project that produces a professional-quality mobile application. Projects will be deployed in real-world applications.
Pre-requisites: SE 225 and SE 312
Co-requisites: None

SE 328 L: Mobile Application Development Lab   **1 (0-2-0)**
Laboratory experiments dealing with mobile application development.
Pre-requisites: SE 225 and SE 312
Co-requisites: SE 328

SE 330: Introduction to Cybersecurity   **3 (3-0-0)**
This course provides students with a baseline understanding of common cyber security threats, vulnerabilities, and risks. The course also includes an introduction to basic cyber security risk analysis, with an overview of how threat-asset matrices can be used to prioritize risk decisions.
Pre-requisites: EE 305
Co-requisites: None

SE 390: Software Engineering Summer Internship   **0 (0-0-0)**
An internship it is an important aspect of Software Engineering curriculum that provides the student with hands-on experience and a good sense of what an actual job in an organization will be like. Students are required to join an IT department in a government or private organization for a summer period of at least 8 weeks in the last summer prior to student graduation. Students should be able to relate the internship experience to the knowledge that he or she has gained through the Software Engineering program courses.
Pre-requisites: SE 324
Co-requisites: None

SE 412: Software Testing and Quality Assurance   **3 (3-0-0)**
The course focuses on software verification and validation throughout the software life cycle, including reviews (inspections and walkthroughs), testing techniques (functional and structural – black box and white box), levels of testing (unit, integration, system, and acceptance), and testing tools (static and dynamic). Testing and quality assurance standards.
Pre-requisites: SE 310
Co-requisites: None

SE 414: Software Project Management   **3 (3-0-0)**
The concepts and use of project management tools, techniques and methodologies are becoming very fundamental and commonplace. This course addresses project management in the context of software projects. Using the framework of the Project Management Body of Knowledge (PMBOK) initiated by the Project Management Institute (PMI), the course covers various aspects pertaining to project initiation, planning, scheduling, monitoring and control, and closure. For planning and scheduling of projects, the use of project network and estimation of time and cost will be elaborated on. Risk assessment methods will also be covered. This course is designed to form a stepping stone for those candidates wishing to pursue related certifications such as the Certified Associate in Project Management (CAPM), the newly introduced Project Management Ready credential, and later on the most demanded Project Management Professional (PMP) designation.
Prerequisite(s): SE 310
Co-requisites: None

SE 423: Software Construction and Processes   **3 (3-0-0)**

This course focuses on human-computer interaction as well as topics related to software maintenance, configuration management and evolution. Aspects such as User interface design and architectures will also be touched upon. Other HCI and usability related topics to be covered include: Assessment and evaluation of user interfaces, design of user interface components including windows, menus, and commands, Usability engineering, Task analysis, User-centered design, prototyping, conceptual models and metaphors, software design rationale, voice and natural language I/O. Response time and feedback. Color, icons, and sound. Software quality issues, defect detection and prevention, reliability engineering, examination of maintenance issues, configuration management. Software evolution issues, planning for evolution. The course will also introduce students to important business aspects related to Entrepreneurship and Innovation in the field of Software Engineering.

Prerequisite(s): SE 412
Co-requisites: None

SE 440: Special Topics in Software Engineering   **3 (3-0-0)**

This course provides instruction and experience in timely topics related to the design and development of quality-engineered software.

Pre-requisites: SE 324

SE 495: Software Engineering Capstone Project I   **3 (0-6-0)**

This course is the first part of a two-semester senior-year capstone project. It is intended to complement the theory and to provide an in-depth, hands-on experience in all aspects of software engineering. The students will work in teams on projects of interest to IT sector and will be involved in analysis of requirements, architecture and design, implementation, testing and validation, project management, software process, software maintenance, and software re-engineering. In this part students give project plan, provide software requirement specification document and develop software high-level design.

Pre-requisites: SE 310, SE 324
Co-requisites: None

SE 496: Software Engineering Capstone Project II   **3 (0-6-0)**

This is the second part of the capstone project started in SE 490 course. In this part, students provide software low-level design produced in SE 490, implement the design, test their code, and manage and evaluate their final product. Student teams must deliver the code, a final report and a do a presentation and demonstration for their implemented software.

Pre-requisites: SE 495
Co-requisites: None

Elective Courses

SE 435: Undergraduate Research in Software Engineering   **3 (0-6-0)**
Students participate in supervised research with a faculty member. Supervised research can be: 1) independent research undertaken by the student (thesis, independent study), or 2) assistance on a faculty member's research project. Students must find a faculty member who is willing to supervise him/her as an assistant on an existing project or as the author of an individual project. The student and the faculty supervisor will complete and sign a research contract which will be turned in to the chair of the Electrical and Software Engineering Department. Drafting the contract will allow the student to develop ideas about what should be accomplished and what the faculty supervisor's expectations are. All academic requirements are at the discretion of the supervising faculty member. Students should agree on a plan for the semester with the faculty mentor before the research begins. The plan should include academic requirements, the basis for grading the experience, and a plan for student/professor meetings for the semester. It is the student's responsibility to report progress and seek guidance when needed. Students are expected to be active and reliable participants in the research experience.
Pre-requisites: GPA of at least 3.0/4.0, signed research contract, and consent of the departmental chair.

SE 440: Special Topics in Software Engineering   **3 (3-0-0)**
This course provides instruction and experience in timely topics related to the design and development of quality-engineered software.
Pre-requisites: SE 324

SE 441: Telecommunications Software Design   **3 (3-0-0)**
Formal models for telecommunications software design and analysis. Protocol specification, design and validation. Protocol verification and testing. Conformance testing. Protocol synthesis. Protocol conversion.
Pre-requisites: EE 305

SE 442: Social Networks for Software Engineers   **3 (3-0-0)**
Student will learn the fundamental interface, systems, and algorithms concepts in designing social software. The case-based syllabus will cover insights from both research and industry. As a student, the student will contribute to this burgeoning field through a quarter-long, team-based project. Students are required to enter the class with an initial project idea.
Pre-requisites: SE 324

SE 443: Cloud Computing for Software Engineers   **3 (3-0-0)**
This course will leverages the World Wide Web to fulfill computing needs. It packages applications, computing power, and storage as a metered service similar to a utility. This model is designed to supplant the traditional mechanism of desktop computing in many cases. This course will cover the origin, theory, enabling technology, and hands-on labs for key concepts in cloud computing.
Pre-requisites: SE 324, EE 305

SE 444: Artificial Intelligence   **3 (3-0-0)**
This course aims in developing computer applications, which encompasses perception, reasoning and learning and to provide an in-depth understanding of major techniques used to simulate intelligence.
Pre-requisites: SE 214, SE 324

SE 445: Information and Software Security   **3 (3-0-0)**
This course provides an introduction to the topic of security in the context of computer networks. The goals are to provide students with a foundation allowing them to identify, analyze, and solve network-related security problems in information systems with the emphasis on the engineering aspects of information security and software security issues.
Pre-requisites: STA 212, SE 324

SE 446: Introduction to Big Data   **3 (3-0-0)**
In this course the students will learn the Big Data platform and data governance in order to efficiently store and manage massive amounts of data. In addition, they will learn Big Data architecture, such as Hadoop, Map Reduce, Hbase, Big SQL and BigSheets. Students will use tools to capture, store and analyze structured and unstructured data.
Pre-requisites: SE 312, SE 314

SE 447: Introduction to Machine Learning   **3 (3-0-0)**
This course introduces machine learning with a practical approach covering some of the most common learning models, algorithms, tools, and techniques. From supervised learning, it covers linear regression, logistic regression, and neural networks. From unsupervised learning, it covers K-means clustering, dimensionality reduction (principal component analysis), and anomaly detection. The course also discusses practical aspects considered when applying machine learning: data visualization, model selection, flow, model evaluation (testing, validation, overfitting, underfitting, bias, variance), regularization, and large scale machine learning.
Pre-requisites: SE 312, SE 314

SE 448: Blockchain Development   **3 (3-0-0)**
In this course the students will learn concepts of the Blockchain technology such as business networks, participants, assets, and trusted transactions. They will also learn how to develop a complete Blockchain network solution using up-to-date tools and platforms.
Prerequisite(s): SE 324

Alfaisal University
Bachelor of Software Enginneering
Study Plan Summary
Effective: Fall 2019

كلّية الهندسة
College of Engineering

Student:		ID#:		Email:	
Advisor:		Starting Semester:		Expected Graduation:	

4-Year Curriculum: 133 Credit Hours Total

Freshman Year - Fall Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
SE 100	Programming for Engineers	3		
SE 100 L	Programming for Engineers Lab	1		
CHM 102	Introduction to Chemistry	3		
CHM 102 L	Introduction to Chemistry Lab	1		
MAT 101	Calculus I	3		
PHU 103	Mechanics and Waves for Engineers	3		
PHU 103 L	Mechanics and Waves for Engineers Lab	1		
ENG 101	Freshman English I	3		
Total		**18**		

Freshman Year - Spring Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
SE 117	Software Practice and Society	3		
SE 120	Object-Oriented Programming I	3		
SE 120 L	Object-Oriented Programming I Lab	1		
MAT 112	Calculus II	3		
PHU 124	Electromagnetism and Optics for Engineers	3		
PHU 124 L	Electromagnetism and Optics for Engineers Lab	1		
ENG 112	Freshman English II	3		
Total		**17**		

Sophomore Year - Fall Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
SE 201	Introduction to Software Engineering	3		
SE 214	Algorithms and Data Structures	3		
SE 214 L	Algorithms and Data Structures Lab	1		
SE 220	Object-Oriented Programming II	3		
SE 220 L	Object-Oriented Programming II Lab	1		
MAT 212	Linear Algebra	3		
ENG 222	Technical Writing	3		
Total		**17**		

Sophomore Year - Spring Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
SE 212	Discrete Structure for Software Engineers	3		
SE 225	Software Requirements	3		
SE 225 L	Software Requirements Lab	1		
EE 210	Digital Logic Design	3		
EE 210 L	Digital Logic Design Lab	1		
MAT 224	Numerical Methods	3		
STA 212	Probability and Statistics for Engineers	3		
Total		**17**		

Junior Year - Fall Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
SE 310	Software Design and Architecture	3		
SE 312	Database Management Systems	3		
SE 312 L	Database Management Systems Lab	1		
SE 314	Operating Systems	3		
SE 314 L	Operating Systems Lab	1		
EE 305	Computer Networks	3		
EE 305 L	Computer Networks Lab	1		
ISL 101	Islamic Studies I	2		
Total		**17**		

Junior Year - Spring Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
SE 322	Internet of Things Application Development	3		
SE 324	Web Application Development	3		
SE 324 L	Web Application Development Lab	1		
SE 328	Mobile Application Development	3		
SE 328 L	Mobile Application Development Lab	1		
SE 330	Introduction to Cybersecurity	3		
ARB 101	Arabic Language and Literature I	2		
Total		**16**		

Junior Year - Summer Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
SE 390	Software Engineering Summer Internship	0		
Total		**0**		

Senior Year - Fall Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
SE 412	Software Testing & Quality Assurance	3		
SE 414	Software Project Management	3		
SE 4 _ _	Technical Elective	3		
SE 4 _ _	Technical Elective	3		
SE 495	Software Engineering Capstone Project I	3		
ISL 112	Islamic Studies II	2		
Total		**17**		

Senior Year - Spring Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
SE 423	Software Construction and Processes	3		
SE 4 _ _	Technical Elective	3		
SE 4 _ _	Technical Elective	3		
SE 496	Software Engineering Capstone Project II	3		
ARB 112	Arabic Language and Literature II	2		
Total		**14**		

Alfaisal University – Bachelor of Software Engineering
Prerequisites Chart (Effective Fall 2019)

Year 1 (Freshman)		Year 2 (Sophomore)		Year 3 (Junior)			Year 4 (Senior)	
Fall	Spring	Fall	Spring	Fall	Spring	Summer	Fall	Spring

Year 1 (Freshman)
- Fall: ENG 101 Freshman English I; MAT 101 Calculus I; PHU 103 Mech. & Waves for Engrs; PHU 103 L; SE 100 Programming for Engineers; SE 100 L; CHM 102 Intro to Chem; CHM 102 L
- Spring: ENG 112 Freshman English II; MAT 112 Calculus II; PHU 124 Electromagnetism. Optics for Engrs; PHU 124L; SE 120 Object Oriented Prog. I; SE 120 L; SE 117 Software & Society

Year 2 (Sophomore)
- Fall: ENG 222 Technical Writing; MAT 212 Linear Algebra; SE 201 Intro to Software Eng.; SE 214 Algorthms and Data Structs; SE 214 L; SE 220 Object Oriented Prog. II; SE 220 L
- Spring: STA 212 Prob. and Stats for Engrs; MAT 224 Numerical Methods; EE 210 Digital Logic Design; EE 210 L; SE 225 Software Requirements; SE 225 L; SE 212 Discrete Structures

Year 3 (Junior)
- Fall: ISL 101 Islamic Studies I; EE 305 Computer Networks; EE 305 L; SE 322 IoT App. Dev.; SE 310 Software Design & Architecture; SE 312 Database Management Sys.; SE 312 L; SE 314 Operating Systems; SE 314 L
- Spring: ARB 101 Arabic Lang. I; SE 330 Intro. to Cybersecurity; SE 328 Mobile App. Dev.; SE 328 L; SE 324 Web App. Dev.; SE 324 L
- Summer: SE 390 Summer Internship

Year 4 (Senior)
- Fall: ISL 112 Islamic Studies II; SE 414 Software Proj. Mgmnt; SE 412 Software Testing & QA; SE 4**[1] Technical Elective; SE 4**[1] Technical Elective; SE 495 Capstone Project I
- Spring: ARB 112 Arabic Lang. II; SE 423 Sftwr Constructions and Processes; SE 4**[1] Technical Elective; SE 4**[1] Technical Elective; SE 496 Capstone Project II

[1]: Prerequisites vary per course