جامعة الفيصل
Alfaisal University

BS in Data Science and Engineering Program

Alfaisal University, College of Engineering & Advanced Computing

Effective: Fall 2025

Approved: April 2025

Curriculum Structure and Study Plan

The Data Science and Engineering program curriculum is composed of **133** Credit Hours (CRHs) divided as follows:

I. General Education Requirements (30 CRHs)
1. Mathematics & Statistics (9 CRHs)
2. Basic Sciences (4 CRHs)
3. Humanities (14 CRHs)

II. Core Requirements (103 CRHs)
1. Software Engineering Courses (87 CRHs)
2. College of Engineering & Advanced Computing Courses (4 CRHs)
3. Technical Electives (12 CRHs)
4. Summer Internship (0 CRHs)

I. General Education Requirements (30 CRHs)

1. Mathematics & Statistics (12 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	1		
MAT 112	Calculus II	3	3	0	0	MAT 101	
MAT 211	Calculus III	3	3	0	0	MAT 112	
MAT 212	Linear Algebra	3	3	0	0	MAT 112	

2. Basic Sciences (4 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect.	Lab	Tut		
PHU 103	Mechanics and Waves for Engineers	3	3	0	1		MAT 101, PHU 103L
PHU 103 L	Mechanics and Waves for Engineers Lab	1	0	2	0		PHU 103

3. Humanities (14 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect	Lab	Tut		
ENG 101	University Writing	3	3	0	0		
ENG 222	Technical Writing	3	3	0	0	ENG 101	
ISL 101	Islamic Studies I	2	2	0	0		
ARB 101	Arabic Language and Literature I	2	2	0	0		
GE _ _ _	General Education Elective I	2	2	0	0		
GE _ _ _	General Education Elective II	2	2	0	0		

II. Core Requirements (103 CRHs)

1. Software Engineering Courses (87 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 100L
SE 100 L	Programming for Engineers Lab	1	0	2	0		SE 100
SE 120	Object-Oriented Programming I	3	3	0	0	SE 100	SE 120L
SE 120 L	Object-Oriented Programming I Lab	1	0	2	0		SE 120
SE 151	Discrete Mathematics	3	3	0	0	SE 100	
DSE 200	Introduction to Data Science	3	3	0	0	SE 120	DSE 212
SE 201	Introduction to Software Engineering	3	3	0	0	SE 120	
DSE 201	Data Visualization	3	3	0	0	DSE 200	
DSE 212	Probability and Statistics for Engineers	3	3	0	0	MAT 112	

AI 213	Introduction to Artificial Intelligence	3	3	0	0	SE 215	
SE 215	Data Structures	3	3	0	0	SE 120	SE 215L
SE 215 L	Data Structures Lab	1	0	2	0		SE 215
SE 239	Computer Networks	3	3	0	0	EE 210	
SE 252	Database Management Systems	3	3	0	0	SE 215	SE 252L
SE 252 L	Database Management Systems Lab	1	0	2	0		SE 252
SE 254	Operating Systems	3	3	0	0	SE 215	SE 254L
SE 254 L	Operating Systems Lab	1	0	2	0		SE 254
DSE 300	Data Preparation and Feature Design	3	3	0	0	DSE 200, SE 215	
SE 301	Analysis of Algorithms	3	3	0	0	SE 215	
DSE 302	Optimization for Data Science	3	3	0	0	DSE 212, MAT 212	
SE 316	Application Development	3	3	0	0	SE 215	
DSE 320	Data Mining	3	3	0	0	DSE 300	
DSE 322	Big Data and Data Warehousing	3	3	0	0	SE 252	
DSE 323	Cloud Computing in Data Science	3	3	0	0	SE 252	
DSE 324	Social Network Analysis	3	3	0	0	DSE 301	
CSE 330	Introduction to Cybersecurity	3	3	0	0	SE 239	SE 254
AI 347	Introduction to Machine Learning	3	3	0	0	SE 252, SE 254	
SE 400	Theory of Computation	3	3	0	0	SE 151, AI 347	
DSE 401	Optimization Techniques for ML	3	3	0	0	DSE 302, AI 347	
AI 480	Natural Language Processing	3	3	0	0	SE 400	
SE 481	Ethical and Professional Development	1	1	0	0	DSE 495	
DSE 495	Capstone Project I	3	0	6	0	DSE 320, DSE 322, DSE 323	

DSE 496	Capstone Project II	3	0	6	0	DSE 495	

2. College of Engineering & Advanced Computing Courses (4 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 103	EE 210L
EE 210 L	Digital Logic Design Lab	1	0	2	0		EE 210

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		
AI 471	Technical Elective 1 (Deep and Reinforcement Learning)	3	3	0	0	AI 347	
DSE 451	Technical Elective 2 (Advanced Databases)	3	3	0	0	SE 252, DSE 322	
DSE 452	Technical Elective 3 (Data Engineering and Pipelines)	3	3	0	0	DSE 320, DSE 322	
DSE 453	Technical Elective 4 (Generative AI and LLM)	3	3	0	0	AI 471	

4. Summer Internship (0 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)	Pre-Requisite Course Code	Co-Requisite Course Code
DSE 390	Software Engineering Summer Internship	0	Department approval	

Typical Study Plan- Data Science and 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)

1st Year			
Fall	Course Code	Course-Title	CRHs
	SE 100	**Programming for Engineers**	**3 (3-0-0)**
	SE 100 L	**Programming for Engineers Lab**	**1 (0-2-0)**
	MAT 101	**Calculus I**	**3 (3-0-2)**
	PHU 103	**Mechanics and Waves for Engineers**	**3 (3-0-1)**
	PHU 103 L	**Mechanics and Waves for Engineers Lab**	**1 (0-2-0)**
	ENG 101	**University Writing**	**3 (3-0-0)**
	ISL 101	**Islamic Studies I**	**2 (2-0-0)**
	GE _ _ _	**General Education Elective I**	**2 (2-0-0)**
		Total	**18**
Spring	Course Code	Course-Title	CRHs
	SE 120	**Object-Oriented Programming I**	**3 (3-0-0)**
	SE 120 L	**Object-Oriented Programming I Lab**	**1 (0-2-0)**
	SE 151	**Discrete Mathematics**	**3 (3-0-0)**
	MAT 112	**Calculus II**	**3 (3-0-2)**
	EE 210	**Digital Logic Design**	**3 (3-0-0)**
	EE 210 L	**Digital Logic Design Lab**	**1 (0-2-0)**
	ENG 222	**Technical Writing**	**3 (3-0-0)**
		Total	**17**

2nd Year			
Fall	Course Code	Course-Title	CRHs
	DSE 200	**Introduction to Data Science**	**3 (3-0-0)**
	DSE 212	**Probability and Statistics for Engineers**	**3 (3-0-0)**
	SE 215	**Data Structures**	**3 (3-0-0)**
	SE 215 L	**Data Structures Lab**	**1 (0-2-0)**
	SE 239	**Computer Networks**	**3 (3-0-0)**
	MAT 211	**Calculus III**	**3 (3-0-0)**
	MAT 212	**Linear Algebra**	**3 (3-0-0)**
		Total	**19**
Spring	Course Code	Course-Title	CRHs
	SE 252	**Database Management Systems**	**3 (3-0-0)**
	SE 252 L	**Database Management Systems Lab**	**1 (0-2-0)**
	SE 254	**Operating Systems**	**3 (3-0-0)**
	SE 254 L	**Operating Systems Lab**	**1 (0-2-0)**
	DSE 201	**Data Visualization**	**3 (3-0-0)**
	AI 213	**Introduction to Artificial Intelligence**	**3 (3-0-0)**
	CSE 330	**Introduction to Cybersecurity**	**3 (3-0-0)**
		Total	**17**

3rd Year			
Fall	Course Code	Course-Title	CRHs
	SE 201	**Introduction to Software Engineering**	**3 (3-0-0)**
	DSE 300	**Data Preparation and Feature Design**	**3 (3-0-0)**
	SE 301	**Analysis of Algorithms**	**3 (3-0-0)**
	DSE 302	**Optimization for Data Science**	**3 (3-0-0)**
	SE 316	**Application Development**	**3 (3-0-0)**
	ARB 101	**Arabic Language and Literature I**	**2 (2-0-0)**
		Total	**17**
Spring	Course Code	Course-Title	CRHs
	DSE 320	**Data Mining**	**3 (3-0-0)**
	AI 347	**Introduction to Machine Learning**	**3 (3-0-0)**
	DSE 322	**Big Data and Data Warehousing**	**3 (3-0-0)**
	DSE 323	**Cloud Computing in Data Science**	**3 (3-0-0)**
	DSE 324	**Social Network Analysis**	**3 (3-0-0)**
			15

Summer	Course Code	Course-Title	CRHs
	DSE 390	**Internship**	**0**
		Total	**0**

4th Year			
Fall	Course Code	Course-Title	CRHs
	SE 400	**Theory of Computation**	**3 (3-0-0)**
	DSE 401	**Optimization Techniques for ML**	**3 (3-0-0)**
	DSE _ _ _	**Technical Elective 1**	**3 (3-0-0)**
	DSE _ _ _	**Technical Elective 2**	**3 (3-0-0)**
	DSE 495	**Software Engineering Capstone Project I**	**3 (0-6-0)**
		Total	**15**
Spring	Course Code	Course-Title	CRHs
	AI 480	**Natural Language Processing**	**3 (3-0-0)**
	SE 481	**Ethics and Professional Development**	**1 (3-0-0)**
	DSE _ _ _	**Technical Elective 3**	**3 (3-0-0)**
	DSE _ _ _	**Technical Elective 4**	**3 (3-0-0)**
	DSE 496	**Software Engineering Capstone Project II**	**3 (0-6-0)**
	GE _ _ _	**General Education Elective II**	**2 (2-0-0)**
		Total	**15**

Course Descriptions

In this section, we give brief descriptions of courses in the Data Science and Engineering 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

Prerequisite(s)

Co-requisites

Core Courses

SE 100: Programming for Engineers 3 (3-0-0)

The course introduces the students to basic notions of computers and computing and then introduces them to programming starting from abstract ways like flowcharts and pseudocode and finally using a typical programming language. The students will be introduced to the basic concepts of data types and structures, operators, and the different ways of data storage, manipulation, and representation.
Emphasis is on problem-solving and structured program design methodologies.
Prerequisite(s): None
Co-requisites: SE 100L

SE 100 L: Programming for Engineers Lab 1 (0-2-0)

This course constitutes the lab component of the Programming for Engineer course (SE 100). The purpose of this lab is to provide hands-on training on programming concepts, technologies and techniques introduced during lectures.
Prerequisite(s): None
Co-requisites: SE 100

SE 120: Object-Oriented Programming I 3 (3-0-0)

After completing this course, students will be equipped with the necessary skills and tools to write programs in Java based on a procedural and object-oriented approach. Topics of focus will include basic Java programming, conditional statements, strings, iteration, methods, arrays, creating classes, encapsulation, inheritance and polymorphism, abstract classes, packages, principles of object-oriented design, as well as exceptions and interfaces.
Prerequisite(s): SE 100
Co-requisites: SE 120L

SE 120 L: Object-Oriented Programming I Lab 1 (0-2-0)

This course constitutes the lab component of the Object-Oriented Programming I course (SE 120). The purpose of this lab is to provide hands-on training on the basics of Java and advanced object-oriented programming. Topics covered include data types and operators, logical expressions, control structures, methods, arrays, inheritance; polymorphism; abstract classes and interfaces. be covered.
Prerequisite(s): None
Co-requisites: SE 120

SE 151: Discrete Structures for Software Engineers **3 (3-0-0)**
This course covers the mathematical elements of computer science including formal logic, propositional logic, predicate logic, logic in mathematics, sets, functions and relations, recursive thinking, mathematical induction, counting, combinatorics, algorithms, matrices, graphs, trees, and Boolean logic. Students will learn to recognize and express mathematical ideas graphically, numerically, symbolically, and in writing.
Prerequisite(s): SE 100

DSE 200: Introduction to Data Science **3 (3-0-0)**
This course covers the mathematical elements of computer science including formal logic, propositional logic, predicate logic, logic in mathematics, sets, functions and relations, recursive thinking, mathematical induction, counting, combinatorics, algorithms, matrices, graphs, trees, and Boolean logic. Students will learn to recognize and express mathematical ideas graphically, numerically, symbolically, and in writing.
Prerequisite(s): SE 120
Co-requisites: DSE 212

DSE 201: Data Visualization **3 (3-0-0)**
This course covers the mathematical elements of computer science including formal logic, propositional logic, predicate logic, logic in mathematics, sets, functions and relations, recursive thinking, mathematical induction, counting, combinatorics, algorithms, matrices, graphs, trees, and Boolean logic. Students will learn to recognize and express mathematical ideas graphically, numerically, symbolically, and in writing.
Prerequisite(s): DSE 200

SE 201: Introduction to Software Engineering **3 (3-0-0)**
This course is designed to present students with several principles relevant to Software Engineering. Students will gain insights into various software process models throughout the course. The curriculum strongly emphasizes the agile software development approach, highlighting the importance of adaptability and collaborative teamwork. Students will acquire knowledge and skills in requirements engineering. The course covers systems modeling and project management strategies. It addresses the value of software reuse and introduces students to human computer interaction and software testing. The final segment of the course focuses on configuration management.
Prerequisite(s): SE 120

DSE 212: Probability and Statistics for Engineers **3 (3-0-0)**
The course is designed to teach students the basics of probability and statistics as used in engineering and the sciences. The course covers introduction to probability theory, random variables, statistics, and regression.
Prerequisite(s): MAT 112

AI 213: Introduction to Artificial Intelligence **3 (3-0-0)**
This course introduces students to the fundamental concepts, techniques, and tools used in artificial intelligence (AI). Topics include perception, reasoning, learning, and search algorithms (informed and uninformed). Students will gain skills in applying AI techniques to real-world problems.
Prerequisite(s): SE 215

SE 215: Algorithms and Data Structures **3 (3-0-0)**
The course involves the study of important data structures and sorting methods commonly encountered in object-oriented software engineering. It covers the design, performance analysis, and implementation of the related algorithms, stressing their practical use and performance.
Prerequisite(s): SE 120
Co-requisites: SE 215L

SE 215 L: Algorithms and Data Structures Lab **1 (0-2-0)**
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 ensure that all error conditions are caught. Laboratory experiments dealing with Algorithms and Data Structures.
Prerequisite(s): None
Co-requisites: SE 215

SE 239: Computer Networks **3 (3-0-0)**
The course teaches the fundamental concepts of communication networks and is concerned specifically with network architectures and protocols. The objective of the course is to allow students to develop a thorough understanding of the architectures of networks and the basic principles and protocols that allow the transmission of data over networks.
Prerequisite(s): EE 210

SE 252: 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.
Prerequisite(s): SE 215
Co-requisites: SE 252 L

SE 252 L: Database Management Systems Lab **1 (0-2-0)**
Laboratory experiments dealing with database management systems.
Prerequisite(s): None
Co-requisites: SE 252

SE 254: 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.
Prerequisite(s): SE 215
Co-requisites: SE 254 L

SE 254 L: Operating Systems Lab **1 (0-2-0)**
Laboratory experiments dealing with Operating Systems.
Prerequisite(s): None
Co-requisites: SE 254

DSE 300: Data Preparation and Feature Design **3 (3-0-0)**
This course delves into the critical preprocessing steps required to convert raw data into meaningful formats for analysis. Students will learn techniques for handling missing data, detecting outliers, scaling features, and encoding categorical variables. The course also emphasizes feature engineering and selection strategies to improve the performance of machine learning models. Through practical exercise.
Prerequisite(s): SE 215, DSE 200

SE 301: Analysis of Algorithms **3 (3-0-0)**
This course examines the design and analyses algorithms with an emphasis on their application in real world environments. Topics include time complexity, space complexity, and optimization strategies for various algorithms. Students will gain experience with sorting, searching, and graph algorithms, as well as dynamic programming techniques. Special focus will be placed on algorithmic problem-solving in real world environments.
Prerequisite(s): SE 215

DSE 302: Optimization for Data Science **3 (3-0-0)**
This course delves into the critical preprocessing steps required to convert raw data into meaningful formats for analysis. Students will learn techniques for handling missing data, detecting outliers, scaling features, and encoding categorical variables. The course also emphasizes feature engineering and selection strategies to improve the performance of machine learning models. Through practical exercise.
Prerequisite(s): DSE 212, MAT 212

SE 316: Application Development **3 (3-0-0)**
This course covers the principles of applications deployed on different platforms such as mobiles, web, and cloud. Students will explore different development environments, and understand concepts from memory management, user interface design, GPS, and motion sensing. Multiple programming languages will be explored such as markup languages (e.g., XHTML, XML), scripting languages (e.g., JavaScript, PHP, Ruby), Ajax, web services, and database integration (e.g., MySQL). Through project-based learning, students will develop professional-quality applications for real-world deployment.
Prerequisite(s): SE 215

DSE 320: Data Mining **3 (3-0-0)**
Data mining focuses on extracting meaningful patterns and knowledge from large datasets. This course covers foundational data mining techniques such as association rule mining, clustering, and classification. Emphasis is placed on understanding the theoretical concepts behind these methods while applying them to practical scenarios. Students will explore tools and libraries used for data mining tasks and tackle projects that simulate real-world applications.
Prerequisite(s): DSE 300

DSE 322: Big Data and Data Warehousing **3 (3-0-0)**
Big data is transforming industries by enabling the analysis of massive datasets. This course focuses on the architecture, tools, and methodologies used in big data analytics and data warehousing. Students will learn about distributed systems like Hadoop and Spark, as well as the principles of data warehousing design and implementation.
Prerequisite(s): SE 252

DSE 323: Cloud Computing in Data Science **3 (3-0-0)**
This course explores the role of cloud computing in data science, including scalable data storage, distributed computing, and cloud-based machine learning. Students will gain hands-on experience with cloud platforms like AWS and Google Cloud to execute data science workflows efficiently.
Prerequisite(s): SE 252

DSE 324: Social Network Analysis **3 (3-0-0)**
Social networks represent complex relationships and interactions. This course introduces students to methods for analysing social networks, including graph theory, community detection, and influence propagation. Applications in marketing, public health, and communication studies are highlighted.
Prerequisite(s): DSE 301

CSE 330: Introduction to Cybersecurity **3 (3-0-0)**
This course provides an overview of core cybersecurity concepts, emphasizing the fundamental principles, tools, and procedures used to secure information systems. Students will employ the CIA triad as a guiding framework, explore prevalent threats, and examine various information security solutions. The course focuses on security and risk management, business impact analysis (BIA), asset security, vulnerabilities, threats and countermeasures, identity and authentication management, incident response and BCP/DRP, as well as key compliance and regulatory issues. By the end of the course, students will have broad, practical knowledge of cybersecurity, including the ability to identify security risks, implement effective defensive measures, and approach cybersecurity challenges with strategic thinking.
Prerequisite(s): SE 239, SE 254

AI 347: 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 Kmeans 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.
Prerequisite(s): SE 252, SE 254

AI 360: Agent Based Systems **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 Kmeans 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.
Prerequisite(s): SE 215, SE 239

DSE 390: Software Engineering Summer Internship (0 CRHs)
An internship is an important aspect of the DSE 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 DSE program courses.
Prerequisite(s): Department approval

SE 400: Theory of Computation 3 (3-0-0)
This course introduces fundamental concepts in the theory of computation. Students will be introduced to formal languages, automata, computability and computational complexity. These include finite automatons, Turing machines, grammars, decidable problems, reductive procedures and different kinds of computational problems. The course aims to explore these theoretical concepts to apply on practical issues of interest to software engineering, data science, and AI, for instance, natural language processing, algorithmic development and evaluation of computational efficiency. By the end of this course, students will be able to assess the performance bounds of computing models and their applicability towards modern computing problems.
Prerequisite(s): SE 151, AI 347

DSE 401: Optimization Techniques for ML 3 (3-0-0)
This course delves into advanced optimization methods used in machine learning, such as convex optimization, stochastic gradient descent, and optimization under constraints. Students will apply these techniques to improve machine learning model performance, focusing on real-world challenges in tuning and scalability.
Prerequisite(s): DSE 302, AI 347

DSE 401: Optimization Techniques for ML 3 (3-0-0)
This course delves into advanced optimization methods used in machine learning, such as convex optimization, stochastic gradient descent, and optimization under constraints. Students will apply these techniques to improve machine learning model performance, focusing on real-world challenges in tuning and scalability.
Prerequisite(s): DSE 302, AI 347

AI 480: Natural Language Processing 3 (3-0-0)
This course introduces the concepts and techniques used in natural language processing (NLP), including text preprocessing, word embeddings, and language models. Students will explore applications such as sentiment analysis, machine translation, and chatbot development. Projects focus on using modern NLP libraries and frameworks to solve practical challenges.
Prerequisite(s): SE 400

SE 481: Ethics for Engineers 1 (1-0-0)
This course will explore the effects of technology on society. Especially the ethical questions that arise when technology interacts with humans. Topics will include secrecy of data, privacy issues, legal obligations, and protecting the society by limiting the reach of technology.
Prerequisite(s): DSE 495

DSE 495: Capstone Project I **3 (0-6-0)**
This course focuses on the principles and applications of generative AI, including Generative Adversarial Networks (GANs) and Large Language Models (LLMs). Students will explore cutting edge techniques in generating synthetic data, text, and images. Applications in creative industries and ethical considerations are also discussed.
Prerequisite(s): DSE 320, DSE 322, DSE 323

DSE 496: Capstone Project II **3 (0-6-0)**
Building on the groundwork laid in CSE 495, this course focuses on implementing and completing the capstone project. Students will execute their proposed solutions. Teams will utilize industry standard tools and techniques to develop a functional prototype or system. The course culminates with a comprehensive project report and a formal presentation to faculty and/or industry stakeholders, demonstrating the ability to tackle complex, real-world problems with data-driven strategies. Emphasis is placed on teamwork, project management, and effective communication of findings.
Prerequisite(s): DSE 495

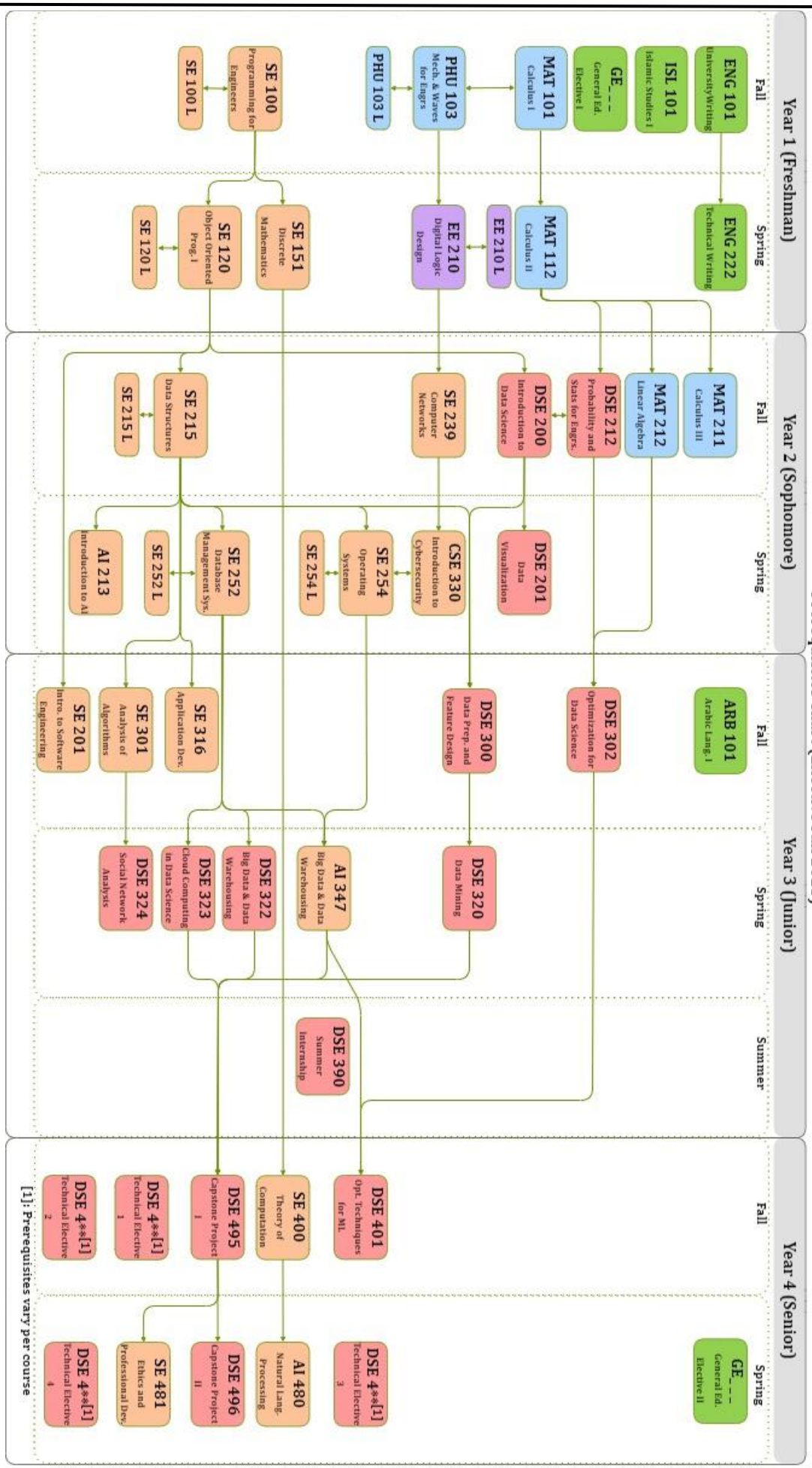
Technical Elective Courses

AI 471: Technical Elective 1 (Deep and Reinforcement Learning) **3 (3-0-0)**
This course provides an in-depth understanding of neural networks, deep learning architectures, and reinforcement learning algorithms. Topics include convolutional networks, recurrent networks, Q-learning, and policy gradients. Students will implement models to solve tasks such as image recognition, game playing, and robotics.
Prerequisite(s): AI 347

DSE 451: Technical Elective 2 (Advanced Databases) **3 (3-0-0)**
This course introduces students to expert systems in general and to rule-based systems in specific. Students learn how to build a rule-based expert system in a variety of application areas. They also learn advanced programming techniques which include topics of inexact reasoning, intelligent database management methods, and how to develop a community of expert systems. Students are also given the opportunity to demonstrate their understanding of the technology by building a rule-based expert system that addresses a real-world problem.
Prerequisite(s): SE 252, DSE 322

DSE 452: Technical Elective 3 (Data Engineering and Pipelines) **3 (3-0-0)**
This course focuses on designing and implementing robust data pipelines to automate the flow of data from diverse sources. Students will learn about ETL (Extract, Transform, Load) processes, real-time data streaming, and frameworks like Apache Airflow and Kafka. Practical projects simulate building scalable and efficient pipelines for enterprise-level applications.
Prerequisite(s): DSE 320, DSE 322

DSE 453: Technical Elective 4 (Generative AI and LLM) **3 (3-0-0)**
This course introduces students to expert systems in general and to rule-based systems in specific. Students learn how to build a rule-based expert system in a variety of application areas. They also learn advanced programming techniques which include topics of inexact reasoning, intelligent database management methods, and how to develop a community of expert systems. Students are also given the opportunity to demonstrate their understanding of the technology by building a rule-based expert system that addresses a real-world problem.
Prerequisite(s): AI 471


Alfaisal University – Bachelor of Science Data Science and Engineering Program
Prerequisites Chart (Effective Fall 2025)
Year 1 (Freshman)
Year 2 (Sophomore)
Year 3 (Junior)
Year 4 (Senior)
Fall
Spring
Summer
ENG 101 University Writing
ISL 101 Islamic Studies I
GE_ _ _ General Ed. Elective I
MAT 101 Calculus I
PHU 103 Mech. & Waves for Engrs
PHU 103 L
SE 100 Programming for Engineers
SE 100 L
ENG 222 Technical Writing
MAT 112 Calculus II
EE 210 L
EE 210 Digital Logic Design
SE 151 Discrete Mathematics
SE 120 Object Oriented Prog. I
SE 120 L
MAT 211 Calculus III
MAT 212 Linear Algebra
DSE 212 Probability and Stats for Engrs.
DSE 200 Introduction to Data Science
SE 239 Computer Networks
SE 215 Data Structures
SE 215 L
ARB 101 Arabic Lang. I
DSE 302 Optimization for Data Science
DSE 300 Data Prep. and Feature Design
SE 201 Intro. to Software Engineering
SE 301 Analysis of Algorithms
SE 316 Application Dev.
DSE 320 Data Mining
AI 347 Big Data & Data Warehousing
DSE 322 Big Data & Data Warehousing
DSE 323 Cloud Computing in Data Science
DSE 324 Social Network Analysis
DSE 390 Summer Internship
DSE 401 Opt. Techniques for ML
SE 400 Theory of Computation
DSE 495 Capstone Project I
DSE 4**[1] Technical Elective 1
DSE 4**[1] Technical Elective 2
GE_ _ _ General Ed. Elective II
DSE 4**[1] Technical Elective 3
AI 480 Natural Lang. Processing
DSE 496 Capstone Project II
SE 481 Ethics and Professional Dev.
DSE 4**[1] Technical Elective 4
SE 252 Database Management Sys.
SE 252 L
AI 213 Introduction to AI
SE 254 Operating Systems
SE 254 L
CSE 330 Introduction to Cybersecurity
DSE 201 Data Visualization
[1]: Prerequisites vary per course