



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 Artificial Intelligence Program

## 1. Overview

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

## 2. University Graduation Requirements

To graduate with a Bachelor of Science in Information Technology, students must complete a four-year program consisting of 138 credit hours. The distribution of courses is as follows:

## 3. Degree Requirements

| Program Structure            | Required/ Elective | No. of courses | Credit Hours | Percentage  |
|------------------------------|--------------------|----------------|--------------|-------------|
| Institution Requirements     | Required           | 12             | 34           | 24.6 %      |
|                              | Elective           | 1              | 3            | 0.02%       |
| College Requirements         | Required           | 15             | 37           | 27%         |
|                              | Elective           |                |              |             |
| Program Requirements         | Required           | 20             | 52           | 37.5%       |
|                              | Elective           | 4              | 12           | .086 %      |
| Capstone Course/Project      |                    |                |              |             |
| Field Experience/ Internship |                    |                |              |             |
| Others                       |                    |                |              |             |
| <b>Total</b>                 |                    | <b>52</b>      | <b>138</b>   | <b>100%</b> |

#### 4. University Graduation Requirements

University Requirements consist of 37 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 selected 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            |

## 5. College Requirements

College Requirements consist of 37 credit hours distributed as follows:

| Course Code  | Course Title                                 | Pre-Requisite Courses | Type of requirements (Institution, College or Department) | Credit Hours |
|--------------|--|-----------------------|---|--------------|
| CSC 100      | Introduction to Computing                    |                       | C   | 3            |
| MATH 101     | Calculus I                                   |                       | C   | 3            |
| PHYS 101     | General Physics I                            |                       | C   | 3            |
| PHYS 101L    | General Physics I Lab                        | PHYS 101              | C   | 1            |
| MATH 102     | Calculus II                                  | MATH 101              | C   | 3            |
| STAT 230     | Probability and Statistics                   | MATH 201              | C   | 3            |
| CEN 220      | Logic Design                                 | MATH 211(co)          | C   | 3            |
| CEN 220L     | Logic Design Lab                             | CEN 220               | C   | 1            |
| CSC 102      | Computer Programming I                       | CSC 100               | C   | 3            |
| CSC 102L     | Computer Programming I Lab                   | CSC 102               | C   | 1            |
| CSC 212      | Algorithms and Data Structure                | CSC 102               | C   | 3            |
| CEN 221      | Computer Organization and Assembly Language  |                       | C   | 3            |
| CEN 221L     | Computer Organization and Assembly Lang. Lab | CEN 221               | C   | 1            |
| CSC 492      | Computing Ethics                             |                       | C   | 3            |
| CEN 320      | Computer Architecture                        | CEN 221               | C   | 3            |
| <b>Total</b> |  |                       |   | <b>37</b>    |

## 6. Program Specialization Requirements

Program specialization requirements consist of 64 credit hours: 52 compulsory credit hours and 12 elective credit hours distributed.

### 6.1. Compulsory Specialization Requirements: (52) credit hours:

| Course Code  | Course Title                               | Pre-Requisite Courses | Credit Hours |
|--------------|--|-----------------------|--------------|
| CIT 114      | Programming with Python                    |                       | 3            |
| CIT 130      | Introduction to web design and development |                       | 3            |
| CIT 235      | Data Analysis and Design                   | CIT 114               | 3            |
| CIT 241      | Fundamentals of E-Commerce                 | CIT 130               | 3            |
| CIT 350      | Database Systems                           | Senior standing       | 3            |
| CIT 350L     | Database Systems Lab                       | CIT 350               | 1            |
| CIT 356      | Machine Learning, I                        | CIT 235               | 3            |
| CIT 385      | Computer Vision                            | CSC 356               | 3            |
| CIT 389      | Natural Language Processing                | CIT 235               | 3            |
| CIT 387      | Artificial Intelligence                    | STAT 230              | 3            |
| CIT 398      | Internship                                 |                       | 1            |
| CIT 470      | Project Management                         | CSC 382               | 3            |
| CIT 472      | Human Computer Interaction                 |                       | 3            |
| CIT 476      | Machine Learning II                        | CIT 356               | 3            |
| CIT 498      | Final Year Project I                       | Senior standing       | 1            |
| CIT 499      | Final Year Project II                      | CIT 498               | 3            |
| CSC 201      | Computer Programming II                    | CSC 102               | 3            |
| CSC 201L     | Computer Programming II Lab                | CSC 201               | 1            |
| CSC 356      | Design and Analysis of Algorithms          | CSC 212               | 3            |
| CSC 382      | Software Engineering                       |                       | 3            |
| <b>Total</b> |  |                       | <b>52</b>    |



## 6.2. Program Specialization Electives – (12) credit hours

| Course code | Course Title                                     | Pre-Requisite     | Credit Hours |
|-------------|--|-------------------|--------------|
| CIT 382     | Evolutionary Computation and Global Optimization |                   | 3            |
| MATH 215    | Linear Algebra                                   | MATH 102          | 3            |
| ** CIT 304  | Introduction To Big Data                         |                   | 3            |
| ** CSC 372  | Operating Systems                                |                   | 3            |
| CSC 386     | Advanced Computer Graphics                       |                   | 3            |
| CIT 397     | Selected Topics in Machine Learning              |                   | 3            |
| CIT 240     | Fundamentals of Data Mining                      |                   | 3            |
| ** CIT 482  | Computer Network and Cryptography                |                   | 3            |
| ** CIT 372  | Cloud Computing and Security                     |                   | 3            |
| ** CIT 364  | Wireless & Mobile Computing                      |                   | 3            |
| CIT 306     | Deep Learning                                    | STAT 201, CSC 387 | 3            |
| CIT 360     | Advanced Software Engineering                    | CSC 382           | 3            |
| CIT 380     | Information and Innovation Management            |                   | 3            |
| CIT 112     | Introduction to Programming concepts and Design  |                   | 3            |

## Proposed Sequence of Study Plan

*BS AI Program Study Plan*

*(138 Credits)*

### Year I

#### First Semester

**(16Credit 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 |
|-----------|---------------------------|-----------|---------------|
| ENGL 102  | Basic Academic English II | 3         | ENGL 101      |
| MATH 120  | Mathematics II            | 3         | MATH 110      |
| CSC 100   | Introduction to Computing | 3         | IT 100        |
| PHYS 101  | General Physics I         | 3         |               |
| 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 Hours)**

| Course   | Title                      | Credits   | Prerequisites |
|----------|----------------------------|-----------|---------------|
| CIT 114  | Programming with Python    | 3         |               |
| 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         | MATH 101      |
|          | <b>Total Credits</b>       | <b>17</b> |               |

**Fourth Semester**

**(16 Credit Hours)**

| Course   | Title  | Credits   | Prerequisites |
|----------|--|-----------|---------------|
| STAT 230 | Probability and Statistics                   | 3         | Math 102      |
| CEN 221  | Computer Organization and Assembly Language  | 3         |               |
| CEN 221L | Computer Organization and Assembly Lang. Lab | 1         |               |
| CIT 130  | Introduction to web design and development   | 3         |               |
| ARAB 101 | Basic Academic Arabic                        | 3         |               |
| CIT 241  | Fundamentals of E-Commerce                   | 3         |               |
|          | Free Elective                                | 3         |               |
|          | <b>Total Credits</b>                         | <b>19</b> |               |





**Year III**

**Fifth Semester**

**(18 Credit Hours)**

| Course   | Title                           | Credits   | Prerequisites |
|----------|---------------------------------|-----------|---------------|
| CEN 320  | Computer Architecture           | 3         |               |
|          | Program Specialization Elective | 3         |               |
| CSC 212  | Algorithms and Data Structure   | 3         | CSC 102       |
| CIT 235  | Data Analysis and Design        | 3         | CIT 130       |
| ARAB 201 | Advanced Academic Arabic        | 3         | ARAB 101      |
| ENGL 203 | Advanced Academic English I     | 3         | ENHL 102      |
|          | <b>Total Credits</b>            | <b>18</b> |               |

**Sixth Semester**

**(17 Credit Hours)**

| Course   | Title                       | Credits   | Prerequisites |
|----------|-----------------------------|-----------|---------------|
| CSC 201  | Computer Programming II     | 3         | CSC 102       |
| CSC 201L | Computer Programming II Lab | 1         | CSC 201 (co)  |
| CIT 356  | Machine Learning, I         | 3         | CIT 235       |
| CSC 382  | Software Engineering        | 3         |               |
| CIT 350  | Database Systems            | 3         |               |
| CIT 350L | Database Systems Lab        | 1         |               |
| CSC 492  | Computing Ethics            | 3         |               |
|          | <b>Total Credits</b>        | <b>17</b> |               |

**Summer Semester**

**(1 Credit Hour)**

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



#### Year IV

##### Seventh Semester

(16 Credit Hours)

| Course  | Title                             | Credits   | Prerequisites |
|---------|-----------------------------------|-----------|---------------|
| CIT 476 | Machine Learning II               | 3         | CIT 356       |
| CIT 387 | Artificial Intelligence           | 3         | STAT 230      |
| CSC 356 | Design and Analysis of Algorithms | 3         | CSC 212       |
| CIT 498 | Final Year Project I              | 1         |               |
| CIT472  | Human Computer Interaction        | 3         |               |
|         | Program Specialization Elective   | 3         |               |
|         | <b>Total Credits</b>              | <b>16</b> |               |

##### Eight Semester

(18 Credit Hours)

| Course                       | Title                           | Credits   | Prerequisites |
|------------------------------|---------------------------------|-----------|---------------|
| CIT 389                      | Natural Language Processing     | 3         |               |
| CIT 385                      | Computer Vision                 | 3         | CIT 356       |
| CIT 470                      | Project Management              | 3         |               |
| CIT 499                      | Final Year Project II           | 3         | CIT 498       |
|                              | Program Specialization Elective | 3         |               |
|                              | Program Specialization Elective | 3         |               |
|                              | <b>Total Credits</b>            | <b>18</b> |               |
| <b>Total Program Credits</b> |                                 |           | <b>138</b>    |

## Course Descriptions

### A) Core Courses:

- CIT 114 Introduction to Python** **3(3, 0, 0)**  
 Python is a language with a simple syntax and a powerful set of libraries. It is an interpreted language, with a rich programming environment, including a robust debugger and profiler. While it is easy for beginners to learn, it is widely used in many scientific areas for data exploration. This course introduces the Python programming language for students without prior programming experience. We cover data types, control flow, object-oriented programming, and graphical user interface-driven applications. The examples and problems used in this course are drawn from diverse areas such as text processing, simple graphics creation and image manipulation, HTML and web programming, and genomics.
- CIT 130 Introduction to Web Design and Development** **3(3, 0, 0)**  
 This course introduces the student to design and development practices for multimedia content, focusing particularly on web sites. Modern design practices for the web are taught, framed by an introduction to human-centered design techniques, particularly heuristic-based interface design guidelines for web interfaces and web accessibility from a global perspective. The course also introduces some basic scripting techniques for going beyond static content. The focus of learning is activity based and incorporates both individual and team-based exercises.
- CIT 235 Data Analysis and Design** **3(3, 0, 0)**  
 This course introduces the data analytics life cycle. It critically analyses methods of dealing with both internal and external data available to organizations. This includes data sourced from cloud and social networks. Effective data usage must take into account efficient data storage and retrieval methodologies to realize potential organizational benefits. Students will apply data modelling techniques and data design strategies to complex problems to illustrate how to maximize the efficient storage and retrieval of organizational data.  
*Prerequisite: CIT 114*
- CIT 241 Fundamentals of Electronic Commerce** **3(3, 0, 0)**  
 Introduces students to the nature of electronic commerce/online business, business decision-making involving electronic commerce/online business. Management issues of technological infrastructure security, privacy and website development for electronic commerce/online business.
- 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.  
*Pre-requisite: Senior Standing.*
- CIT 350L Database Systems Lab** **1(0, 0, 2)**  
 Laboratory experience to complement CIT 350 material.  
*Co-requisite: CIT 350*
- CIT 356 Machine Learning I** **3(3, 0, 0)**  
 This course provides a broad introduction to machine learning and statistical pattern recognition. Topics include supervised learning (generative/discriminative learning, parametric/non-parametric learning, neural networks, support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods). The course will also discuss recent machine learning applications, such as robotic control, autonomous navigation, bioinformatics, speech recognition, and text and web data processing.  
*Prerequisite: CIT 235*
- CIT 385 Computer Vision** **3(3, 0, 0)**  
 Fundamentals of computer vision including image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification and scene understanding. Focus of course is to develop intuitions and mathematics of the lecture methods and then to learn about the difference between theory and practice in the projects.  
*Prerequisites: CIT 356.*

**CSC 389 Natural Language Processing 3(3, 0, 0)**

Natural Language Processing (NLP) is a rapidly developing field with broad applicability throughout the hard sciences, social sciences, and the humanities. The ability to harness, employ and analyze linguistic and textual data effectively is a highly desirable skill for academic work, in government, and throughout the private sector. This course is intended as a theoretical and methodological introduction to the most widely used and effective current techniques, strategies and toolkits for natural language processing, with a primary focus on those available in the Python programming language

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

This is an introductory course on Artificial Intelligence. The topics may include: AI methodology and fundamentals; intelligent agents; search algorithms; game playing; supervised and unsupervised learning; decision tree learning; neural networks; nearest neighbor methods; dimensionality reduction; clustering; kernel machines; support vector machines; uncertainty and probability theory; probabilistic reasoning in AI; Bayesian networks; statistical learning; fuzzy logic. Several assignments will be given to enable the student to gain practical experience in using these techniques.

*Prerequisites: STAT 230.*

**CIT 398 Internship/Practicum 1(0, 1, 0)**

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

**CIT 470 Project Management 3(3, 0, 0)**

This course introduces students to the concepts currently being used in the emerging professional field of Project Management. Project Management is designed to build and expand the foundation of knowledge needed by successful managers.

*Pre-requisite: CSC382*

**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.

*Prerequisite: Senior Standing*

**CIT 476 Machine Learning II 3(3, 0, 0)**

Advanced statistical pattern recognition and machine learning are introduced in this course, which is intended for a wide audience. Advanced machine learning and reinforcements techniques are topics covered in this course. The course will also cover modern advanced machine learning applications, such as robotic control, autonomous navigation, bioinformatics, voice recognition, text and online data processing, and bioinformatics applications.

*Prerequisite: CIT 356*

**CIT 498 Final Year Project in Information Technology I 1 (0, 1, 0)**

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

**CIT 499 Final Year Project in Information Technology II 3 (0, 3, 0)**

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

*Prerequisite: CSC 498.*

## B) Elective Courses

**CIT 112 Introduction to Programming Concepts and Design 3(3, 0, 0)**

This course is for the absolute beginner in computing. It covers the basics of programming in Python including variables, expressions, Comprehensive Course Description loops, conditions, lists, strings, functions, and standard and file I/O in a hands-on fashion.

**CIT 240 Fundamental of Data Mining 3(3, 0, 0)**

An introduction to data mining includes the basic concepts, principles, methods, implementation techniques, and applications of data mining, with a focus on two major data mining functions: (1) pattern discovery and (2) cluster analysis.

**CIT 304 Introduction to Big Data 3 (0, 3, 0)**  
Fundamental issues in Big Data. Examine issues related to data organization, storage, retrieval, analysis and knowledge discovery at scale. Topics include large-scale data analysis, scalable computing frameworks, data storage systems, and semi-structured data models. Involves hands-on programming assignments and term project using real-world datasets.

**CIT 306 Deep Learning 3(3, 0, 0)**  
Deep Learning is one of the most highly sought-after skills in AI. We will help you become good at Deep Learning. In this course, you will learn the foundations of Deep Learning, understand how to build neural networks, and learn how to lead successful machine learning projects. You will learn about Convolutional networks, RNNs, LSTM, Adam, Dropout, and more. You will work on case studies from healthcare, autonomous driving, sign language reading, music generation, and natural language processing. You will master not only the theory but also see how it is applied in the industry. You will practice all these ideas in Python and in TensorFlow, which we will teach. AI is transforming multiple industries. After this course, you will likely find creative ways to apply it to your work. This class is taught in the flipped-classroom format. You will watch videos and complete in-depth programming assignments and online quizzes at home, then come to class for advanced discussions and work on projects. This class will culminate in an open-ended final project, which the teaching team will help you with.

*Prerequisites: STAT230, CSC 387.*

**CIT 360 Advanced Software Engineering 3(3, 0, 0)**  
This course covers techniques that scale to programming large software systems with teams of programmers. The techniques are explained in the context of the specification, implementation, testing and maintenance of software systems. This course focuses on the technical and management processes and practices used for the effective and efficient development of high quality, complex systems. This course will cover software engineering topics associated with large systems development such as requirements and specifications, testing and maintenance, and design with the emphasis on verification and validation techniques. Specific attention will be given to development tools and automated support environments.

*Prerequisite: CSC 382*

**CIT 364 Wireless & Mobile Computing 3(3, 0, 0)**  
This course provides a comprehensive study of the principles and paradigms associated with wireless and mobile computing. Students will gain an understanding of the underlying technologies, protocols, and challenges faced in the domain of wireless communication and mobile computing. Covering both theoretical foundations and practical approaches, the course will explore the design, analysis, and implementation of wireless networks, mobile communication systems, mobile applications, and mobile computing architectures.

**CIT 372 Cloud Computing and Security 3(3, 0, 0)**  
This intensive course delves into the fundamentals of cloud computing and its associated security concerns. Students will explore core cloud concepts, service models, and gain practical insights into safeguarding cloud infrastructures. Emphasis is placed on real-world applications, ensuring participants are well-equipped to address cloud-related challenges in today's digital landscape.

**CIT 380 Information and Innovation Management 3(3, 0, 0)**  
Introduction to the management of technology & innovation, including strategic & operational technology & innovation management, business competitiveness, business partnerships & alliances, managing R&D, new product development, & valuation of technology.

**CIT 382 Evolutionary Computation and Global Optimization 3(3, 0, 0)**  
This course delves into the intriguing domain of evolutionary computation, a subfield of artificial intelligence inspired by the processes of natural evolution. Students will explore algorithms based on natural phenomena, such as genetic algorithms, swarm intelligence, and evolutionary strategies, primarily focusing on their applications in global optimization problems. The course provides a blend of theoretical foundations and hands-on experience, enabling students to design, implement, and assess evolutionary algorithms for complex optimization challenges across various disciplines.

**CIT 397 Selected Topics in Machine Learning 3(3, 0, 0)**  
This course offers an advanced exploration of contemporary and emerging areas in the rapidly evolving field of machine learning (ML). Tailored for students with a foundational grasp of ML, the curriculum delves into a curated selection of state-of-the-art techniques, methodologies, and applications. Blending theoretical knowledge with hands-on experiences, participants will be immersed in the cutting edge of ML research and applications, empowering them with the knowledge and skills to shape and influence future developments in the field.



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**CIT 482 Computer Network and Cryptography**

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

This course bridges the domains of computer networking and cryptography, offering an in-depth exploration into the intertwined realms of network architecture and data security. Students will unpack the intricacies of the network protocol stack while gaining mastery over the cryptographic methods safeguarding data as it traverses these networks. The curriculum provides a balanced insight into the mechanics of networking operations and the encryption techniques that underpin secure communications in our digital world.