



Bachelor of Artificial Intelligence Program

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Artificial Intelligence**

The Bachelor of Artificial Intelligence program is designed over a period of four years (eight semesters) according to American standards, and requires the completion of 132 credit hours. The program aims to prepare qualified specialists to understand and apply modern artificial intelligence technologies in several fields. The program is concerned with providing the student with basic skills in computer science and artificial intelligence, with a comprehensive understanding of practical applications, and the inclusion of materials in cybersecurity and general disciplines. The importance of the program lies in the fact that it meets the growing needs of the labor market in the fields of artificial intelligence cutting-edge (e.g., healthcare, finance, transportation, and education) that use AI algorithms to improve medical diagnostics, forecast needs, and analyze big data. In this sense, the program seeks to provide students with the theoretical knowledge and practical skills necessary to design and build advanced AI solutions, taking into account relevant ethical and social considerations.

First: Program Learning Outcomes

At the end of the program, graduates are expected to achieve the following Program Learning Outcomes (PLOs):

- **Knowledge and Understanding:** The ability to understand the theoretical and mathematical foundations of artificial intelligence and its associated computational algorithms.
- **Problem Analysis:** The ability to identify and analyze complex problems in the field of artificial intelligence and choose appropriate technologies to solve them.
- **Solution Design and Development:** The ability to design and build new AI models and systems (such as neural networks or machine learning systems), and to use modern software and tools to achieve this.

- **Critical Thinking and Creativity:** Apply critical thinking and problem-solving methodologies to understand AI challenges and propose innovative solutions.
- **Professional and ethical aspects:** Understand ethical and professional standards in AI, such as privacy, fairness, and accountability, and assess the impact of technologies on society.
- **Communication and teamwork:** Demonstrate effective communication skills (orally and in writing in Arabic and English) and work effectively in multidisciplinary teams.
- **Lifelong learning:** Develop the ability to independently follow technical and academic developments in AI and pursue continuous professional development.

Second: Courses Coding System

A unified American coding system has been adopted for all courses in the program, so that each course is symbolized by an alphabet set that refers to the area of specialization (e.g.: **CS** for computers, **ML** for machine learning, **CV** for computer vision, **NLP** for natural language processing, **ROB** for robotics, **ETH** for artificial intelligence ethics, **HCI** for human-computer interaction, **AIG** for generative intelligence, **AIE** for Intelligence in Education, **AIH** for Intelligence in Healthcare, and **AIF** for Intelligence in Management and Future Foresight).

The alphanumeric code follows a triple digit starting at 100. For example, core courses may have code names such as CS 101 for general computer subjects, and specialization courses such as AIG 301 for generative AI.

Third: Study Plan (Eight Semesters)

The program is implemented over eight semesters as follows:

First Semester:

Course Code	Course Name (Arabic)	Course Title (English)	Credit Hours	Mandatory/Optional
GEN 101	Arabic Communication Skills	Arabic Communication Skills	3	Mandatory
GEN 102	English Communication Skills 1	English Communication Skills 1	3	Mandatory
CS 101	Introduction to Computer Science	Introduction to Computing	4	Mandatory
CS 102	Principles of Programming	Programming Fundamentals	4	Mandatory
GEN 103	Critical thinking and problem-solving	Critical Thinking & Problem Solving	3	Mandatory

Second Semester:

Course Code	Course Name (Arabic)	Course Title English	Hours	Mandatory/Optional
GEN 104	English Communication Skills 2	English Communication Skills 2	3	Mandatory
MATH 101	Fundamentals of Mathematics	Fundamentals of Calculus	4	Mandatory
MATH 102	Discrete Mathematics	Discrete Mathematics	3	Mandatory
CS 201	Data Structures	Data Structures	4	Mandatory
GEN 105	Principles of Sustainable Development	Principles of Sustainable Development	3	Mandatory

Third Semester:

Course Code	Course Name (Arabic)	Course Title English	Hours	Mandatory/Optional
CS 202	Computer Architectures	Computer Architecture	4	Mandatory
MATH 201	Linear algebra	Linear Algebra	3	Mandatory
MATH 202	Statistics and Probability	Probability & Statistics	3	Mandatory
CS 301	Computer Algorithms	Computer Algorithms	3	Mandatory
CS 302	Software Engineering	Software Engineering	4	Mandatory

Fourth Semester:

Course Code	Course Name (Arabic)	Course Title English	Hours	Mandatory/Optional
CS 303	Operating Systems	Operating Systems	3	Mandatory
CS 304	Computer Networks	Computer Networks	3	Mandatory
CS 305	Databases	Database Systems	4	Mandatory
SEC 301	Cybersecurity Fundamentals	Cybersecurity Fundamentals	3	Mandatory
ETH 101	IT Ethics	Ethics in Information Technology	3	Mandatory

Fifth Semester:

Course Code	Course Name (Arabic)	Course Title English	Hours	Mandatory/Optional
ML 301	Machine Learning	Machine Learning	4	Mandatory
ML 302	Deep Learning	Deep Learning	4	Mandatory
SEC 302	Network Security	Network Security	3	Mandatory
AIH 301	Artificial Intelligence in Healthcare	AI in Healthcare	3	Mandatory
ML 303	Data Mining and Machine Learning	Data Mining & Machine Learning	3	Mandatory

Sixth Semester:

In this semester, the student follows the courses of specialization (practical application), or he can choose compensatory courses. Among the courses available as *elective courses*:

Note: Although some of these courses are practical, their nature remains both theoretical and practical (as is customary in international teaching methodologies).

Course Code	Course Name (Arabic)	Course Title English	Hours	Mandatory/Optional
NLP 301	Natural Language Processing	Natural Language Processing	3	elective
CV 301	Computer Vision	Computer Vision	3	elective
SEC 303	Encryption and Information Security	Cryptography & Information Security	3	elective
SEC 304	Ethical Hacking and Penetration Testing	Ethical Hacking & Penetration Testing	3	elective
ROB 301	Robotics and intelligent systems	Robotics and Intelligent Systems	3	elective
AIG 301	Generative Adversarial Networks	Generative Adversarial Networks	3	elective
AIE 301	Artificial Intelligence in Education	AI in Education	3	elective
AIF 301	Artificial Intelligence in Management	AI in Management	3	elective

Seventh Semester:

Course Code	Course Name (Arabic)	Course Title English	Hours	Mandatory/Optional
CS401	Graduation Project 1	Graduation Project 1	3	Mandatory
SEC 401	Secure Systems Programming	Secure Systems Programming	3	elective
AI 401	Advanced Systems in Artificial Intelligence	Advanced AI Systems	4	elective
INT 401	Hands	Internship	3	elective
EL 401	General elective course	General Elective	3	elective
AIG 401	Advanced Generative Models	Advanced Generative Models	3	elective
AIE 401	Educational Data Analysis	Educational Data Analytics	3	elective
AIH 401	AI Medical Imaging	AI in Medical Imaging	3	elective
AIF 401	Financial Statement Analysis	Financial Data Analysis	3	elective

Eighth Semester:

Course Code	Course Name (Arabic)	Course Title English	Hours	Mandatory/Optional
CS 402	Graduation Project 2	Graduation Project 2	6	Mandatory
SEC 402	Cybersecurity Law and Ethics	Cybersecurity Law & Ethics	4	elective
HCI 401	Human-Computer Interaction and Artificial Intelligence	Human-Computer/AI Interaction	3	elective
ML 401	Reinforcement Learning	Reinforcement Learning	3	elective
AIG 402	Generative Intelligence Applications	Generative AI Applications	3	elective
AIE 402	Adaptive and personalized learning	Adaptive and Personalized Learning	3	elective
AIH 402	Predictive Medicine and Diagnostics	Predictive Medicine & Diagnostics	3	elective
AIF 402	Artificial Intelligence in Financial Foresight	AI in Financial Foresight	3	elective

Fourth: Course Description

The following is a detailed description of each of the program's courses, including the course title, theoretical/practical ratio, a brief description, objectives, learning outcomes, and prerequisites:

First Semester

- **GEN 101 - Communication Skills in Arabic**
 - Theoretical: 70% | Practical: 30%
 - Course Description: Aims to develop oral and written expression skills in Arabic, with a focus on grammar, essay building, and oral presentation skills.
 - Objectives: To enable students to speak and write in fluent Arabic, formulate logical arguments, and analyze texts.
 - Learning Outcomes: Able to write clear and structured Arabic reports, present complex ideas orally, and use scientific terminology accurately.
 - Prerequisites: None.
- **GEN 102 - English Communication Skills 1**
 - Theoretical: 70% | Practical: 30%
 - Course Description: Develop students' basic English language skills, including basic vocabulary, beginner academic writing, and understanding of scientific texts.

- Objectives: Enhance listening, speaking, reading, and writing skills in English.
- Learning Outcomes: Able to understand and write academic technical texts in simple English, and to make a presentation in English on a technical topic.
- Prerequisites: None.
- **CS 101 - Introduction to Computer Science**
 - Theoretical: 80% | Practical: 20%
 - Course Description: Introduce students to the basics of computers and information systems, including the history of computing, computer components, operating systems, and computer infrastructure.
 - Objectives: To establish the basic concepts of computer science, including hardware and software, and to clarify the role of computers in solving problems.
 - Learning Outcomes: Able to explain computer components and functions, use basic computer tools, and think systematically to solve simple computing problems.
 - Prerequisites: None.
- **CS 102 - Programming Fundamentals**
 - Theoretical: 40% | Practical: 60%
 - Course Description: Introduces the basic principles of computer programming, including simple algorithms, variables, loops, and conditionals, using a high-level programming language (such as Python or C).
 - Objectives: Teach students how to develop algorithms and software solutions to problems, build small programs, and analyze programming errors.
 - Learning Outcomes: Able to write simple programs to perform specific tasks using different control structures, and test and debug programs.
 - Prerequisites: CS 101
- **GEN 103 - Critical Thinking & Problem Solving**
 - Theoretical: 60% | Practical: 40%
 - Course Description: Develops logical analysis and critical thinking skills to solve problems. Covers the concepts of analyzing situations, evaluating arguments, and using creative strategies for solution.
 - Objectives: To enhance students' ability to think deeply, apply systematic methods in analyzing information, and provide innovative solutions.
 - Learning Outcomes: Able to analyze a complex problem into its sub-elements, and provide solutions supported by logical arguments.

- Prerequisites: None.

Second Semester

- **GEN 104 - English Communication Skills 2**

- Theoretical: 70% | Practical: 30%
- Course Description: Complements the GEN 102 course, with a focus on developing the most complex academic literacy skills, and preparing for the academic environment.
- Objectives: To enhance advanced written and oral expression skills in English.
- Learning Outcomes: Able to write academic essays, absorb specialized technical texts, and participate in academic discussions.
- Prerequisites GEN 102:

- **MATH 101 – Fundamentals of Calculus**

- Theoretical: 90% | Pragmatic: 10%
- Course Description: The study of the concepts of calculus for a single variable, including limits, derivatives, and their applications to physical and geometric problems.
- Objectives: Mastering the concepts of limits, chain rule, and derivatives of functions, and how to use them in the analysis of continuous systems.
- Learning Outcomes: Able to calculate many derivatives of functions, solve growth problems, and understand the applications of calculus in modeling.
- Prerequisites: None.

- **MATH 102 - Discrete Mathematics**

- Theoretical: 90% | Pragmatic: 10%
- Course Description: The study of the mathematical fundamentals used in computer science, such as mathematical logic, sets, relationships, graphs, principles of counting and aggregation, and stereotyped expressions.
- Objectives: To provide students with the theoretical tools necessary for computer science, especially in the areas of algorithms and modeling.
- Learning Outcomes: Able to use demonstrative logic, solve counting problems (combinatorics), analyze graphs and order concepts.
- Prerequisites: None.

- **CS 201 - Data Structures**

- Theoretical: 50% | Practical: 50%

- Course Description: Covers basic data structures such as interconnected lists, stacks, queues, trees, hash tables, and graphs. Includes the study of the search and sorting algorithms associated with these structures.
- Objectives: To enable students to select and build appropriate data structures to efficiently solve various software problems.
- Learning Outcomes: Able to apply lists and trees in organizing data, and know the procedures for accessing, inserting, and deleting them.
- Prerequisites: CS 102
- **GEN 105 - Principles of Sustainable Development**
 - Theoretical: 80% | Practical: 20%
 - Course Description: Examine the basic concepts of sustainable development and its importance at the local and global levels, with a focus on the sustainability of the environment and resources.
 - Objectives: To raise students' awareness of environmental, social, and economic issues related to sustainable development and the role of modern technologies in achieving them.
 - Learning Outcomes: Understand sustainability concepts and use them in evaluating technology projects.
 - Prerequisites: None.

Third Semester

- **CS 202 - Computer Architecture**
 - Theoretical: 70% | Practical: 30%
 - Course Description: Review the design and architecture of a computer from the logical level to the physical level, including processing units (CPUs), memory, and core circuits.
 - Objectives: Understand how to execute instructions and process data in a computer, and learn about high-performance digital systems and algorithms.
 - Learning Outcomes: Able to explain the architecture of computer processors, the internal execution process (e.g., instruction pipes), and the role of cache.
 - Prerequisites: CS 101
- **MATH 201 - Linear Algebra**
 - Theoretical: 80% | Practical: 20%
 - Course Description: The study of linear systems, matrices, determinants, vector spaces, values and eigenvectors.
 - Objectives: To provide students with the basic algebraic knowledge needed in the areas of machine learning and data analysis.

- Learning Outcomes: Able to solve systems of linear equations, understand matrix reduction algorithms, and apply eigenvalues to vector space problems.
- Prerequisites: MATH 101
- **MATH 202 - Statistics & Probability & Statistics /**
 - Theoretical: 80% | Practical: 20%
 - Course Description: Principles in Statistics and Probability including probability distributions, correlation coefficient, descriptive statistics, and parameter guessing.
 - Objectives: To provide the mathematical foundation for understanding statistics-based machine learning models and data analysis.
 - Learning Outcomes: Able to calculate basic probability distributions, and apply descriptive statistics and statistical inference tests to data sets.
 - Prerequisites: MATH 101
- **CS 301 - Computer Algorithms**
 - Theoretical: 60% | Practical: 40%
 - Course Description: Study, design, and analysis of the complexity of classical algorithms (space-time), such as sorting algorithms, search, hashing, iteration techniques, and dynamic programming.
 - Objectives: Understand how to design effective algorithms to solve fundamental problems and analyze their efficiency.
 - Learning Outcomes: Able to analyze the temporal complexity of common algorithms and develop new algorithms using the problem segmentation approach.
 - Prerequisites: CS 201
- **CS 302 - Software Engineering /**
 - Theoretical: 50% | Practical: 50%
 - Course Description: Principles of structured software development, including software life models, systems design, user requirements management, and software testing.
 - Objectives: To teach the student how to plan, design, and manage large software projects efficiently and with high quality.
 - Learning Outcomes: Able to follow software engineering methodologies to organize the development process, conduct comprehensive testing and quality assurance of software.
 - Prerequisites: CS 102

Fourth Semester

- **CS 303 - Operating Systems**

- Theoretical: 60% | Practical: 40%
- Course Description: Study of operating system concepts such as process scheduling, memory management, file systems, and access control.
- Objectives: Understand how the operating system acts as an intermediary between applications and devices, and manage resources effectively.
- Learning Outcomes: Able to explain the mechanism of process scheduling, memory management, and examine how to protect computer resources.
- Prerequisites : CS 202

- **CS 304 - Computer Networks**

- Theoretical: 60% | Practical: 40%
- Course Description: Fundamentals of Computer Networks and Associated Concepts in Their Different Layers (OSI Reference Model), Local Area and Wide Area Networks, and Transport Protocols (TCP/IP).
- Objectives: Understand the design and architecture of networks, and the techniques used in data transmission and communication over networks.
- Learning Outcomes: Able to describe the functioning of key protocols such as IP, TCP, HTTP, simple LAN setup, and network performance evaluation.
- Prerequisites: CS 202

- **CS 305 - Database Systems**

- Theoretical: 50% | Practical: 50%
- Course Description: Relational Database Concepts and Design (ERD, Relationships, SQL Query Language), Designing Effective Databases, and Using Database Management Systems (DBMS).
- Objectives: Teach students how to plan and implement a database, and use SQL queries to retrieve and process data.
- Learning Outcomes: Able to design a relational database schema, write advanced SQL queries, and ensure data integrity.
- Prerequisites: CS 201

- **AI 301 - Introduction to Artificial Intelligence**

- Theoretical: 60% | Practical: 40%

- Course Description: A theoretical and practical introduction to the principles of artificial intelligence, including tree research, knowledge representation, logic, and automated decision-making techniques.
- Objectives: To introduce students to basic AI approaches and their early applications, and to demonstrate how knowledge modeling and decision-making are computer-based.
- Learning Outcomes: Able to explain search algorithms, use logic to represent knowledge, and apply basic techniques to solve simple AI problems.
- Prerequisites: CS 301
- **ETH 101 - Ethics in Information Technology**
 - Theoretical: 80% | Practical: 20%
 - Course Description: Examine ethical and legal issues in information technology and computing, with a focus on privacy, intellectual property, and professional responsibility.
 - Objectives: To educate students about the ethical framework for solving technical problems, including data policies and the impact of technology on society.
 - Learning Outcomes: Able to analyze ethical issues, propose solutions based on professional principles, and understand the legal framework for data protection.
 - Prerequisites: None.

Fifth Semester

- **ML 301 - Machine Learning**
 - Theoretical: 50% | Practical: 50%
 - Course Description: Introduction to machine learning as a field that connects statistics and computer science. It focuses on developing algorithms for pattern detection and model learning from big data.
 - Objectives: To enable students to understand the fundamentals of machine learning algorithms and apply them to real datasets.
 - Learning Outcomes: Able to perform simple grading tasks, and understand the difference between supervised and unsupervised learning.
 - Prerequisites: MATH 202 and CS 102
- **ML 302 - Deep Learning**
 - Theoretical: 40% | Practical: 60%
 - Course Description: Specializing in deep neural networks, deep learning is defined as a branch of machine learning that focuses on learning complex representations.

- Objectives: To provide mathematical and algorithmic understanding of deep neural networks, and to enable students to build deep learning models and solve real problems.
- Learning Outcomes: Able to explain the components of neural networks, apply the reverse propagation algorithm to train the model, and choose an appropriate structure for a specific problem.
- Prerequisites: ML 301
- **SEC 301 - Cybersecurity Fundamentals / Cybersecurity Fundamentals**
 - Theoretical: 60% | Practical: 40%
 - Course Description: Introduction to information security and cyber protection concepts. Discusses basic encryption, access control, firewalls, and protecting networks from common attacks.
 - Objectives: Introduce students to cybersecurity risks and how to apply basic protection methods to systems and networks.
 - Learning Outcomes: Able to explain the principles of cryptography, prepare a basic security policy for a small network, and apply attack detection techniques.
 - Prerequisites: CS 303 or CS 304
- **SEC 302 – Network Security**
 - Theoretical: 50% | Practical: 50%
 - Course Description: Focuses on network security principles, including data protection in transportation, access control, firewalls, and data integrity, with a focus on practical applications in the design of secure networks.
 - Objectives: To provide students with the skills needed to protect networks from attacks, and how to build and manage secure networks.
 - Learning Outcomes: Able to design secure networks, understand the mechanism of firewalls and anti-intrusion systems, and apply encryption techniques at the network level.
 - Prerequisites: CS 304
- **ML 303 - Data Mining & Machine Learning /**
 - Theoretical: 50% | Practical: 50%
 - Course Description: This course introduces the basics of extracting knowledge from large databases using statistical algorithms.
 - Objectives: Teach students how to use mining algorithms to explore big data and build predictive models.
 - Learning Outcomes: Able to apply popular data mining algorithms (e.g., Decision Trees , Clustering), and build a predictive model using machine learning.

- Prerequisites: CS 201 and ML 301

Sixth Semester

- **NLP 301 - Natural Language Processing /**

- Theoretical: 50% | Practical: 50%
- Course Description: Introduction to word processing techniques and natural language, covering statistical models, text analysis, and basic concepts for building a text-generating system.
- Objectives: To prepare the student to understand the basic methodologies and techniques in the field of natural language processing.
- Learning Outcomes: Able to analyze linguistic and textual data, and build simple language models.
- Prerequisites: ML 301 and MATH 201

- **CV 301 - Computer Vision /**

- Theoretical: 50% | Practical: 50%
- Course Description: Introduction to computer image formation and the geometric foundations of imaging and image analysis. Teaches methods of discovering features and recognizing patterns in images.
- Objectives: To provide students with basic skills in analyzing and processing images and videos.
- Learning Outcomes: Able to understand the basics of image composition, feature discovery, and design software projects on image and video data.
- Prerequisites : ML 301 and MATH 201

- **SEC 303 - Cryptography & Information Security**

- Theoretical: 60% | Practical: 40%
- Course Description: A deeper study of encryption concepts, including symmetric and asymmetric encryption, digital signature mechanisms, and infrastructure security.
- Objectives: To provide students with the knowledge necessary to design secure systems through the application of encryption techniques.
- Learning Outcomes: Able to apply different encryption algorithms, and understand how digital signature works.
- Prerequisites : SEC 301

- **SEC 304 - Ethical Hacking & Penetration Testing / Ethical Hacking & Penetration Testing**

- Theoretical: 30% | Practical: 70%
- Course Description: Focuses on the practical aspect of cybersecurity by teaching ethical hacking techniques, penetration testing tools, and attack protection techniques.
- Objectives: Enable students to assess the security of systems and detect vulnerabilities before they are exploited by hackers.
- Learning Outcomes: Able to perform penetration testing on networks or applications, and write professional security reports.
- Prerequisites : SEC 301 and SEC 302
- **ROB 301 - Robotics and Intelligent Systems /**
 - Theoretical: 40% | Practical: 60%
 - Course Description: Studying the basics of robotics, including the types of industrial and mobile robots, and their operating environments.
 - Objectives: Understand how robotic systems are designed and developed.
 - Learning Outcomes: Able to understand the principles of movement and dynamics of robots, and use specialized engineering and software tools.
 - Prerequisites : AI 301 and CS 301
- **AIG 301 - Generative Adversarial Networks**
 - Theoretical: 40% | Practical: 60%
 - Course Description: An introduction to generative AI concepts using adversarial networks (GAN), where a data generation model is learned through the competition of two networks.
 - Objectives: To provide students with basic knowledge of models capable of generating new data (images, texts).
 - Learning Outcomes: Able to understand and train how adversarial networks work.
 - Prerequisites: ML 302
- **AIE 301 - AI in Education**
 - Theoretical: 50% | Practical: 50%
 - Course Description: Focuses on the application of AI in education, such as designing smart educational systems, and analyzing educational data.
 - Objectives: To prepare specialists to design and develop smart educational systems.

- Learning Outcomes: Able to use AI techniques to improve learning outcomes.
- Prerequisites : ML 301
- **AIF 301 - AI in Management:**
 - Theoretical: 60% | Practical: 40%
 - Course Description: Apply AI techniques in management and business areas, such as financial data analysis and strategic decision-making.
 - Objectives: To prepare specialists for the use of AI in business areas.
 - Learning Outcomes: Able to analyze financial statements and predict future trends.
 - Prerequisites: CS 305 and ML 301

Seventh Semester

- **CS 401 – Graduation Project 1 / Graduation Project 1**
 - Theoretical: 20% | Practical: 80%
 - Course Description: The first stage of the graduation project, where students identify the problem, conduct research, and develop a detailed project plan.
 - Objectives: Enhance students' research, planning, and problem-solving skills.
 - Learning Outcomes: Able to identify a research or applied problem, develop an action plan, and write a research report.
 - Prerequisites: CS 301
- **SEC 401 - Secure Systems Programming /**
 - Theoretical: 40% | Practical: 60%
 - Course Description: Focuses on practicing secure programming and how to write offensive-resistant code.
 - Objectives: Teach students how to build secure applications and systems from scratch.
 - Learning Outcomes: Able to write secure code, understand and avoid common programming gaps.
 - Prerequisites: CS 302 and SEC 301
- **AI 401 - Advanced AI Systems (Big Data)**
 - Theoretical: 50% | Practical: 50%
 - Course Description: Addresses advanced topics in artificial intelligence and its applications to big data and complex intelligent systems.

- Objectives: To provide students with the advanced knowledge needed to design large AI systems.
- Learning Outcomes: Capable of handling big data, and designing scalable machine learning systems.
- Prerequisites: ML 301
- **INT 401 - Internship**
 - Theoretical: 10% | Practical: 90%
 - Course Description: An applied training in a real work environment, in which the student applies the theoretical and practical knowledge acquired in the program.
 - Objectives: To provide students with practical experience, build professional relationships, and understand the requirements of the labor market.
 - Learning Outcomes: Able to work in a team, and apply their skills in solving real problems in a professional environment.
 - Prerequisites: Complete 100 credit hours.
- **EL 401 – General Elective /**
 - Theoretical: 70% | Practical: 30%
 - Course Description: An elective course that allows the student to choose any subject outside their main major to enhance side skills.
 - Objectives: To expand the student's knowledge horizons in other areas.
 - Learning Outcomes: Understanding concepts in a field other than computer science.
 - Prerequisites: None.

Eighth Semester

- **CS 402 – Graduation Project 2/2**
 - Theoretical: 10% | Practical: 90%
 - Course Description: The second phase of the graduation project, where students implement the plan they developed in CS 401, build the system or model, write the final report, and make a presentation.
 - Objectives: To enable students to apply their knowledge and skills acquired in the program in a practical project.
 - Learning Outcomes: Able to build an integrated computer system, accurately document its work, and present results effectively.
 - Prerequisites: CS 401
- **SEC 402 - Cybersecurity Law & Ethics**

- Theoretical: 80% | Practical: 20%
- Course Description: Studying laws and legislation related to cybersecurity, such as data protection and privacy laws, and legal liability in cybercrimes.
- Objectives: To educate students about the legal and ethical framework for cybersecurity.
- Learning Outcomes: Able to understand and adhere to laws related to cybersecurity.

Prerequisites : SEC 301

- **HCI 401 : Human-Computer and Artificial Intelligence Interaction /**

Human-Computer and AI Interaction

- Theoretical: 50% | Practical: 50%
- Course Description: It focuses on designing user interfaces for AI-based systems, taking into account psychological and cognitive aspects.
- Objectives: To prepare specialists in designing interactive systems that take into account the needs of the user.
- Learning Outcomes: Able to design user-friendly and user-experience (UX) user interfaces .
- Prerequisites: ML 301 and CS 302

- **ML 401 - Reinforcement Learning**

- Theoretical: 40% | Practical: 60%
- Course Description: Focuses on reinforcement learning techniques, where a software agent learns how to make decisions in a complex environment through reward and punishment.
- Objectives: To enable students to understand how to build AI systems that make independent decisions.
- Learning Outcomes: Able to design and implement reinforcement learning algorithms to solve problems such as games or robot control.
- Prerequisites : AI 301 and ML 302

- **AIG 402 - Generative AI Applications**

- Theoretical: 30% | Practical: 70%
- Course Description: Practical applications of generative intelligence in various fields, such as poetic text generation, music composition, or game design.
- Objectives: To provide students with practical experience in building creative applications using generative intelligence.

- Learning Outcomes: Able to build an applied project using advanced generative models.
- Prerequisites: AIG 301
- **AIE 402 – Adaptive and Personalized Learning**
 - Theoretical: 50% | Practical: 50%
 - Course Description: It focuses on building educational systems that adapt to the needs of each individual student, and provide personalized content.
 - Objectives: To prepare specialists in designing smart educational systems that adapt to students' performance.
 - Learning Outcomes: Able to build a smart learning system that provides a personalized learning experience.
 - Prerequisites: AIE 301
- **AIH 402 - Predictive Medicine & Diagnostics/**
 - Theoretical: 40% | Practical: 60%
 - Course Description: Focuses on the use of artificial intelligence in predicting the course of diseases, diagnosing medical conditions, and analyzing electronic health records.
 - Objectives: To prepare specialists in the use of artificial intelligence to improve diagnosis and treatment.
 - Learning Outcomes: Able to build predictive models for medical analysis.
 - Prerequisites: ML 302 and CS 305
- **AIF 402 - AI in Financial Foresight**
 - Theoretical: 40% | Practical: 60%
 - Course Description: Use of artificial intelligence in forecasting financial markets, identifying investment trends, and analyzing risks.
 - Objectives: To prepare specialists in the use of artificial intelligence in financial forecasting.
 - Learning Outcomes: Able to build predictive models of financial markets.
 - Prerequisites: AIF 301

Fifth: Specialization Tracks (Third and Fourth Year)

Beginning in the third year, the program offers specialized tracks to enable students to delve deeper into specific areas of artificial intelligence. Each track includes four courses taught sequentially. The tracks and their courses are as follows:

Certainly, here is a complete list of all eleven specialization tracks available in the study plan, with a brief description of each course within each track.

1- Computer Vision Track

- **CV 301 - Principles of Computer Vision:** Introduction to Computational Image Formation and the Geometric Foundations of Imaging and Image Analysis. Examines methods of feature detection and pattern recognition in images.
- **CV 302 - Image Processing and Pattern Recognition:** Goes deep into image processing techniques (filtering, enhancing) and automatic recognition of shapes and objects in images.
- **CV 303 - Computer Vision Using Deep Learning:** Application of Convolutional Neural Networks in Vision Tasks such as Image Classification, Object Detection, and Segmentation, with a Focus on Network Architectures and Software Training.
- **CV 304 - Advanced Computer Vision Applications:** Applied Projects in Medical Imaging, Industrial Vision, and Augmented Reality.

2 - Natural Language Processing Pathway

- **NLP 301 - Introduction to NLP:** An introduction to word processing techniques and natural language, covering statistical models, text analysis, and basic concepts for building a system that generates texts.
- **NLP 302 - Machine Learning Applications in NLP:** Apply machine learning algorithms to language problems, such as text classification and automatic task response.
- **NLP 303 - Text Neural Networks:** A Study of Advanced Models such as Embedding Models, Recurrent Neural Networks, and Metamorphosed Networks for Language Processing and Comprehension.
- **NLP 304 - Practical NLP Projects:** Building Chatbots, Sentiment Analysis, and Machine Translation as Applied Models.

3 - Robotics and Intelligent Systems Track

- **ROB 301 - Introduction to Robotics and Intelligent Systems:** A Study of the Fundamentals of Robotics, including Types of Industrial and Mobile Robots, and Their Operating Environments.
- **ROB 302 - Kinetic Modeling and Control:** The study of motion and dynamics of robotic systems, pathway generation and motion control techniques.
- **ROB 303 - Programming Robots and Intelligent Systems:** Application of Industrial Robot Programming, with the Study of Sensors and Autonomous Control.
- **ROB 304 – Artificial Intelligence Applied to Robots:** Artificial Intelligence Algorithms Used in Robots and Autonomous Devices.

4 - Artificial Intelligence in Healthcare (AI in Healthcare) Track

- **AIH 301 – Health Data and Machine Learning:** Processing Medical Data to Build Predictive Models in Health Diagnosis and Decision-Making.
- **AIH 302 - AI Medical Imaging:** The use of deep learning and image analysis for medical diagnostics, such as the detection of tumors in radiographs.
- **AIH 303 - Health Information Systems:** Concepts of Health Data Storage and Retrieval, Privacy Protection and Data Integrity.
- **AIH 304 - Personalized Treatments and Health Prediction:** Applications of AI in personalized medicine, such as drug selection and disease course prediction.

5 - Generative AI Track

- **GEN 301 - Generative Adversarial Networks (GANs):** An introduction to generative AI concepts using adversarial networks (GAN), where the data generation model is learned through the competition of two networks.
- **GEN 302 - Generative Machine Learning:** Study of text and image generation models, including large language models and unsupervised learning techniques.
- **GEN 303 - Practical Applications of Generative Intelligence:** Practical applications for creating content (images, video, and text) using advanced models.
- **GEN 304 - Advanced Generative Projects:** A research or application project that uses generative techniques to solve a creative problem, such as designing a toy using generative intelligence.

6 - AI Ethics Track

- **ETH 301 - Principles of Ethics in Artificial Intelligence:** A theoretical framework for the principles of ethics in artificial intelligence, including values (e.g., interest and harm), responsibility, transparency, and data protection.
- **ETH 302 - Data Privacy and Law:** Studying policies and legislation related to data privacy and artificial intelligence, such as GDPR and anti-bias frameworks.
- **ETH 303 - Artificial Intelligence and Social Responsibility:** Analyzing Automation Issues and the Impact of AI on the Labor Market, with Methods for Social Impact Assessment and Risk Response.
- **ETH 304 - Ethical and Applied Projects:** Case Studies and Applied Project to Evaluate an AI System from an Ethical Perspective.

- 7 Human-Computer Interaction Pathway and Artificial Intelligence (HCI/AI Interaction)

- **HCI 301 - Fundamentals of Human-Computer Interaction:** Principles of User Interface Design and Ease of Use, including Psychological and Cognitive Studies.

- **HCI 302 - User Experience and AI Interfaces:** Designing user interfaces for intelligent systems that interact with users, with attention to user experience (UX) and feedback mechanisms.
- **HCI 303 - Virtual and Augmented Reality:** Studying Mixed Reality Applications in Interactive Interfaces, and Programming Interactive 3D Environments.
- **HCI 304 - Interface Design Projects:** Design and evaluation of an AI-based software interface or application, with usability tests.

- 8 Machine Learning Track

- **ML 301 - Machine Learning 1:** Introduction to Machine Learning as a Scope that Connects Statistics and Computer Science. It focuses on developing algorithms for pattern detection and model learning from big data.
- **ML 302 - Deep Learning:** Specialized in deep neural networks, where deep learning is defined as a branch of machine learning that focuses on learning complex representations.
- **ML 303 - Data Mining and Machine Learning:** This course introduces the fundamentals of extracting knowledge from large databases using statistical algorithms.
- **ML 401 - Reinforcement Learning:** Focuses on reinforcement learning techniques, where a software agent learns how to make decisions in a complex environment through reward and punishment.
- **ML 402 - Unsupervised Learning:** The study of machine learning algorithms that run on uncategorized datasets, such as clustering and dimensionality reduction algorithms.
- **ML 403 - Advanced Deep Learning:** Covers advanced topics in deep neural networks, such as image convolutional neural networks and text repetitive networks.

9 - Cybersecurity Track

- **SEC 301 - Cybersecurity Fundamentals:** An introduction to information security and cyber protection concepts. Discusses basic encryption, access control, firewalls, and protecting networks from common attacks.
- **SEC 302 - Network Security:** Focuses on network security principles, including data protection in transportation, access control, and firewalls, with a focus on practical applications in the design of secure networks.
- **SEC 303 - Encryption and Information Security:** A deeper study of encryption concepts, including symmetric and asymmetric encryption, digital signature mechanisms, and infrastructure security.
- **SEC 304 - Ethical Hacking and Penetration Testing:** Focuses on the practical side of cybersecurity by teaching ethical hacking techniques, penetration testing tools, and attack protection techniques.
- **SEC 401 – Secure Systems Programming:** Focuses on the practice of secure programming and how to write code that is resistant to attacks.

- **SEC 402 - Cybersecurity Law and Ethics:** The study of laws and legislation related to cybersecurity, such as data protection and privacy laws, and legal liability in cybercrimes.

- 10 Artificial Intelligence in Management and Future Foresight (AIF)

- **AIF 301 - Artificial Intelligence in Management:** The application of AI technologies in management and business areas, such as financial data analysis and strategic decision-making.
- **AIF 401 - Financial Data Analysis:** Focuses on the use of artificial intelligence in forecasting financial markets, identifying investment trends, and analyzing risks.
- **AIF 402 - Artificial Intelligence in Financial Foresight:** The use of artificial intelligence in forecasting financial markets, identifying investment trends, and analyzing risks.

11 - Artificial Intelligence in Education (AIE) Track

- **AIE 301 - Artificial Intelligence in Education:** Focuses on the application of AI in education, such as designing intelligent educational systems, and analyzing educational data.
- **AIE 401 - Educational Data Analytics:** Focuses on educational data analysis techniques, such as data mining and predictive learning.
- **AIE 402 - Adaptive and Personalized Learning:** Focuses on building learning systems that adapt to each student's needs individually, and provide personalized content.

Sixth: The Matrix of Distribution of Courses on Tracks

The table below shows the distribution of the courses across the seven specialized tracks ("X" refers to the course affiliation with the respective track):

Rapporteur	Computer Vision	Natural Language Processing	Robotics and intelligent systems	Ethics of Artificial Intelligence	Human-Machine Interaction	Generative AI	Intelligence in Education	Intelligence in Health care	Intelligence in Management	Machine Learning	Cybersecurity
CV 301	X										
CV 302	X										
CV 303	X										
NLP 301		X									
NLP 302		X									
NLP 303		X									
ROB 301			X								

[illegible]

SEC 303											X
SEC 304											X
SEC 401											X
SEC 402											X

This distribution shows that each specialized course follows only one track, allowing the student to specialize in the field of their choice in depth.

We can write the specialization tracks as follows:

1. **Computer Vision** CV 301, CV 302, CV 303, CV 304 :
2. **Natural Language Processing** : NLP 301, NLP 302, NLP 303, NLP 304
3. **Robots** : ROB 301, ROB 302, ROB 303, ROB 304
4. **Artificial Intelligence in Healthcare** : AIH 301, AIH 302, AIH 401, AIH 402
5. **Generative AI** AIG 301, GEN 302, GEN 303, AIG 402 :
6. **AI Ethics** : ETH 301, ETH 302, ETH 303, ETH 304
7. **Human-Computer Interaction** HCI 301, HCI 302, HCI 303, HCI 304:
8. **Artificial Intelligence in Education** : + AIE 301, AIE 401, AIE 402 Elective Course
9. **AI/Finance** AIF 301, AIF 401, AIF 402, : Elective Course

Seventh: Articles and their Prerequisites

The table below shows the subjects and their prerequisites, if any, for each subject and for each year separately.

First Year

Prerequisites	Course Name	Course Code
There isn't any	Arabic Communication Skills	GEN 101
There isn't any	English Communication Skills 1	GEN 102
There isn't any	Introduction to Computer Science	CS 101
CS 101 Introduction to Computer Science	Principles of Programming	CS 102

There isn't any	Critical thinking and problem-solving	GEN 103
GEN 102 English Communication Skills 1	English Communication Skills 2	GEN 104
There isn't any	Fundamentals of Mathematics	MATH 101
There isn't any	Discrete Mathematics	MATH 102
CS 102 Principles of Programming	Data Structures	CS 201
There isn't any	Principles of Sustainable Development	GEN 105

Second Year

Prerequisites	Course Name	Course Code
CS 101 Introduction to Computer Science	Computer Architectures	CS 202
MATH 101 Fundamentals of Mathematics	Linear algebra	MATH 201
MATH 101 Fundamentals of Mathematics	Statistics and Probability	MATH 202
CS 201 Data Structures	Computer Algorithms	CS 301
CS 102 Principles of Programming	Software Engineering	CS 302
CS 202 Computer Architectures	Operating Systems	CS 303
CS 202 Computer Architectures	Computer Networks	CS 304
CS 201 Data Structures	Databases	CS 305
CS 301 Computer Algorithms	Introduction to Artificial Intelligence	AI 301
There isn't any	IT Ethics	ETH 101

Third year:

Prerequisites	Course Name	Course Code
MATH 202 Statistics and Probability and CS 102 Programming Principles	Machine Learning 1	ML 301
ML 301 Machine Learning 1	Deep Learning	ML 302
CS 303 Operating Systems or CS 304 Computer Networks	Cybersecurity Fundamentals	SEC 301
CS 304 Computing Networking	Network Security	SEC 302
CS 201 Data Structures and ML 301 Machine Learning 1	Data Mining and Machine Learning	ML 303
ML 301 Machine Learning 1	Natural Language Processing	NLP 301
ML 301 Machine Learning 1	Computer Vision	CV 301
SEC 301 Cybersecurity Fundamentals	Encryption and Information Security	SEC 303
SEC 301 Cybersecurity Fundamentals and SEC 302 Network Security	Ethical Hacking and Penetration Testing	SEC 304
AI 301 Introduction to Artificial Intelligence	Robotics and intelligent systems	ROB 301
ML 302 Deep Learning	Generative Adversarial Networks	AIG 301
ML 301 Machine Learning 1	Artificial Intelligence in Education	AIE 301
CS 305 Databases and ML 301 Machine Learning 1	Artificial Intelligence in Management	AIF 301

Fourth Year

Prerequisites	Course Name	Course Code
CS 301 Computer Algorithms	Graduation Project I	CS 401
CS 302 Software Engineering	Secure Systems Programming	SEC 401
ML 301 Machine Learning 1	Advanced Systems in Artificial Intelligence	AI 401
Complete 100 credit hours	Hands	INT 401
There isn't any	General elective course	EL 401
CS 401 Graduation Project I	Graduation Project II	CS 402
SEC 301 Cybersecurity Fundamentals	Cybersecurity Law and Ethics	SEC 402

ML 301 Machine Learning 1	Human-Computer Interaction and Artificial Intelligence	HCI 401
AI 301 Introduction to Artificial Intelligence and ML 302 Deep Learning	Reinforcement Learning	ML 401
AIG 301 Generative Adversarial Networks	Generative Intelligence Applications	AIG 402
AIE 301 Artificial Intelligence in Education	Adaptive and personalized learning	AIE 402
ML 302 Deep Learning and CS 305 Databases	Predictive Medicine and Diagnostics	AIH 402
AIF 301 Artificial Intelligence in Management	Artificial Intelligence in Financial Foresight	AIF 402