**Ajloun National University**  جامعة عجلون الوطنية

# Faculty of Information Technology

## Department of
## Computer Science

## Study Plan for the Bachelor's Degree
## in Computer Science
## Academic year 2025/2026

## Vision

Achieving academic and research excellence to support society with practical solutions in the field of computer science that are compatible with the needs of the labor market, taking into account the application of local and international quality standards.

## Mission

Providing leaders, professional programmers, and researchers in computer science and computer technology, creating a distinguished scientific and applied academic environment and an advanced, renewable study program based on labor market requirements and the latest research in the field of computer science, and developing human resources to ensure highly qualified academic outputs that provide the local community with graduates armed with skills compatible with. Local and international labor market needs.

## Goals

1) Training qualified leaders: Developing students to become qualified leaders in the field of computer science, distinguished by technical and leadership skills.

2) Developing programming skills: Developing students' programming skills, enabling them to design and develop effective programming solutions.

3) Promoting scientific research: Encouraging professors and students to participate in scientific research activities and developing the field of computer science.

4) Updating the study program: regularly improving and updating the study program to keep it in line with technological progress and labor market needs.

5) Promoting interaction with the community: Encouraging interaction with the local community and industry by offering opportunities for training and industrial cooperation.

6) Develop critical thinking skills: Develop students' critical and analytical thinking skills in the field of computer science.

7) Achieving a balance between theory and practice: It aims to achieve an effective balance between providing theoretical basics and enhancing applied experience.

8) Improving graduates' readiness for the labor market: It seeks to develop students' skills and improve their readiness to enter the labor market by integrating course content with the needs of industry and the labor market.

# Learning Outcomes

## Knowledge

the knowledge of how to use computer principles to comprehend, apply, and analyze mathematical problems and find appropriate solutions.

the knowledge about various programming language methodologies.

the knowledge about the design, internal structure and organization, core components, and different operating systems of computers.

the knowledge about the levels of building databases, software development, networking, and understanding the fundamentals of their security.

the knowledge about the principles of operating systems and their functioning mechanisms

## Skills

Develop a skill in analysing and understanding mathematical problems and utilizing mathematical concepts in algorithm analysis.

Develop a skill in using various programming languages and applying them in creating computer applications.

Develop a skill in verifying the correctness and reliability of software.

Develop a skill in developing information systems and databases.

Develop a skill in designing logical circuits of various types.

## Competencies

Commitment to ethics and professional standards in computer science and working effectively as a member or team leader.

Ability to analyze, design, build, and develop effective and reliable computer programs within the required user standards.

Ability to keep pace with continuous development and change in computer science, programming languages, and operating systems.

## Contents of the Study Plan

The study plan for the bachelor's degree in computer science of (132) credit hours distributed as follows:

**Certified On Campus learning (1+1, An hour and a half of on campus learning + one half hour of campus learning).**
**Certified Electronic (1+1, An hour and a half synchronous Electronic + campus learning).**
**Certified Blended (1+1, An hour and a half synchronous Blended + campus learning).**

| Number | Type of Requirement | Credit Hours | percentage% |
|---|---|---|---|
| First | University Requirements | 27 | 20.45% |
| Second | Faculty Requirements | 18 | 13.64 % |
| Third | Supportive Requirements | 09 | 06.82 % |
| Fourth | Department Compulsory Requirements | 69 | 52.27 % |
| | Department Elective Requirements | 09 | 06.82 % |
| Total | | 132 | 100% |

## University Coding System

| Faculty Code | Department Code | ( Level Year) | Knowledge Area | Course sequence |
|---|---|---|---|---|
| 3 | 11 | | | |

0 Remedial
1 First
2 Second
3 Third
4 Fourth

## Knowledge Area

| Knowledge Number | Knowledge Area | Number of Credit Hours |
|:---:|:---:|:---:|
| 0 | **Programming** | 21 |
| 1 | **Computer Science and algorithms** | 12 |
| 2 | **Main Computer Components** | 12 |
| 3 | **Networks** | 3 |
| 4 | **Applications and Information Science** | 9 |
| 5 | **Intelligent Systems** | 3 |
| 6 | **Special topics in in computer science** | 6 |
| 7 | **Graduation Project** | 3 |
| 8 | **Field Training** | 3 |

# Ajloun National University    جامعة عجلون الوطنية

## First: University Requirements (27) Credit Hours

### 1.  University Compulsory Requirement (12) Credit Hours

| Learning Type | | | Course code | Course Name | Course activities | Activities Hours | Credit Hour | Prerequisite |
|---|---|---|---|---|---|---|---|---|
| Electronic | Blended | On | | | | | | |
| | √ | | 704107 | Entrepreneurship and Innovation | Theory | 1 | 1 | |
| | √ | | 704109 | Leadership and Social Responsibility | Theory | 1 | 1 | |
| | √ | | 704116 | Life Skills | Theory | 1 | 1 | |
| √ | | | 704117 | English Language Skills (1) | Theory | 2 | 2 | 714099 |
| | √ | | 704118 | Arabic Language Skills (1) | Theory | 2 | 2 | 704099 |
| | √ | | 704119 | National Culture | Theory | 2 | 2 | - |
| √ | | | 704200 | Military Science | Theory | 3 | 3 | - |

### 2.  University Elective Requirements   (15) Credit Hours

| Learning Type | | | Course code | Course Name | Course activities | Activities Hours | Credit Hour | Prerequisite |
|---|---|---|---|---|---|---|---|---|
| Electronic | Blended | On | | | | | | |
| | √ | | 201101 | Law in our Lives | Theory | 3 | 3 | |
| | √ | | 202132 | Human rights | Theory | 3 | 3 | |
| | √ | | 401100 | Principles of Administration | Theory | 3 | 3 | |
| | | √ | 704103 | Contemporary International and Arabic Issues | Theory | 3 | 3 | |
| √ | | | 704104 | Islamic Culture | Theory | 3 | 3 | - |
| | √ | | 704108 | Integrity and Transparency | Theory | 3 | 3 | |
| | √ | | 704110 | Digital Culture | Theory | 3 | 3 | |
| | √ | | 704112 | Arabic language skills (2) | Theory | 3 | 3 | 704118 |
| | | √ | 704113 | The Art of Elocution and Dialogue | Theory | 3 | 3 | |
| | √ | | 704115 | Development and Family Planning in Islam | Theory | 3 | 3 | |
| √ | | | 701140 | Arabic Library and Dictionaries | Theory | 3 | 3 | - |
| | √ | | 704141 | History of Jerusalem | Theory | 3 | 3 | |
| | √ | | 704151 | Computer skills (1) | Theory | 3 | 3 | 724099 |
| | √ | | 704152 | Computer skills (2) | Theory | 3 | 3 | 704151 |
| | | √ | 404132 | Principles of Islamic Economics | Theory | 3 | 3 | |
| | √ | | 704172 | Sports and Health | Theory | 3 | 3 | |
| | √ | | 704132 | Traffic safety | Theory | 3 | 3 | |

## Second: Faculty Requirements (18) Credit Hours

| Electronic | Blended | On | Course code | Course Name | Course activities | Activities Hours | Credit Hour | Prerequisite |
|---|---|---|---|---|---|---|---|---|
| √ | | | 311100 | Introduction to Computer Programming | Theory | 3 | 3 | -- |
| | √ | | 313160 | Introduction to Software Engineering | Theory | 3 | 3 | -- |
| | | √ | 314121 | Introduction to cyber security | Theory | 3 | 3 | |
| | | √ | 315117 | Introduction to Artificial Intelligence | Theory | 3 | 3 | 311100 |
| | | √ | 311101A | Programming Language (1) | Theory | 2 | 2 | 311100 |
| | | √ | 311101L | Lab of Programming Language (1) | Practical | 2 | 1 | 311101A |
| | √ | | 311178 | English Language Information Technology Students | Theory | 3 | 3 | 704117 |

## Third: Supportive Requirements (9) Credit Hours

| Electronic | Blended | On | Course code | Course Name | Course activities | Activities Hours | Credit Hour | Prerequisite |
|---|---|---|---|---|---|---|---|---|
| | √ | | 601131 | Principles of Statistics | Theory | 3 | 3 | - |
| | √ | | 601372 | Numerical Analysis 1 | Theory | 3 | 3 | 601101 |
| | √ | | 601101 | Calculus 1 | Theory | 3 | 3 | -- |

## Fourth: Department Requirements (78) Credit Hours
### 1. Department Compulsory Requirements (69) Credit Hours

| Learning Type | | | Course code | Course Name | Course activities | Activities Hours | Credit Hour | Prerequisite |
|---|---|---|---|---|---|---|---|---|
| Electronic | Blended | On | | | | | | |
| | | √ | 311202A | Object Oriented programming | Theory | 2 | 2 | 311101A |
| | | √ | 311202L | Lab of Object-Oriented programming | Practical | 2 | 1 | 311202A |
| | | √ | 311203A | Java Programming | Theory | 2 | 2 | 311202A |
| | | √ | 311203L | Lab of Java Programming | Practical | 2 | 1 | 311203A |
| | | √ | 311204A | Python Programming Language | Theory | 2 | 2 | 311101A |
| | | √ | 311204L | Lab of Python Programming | Practical | 2 | 1 | 311204A |
| | | √ | 311210 | Discrete Mathematics for Information Technology Students | Theory | 3 | 3 | 601101 |
| | √ | | 311211 | Theory of Computation | Theory | 3 | 3 | 311210 |
| | | √ | 311213A | Data Structures | Theory | 2 | 2 | 311202A |
| | | √ | 311213L | Lab of Data Structures | Practical | 2 | 1 | 311213A |
| | | √ | 311220 | Digital Logic Design | Theory | 3 | 3 | 311100 |
| | √ | | 311240A | Databases | Theory | 2 | 2 | 311100 |
| | | √ | 311240L | Lab of Databases | Practical | 2 | 1 | 311240A |
| √ | | | 311241 | Systems Analysis and Design | Theory | 3 | 3 | 311240A |
| | | √ | 311304A | Internet Application Programming | Theory | 2 | 2 | 311202A |
| | | √ | 311304L | Lab of Internet Application Programming | Practical | 2 | 1 | 311304A |
| | | √ | 311305A | Visual Programming | Theory | 2 | 2 | 311202A |
| | | √ | 311305L | Lab of Visual Programming | Practical | 2 | 1 | 311305A |
| | | √ | 311314 | Algorithms | Theory | 3 | 3 | 311213A |
| | √ | | 311321 | Computer Architecture | Theory | 3 | 3 | 311220 |
| | √ | | 311323 | Microprocessors | Theory | 3 | 3 | 311220 |
| | √ | | 311330 | Computer Networks | Theory | 3 | 3 | 311220 |
| | | √ | 311340A | Database Management Systems | Theory | 2 | 2 | 311240A |
| | | √ | 311340L | Lab of Database Management Systems | Practical | 2 | 1 | 311340A |
| | | √ | 311350A | Artificial Intelligence | Theory | 2 | 2 | 311314 |
| | | √ | 311350L | Lab of Artificial Intelligence | Practical | 2 | 1 | 311350A |
| | | √ | 311361 | Data Mining | Theory | 3 | 3 | 311314 |
| | √ | | 311422 | Operating Systems | Theory | 3 | 3 | 311314 |
| | √ | | 314468 | Information Security and Network | Theory | 3 | 3 | 311330 |
| √ | | | 311470 | Graduation Project | Practical | 6 | 3 | Pass 90 hrs |
| | | √ | 311480 | Field Training | Practical | 6 | 3 | Pass 90 hrs |
| | √ | | 311341 | Operation Research | Theory | 3 | 3 | 311210 |

## 2. Department Elective Requirements (9) Credit Hours

| Electronic | Blended | On | Course code | Course Name | Course activities | Activities Hours | Credit Hour | Prerequisite |
|---|---|---|---|---|---|---|---|---|
| | √ | | 311160 | Computer Ethics | Theory | 3 | 3 | - |
| | √ | | 311261A | Multimedia | Theory | 2 | 2 | 311101 |
| | | √ | 311261L | Lab of Multimedia | Practical | 2 | 1 | 311261A |
| | √ | | 311312 | Complier Design | Theory | 3 | 3 | 311211 |
| | √ | | 311431 | Wireless Network | Theory | 3 | 3 | 311330 |
| | √ | | 311360A | Website Design | Theory | 2 | 2 | 311101A |
| | | √ | 311360L | Lab of Website Design | Practical | 2 | 1 | 311360A |
| | √ | | 311362 | Simulation and Modeling Methods | Theory | 3 | 3 | 311241 |
| | | √ | 311402A | Network Programming | Theory | 2 | 2 | 311330 |
| | | √ | 311402L | Lab of Network Programming | Practical | 2 | 1 | 311402A |
| | | √ | 311404A | Game Programming | Theory | 2 | 2 | 311305A |
| | | √ | 311404L | Lab of Game Programming | Practical | 2 | 1 | 311404A |
| | √ | | 311417 | Pictorial Representation of Information | Theory | 3 | 3 | 311314 |
| | √ | | 311452 | Expert system | Theory | 3 | 3 | 311350A |
| | | √ | 311462 | Computer Graphics | Theory | 3 | 3 | 311202A |
| | √ | | 311463 | Image Processing | Theory | 3 | 3 | 311204A |
| | √ | | 311464 | Special Topics in Computer Science | Theory | 3 | 3 | Pass 60hrs |
| | | √ | 311465A | Mobile Phone Programming | Theory | 2 | 2 | 311305A |
| | | √ | 311465L | Lab of Mobile Phone Programming | Practical | 2 | 1 | 311465A |

## First Year

### First Semester

| Course Number | Course Name | Course activities | Activities Hours | Credit Hours* | Prerequisite |
|---|---|---|---|---|---|
| 311100 | Introduction to Computer Programming | Theory | 3 | 3 | - |
| 313160 | Introduction to Software Engineering | Theory | 3 | 3 | - |
| 314121 | Introduction to cyber security | Theory | 3 | 3 | - |
| 601101 | Calculus 1 | Theory | 3 | 3 | - |
| - | University Compulsory Requirement | Theory | 2 | 2 | - |
| - | University Compulsory Requirement | Theory | 1 | 1 | - |
| **Total** | | | | **15** | |

### Second Semester

| Course Number | Course Name | Course activities | Activities Hours | Credit Hours* | Prerequisite |
|---|---|---|---|---|---|
| 315117 | Introduction to Artificial Intelligence | Theory | 3 | 3 | 311100 |
| 311101A | Programming Language (1) | Theory | 2 | 2 | 311100 |
| 311101L | Lab of Programming Language (1) | Practical | 2 | 1 | 311101L |
| 311178 | English Language Information Technology Students | Theory | 3 | 3 | 704117 |
| 311220 | Digital Logic Design | Theory | 3 | 3 | 311100 |
| 311240A | Databases | Theory | 2 | 2 | 311100 |
| 311240L | Lab of Databases | Practical | 2 | 1 | 311240A |
| - | University Compulsory Requirement | Theory | 1 | 1 | - |
| - | University Compulsory Requirement | Theory | 2 | 2 | - |
| **Total** | | | | **18** | |

أُقرت بقرار مجلس العمداء رقم (6/2025-2026) في جلسته الأولى المنعقدة بتاريخ 2025/10/6.

## Second Year

### First Semester

| Course Number | Course Name | Course activities | Activities Hours | Credit Hours* | Prerequisite |
|---|---|---|---|---|---|
| 311202A | Object-Oriented Programming | Theory | 2 | 2 | 311101A |
| 311202L | Lab of Object-Oriented Programming | Practical | 2 | 1 | 311202A |
| 311204A | Python Programming Language | Theory | 2 | 2 | 311101A |
| 311204L | Lab of Python Programming Language | Practical | 2 | 1 | 311204A |
| 311241 | Systems Analysis and Design | Theory | 3 | 3 | 311240A |
| 601131 | Principles of Statistics | Theory | 3 | 3 | - |
| - | University Compulsory Requirement | Theory | 2 | 2 | - |
| - | University Compulsory Requirement | Theory | 1 | 1 | - |
| - | University Elective Requirement | Theory | 3 | 3 | - |
| **Total** | | | **18** | | |

### Second Semester

| Course Number | Course Name | Course activities | Activities Hours | Credit Hours* | Prerequisite |
|---|---|---|---|---|---|
| 311203A | Java Programming | Theory | 2 | 2 | 311202A |
| 311203L | Lab of Java Programming | Practical | 2 | 1 | 311203A |
| 311211 | Theory of Computation | Theory | 3 | 3 | 311210 |
| 311213A | Data Structures | Theory | 2 | 2 | 311202A |
| 311213L | Lab of Data Structures | Practical | 2 | 1 | 311213A |
| 311330 | Computer Networks | Theory | 3 | 3 | 311220 |
| 311210 | Discrete Mathematics for Information Technology Students | Theory | 3 | 3 | 601101 |
| - | University Elective Requirement | Theory | 3 | 3 | - |
| **Total** | | | **18** | | |

أُقرت بقرار مجلس العمداء رقم (2025/6-2026) في جلسته الأولى المنعقدة بتاريخ 2025/10/6.

# Third Year

## First Semester

| Course Number | Course Name | Course activities | Activities Hours | Credit Hours* | Prerequisite |
|---|---|---|---|---|---|
| 311304A | Internet Application Programming | Theory | 2 | 2 | 311202A |
| 311304L | Lab of Internet Application Programming | Practical | 2 | 1 | 311304A |
| 311305A | Visual Programming | Theory | 2 | 2 | 311202A |
| 311305L | Lab of Visual Programming | Practical | 2 | 1 | 311305A |
| 311314 | Algorithms | Theory | 3 | 3 | 311213A |
| 311340A | Database Management Systems | Theory | 2 | 2 | 311240A |
| 311340L | Lab of Database Management Systems | Practical | 2 | 1 | 311340A |
| 311321 | Computer Architecture | Theory | 3 | 3 | 311220 |
| - | Department Elective Requirement | | | 3 | - |
| **Total** | | | | **18** | |

## Second Semester

| Course Number | Course Name | Course activities | Activities Hours | Credit Hours* | Prerequisite |
|---|---|---|---|---|---|
| 311350A | Artificial Intelligence | Theory | 2 | 2 | 311314 |
| 311350L | Lab of Artificial Intelligence | Practical | 2 | 1 | 311350A |
| 601372 | Numerical Analysis 1 | Theory | 3 | 3 | 601101 |
| 311323 | Microprocessors | Theory | 3 | 3 | 311220 |
| 311341 | Operation research | Theory | 3 | 3 | 311210 |
| - | University Elective Requirement | Theory | 3 | 3 | - |
| **Total** | | | | **15** | |

# Ajloun National University

جامعة عجلون الوطنية

## Fourth Year

### First Semester

| Course Number | Course Name | Course activities | Activities Hours | Credit Hours* | Prerequisite |
|---|---|---|---|---|---|
| 311422 | Operating Systems | Theory | 3 | 3 | 311314 |
| 311361 | Data Mining | Theory | 3 | 3 | 311314 |
| 314468 | Information Security and Network | Theory | 3 | 3 | 311330 |
| - | Department Elective Requirement | Theory | 3 | 3 | - |
| - | University Elective Requirement | Theory | 3 | 3 | - |
| **Total** | | | | **15** | |

### Second Semester

| Course Number | Course Name | Course activities | Activities Hours | Credit Hours* | Prerequisite |
|---|---|---|---|---|---|
| 311470 | Graduation Project | Theory | 6 | 3 | Pass 90 hrs. |
| 311480 | Field Training | Theory | 6 | 3 | Pass 90 hrs. |
| - | University Compulsory Requirement | Theory | 3 | 3 | - |
| - | University Elective Requirement | Theory | 3 | 3 | - |
| - | Department Elective Requirement | Theory | 3 | 3 | - |
| **Total** | | | | **15** | |

## Courses Description

## Faculty Compulsory Requirements ( 18  Credit Hours)

| | |
|---|---|
| **Course Number** | : 311100 |
| **Course Title** | : **Introduction to Computer Programming** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : - |

**General concepts of problem-solving, program concepts, program flowcharts, variables and constants, data types, arithmetic and logical operations, solving problems using decision-making statements, solving problems using repetition statements, solving problems using logical case statements, programming functions, lists and arrays, linked sequences, sorting lists.**

| | |
|---|---|
| **Course Number** | : 311101A |
| **Course Title** | : **Programming Language 1** |
| **Credit Hours** | :  2 |
| **Prerequisites** | : 311100 |

**Programming Fundamentals, programming languages and their evolution, principles of programming in C++, variables and naming conventions, data types, arithmetic and logical operations, control statements, repetition statements, functions, arrays, introduction to object-oriented programming**.

| | |
|---|---|
| **Course Number** | : 311101L |
| **Course Title** | : **Lab of Programming Language 1** |
| **Credit Hours** | :  1 |
| **Prerequisites** | : 311101A |

**This Lab provides students with a foundational introduction to programming concepts using the C++ language. Students will learn the basic principles of structured and object-oriented programming, including variables, data types, operators, control structures, functions, and arrays. The course focuses on practical laboratory exercises to develop applied programming skills and enhance problem-solving abilities.**

| Course Number | : 313160 |
|---|---|
| **Course Title** | : **Introduction To Software Engineering** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : - |

**planning and managing software projects, software requirements specification and processes, system modelling, preliminary software modelling, system architecture design, various methods of system and software design such as object-oriented design and distributed design, CASE tools for software engineering.**

| Course Number | : 311178 |
|---|---|
| **Course Title** | : **English Language Information Technology Students** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 704117 |

**reading, writing, and grammar) with a focus on IT-related terminology and concepts. Common topics include sentence patterns, tense rules, conditional sentences, the passive voice, and computer-related conversations, with the goal of enabling students to communicate effectively in their academic and professional environments.**

| Course Number | : 315117 |
|---|---|
| **Course Title** | : **Introduction to Artificial Intelligence** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 311100 |

**Basic concepts in the field of artificial intelligence, a historical overview of the development of artificial intelligence and its most prominent milestones, the most important contemporary applications of this technology in daily life, including digital assistants, recommendation systems, and intelligent systems. Machine learning, neural networks, natural language processing, and computer vision are covered. A simplified explanation of advanced concepts such as knowledge representation, logical reasoning, reinforcement learning, and the basics of robotics and interactive systems. The role of artificial intelligence in business and society, with a focus on vital sectors such as health, industry, education, and smart cities. Ethical issues related to the use of artificial intelligence, including privacy and bias issues.**

| | |
|---|---|
| **Course Number** | : 314121 |
| **Course Title** | : **Introduction to Cybersecurity** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : - |

**Provides a comprehensive study of information systems security principles and practices. Security topics and threats, vulnerabilities and countermeasures, attacks and security services (confidentiality, integrity, availability, non-repudiation, and accountability), symmetric and asymmetric key cryptography, user authentication, access control, social engineering, security in operating systems, web security: SSL, TLS, email security (PGP.MOME), malware, and firewalls. Apply these concepts to protect computing infrastructure from threats.**

## Supportive Requirements (9 Credit Hours):

| | |
|---|---|
| **Course Number** | : 601101 |
| **Course Title** | : **Calculus 1** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : - |

Functions, exponential and logarithmic functions, limits and continuity, differentiation, rules of differentiation, tangents and normals, the Mean Value Theorem and its applications, indeterminate forms ($0/0$, $\infty/\infty$), horizontal and vertical asymptotes, local extreme values, concavity, graphing curves, definite integrals, the Fundamental Theorem of Calculus, indefinite integrals, integration by substitution, applications of definite integrals (area, volumes, volumes of revolution).

| | |
|---|---|
| **Course Number** | : 601131 |
| **Course Title** | : **Principles of Statistics** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : - |

Definition and uses of statistics, types of data and its collection methods, descriptive statistics: organizing and presenting data, summarizing data with tables, graphs, and numerical measures, measures of central tendency (mean, median, mode), measures of dispersion (range, quartiles and interquartile range, percentiles and percentile range, variance, and standard deviation), outliers, standard scores, Chebyshev's rule and the empirical rule, linear transformations in preparing descriptive statistics, definition of probability and its uses, elements of probability, counting methods, conditional probability, random variables, expectation and variance, computing probabilities and areas under the curves of discrete random distributions (binomial distribution) and continuous random distributions (normal distribution), Central Limit Theorem.

# جامعة عجلون الوطنية

**Ajloun National University**

| | | |
|---|---|---|
| **Course Number** | : | 601372 |
| **Course Title** | : | **Numerical Analysis 1** |
| **Credit Hours** | : | 3 |
| **Prerequisites** | : | 601101 |

**Mathematical preliminaries and error analysis, numerical methods for solving single-variable equations, numerical solutions for differentiation and integration, direct numerical methods for linear systems**

## Compulsory Department Requirements ( 78 Credit Hours):

| | |
|---|---|
| **Course Number** | : 311202A |
| **Course Title** | : **Object-Oriented Programming** |
| **Credit Hours** | : 2 |
| **Prerequisites** | : 311101A |

**Object-oriented programming concepts and models, a review of control structures, data types, functions, arrays, and pointers, data abstraction, encapsulation and information hiding, class properties and associated operations, inheritance, and polymorphism, templates.**

| | |
|---|---|
| **Course Number** | : 311202L |
| **Course Title** | : **Lab of Object-Oriented Programming** |
| **Credit Hours** | : 1 |
| **Prerequisites** | : 311202A |

**This Lab provides students with practical experience in object-oriented programming concepts and paradigms using C++. Students begin by reviewing programming fundamentals such as control structures, data types, functions, arrays, and pointers, and then gradually apply them in the context of object-oriented design. Through practical labs, students implement fundamental principles such as data abstraction, encapsulation, inheritance, and polymorphism. This gives students a deeper understanding of how object-oriented programming supports concepts such as program organization, reusability, and program reliability.**

| | |
|---|---|
| **Course Number** | : 311203A |
| **Course Title** | : **Java Programming** |
| **Credit Hours** | : 2 |
| **Prerequisites** | : 311202A |

**An introduction to programming languages, problem-solving steps, an introduction to Java, fundamentals of programming in Java, variable types, arithmetic and logical operations, control and loop statements, functions, passing data to procedures, arrays (one-dimensional and two-dimensional) and their applications such as sorting and searching, basic concepts of object-oriented programming including classes and objects in Java.**

| Course Number | : 311203L |
|---|---|
| **Course Title** | : **Lab of Java Programming** |
| **Credit Hours** | : 1 |
| **Prerequisites** | : 311203A |

Training on creating programming functions using the Java language, which may include converting between types, arithmetic and logical operations, making decisions using conditional statements, various repetition techniques such as for, while, and do-while loops, creating functions for code reuse, building interactive programs, performing calculations, and handling user input effectively.

| Course Number | : 311204A |
|---|---|
| **Course Title** | : **Python Programming Language** |
| **Credit Hours** | : 2 |
| **Prerequisites** | : 311101A |

Introduction to the Python programming language covering data types, control statements, loop statements, functions, arrays, an introduction to object-oriented programming, and graphical applications based on user interfaces.

| Course Number | : 311204L |
|---|---|
| **Course Title** | : **Lab of Python Programming Language** |
| **Credit Hours** | : 1 |
| **Prerequisites** | : 311204A |

Python programming training, training on creating programming functions using the Python language that may include conversion between types, arithmetic and logical operations, making decisions using conditional statements, and various repetition techniques such as for, while, and do-while loops, creating functions to reuse code, to build interactive programs, perform calculations, and handle user input effectively. Training is also provided on object-oriented programming and graphical interfaces using Tkinter.

| | |
|---|---|
| **Course Number** | : 311210 |
| **Course Title** | : **Discrete Mathematics for Information Technology Students** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 601101 |

**Introduction to logic, propositional logic, conventional and unconventional proofs, sets, set operations, functions, countable and uncountable sets, integers and remainder arithmetic, sequences, series, mathematical induction, recursion, counting, permutations,**

| | |
|---|---|
| **Course Number** | : 311211 |
| **Course Title** | : **Theory of Computation** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 311210 |

**The concept of languages and their types and representation methods, language rules and their uses in generating formal languages, machines that accept formal languages, regular languages and regular expressions, regular grammars, finite automata including DFA (Deterministic Finite Automata), NFA (Nondeterministic Finite Automata), Moore and Mealy machines, context-free grammar rules, deterministic and nondeterministic machines associated with stacks, context-sensitive grammar rules, language and rules for sentence parsing, Turing machine, Chomsky machine, Chomsky normal form, context representation tree.**

| | |
|---|---|
| **Course Number** | : 311213A |
| **Course Title** | : **Data Structures** |
| **Credit Hours** | : 2 |
| **Prerequisites** | : 311202A |

**Basic concepts, algorithm analysis and data representation methods, pointers and string arrays, queues, stacks, circularly linked list structures, linearly linked list structures, multiply linked list structures, tree structures, sorting and searching algorithms.**

| | |
|---|---|
| **Course Number** | : 311213L |
| **Course Title** | : **Lab of Data Structures** |
| **Credit Hours** | : 1 |
| **Prerequisites** | : 311213A |

**This lab provides hands-on experience with the fundamental concepts of data structures and algorithmic analysis. Students will develop a deep understanding of how data is represented, organized, and manipulated in memory, and how these choices affect the efficiency of algorithms. The course focuses on theoretical understanding and practical application of key structures and algorithms used in software development and problem solving.**

| | |
|---|---|
| **Course Number** | : 311220 |
| **Course Title** | : **Digital Logic Design** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 311100 |

**Number systems, binary system, Boolean algebra and basic logic gates, complex circuits, simplification of logic circuits, sequential circuits, flip-flops, registers, counters, memory, logic of transferring information between registers.**

| | |
|---|---|
| **Course Number** | : 311240A |
| **Course Title** | : **Databases** |
| **Credit Hours** | : 2 |
| **Prerequisites** | : 311100 |

**Basic concepts and terminology of databases, database administrator, database management systems. Characteristics and methodologies of databases, three-level architecture of data schema, the entity-relationship model for database description: symbols and concepts. Concepts, constraints, and operations related to the relational model, relational algebra, building a database from entity-relationship models, introduction to SQL language, functional dependencies, simplification of database designs.**

| Course Number | : 311240L |
|---|---|
| **Course Title** | : **Lab of Databases** |
| **Credit Hours** | : 1 |
| **Prerequisites** | : 311240A |

A practical database lab, providing training and hands-on demonstrations of the design, implementation, and management of relational databases. Students will explore basic database concepts and terminology, learn about the components of database management systems, and understand real-world applications of databases across domains. The labs aim to build skills progressively—from creating and manipulating tables in SQL to developing modular database designs based on entity-relationship models. The course includes student project completion.

| Course Number | : 311241 |
|---|---|
| **Course Title** | : **Systems Analysis and Design** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 311240 |

Principles of systems, stages of system development life cycle, system analysis, preliminary investigations and gathering information about the system, feasibility study and cost of building systems, system development, presenting the system design and related activities and constructing data flow diagrams, implementation of system construction, testing and quality assurance, system construction and maintenance, Gantt chart and network diagram.

| Course Number | : 311304A |
|---|---|
| **Course Title** | : **Internet Application Programming** |
| **Credit Hours** | : 2 |
| **Prerequisites** | : 311202A |

This course aims to equip students with advanced issues in designing and implementing websites. Design and implementation of web-based applications, and fully database-driven websites. Advanced server-side programming (e.g., PHP), implementation of advanced server-side programming, and enhancing personal productivity concepts through web authoring. It also covers security, access rights, financial transactions.

| Course Number | : 311304L |
|---|---|
| Course Title | : **Lab of Internet Application Programming** |
| Credit Hours | : 1 |
| Prerequisites | : 311304A |

**This course focuses on designing and programming interactive web applications using HTML, CSS, and JavaScript for the front-end, and Python or ASP.NET for the back-end, as well as designing and implementing websites that are fully SQL-based. Advanced server-side programming (such as PHP) is also included. It aims to enable students to build secure and efficient web applications, with an emphasis on integration, security, and deployment to cloud servers.**

| Course Number | : 311305A |
|---|---|
| Course Title | : **Visual Programming** |
| Credit Hours | : 2 |
| Prerequisites | : 311202A |

**Fundamentals of visual programming language, problem-solving, control and loop statements, language elements, event programming, data types, input and output, subprograms, functions, arrays, records, and file handling, with the practical aspect including the application of these concepts using the C# language.**

| Course Number | : 311305L |
|---|---|
| Course Title | : **Lab of Visual Programming** |
| Credit Hours | : 1 |
| Prerequisites | : 311305A |

**Training in application development using Visual Studio, managing event-driven GUI development using Windows Forms, working with files via System.IO, and connecting to databases using ADO.NET to perform CRUD operations. Emphasis is placed on writing modular, maintainable, and scalable code through incremental, hands-on projects.**

| | |
|---|---|
| **Course Number** | : 311314 |
| **Course Title** | : **Algorithms** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 311213A |

**Design, construction, and analysis of computer algorithms, growth of function values, execution time and efficiency of algorithms, self-recurring relations and their solutions, design and analysis of various sorting algorithms (insertion, merge, quicksort, heapsort), search algorithms in structures (breadth-first search and depth-first search), minimum spanning trees in structures.**

| | |
|---|---|
| **Course Number** | : 311321 |
| **Course Title** | : **Computer Architecture** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 311220 |

**Computer components and types, Central Processing Unit (CPU), instruction sets and formats, addressing methods, stacks, interrupts, CISC and RISC architectures, memory organization, memory hierarchy, methods of connecting memory to the CPU, associative memory, cache memory, memory organization Input and output.**

| | |
|---|---|
| **Course Number** | : 311323 |
| **Course Title** | : **Microprocessors** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 311220 |

**This course covers the fundamental principles of 8086/8088 microprocessor addressing modes, data movements instructions, arithmetic and logic instructions, program control instruction, 8086/8088 hardware specifications, memory interface, basic i/o interface, interrupts, direct memory access.**

| | |
|---|---|
| **Course Number** | : 311330 |
| **Course Title** | : **Computer Networks** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 311220 |

**Concepts and terminology in data communication and computer networks, physical and logical design of computer networks, network architecture, and media used for data transmission in computer networks. The OSI (Open Systems Interconnection) reference model, the TCP/IP reference model, the Physical Layer, the Data Link Layer, the Network Layer, the Transport Layer, the Session Layer, the Presentation Layer, the Application Layer. ALOHA protocol, CSMA protocols, local area networks (LANs), standard protocols, IEEE protocols (Token Ring, Token Bus, Ethernet), fundamentals of the Physical Layer and the Data Link Layer, frame protocols, error detection and correction, routing algorithms, data flow control in networks, congestion control algorithms in networks. Personal computer networks.**

| | |
|---|---|
| **Course Number** | : 311340A |
| **Course Title** | : **Database Management Systems** |
| **Credit Hours** | : 2 |
| **Prerequisites** | : 311240A |

**Introduction to SQL, the Select statement, single-row functions, aggregate functions, displaying data from multiple tables, nested queries, creating a database, creating tables, constraints, basic concepts of PL/SQL, forms, reports.**

| | |
|---|---|
| **Course Number** | : 311340L |
| **Course Title** | : **Lab of Database Management Systems** |
| **Credit Hours** | : 1 |
| **Prerequisites** | : 311340A |

**Training in writing basic and advanced SQL queries, applying functions to manipulate data, and performing bulk data analysis. Joining multiple tables, creating and enforcing constraints to maintain data integrity, and writing nested and related queries to retrieve complex data. Procedural programming using PL/SQL, using variables, control structures, exception handling, and designing forms and reports to support interactive data entry and presentation.**

| | |
|---|---|
| **Course Number** | : 311350A |
| **Course Title** | : **Artificial Intelligence** |
| **Credit Hours** | : 2 |
| **Prerequisites** | : 311314 |

**This course provides an overview of the general principles of artificial intelligence including search strategies, knowledge representation methods, search structures in state space, deductive and attributive logic, search strategies in state spaces, heuristic search, programming search methods, and generative systems. It also covers several research and applied areas in artificial intelligence, such as expert systems, machine learning, intelligent agents, and neural network.**
**data entry and presentation.**

| | |
|---|---|
| **Course Number** | : 311350L |
| **Course Title** | : **Lab of Artificial Intelligence** |
| **Credit Hours** | : 1 |
| **Prerequisites** | : 311350A |

**This course provides an overview of the general principles of artificial intelligence, This Training students on how to run the clips software and training them on (defining facts, managing rules, running the inference engine, monitoring processes, defining templates, saving and restoring work).**

| | |
|---|---|
| **Course Number** | : 311361 |
| **Course Title** | : **Data Mining** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 311314 |

**Concepts and functions of data extraction, data preprocessing, data reduction, mining association rules in large databases, classification and prediction techniques, cluster analysis algorithms, data visualization, extraction of complex data types (text mining, multimedia mining, web mining), data mining languages, data mining applications, new trends, and cluster analysis.**

| Course Number | : | 311422 |
|---|---|---|
| **Course Title** | : | **Operating Systems** |
| **Credit Hours** | : | 3 |
| **Prerequisites** | : | 311314 |

**Definition of an operating system, history of operating system development, types of operating systems, structure and functions of operating systems, processor scheduling, scheduling metrics, process management, threads, memory management, synchronization, critical section problem, deadlock situations, scheduling in multipurpose processors, management of input and output units, file management.**

| Course Number | : | 311470 |
|---|---|---|
| **Course Title** | : | **Graduation project** |
| **Credit Hours** | : | 3 |
| **Prerequisites** | : | Pass 90 hours |

**Students are expected to employ their knowledge and accumulated experience from the courses studied in this program by developing or working on their graduation project.**

| Course Number | : | 311480 |
|---|---|---|
| **Course Title** | : | **Field Training** |
| **Credit Hours** | : | 3 |
| **Prerequisites** | : | Pass 90 hours |

**Students are required to undergo training in either a government or private institution under the supervision of an academic advisor. During this training, students apply what they have learned throughout their university studies. The organization where the student is training fills out a preprepared report by the department to assess the trainee student.**

| Course Number | : | 314468 |
|---|---|---|
| **Course Title** | : | **Information Security and Network** |
| **Credit Hours** | : | 3 |
| **Prerequisites** | : | 311330 |

**Learning the basic principles related to the security of wired and wireless communication networks and computers. Covered topics include explaining network access control protocols, transport layer security in checks, wireless network security, email security, and protocols for verifying and authenticating internet users. Concepts, mechanisms, and application of information security. Teaching methods of attack and defense and designing systems that resist them.**

| Course Number | : | 311341 |
|---|---|---|
| **Course Title** | : | **Operation Research** |
| **Credit Hours** | : | 3 |
| **Prerequisites** | : | 311210 |

**Introduction to mathematical programming, mathematical model, feasible solutions, optimal solutions, types of problems and their solutions, graphical method, simplex method, primal and dual simplex, sensitivity analysis, project scheduling, transportation problems, networks.**

## Elective Department Requirements (9 Credit Hours):

| | |
|---|---|
| **Course Number** | : 3111160 |
| **Course Title** | : **Computer Ethics** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : - |

Ethics of computer use, privacy considerations, introduction to issues of ethics and laws governing computer programmers and users (privacy, viruses, hacking), rights and duties, legal responsibility in using software, violating the privacy of others, introduction to laws related to computers and software, freedom of information and privacy. (Copyright, patents, computer crimes).

| | |
|---|---|
| **Course Number** | : 311261A |
| **Course Title** | : **Multimedia** |
| **Credit Hours** | : 2 |
| **Prerequisites** | : 311101A |

Principles of computer-based multimedia design, concepts and applications, hypermedia, presentation graphics, graphic images, animations, sound, video, data compression, modeling and coding, multimedia on the World Wide Web, and integrated multimedia authoring techniques.

| | |
|---|---|
| **Course Number** | : 311261L |
| **Course Title** | : **Lab of Multimedia** |
| **Credit Hours** | : 1 |
| **Prerequisites** | : 311261A |

Through practical assignments and projects, students will gain practical experience in developing multimedia applications and applying technologies such as data processing, compression, and networking. By the end of the course, students will have a basic understanding of multimedia concepts and the ability to design and develop multimedia systems and applications.

| Course Number | : 311312 |
|---|---|
| **Course Title** | : **Compiler Design** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 311211 |

**This course provides a deep understanding of the techniques and concepts involved in the different stages of software compilation, including lexical analysis, syntactic and morphological analysis and sentence structures, top-down and bottom-up parsing, semantic analysis, and the assembly phase represented in memory allocation and code generation.**

| Course Number | : 311360A |
|---|---|
| **Course Title** | : **Website Design** |
| **Credit Hours** | : 2 |
| **Prerequisites** | : 311101A |

**Basic concepts in internet applications and web browsers, fundamentals of website design, web page languages, implementing web pages (HTML, CSS), fundamentals of XHTML language (texts, styles, colors, images, menus, tables, frames, and markup languages like JavaScript), publishing websites, principles of website evaluation, web page building tools such as FrontPage and Dreamweaver.**

| Course Number | : 311360L |
|---|---|
| **Course Title** | : **Lab of Website Design** |
| **Credit Hours** | : 1 |
| **Prerequisites** | : 311360A |

**Training in writing XHTML and CSS codes to build and format content, and training in writing JavaScript codes to add interactivity, build, format, and publish functional and easy-to-use websites.**

| Course Number | : | 311362 |
|---|---|---|
| **Course Title** | : | **Simulation and Modelling Method** |
| **Credit Hours** | : | 3 |
| **Prerequisites** | : | 314241 |

**Introduction to modeling and simulation, types of simulation, next-event scheduling and active scanning. Types of oriented operations ABC method, Random number: concepts and algorithms for generation and testing methods. Random variable: concepts and types of distributions. Optimizing random variables: variance reduction. Collecting observations: concepts, replication, methods, warm-up period, cycling technique, examples of inputs and outputs, fundamentals of GPSS language.**

| Course Number | : | 311402A |
|---|---|---|
| **Course Title** | : | **Network Programming** |
| **Credit Hours** | : | 2 |
| **Prerequisites** | : | 311330 |

**Java input/output streams; Internet addressing; Socket class; Datagram Socket class; basics of communication; protocol specifications, design, and implementation; multi-threaded client/server applications; Java Network Programming API will be used for implementing some practical aspects of networking.**

| Course Number | : | 311402L |
|---|---|---|
| **Course Title** | : | **Lab of Network Programming** |
| **Credit Hours** | : | 1 |
| **Prerequisites** | : | 311402A |

**The Network Programming Lab is a practical course that applies the theoretical concepts of network programming. Students learn how to write programs that communicate over a network using various programming languages and network protocols, with a focus on building and developing client-server network applications, programming network devices, and applying practical concepts of network security.**

| Course Number | : 311404A |
|---|---|
| **Course Title** | : **Game Programming** |
| **Credit Hours** | : 2 |
| **Prerequisites** | : 311305A |

**Theoretical and practical principles of game production using the Unity 3D design engine, development of game concepts: prototypes, testing, reconstruction of ideas, job market roles including: game designer, technical artist, programmer, producer, building complete 3D projects using included knowledge and skills: using a game editor for game development, understanding the components of a game production line, designing effective gameplay levels, programming in C#, and building and running games.**

| Course Number | : 311404L |
|---|---|
| **Course Title** | : **Lab of Game Programming** |
| **Credit Hours** | : 1 |
| **Prerequisites** | : 311404A |

**Its remarkable ability to deliver high-quality graphics, provide a stunning visual experience, and enhance its powerful performance on various mid-range devices. It also offers a wide range of tools and libraries that facilitate the development of virtual reality and augmented reality games, enabling the creation of unique and innovative experiences on mobile phones. It is compatible with multiple platforms, including Android and iOS, helping it reach a large user base.**

| Course Number | : 311431 |
|---|---|
| **Course Title** | : **Wireless Networks** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 311330 |

**Designing computer networks to support computer mobility. Principles of cellular network design. Wireless technologies and protocols. Standards for wireless local area networks. Models of indoor and outdoor mobile networks. System issues such as performance. Ensuring quality of service, reliability, and security in a mobile computing environment. Device protocols and access for mobile networks. Mobile application protocols.**

| | |
|---|---|
| **Course Number** | : 311464 |
| **Course Title** | : **Special Topics in Computer Science** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : Pass 60 hrs |

**Special, modern and advanced topics in the field of computer science are carefully selected and approved by the department.**

| | |
|---|---|
| **Course Number** | : 311417 |
| **Course Title** | : **Pictorial Representation of Information** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 311314 |

**Discovering embedded structures by relying on graphical data representation, which in turn stimulates human cognitive abilities. This course addresses algorithms and systems for visual discovery, comprehension, and analysis of complex data, especially large volumes of data. Graphical representation of information focuses on representing abstract data from various sources such as symbolic, tabular, structural, textual data, and more. Students in this course will learn the principles of graphical representation of information and the methods and systems used. Students will acquire skills and knowledge that help them in designing new and creative methods for information representation.**

| | |
|---|---|
| **Course Number** | : 311452 |
| **Course Title** | : **Expert system** |
| **Credit Hours** | : 3 |
| **Prerequisites** | : 311350 |

**Introduction to expert systems, expert systems programming languages, knowledge base, rule base, knowledge analysis , expert systems architecture , case studies.**

| | | |
|---|---|---|
| **Course Number** | : | 311462 |
| **Course Title** | : | **Computer Graphics** |
| **Credit Hours** | : | 3 |
| **Prerequisites** | : | 311202 |

**This course includes an overview of Computer Graphics applications; Graphics Output Primitives and its attributes; 2D and 3D Geometric Transformations; 2D Viewing and Clipping; Graphical User Interface and its attributes; Introduction to OpenGL programming and its applications; Example applications will be developed in lectures using C++ and OpenGL to demonstrate the techniques being presented.**

| | | |
|---|---|---|
| **Course Number** | : | 311463 |
| **Course Title** | : | **Image Processing** |
| **Credit Hours** | : | 3 |
| **Prerequisites** | : | 311204A |

**Introduction to image processing, introduction to machine vision, the human visual system, image acquisition methods, image enhancement in spatial and frequency domains, color image processing, image compression and analysis, image segmentation, morphological image processing, image restoration, illumination modeling, edge detection methods, binary image processing, computational vision, motion vision, object recognition, aligning object representations, recognizing object postures.**

| | | |
|---|---|---|
| **Course Number** | : | 311465A |
| **Course Title** | : | **Mobile Phone Programming** |
| **Credit Hours** | : | 2 |
| **Prerequisites** | : | 311202A |

**Introduction to Mobile Devices, Mobile Operating Systems, Cross-Platform Applications, Event-Driven Programming, Features and Methods, Building Graphical User Interfaces, Designing Graphical User Interfaces, Prototyping, Evaluation, Implementation, Controls, Tools, Menus, Toolbars, Sounds and Multimedia, Visual Development Environment, Databases and Connectivity.**

| | | |
|---|---|---|
| **Course Number** | : | 311465L |
| **Course Title** | : | **Lab of Mobile Phone Programming** |
| **Credit Hours** | : | 1 |
| **Prerequisites** | : | 311465A |

**The Mobile Programming Lab is a coursework that aims to teach students the fundamentals of smartphone app design, with a focus on development environments such as Android and iOS, and training in programming languages such as Kotlin and Swift, as well as advanced technologies such as user interfaces, services, location, and requirements handling, while applying data engineering principles and security standards.**