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 2023/2024

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.

Ajloun National University   جامعة عجلون الوطنية

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	06	04.55 %
Fourth	Department Compulsory Requirements	69	52.27 %
	Department Elective Requirements	09	06.82 %
Fifth	Elective Free Requirements	03	02.27%
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

Ajloun National University   جامعة عجلون الوطنية

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

First: University Requirements (27) Credit Hours

A. University Compulsory Requirement (12) Credit Hours

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

B. University Elective Requirements (15) Credit Hours

Course code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
201101	Law in our Lives	3			√	
202132	Human rights	3			√	
401100	Principles of Administration	3			√	
704103	Contemporary International and Arabic Issues	3				√
704104	Islamic Culture	3	-	√		
704108	Integrity and Transparency	3			√	
704110	Digital Culture	3			√	
704112	Arabic language skills (2)	3	704118		√	
704113	The Art of Elocution and Dialogue	3				√
704115	Development and Family Planning in Islam	3			√	
701140	Arabic Library and Dictionaries	3	-	√		
704141	History of Jerusalem	3			√	
704151	Computer skills (1)	3	724099		√	
704152	Computer skills (2)	3	704151		√	
704163	Foreign Language other than English	3			√	
704172	Sports and Health	3			√	√

Ajloun National University

جامعة عجلون الوطنية

Second: Faculty Requirements (18) Credit Hours

Course code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
311100	Introduction to Computer Programming	3	--	√		
311101	Programming Language (1)	3	311100			√
311202	Object-Oriented Programming	3	311101			√
311210	Discrete Mathematics for Information Technology Students	3	601101			√
313160	Introduction to Software Engineering	3	--		√	
601101	Calculus 1	3	--		√	

Third: Supportive Requirements (6) Credit Hours

Course code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
601131	Principles of Statistics	3	-		√	
601372	Numerical Analysis 1	3	601101		√	

Ajloun National University جامعة عجلون الوطنية

Fourth: Department Requirements (78) Credit Hours

A. Department Compulsory Requirements (69) Credit Hours

Course code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
311203	Java Programming	3	311202			√
311204	Python Programming Language	3	311101			√
311211	Theory of Computation	3	311210		√	
311213	Data Structures	3	311202			√
311220	Digital Logic Design	3	311100			√
311240	Databases	3	311100		√	
311241	Systems Analysis And Design	3	311240	√		
311261	Multimedia	3	311101		√	
311304	Internet Application Programming	3	311202			√
311305	Visual Programming	3	311202			√
311314	Algorithms	3	311213			√
311321	Computer Architecture	3	311220	√		
311330	Computer Networks	3	311220		√	
311340	Database Management Systems	3	311240			√
311341	Operation Research	3	311210		√	
311350	Artificial Intelligence	3	311314			√
311361	Data Mining	3	311314			√
311422	Operating Systems	3	311314		√	
311431	Wireless Networks	3	311330		√	
311470	Graduation Project	3	Pass 90 hours	√		
311480	Field Training	3	Pass 90 hours	√		
314161	Introduction to cyber security	3	-	√		
314468	Information Security and Network	3	311330			√

B. Department Elective Requirements (9) Credit Hours

Course code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
311160	Computer Ethics	3	-		√	
311312	Compiler Design	3	311211		√	
311360	Website Design	3	311101		√	
311362	Simulation and Modeling Methods	3	311241		√	
311402	Network Programming	3	311330			√
311404	Game Programming	3	311305			√
311417	Pictorial Representation of Information	3	311314		√	
311452	Expert system	3	311350		√	
311462	Computer Graphics	3	311202			√
311463	Image Processing	3	311261		√	
311464	Special Topics in Computer Science	3	312361		√	
311465	Mobile Phone Programming	3	311305			√
502102	General Physics 1	3	-		√	

Fifth: Free Elective Requirements (03) Credit Hours

The students studies a free course offered by the university with (3) credit hours

Advisement Plan for obtaining a bachelor's degree in Computer Science

First Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
311100	Introduction to Computer Programming	3	-
313160	Introduction to Software Engineering	3	-
314161	Introduction to cyber security	3	-
601101	Calculus 1	3	-
-	University Compulsory Requirement	1	-
-	University Compulsory Requirement	2	-
	Total	15	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
311101	Programming Language (1)	3	311100
311210	Discrete Mathematics for Information Technology Students	3	601101
311220	Digital Logic Design	3	311100
311240	Databases	3	-
601131	Principles of Statistics	3	-
-	University Compulsory Requirement	1	-
-	University Compulsory Requirement	2	-
	Total	18	

Second Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
311202	Object-Oriented Programming	3	311101
311204	Python Programming Language	3	311101
311241	Systems Analysis And Design	3	311240
311330	Computer Networks	3	311220
-	University Compulsory Requirement	3	-
-	University Compulsory Requirement	1	-
-	University Elective Requirement	2	-
Total		18	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
311203	Java Programming	3	311202
311211	Theory of Computation	3	311210
311213	Data Structures	3	311202
311261	Multimedia	3	311101
311321	Computer Architecture	3	311220
-	University Elective Requirement	3	-
Total		18	

Third Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
311304	Internet Application Programming	3	311202
311305	Visual Programming	3	311202
311314	Algorithms	3	311213
311340	Database Management Systems	3	311240
311341	Operation Research	3	311210
-	Department Elective Requirement	3	-
Total		18	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
311350	Artificial Intelligence	3	311314
311361	Data Mining	3	311314
601372	Numerical Analysis 1	3	601101
-	Free Requirement	3	-
-	Department Elective Requirement	3	-
-	University Elective Requirement	3	-
Total		18	

Fourth Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
311422	Operating Systems	3	311314
311431	Wireless Networks	3	311330
314468	Information Security and Network	3	311330
-	Department Elective Requirement	3	-
-	University Elective Requirement	3	-
Total		15	

Second Semester

Course Number	Course Name	Cridit Hours	Prerequisite
311470	Graduation Project	3	More 90 hrs
311480	Field Training	3	More 90 hrs
-	University Compulsory Requirement	3	-
-	University Elective Requirement	3	-
Total		12	

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	: 311101
Course Title	: **Programming Language 1**
Credit Hours	: 3
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	: 311202
Course Title	: **Object-Oriented Programming**
Credit Hours	: 3
Prerequisites	: 311101

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	: 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, combinations, probabilities, relations, graph theory, trees.

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

Basic principles of systems engineering and software engineering, software development, 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	: 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 ($0/0$, ∞/∞), 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).

Supportive Requirements (6 Credit Hours):

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.

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	: 311203
Course Title	: **Java Programming**
Credit Hours	: 3
Prerequisites	: 311202

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	: 311204
Course Title	: **Python Programming Language**
Credit Hours	: 3
Prerequisites	: 311101

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	: 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	:	311213
Course Title	:	**Data Structures**
Credit Hours	:	3
Prerequisites	:	311202

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	:	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	:	311240
Course Title	:	**Databases**
Credit Hours	:	3
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	: 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	: 311261
Course Title	: **Multimedia**
Credit Hours	: 3
Prerequisites	: 311101

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	: 311304
Course Title	: **Internet Application Programming**
Credit Hours	: 3
Prerequisites	: 311202

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, and legal issues. Gaining practical experience in creating dynamic web applications that interact with a database using client-side scripting.

Course Number	: 311305
Course Title	: **Visual Programming**
Credit Hours	: 3
Prerequisites	: 311202

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	: 311314
Course Title	: **Algorithms**
Credit Hours	: 3
Prerequisites	: 311213

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	: 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	: 311340
Course Title	: **Database Management Systems**
Credit Hours	: 3
Prerequisites	: 311240

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

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

Course Number	: 311350
Course Title	: **Artificial Intelligence**
Credit Hours	: 3
Prerequisites	: 311314

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 a number of research and applied areas in artificial intelligence, such as expert systems, machine learning, intelligent agents, and neural network.

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	: 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	: 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	:	314161
Course Title	:	**Introduction to cyber security**
Credit Hours	:	3
Prerequisites	:	-

A comprehensive study of the principles and practices of information systems security. Topics include security threats, vulnerabilities and countermeasures, attacks and security services (confidentiality, integrity, availability, non-repudiation, and accountability), symmetric and asymmetric encryption, user authentication, access control, social engineering, security in operating systems and web security: SSL and TLS, email security (PGP, MIME), malware, and firewalls. Application of these concepts to protect computing infrastructure from cybersecurity threats and attacks.

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.

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	: 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	: 311360
Course Title	: **Website Design**
Credit Hours	: 3
Prerequisites	: 311101

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	:	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	:	311402
Course Title	:	**Network Programming**
Credit Hours	:	3
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	:	311404
Course Title	:	**Game Programming**
Credit Hours	:	3
Prerequisites	:	311305

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	: 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	: 311202

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	: 311350

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	: 311261

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	: 311464
Course Title	: **Special Topics in Computer Science**
Credit Hours	: 3
Prerequisites	: 312361

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

Course Number	: 311465
Course Title	: **Mobile Phone Programming**
Credit Hours	: 3
Prerequisites	: 311202

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	: 502102
Course Title	: **General Physics 1**
Credit Hours	: 3
Prerequisites	: -

General and fundamental physical concepts in mechanics, units, vectors, equations of motion in a straight line and plane, Newton's laws, the concept of energy and its conservation, work, collisions, and rotational motion.