Ajloun National University   جامعة عجلون الوطنية

Faculty of Information Technology

Department of
Software Engineering

Study Plan for the Bachelor's Degree
in Software Engineering
Academic year 2025/2026

Vision

Excellence and Leadership in delivering educational and research programs and curricula in Software Engineering to serve the community at the local, regional, and international levels.

Mission

The mission of the Software Engineering Department is to prepare specialists in constructing, designing, developing, testing, and documenting software environments using standardized methodologies and modern tools. This is achieved through providing a distinguished, pioneering, and stimulating scientific, research, and applied academic environment that fosters creativity and excellence. The department is committed to generating applied research projects that meet the needs of both the local and international job markets.

Goals

1. Prepare graduates with advanced skills in software development, covering areas such as design, implementation, testing, and documentation.
2. Foster a deep understanding of standardized methodologies and modern tools used in the field of software engineering.
3. Establish a rigorous academic and research environment that encourages creativity, innovation, and excellence.
4. Provide practical, hands-on experience through applied academic projects to bridge the gap between theoretical knowledge and real-world industry needs.
5. Equip students with the ability to critically analyze, evaluate, and solve complex problems in software engineering.
6. Ensure a comprehensive understanding of industry standards and practices, preparing graduates for successful integration into the local and international job markets.
7. Facilitate continuous learning and professional development through exposure to emerging technologies and trends in software engineering.
8. Contribute to applied research projects that address the evolving demands of the local and global software industry.
9. Promote Collaboration and partnerships with industry leaders, research institutions, and the broader community to enhance the impact of the department's initiatives.

10. Strive to maintain and enhance the department's reputation for producing competent and sought-after professionals in the field of software engineering."

Learning Outcomes

Knowledge

The knowledge of software engineering principles, including understanding of software analysis and design, evaluation and testing and software quality and correctness.

Understanding of software engineering processes including, management of complex software development projects.

The knowledge of systems fundamentals, including architectures and organization, operating systems, networking and communication, parallel and distributed computation, and security

The knowledge of software development fundamentals, including data structures, algorithms, complexity, multiple programming languages, paradigms, and technologies.

Skills

An ability to analyze, design, verify, validate, implement, apply, maintain, and manage the development of software systems to meet desired needs within realistic constraints.

An ability to identify, formulates, and solve problems using software engineering .

An ability to use the techniques, skills, and modern tools necessary for software engineering practice.

An ability to appropriately apply discrete mathematics, probability and statistics, and relevant topics in computer science and supporting disciplines to complex software systems

Competencies

An ability to function on multidisciplinary teams to communicate effectively.

Ability to develop software systems in one or more significant application domains

An ability to communicate with, and learn from, experts from different domains throughout their careers.

To Work colLaboratively to apply the acquired knowledge, develop communication skills, and work in the team spirit via building smart projects.

Contents of the Study Plan

**The study plan for the bachelor's degree in software engineering   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 | | 13 |

0 Remedial
1 First
2 Second
3 Third
4 Fourth

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

Ajloun National University   جامعة عجلون الوطنية

Knowledge Area		
Knowledge Number	**Knowledge Area**	**Number of Credit Hours**
0	**Programming**	15
1	**Computer Science and algorithms**	12
2	**Main Computer Components**	12
3	**Applications and Information Science**	9
4	**Special topics in software engineering**	27
5	**Graduation Project**	3
6	**Field Training**	3

First: University Requirements (27) Credit Hours

1. University Compulsory Requirement (12) Credit Hours

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

2. University Elective Requirements (15) Credit Hours

Course code	Course Name	Course Activities	Hours Activities	Credit Hour	Prerequisite	Learning Type		
						On Campus	Blended	Electronic
201101	The Law in our Lives	Theoretical	3	3			√	
202132	Human Rights	Theoretical	3	3			√	
401100	Principles of Administration	Theoretical	3	3			√	
701140	Arab Library and Lexicography	Theoretical	3	3	-			√
704103	International and Arab Contemporary Issues	Theoretical	3	3		√		
704104	Islamic Culture	Theoretical	3	3	-			√
704108	Integrity and Transparency	Theoretical	3	3			√	
704110	Digital Culture	Theoretical	3	3			√	
704112	Arabic Language Skills (2)	Theoretical	3	3	704118		√	
704113	Art of Rhetoric and Dialogue	Theoretical	3	3		√		
704115	Development and Family Planning in Islam	Theoretical	3	3			√	
704132	Traffic Safety	Theoretical	3	3	-		√	
704141	History of Jerusalem	Theoretical	3	3			√	
704151	Computer Skills (1)	Theoretical	3	3	724099		√	
704152	Computer Skills (2)	Theoretical	3	3	704151		√	
404132	Principles of Islamic economics	Theoretical	3	3			√	
704172	Sports and Health	Theoretical	3	3		√		

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

Second: Faculty Requirements (18) Credit Hours

1. Faculty Compulsory Requirements (18) Credit Hours

Course code	Course Name	Course Activities	Hours Activities	Credit Hour	Prerequisite	Learning Type		
						On Campus	Blended	Electronic
311100	Introduction to computer programming	Theoretical	3	3	--			√
313160	Introduction to software engineering	Theoretical	3	3	--		√	
314121	Introduction to cybersecurity	Theoretical	3	3	-	√		
315117	Introduction to artificial intelligence	Theoretical	3	3	311100	√		
311101 A	Programming language (1)	Theoretical	2	2	311100	√		
311101L	Programming Language (1) Lab	Practical	2	1	311101A	√		
311178	English language for students of the Faculty of Information Technology	Theoretical	3	3	704117		√	

Third: Supportive Requirements (9) Credit Hours

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

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

Course code	Course Name	Course Activities	Hours Activities	Credit Hour	Prerequisite	Learning Type		
						On Campus	Blended	Electronic
311202A	Object Oriented programming	Theoretical	2	2	311101A	√		
311202L	Object Oriented programming Lab	Practical	2	1	311202A	√		
311213A	Data structures	Theoretical	2	2	311202A	√		
311213L	Data structures Lab	Practical	2	1	311213A	√		
311210	Discrete mathematics for Information Technology students	Theoretical	3	3	601101	√		
311220	Digital logic design	Theoretical	3	3	311100	√		
311314	Algorithms	Theoretical	3	3	311213A	√		
311340A	Database Management System	Theoretical	2	2	313130 A	√		
311340L	Database management systems Lab	Practical	2	1	311340A	√		
313130A	Fundamentals of databases	Theoretical	2	2	311100		√	
313130L	Fundamentals of databases Lab	Practical	2	1	313130 A	√		
313142	Software Engineering Requirements	Theoretical	3	3	313160		√	
313220	Principles of computer networks	Theoretical	3	3	311220		√	
313221	Computer organization and architecture	Theoretical	3	3	311220		√	
313231	Systems Analysis and design	Theoretical	3	3	313130A			√
313243	Software project management	Theoretical	3	3	313160		√	
313304A	Internet application development	Theoretical	2	2	311202A	√		
313304L	Internet application development Lab	Practical	2	1	313304A	√		
313305A	Visual programming applications	Theoretical	2	2	311202A	√		
313305L	visual programming applications Lab	Practical	2	1	313305A	√		
313310A	Artificial intelligence in software engineering	Theoretical	2	2	311314	√		
313310L	artificial intelligence in software engineering Lab	Practical	2	1	313310A	√		
313340A	Software design	Theoretical	2	2	313142	√		
313340L	Software Design Lab	Practical	2	1	313340A	√		
313342A	Software testing	Theoretical	2	2	313340A	√		
313342L	Software Testing Lab	Practical	2	1	313342A	√		
313343	Software specifications	Theoretical	3	3	313142		√	
313422	Operating systems for software engineering students	Theoretical	3	3	311314		√	
313440	Software security	Theoretical	3	3	313220	√		
313442	Software maintenance and development	Theoretical	3	3	313343		√	
313450	Graduation project	Practical	6	3	Pass 90 hours			√
313460	Field training	Practical	6	3	Pass 90 hours			√

2. Department Elective Requirements (9) Credit Hours

Course code	Course Name	Course Activities	Hours Activities	Credit Hour	Prerequisite	Learning Type		
						On Campus	Blended	Electronic
313204A	Advanced programming	Theoretical	2	2	311101A	√		
313204L	Advanced programming Lab	Practical	2	1	313204A	√		
313244A	Multimedia systems	Theoretical	2	2	311101A	√		
313244L	Multimedia Systems Lab	Practical	2	1	313244A	√		
313245	Core Approaches in Software Engineering	Theoretical	3	3	313160		√	
313246	Software components and structure	Theoretical	3	3	313160		√	
313344A	Internet Web Design	Theoretical	2	2	311101A	√		
313344L	Internet Web Design Lab	Practical	2	1	313344A	√		
313345	Software quality	Theoretical	3	3	313342A		√	
313446	Software architecture	Theoretical	3	3	313341	√		
313447	Secure software engineering	Theoretical	3	3	313340A	√		
313448	Software re-engineering and restructuring	Theoretical	3	3	313440A	√		
313449	Special topics in software engineering	Theoretical	3	3	Pass 60 hours		√	
313341	Object-Oriented Software Engineering	Theoretical	3	3	313142	√		
313441	Software documentation	Theoretical	3	3	313231		√	

First Year

First Semester

Course Number	Course Name	Course Activities	Hours Activities	Credit Hour*	Prerequisite
311100	Introduction to computer programming	Theoretical	3	3	-
313160	Introduction to software engineering	Theoretical	3	3	-
314121	Introduction to cybersecurity	Theoretical	3	3	-
601101	Calculus 1	Theoretical	3	3	-
-	University Requirement	Theoretical	2	2	-
-	University Requirement	Theoretical	1	1	-
Total			**15**		

Second Semester

Course Number	Course Name	Course Activities	Hours Activities	Credit Hour*	Prerequisite
311101A	Programming language (1)	Theoretical	2	2	311100
311101L	Programming Language (1) Lab	Practical	2	1	311101A
313130A	Fundamentals of databases	Theoretical	2	2	311100
313130L	Fundamentals of Database Lab	Practical	2	1	313130A
315117	Introduction to artificial intelligence	Theoretical	3	3	311100
601131	Principles of Statistics	Theoretical	3	3	-
311178	English Language for Information Technology Students	Theoretical	3	3	704117
-	University Requirement	Theoretical	2	2	-
-	University Requirement	Theoretical	1	1	-
Total			**18**		

Second Year

First Semester

Course Number	Course Name	Course Activities	Hours Activities	Credit Hour*	Prerequisite
313142	Software Requirements Engineering	Theoretical	3	3	313160
311202A	Object-Oriented Programming	Theoretical	2	2	311101A
311202L	Object-Oriented Programming Lab	Practical	2	1	311202A
311210	Discrete Mathematics for IT Students	Theoretical	3	3	601101
311220	Digital Logic Design	Theoretical	3	3	311100
313220	Computer Network Principles	Theoretical	3	3	311220
-	University Requirement	Theoretical	2	2	-
-	University Requirement	Theoretical	1	1	-
Total				**18**	

Second Semester

Course Number	Course Name	Course Activities	Hours Activities	Credit Hour*	Prerequisite
311213A	Data Structures	Theoretical	2	2	311202A
311213L	Data Structures Lab	Practical	2	1	311213A
313221	Computer Organization and Architecture	Theoretical	3	3	311220
313231	Systems Analysis and Design	Theoretical	3	3	313130A
313243	Software Project Management	Theoretical	3	3	313160
-	Elective Major Requirement	Theoretical	3	3	-
-	Elective University Requirement	Theoretical	3	3	-
Total				**18**	

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

Third Year

First Semester

Course Number	Course Name	Course Activities	Hours Activities	Credit Hour*	Prerequisite
311314	Algorithms	Theoretical	3	3	311213A
311340A	Database management systems	Theoretical	2	2	313130A
313340L	Database management systems Lab	Practical	2	1	311340A
313304A	Internet Application Development	Theoretical	2	2	311202A
313304L	Internet application development Lab	Practical	2	1	313304A
313305A	Visual programming applications	Theoretical	2	2	311202A
313305L	visual programming applications Lab	Practical	2	1	313305A
313340A	Software design	Theoretical	2	2	313142
313340L	Software Design Lab	Theoretical	2	1	313340A
	Elective University Requirement	Theoretical	3	3	
Total				**18**	

Second Semester

Course Number	Course Name	Course Activities	Hours Activities	Credit Hour*	Prerequisite
313310A	Artificial intelligence in software engineering	Theoretical	2	2	313314
313310L	artificial intelligence in software engineering Lab	Practical	2	1	313310A
313342A	Software testing	Theoretical	2	2	313340A
313342L	Software Testing Lab	Practical	2	1	313342A
313343	Software specifications	Theoretical	3	3	313142
601372	Numerical Analysis (1)	Theoretical	3	3	601101
-	Elective Major Requirement	Theoretical	3	3	-
-	Elective University Requirement	Theoretical	3	3	-
Total				**18**	

Fourth Year

First Semester

Course Number	Course Name	Course Activities	Hours Activities	Credit Hour*	Prerequisite
313422	Operating systems for software engineering students	Theoretical	3	3	311314
313440	Software security	Theoretical	3	3	313220
313442	Software maintenance and development	Theoretical	3	3	313343
-	Elective Major Requirement	Theoretical	3	3	-
-	Elective University Requirement	Theoretical	3	3	-
Total			**15**		

Second Semester

Course Number	Course Name	Course Activities	Hours Activities	Credit Hour*	Prerequisite
313450	Graduation project	Practical	6	3	Pass 90 Hours
313460	Field training	Practical	6	3	Pass 90 Hours
-	University requirement	Theoretical	3	3	
-	Elective University Requirement	Theoretical	3	3	
Total			**12**		

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

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 transactions, solving problems using Decision Support sentences, solving problems using repetition sentences, solving problems using logical case sentences, software functions, lists and arrays, interrelated sequences, ordering lists.

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	: 314121
Course Title	: Introduction to cybersecurity
Credit Hours	: 3
Prerequisites	: -

Provide a comprehensive study of the principles and security practices of Information Systems. Topics and security threats, vulnerabilities and countermeasures, attacks and security services (confidentiality, integrity, availability, non-repudiation, accountability), symmetric and asymmetric key encryption, user authentication, access control, social engineering, security in the operation of systems and web security: SSL, TLS and email security (PGP.MOME), malware and firewalls. Apply these concepts to protect computing infrastructure from cybersecurity threats and attacks.

Course Number	: 315117
Course Title	: Introduction to artificial intelligence
Credit Hours	: 3
Prerequisites	: 311101A

Basic concepts in the field of artificial intelligence, a historical overview of the development of artificial intelligence and its most prominent stations, the most important contemporary applications of this technology in everyday life, including digital aids, recommendation systems, and smart systems. Machine learning, neural networks, natural language processing, computer vision, a simplified explanation of advanced concepts such as knowledge representation, logical reasoning, augmented learning, the basics of robotics and interactive systems. The role of artificial intelligence in business and society, focusing on vital sectors such as health, industry, education, smart cities. Ethical issues associated with the use of artificial intelligence, including the topics of privacy and prejudice.

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

Programming basics, introduction to programming languages and their development, programming principles in one of the well-known programming languages, variables and naming methods, data types, arithmetic and logical operations, control statements, repetition statements, functions, arrays, introduction to object-oriented programming.

Course Number	: 311101L
Course Title	: Programming Language 1 Lab
Credit Hours	: 1
Prerequisites	: 311101A

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

Course Number	:	311178
Course Title	:	English Language for Information Technology Students
Credit Hours	:	3
Prerequisites	:	704117

The English for IT course aims to develop basic language skills (listening, speaking, 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	:	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	:	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).

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 paradigms, review of control forms, data types, associations, arrays, and pointers, data abstraction, encapsulation and information hiding, class properties and associated operations, inheritance and polymorphism, and templates.

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

This course 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	: 311213A
Course Title	: **Data Structures**
Credit Hours	: 2
Prerequisites	: 311202A

Fundamental concepts, algorithm analysis and data representation methods, pointers and strings, queues, stacks, the structure of circularly linked lists, the structure of linearly linked lists, the structure of multiply linked lists, tree structures, sorting and searching algorithms

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

This course provides students with practical training in building software that uses data structures (stacks, queues, linked lists, and binary trees). Students are also trained in programming some algorithms, such as sorting and searching algorithms.

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

Introduction to logic, deductive logic, conventional and non-conventional proofs, sets, set operations, functions, countable and uncountable sets, integers and remainders, sequences, sums, mathematical induction, recursion, counting, permutations, combinations, probability, relations, graph theory, trees.

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

Digital Logic Design: Number systems, the binary system, Boolean algebra and basic logic gates, complex circuits, simplification of logic circuits, sequential circuits, flip-flops, registers, counters, memory, logic for information transfer between registers.

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	: 311340A
Course Title	: **Database Management System**
Credit Hours	: 2
Prerequisites	: 313130A

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	: **Database Management System Lab**
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	: 313130A
Course Title	**: Fundamentals Of 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	: 313130L
Course Title	**: Fundamentals Of Databases Lab**
Credit Hours	: 1
Prerequisites	: 313130A

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	: 313142
Course Title	**: Software Engineering Requirements**
Credit Hours	: 3
Prerequisites	: 313160

The software engineering process, requirements gathering, functional and non-functional requirements, system services and constraints, quality of requirements - Requirements Traceability Matrix, measurements of non-functional requirements - Use case explanation, contextual diagrams and use case diagrams - Software requirements specification, IEEE standard - Requirements in rapid development methods, requirements for different systems: embedded systems, web systems, business management systems, and requirements management. Ethical behaviour in software analysis will be discussed when collecting requirements with stakeholders.

Course Number	:	313220
Course Title	:	**Principle of 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	:	313221
Course Title	:	**Computer Organization and 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	:	313231
Course Title	:	**Systems Analysis and Design**
Credit Hours	:	3
Prerequisites	:	313130A

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 and constructing data flow

diagrams, implementation of system construction, testing and, system, Gantt chart and network diagram Models Developments: water full, OOP+ JAD+ RAD).

Course Number	: 313243
Course Title	: **Software Project Management**
Credit Hours	: 3
Prerequisites	: 313160

Equipping students with the knowledge necessary to manage software and application projects. Topics covered include the basic principles of systems engineering and software engineering, software development processes, planning and managing software projects, resource and tools management and techniques, integration management and project planning, scope management, scheduling and budget monitoring, human resource management, communications management, risk analysis and management, quality management project, and procurement management.

Course Number	: 313304A
Course Title	: **Internet Application Development**
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	: 313304L
Course Title	: **Internet Application Development Lab**
Credit Hours	: 1
Prerequisites	: 313304A

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	: 313305A
Course Title	: **Visual Programming Applications**
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	: 313305L
Course Title	: **Visual Programming Applications Lab**
Credit Hours	: 1
Prerequisites	: 313305A

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	: 313310A
Course Title	: **Artificial intelligence in software engineering**
Credit Hours	: 2
Prerequisites	: 311314

This course covers the fundamentals of knowledge representation and problem-solving techniques, with an emphasis on search algorithms, machine learning, neural networks, and generative AI for design automation, testing, and maintenance. It covers the use of AI in code analysis, error detection, and automatic software generation, as well as its applications in areas such as intelligent application development, robotics, embedded systems, and natural language processing. It also reviews AI applications in enhancing software engineering processes.

Course Number	: 313310L
Course Title	**: Artificial intelligence in software engineering Lab**
Credit Hours	: 1
Prerequisites	: 313310A

This course aims to integrate artificial intelligence (AI) techniques into software development using advanced programming languages, with the goal of improving efficiency and quality. Students are introduced to the use of programming languages such as Python, Java, and C++ to implement techniques such as machine learning, natural language processing (NLP), and software process automation. Students learn how to apply these tools in various contexts such as software testing, data analysis, and software project management. Through the course, students are empowered to design and develop intelligent software solutions using specialized AI libraries and frameworks. The course also focuses on enhancing productivity and stimulating innovation in the field of software engineering, emphasizing programming languages as an essential tool for transforming theoretical concepts into practical applications.

Course Number	: 313340A
Course Title	**: Software Design**
Credit Hours	: 2
Prerequisites	: 313142

Introduction to structuring and designing complete software systems, building basic components and models. Topics include architectural principles, design documentation, and the relationships between levels of abstraction. Software architecture for specific fields and related models, communication mechanisms, real-time systems and distributed systems, general design, architectural methods, frameworks, and auxiliary models.

Course Number	: 313340L
Course Title	**: Software Design Lab**
Credit Hours	: 1
Prerequisites	: 313340A

This course aims to train students to apply theoretical concepts and models of software design in a practical environment. The lab focuses on transforming software requirements into structured, executable designs using modern software engineering tools and techniques. Students are trained in the use of UML diagrams, object-oriented programming (OOP) principles, and design patterns.

Course Number	: 313342A
Course Title	: **Software testing**
Credit Hours	: 2
Prerequisites	: 313340A

This course aims to equip students with the knowledge necessary for systematic testing of software systems. Topics covered include: verification and validation of software, different types of white-box and black-box testing, debugging programs, quality assurance and measurement, predicting software reliability, project management, software maintenance, software reuse.

Course Number	: 313342L
Course Title	: **Software testing Lab**
Credit Hours	: 1
Prerequisites	: 313342A

This course aims to train students to apply theoretical concepts and models of software design in a practical environment. The lab focuses on transforming software requirements into structured, executable designs using modern software engineering tools and techniques. Students are trained in the use of UML diagrams, object-oriented programming (OOP) principles, and design patterns.

Course Number	: 313343
Course Title	: **Software specifications**
Credit Hours	: 3
Prerequisites	: 313142

Equipping students with the knowledge and skills necessary for software development, with a focus on analysis, design, and model construction. Topics covered include the basic principles of systems engineering and software engineering, software development processes, describing functional and non-functional software requirements and representing them using the standard model, models used in describing requirements, requirements specifications, processes of documenting and verifying requirements.

| Page26

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

Course Number	: 313422
Course Title	: **Operating Systems for Software Engineering Students**
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	: 313440
Course Title	: **Software security**
Credit Hours	: 3
Prerequisites	: 313220

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	: 313442
Course Title	: **Software Maintenance and Development**
Credit Hours	: 3
Prerequisites	: 313343

This course covers four types of maintenance: corrective, adaptive, perfective, and preventive, along with the economic impacts of maintenance, and management issues related to system maintenance such as the organizational structure for maintenance, quality measurement, and related processes for change requests and configuration management. Topics include: on-site maintenance, the role of case tools; reverse engineering and restructuring, code restructuring and preventive maintenance. Students will also learn about different models of maintenance processes such as Boehm, Osborne's iterative enhancement, and object-oriented reuse methods. Students participate in a group project on software maintenance and development.

Course Number	: 313450
Course Title	: **Graduation project**
Credit Hours	: 3
Prerequisites	: Pass 90 hours

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

Course Number	: 313460
Course Title	: **Field training**
Credit Hours	: 3
Prerequisites	: Pass 90 hours

Students undertake training in either a government or private institution under the supervision of an academic advisor. During this training, students apply what they have learned during their university studies. The institution where the student is training fills out a pre-prepared report by the department to assess the student's trainee.

Elective Department Requirements (9 Credit Hours):

Course Number	: 313204A
Course Title	: **Advanced programming**
Credit Hours	: 2
Prerequisites	: 311101A

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

Course Number	: 313204L
Course Title	: **Advanced programming Laboratory**
Credit Hours	: 1
Prerequisites	: 313204A

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	: 313244A
Course Title	: **Multimedia systems**
Credit Hours	: 2
Prerequisites	: 311101A

Principles and modern technologies in the design of multimedia systems. Acquiring practical experience in this field. Topics include the design of multimedia systems, multimedia hardware and software, and issues in the representation, processing, and transmission of multimedia data such as text, graphics, sound, music, images, and video.

Course Number	: 313244L
Course Title	**: Multimedia systems Laboratory**
Credit Hours	: 1
Prerequisites	: 313244A

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	: 313245
Course Title	**: Core Approaches in Software Engineering**
Credit Hours	: 3
Prerequisites	: 313160

This course presents goals, concepts, principles, methods, models, and tools in software engineering. Additionally, the course describes process models, planning and effort estimation, team organization, object-oriented analysis and design, software testing techniques, quality metrics, quality assurance, software management, and a comprehensive study of some software projects.

Course Number	: 313246
Course Title	**: Software components and architecture**
Credit Hours	: 3
Prerequisites	: 313160

Discussion of methods and techniques associated with software construction, detailed design methods and notations, implementation tools, coding standards and techniques, concepts and foundations of Component-Based Software Development (CBSD) and associated technologies, designing, building, assembling, and deploying commercially reusable software.

Course Number	: 313344A
Course Title	: **Internet Web Design**
Credit Hours	: 2
Prerequisites	: 311101A

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

Course Number	: 313344L
Course Title	: **Internet Web Design Laboratory**
Credit Hours	: 1
Prerequisites	: 313344A

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	: 313345
Course Title	: **Software Quality**
Credit Hours	: 3
Prerequisites	: 313342A

Equipping students with the knowledge necessary to verify software quality. Topics covered include software quality assurance, quality metrics, configuration management and verification, inspection and auditing processes, software process improvement models, process and product standards, internal and external quality attributes of software.

Course Number	: 313446
Course Title	: **Software architecture**
Credit Hours	: 3
Prerequisites	: 313341

The course covers the following areas: phases of software development, modeling and designing the system at the structural or architectural level, the principle of the methodology driven by the software system's structure, object-oriented analysis and design, contract-based design, design pattern principles, software development growth principle, software re-engineering, and reverse engineering techniques in software engineering.

Course Number	: 313447
Course Title	: **Secure Software Engineering**
Credit Hours	: 3
Prerequisites	: 313340A

This course covers the development of secure software. Students should be able to ensure security at every stage of the software development life cycle, including the requirements phase and how to involve security requirements, the modeling phase and how to involve threat modeling, security programming guidelines, and testing.

Course Number	: 313448
Course Title	: **Software re-engineering and restructuring**
Credit Hours	: 3
Prerequisites	: 313340A

Software maintenance through re-engineering; computer-based techniques for retrieving information from existing systems; re-analysis, restructuring, program transformations, reverse engineering of data, and goal-directed re-engineering.

Course Number	: 313449
Course Title	: **Special Topics in Software Engineering**
Credit Hours	: 3
Prerequisites	: Pass 60 Hours

Special, recent, and advanced topics in the field of software engineering are carefully selected and approved by the department.

Course Number	:	313341
Course Title	:	**Object-Oriented Software Engineering**
Credit Hours	:	3
Prerequisites	:	313142

Building software using an object-oriented language, with support for graphical user interfaces, complex data structures and specifications, design patterns, extraction techniques, procedures and data and iteration, type, polymorphism techniques, information hiding and layers, inheritance, exceptions, event systems, concurrency.

Course Number	:	313441
Course Title	:	**Software Documentation**
Credit Hours	:	3
Prerequisites	:	313231

An introduction to software documentation activities during the software development process. Detailed guidelines for the documentation process include institutional policies, document templates, introduction to international standards for software engineering document templates, professional techniques in designing, producing, and packaging software documents, producing user-friendly tutorials and help menus in documentation projects, practical training in writing software documentation.