



Ajloun National University

جامعة عجلون الوطنية

# Faculty of Information Technology

## Department of Cyber Security and Cloud Computing

### **Study Plan for the Bachelor's Degree in Cyber Security and Cloud Computing Academic year 2025/2026**



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## Vision

Leading and excelling in academic and research endeavors, and delivering creativity and innovation in the application and development of information security and protection programs, by global standards.

## Mission

To prepare distinguished professionals in cybersecurity and cloud computing capable of building and developing secure information systems, protecting digital systems and networks from threats, and advancing the curriculum based on market demands and the latest research in the field of cybersecurity and cloud computing.

## Goals

1. Specialized workforce preparation: Aim to equip students with the necessary skills and knowledge to analyze and understand cybersecurity and cloud computing challenges and threats.
2. Security enhancement: Focus on preparing students to build and maintain secure information systems, protect digital systems, and networks from growing threats.
3. Expansion of scientific research: Promote scientific research in the areas of cybersecurity and cloud computing, contributing to the development of effective solutions for modern challenges.
4. Development of innovation and leadership skills: Encourage the development of students' skills in innovation and leadership to achieve progress and advancement in the fields of cybersecurity and cloud computing.
5. Interaction with job market needs: Aim to ensure that students' skills align with the needs of the job market in the fields of cybersecurity and cloud computing.
6. Encouragement of continuous learning: Foster a culture of continuous learning and provide opportunities for the development of professional skills in the fields of cybersecurity and cloud computing.
7. Awareness and responsibility promotion: Strive to enhance awareness of the importance of cybersecurity and promote responsibility in the safe and sustainable use of technology.



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## Learning Outcomes

### Knowledge

Knowledge of a broad and in-depth range of foundations, theories, principles and basic concepts in the field of cybersecurity.

Knowledge and understanding of the processes, tools, techniques, policies and practices used in cybersecurity.

Knowing, understanding and explaining the basic concepts of data networks, including components, layers, protocols, services, applications, and tools, and their relationship to cybersecurity.

Knowing and understanding the analysis of mathematical problems and methods of designing algorithms and evaluating their effectiveness and knowledge of the various data structures, uses, advantages and disadvantages.

A wide range of specialized knowledge related to current and emerging developments and advanced topics in the field of cybersecurity.

### Skills

Analyze and evaluate various complex information in the field of cybersecurity.

Critically evaluate, select, and use cybersecurity techniques, methodologies, and tools to solve problems, reduce risks, and perform cybersecurity work.

Performing a wide range of tasks and actions using cybersecurity tools in various complex operations; Creativity and innovation in this aspect.

Using computational operations and quantitative methods to process data and information in various complex cybersecurity contexts.

Using study, investigation, and research methodologies in cybersecurity projects and activities.

### Competencies

Independently manage tasks related to cyber security, work collaboratively and constructively, have the ability to lead, entrepreneur, and perform a wide range of tasks responsibly.

Make constructive decisions in situations that require self-reliance to work, learn and innovate independently, and adhere to the ethics and standards of the profession for cybersecurity

The student must produce and implement smart computer applications and have the ability to infer, deduce, analyze, extrapolate and interpret data.

Active participation in the development of cybersecurity specialization and community service.



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## Contents of the Study Plan

The study plan for the bachelor's degree in Cyber Security and Cloud Computing 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	6.82 %
Fourth	Department Compulsory Requirements	69	52.27 %
	Department Elective Requirements	09	6.82 %
Total		132	100%

## University Coding System

Faculty Code      Department Code      ( Level Year)      Knowledge Area      Course sequence

3

14

0 Remedial

1 First

2 Second

3 Third

4 Fourth





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### Knowledge Area

Knowledge Number	Knowledge Area	Number of Credit Hours
0	Programming	15
1	Computer Science and algorithms	12
2	Fundamentals of cybersecurity	15
3	Fundamentals of cloud computing	12
4	Special topics in Cyber Security and Cloud Computing	12
5	Graduation Project	3
6	Field Training	3



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## First: University Requirements (27) Credit Hours

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

Course code	Course Name	Course activities	Activities hours	Credit Hour	Prerequisite	Learning Type		
						Electronic	Blended	On
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	Activities hours	Credit Hour	Prerequisite	Learning Type		
						Electronic	Blended	On
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		√	
704172	Sports and Health	theoretical	3	3	-			√



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## Second: Faculty Requirements (18) Credit Hours

### 1. Faculty Compulsory Requirements (18) Credit Hours

Course code	Course Name	Course activities	Activities hours	Credit Hour	Prerequisite	Learning Type		
						Electronic	Blended	On
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			√
311101A	Programming Language 1	theoretical	2	2	311100			√
311101L	Programming Language 1 Lab	practical	2	1	311101A			√
311178	English for Information Technology College Students	theoretical	3	3	704117		√	

## Third: Supportive Requirements (9) Credit Hours

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

## Fourth: Department Requirements (78) Credit Hours

### 1. Department Compulsory Requirements (69) Credit Hours



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Course code	Course Name	Course activities	Activities hours	Credit Hour	Prerequisite	Learning Type		
						Electronic	Blended	On
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			√
311213A	Data Structures	theoretical	2	2	311202A			√
311213L	Data Structures lab	practical	2	1	311213A			√
311220	Digital Logic Design	theoretical	3	3	311100			√
314130	Principles of Cloud Computing	theoretical	3	3	314121	√		
314209A	Programming for Cybersecurity	theoretical	2	2	311213A			√
314209L	Programming for Cybersecurity lab	practical	2	1	314209A			√
314211A	Databases and their applications	theoretical	2	2	311100		√	
314211L	Databases and their applications lab	practical	2	1	314211A			√
314220	Computer Network Data Communication	theoretical	3	3	311220		√	
314223	Data and Software Security	theoretical	3	3	314121			√
314242	Encryption	theoretical	3	3	314121			√
314243A	data Analysis in Cyber Security and Cloud Computing	theoretical	2	2	314211A			√
314243L	data Analysis in Cyber Security and Cloud Computing lab	practical	2	1	314243A			√
314304A	Web application programming	theoretical	2	2	311202A			√
314304L	Web application programming lab	practical	2	1	314304A			√
314315	Algorithmic Analysis	theoretical	3	3	311213A			√
314316	Operating Systems for Cybersecurity	theoretical	3	3	314315		√	
314320A	Infrastructure Security Using Linux	theoretical	2	2	314316			√
314320L	Infrastructure Security Using Linux lab	practical	2	1	314320A			√
314331	Advanced Cloud Computing	theoretical	3	3	314220			√
314340A	Ethical Hacking	theoretical	2	2	311202A		√	
314340L	Ethical Hacking lab	practical	2	1	314340A			√
314341A	Artificial Intelligence in Cybersecurity and Cloud Computing	theoretical	2	2	314315		√	
314341L	Artificial Intelligence in Cybersecurity and Cloud Computing lab	practical	2	1	314341A			√
314435	Network Security	theoretical	3	3	314320A			√
314430	Cloud Computing Security	theoretical	3	3	3143331		√	
314321A	Digital evidence investigations	theoretical	2	2	314243A		√	
314321L	Digital evidence investigations lab	practical	2	1	314321A			√
314450	Graduation Project	practical	6	6	Pass 90 hours	√		
314460	Field Training	practical	6	6	Pass 90 hours			√





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

Course code	Course Name	Course activities	Activities hours	Credit Hour	Prerequisite	Learning Type		
						Electronic	Blended	On
314244	Privacy Issues in Cloud Computing	theoretical	3	3	314130		√	
314332	Cloud computing and virtual technology	theoretical	3	3	314130			√
314343	Electronic crimes	theoretical	3	3	314121		√	
314344A	Crypt analysis	theoretical	2	2	314242			√
314344L	Crypt analysis lab	practical	2	1	314344A			√
314345	Confidentiality and privacy of data	theoretical	3	3	314130		√	
314402A	Secure network programming	theoretical	2	2	314220			√
314402L	Secure network programming lab	practical	2	1	314402A			√
314431	Secure software engineering	theoretical	3	3	313160			√
314432 A	Internet of things security	theoretical	2	2	314121			√
314432 L	Internet of things security lab	practical	2	1	314432 A			√
314342	Secure communication protocols	theoretical	3	3	314220		√	
314433	Special Topics in Cloud Computing	theoretical	3	3	Pass 60 hours		√	
314434	Artificial Intelligence in Cyber Security and Advance Cloud Computing	theoretical	3	3	314341A		√	
314446	Special Topics in Cyber Security	theoretical	3	3	Pass 60 hours			√
314468	Information security and Network	theoretical	3	3	314220	√		



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## First Year

### First Semester

Course Number	Course Name	Course activities	Activities hours	Credit Hours*	Prerequisite
311100	Introduction to Computer Programming	theoretical	3	3	-
313160	Introduction to Software Engineering	theoretical	3	3	-
314121	Introduction to cyber security	theoretical	3	3	-
601101	Calculus 1	theoretical	3	3	-
-	University Compulsory Requirement	theoretical	2	2	-
-	University Compulsory Requirement	theoretical	1	1	-
<b>Total</b>			<b>15</b>		

### Second Semester

Course Number	Course Name	Course activities	Activities hours	Credit Hours*	Prerequisite
311101A	Programming Language 1	theoretical	2	2	311100
311101L	Programming Language 1 lab	practical	2	1	311101A
314130	Principles of Cloud Computing	theoretical	3	3	314121
314211A	Databases and their applications	theoretical	2	2	311100
314211L	Databases and their applications lab	practical	2	1	314211A
315117	Introduction to artificial intelligence	theoretical	3	3	311100
311178	English for Information Technology College Students	theoretical	3	3	704117
-	University Compulsory Requirement	theoretical	2	2	-
-	University Compulsory Requirement	theoretical	1	1	-
<b>Total</b>			<b>18</b>		



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## Second Year

### First Semester

Course Number	Course Name	Course activities	Activities hours	Credit Hours*	Prerequisite
311220	Digital Logic Design	theoretical	3	3	311100
311202A	Object-Oriented Programming	theoretical	2	2	311101A
311202L	Object-Oriented Programming lab	practical	2	1	311202A
314242	Encryption	theoretical	3	3	314121
314243A	data Analysis in Cyber Security and Cloud Computing	theoretical	2	2	314211A
314243L	data Analysis in Cyber Security and Cloud Computing lab	practical	2	1	314243A
-	University Elective requirement	theoretical	3	3	-
-	University Compulsory Requirement	theoretical	2	2	-
-	University Compulsory Requirement	theoretical	1	1	-
<b>Total</b>			<b>18</b>		

### Second Semester

Course Number	Course Name	Course activities	Activities hours	Credit Hours*	Prerequisite
311210	Discrete Mathematics for Information Technology Students	theoretical	3	3	601101
311213A	Data Structures	theoretical	2	2	311202A
311213L	Data Structures lab	practical	2	1	311213A
314223	Data and software security	theoretical	3	3	314121
314220	Computer network data communication	theoretical	3	3	311220
601131	Principles of statistics	theoretical	3	3	-
-	University Elective requirement	theoretical	3	3	-
<b>Total</b>			<b>18</b>		



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### Third Year

#### First Semester

Course Number	Course Name	Course activities	Activities hours	Credit Hours*	Prerequisite
314304A	Web Application Programming	theoretical	2	2	311202A
314304L	Web Application Programming lab	practical	2	1	314304A
314209A	Programming for Cybersecurity	theoretical	2	2	311213A
314209L	Programming for Cybersecurity lab	practical	2	1	314209A
314315	Analysis of Algorithms	theoretical	3	3	311213A
314331	Advanced Cloud Computing	theoretical	3	3	314220
314316	Operating system for cyber security	theoretical	3	3	314315
-	Department elective requirement	theoretical	3	3	-
<b>Total</b>			<b>18</b>		

#### Second Semester

Course Number	Course Name	Course activities	Activities hours	Credit Hours*	Prerequisite
314320A	Infrastructure Security using Linux	theoretical	2	2	314316
314320L	Security infrastructure using Linux Lab	practical	2	1	314320A
314340A	Ethical Hacking	theoretical	2	2	314202A
314340L	Ethical Hacking lab	practical	2	1	314340A
314321A	Digital Evidence Investigations	theoretical	2	2	314243A
314321L	Digital Evidence Investigations lab	practical	2	1	314321A
601372	Numerical Analysis 1	theoretical	3	3	601101
-	University Elective requirement	theoretical	3	3	-
-	Department elective requirement	theoretical	3	3	-
<b>Total</b>			<b>18</b>		





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## Fourth Year

### First Semester

Course Number	Course Name	Course activities	Activities hours	Credit Hours*	Prerequisite
314435	Network Security	theoretical	3	3	314320A
314430	Cloud computing security	theoretical	3	3	314331
314341A	Artificial Intelligence in Cyber Security and Advance Cloud Computing	theoretical	2	2	314315
314341L	Artificial Intelligence in Cyber Security and Advance Cloud Computing	practical	2	1	314341A
-	University Elective requirement	theoretical	3	3	-
-	Department elative requirement	theoretical	3	3	-
<b>Total</b>			<b>15</b>		

### Second Semester

Course Number	Course Name	Course activities	Activities hours	Credit Hours*	Prerequisite
314450	Graduation Project	practical	6	6	Pass 90 hours
314460	Field Training	practical	6	6	Pass 90 hours
-	University Compulsory Requirement	theoretical	3	3	-
-	University Elective requirement	theoretical	3	3	-
<b>Total</b>			<b>12</b>		



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## Courses Description

### Faculty Compulsory Requirements ( 18 Credit Hours)

<b>Course Number</b>	: 311100
<b>Course Title</b>	: Introduction to Computer Programming
<b>Credit Hours</b>	: 3
<b>Prerequisites</b>	: -

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.

<b>Course Number</b>	: 311101A
<b>Course Title</b>	: Programming Language 1
<b>Credit Hours</b>	: 2
<b>Prerequisites</b>	: 311100

Fundamentals of programming, introduction to 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.

<b>Course Number</b>	: 311101L
<b>Course Title</b>	: Programming Language 1 Lab
<b>Credit Hours</b>	: 1
<b>Prerequisites</b>	: 311100

Students in this course prepare programming assignments and programming projects with the aim of practical training in writing programs. Students must possess sufficient individual programming skills.



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**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, simplified explanation of advanced concepts such as knowledge representation, logical reasoning, reinforcement learning, and basics of robotics and interactive systems. The role of artificial intelligence in business and society, with focus on vital sectors such as health, industry, education, smart cities. Ethical issues related to the use of artificial intelligence, including topics of privacy, bias.

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

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



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

Basic principles of systems engineering and software engineering, software development, software project planning and management, software requirements specifications and processes, systems modeling, software prototyping, system architecture design, different methods for systems and software design such as object-oriented design and distributed design, CASE tools for software engineering.

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

The English language course for Information Technology students aims to develop basic language skills (listening, speaking, reading, writing, grammar) with focus on terminology and concepts related to the field of information technology, and common topics include sentence patterns, tense rules, conditional sentences, passive voice, and computer-related conversations, with the aim of enabling students to communicate effectively in their academic and professional environment.





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### Supportive Requirements( 9 Credit Hours)

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

Definition of statistics and its uses, types of data and methods of collection, descriptive statistics: organizing and presenting data, summarizing data with tables, graphs and numerical measures, measures of central tendency (mean, median and mode), measures of dispersion (range, quartiles and interquartile range, percentiles and percentile range, variance and standard deviation), outliers, standard score, Chebyshev's rule and the approximate rule, linear transformations in preparing descriptive statistics, definition of probability and its uses, probability elements, counting methods, conditional probability, random variables, expectation and variance, calculating probabilities and areas under 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 equations with one variable, numerical solution for differentiation and integration for direct numerical methods for linear systems.



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**Course Number** : 601101  
**Course Title** : Calculus and Integration (1)  
**Credit Hours** : 3  
**Prerequisites** :

**Functions, general exponential and logarithmic functions, limits and continuity, differentiation, differentiation rules, tangents and perpendiculars, mean value theorem and applications, indeterminate forms ( $0/0$ ,  $\infty/\infty$ ), horizontal and vertical asymptotes, local extreme values, concavity, curve sketching, definite integration, fundamental theorem of calculus, indefinite integration, integration by substitution, applications of definite integration (area, volumes, volumes of revolution).**



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### Department Compulsory Requirements( 69 Credit Hours):

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

Object-oriented programming concepts and models, review of control forms, 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** : Object-Oriented Programming Lab  
**Credit Hours** : 1  
**Prerequisites** : 311202A

Students are trained in object-oriented programming using C++, such as encapsulation and abstraction to design classes securely, inheritance and polymorphism for code reuse and dynamic behaviour, functions, achieving static polymorphism. Students are trained in building arrays, pointers, templates and generic programming to build reusable and type-safe components

**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.



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

In this course, students are trained practically in building software that uses data structures (stacks and queues, linked lists, and binary trees). Training 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, 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** : 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.





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**Course Number** : 314130  
**Course Title** : Principles of Cloud Computing  
**Credit Hours** : 3  
**Prerequisites** : 314121

Fundamentals of cloud computing technologies, topics such as virtualization, containers, orchestration, cloud resource management, cloud storage; common cloud frameworks covering batch processing and data streaming; solutions to problems related to load management and fault tolerance, distributed systems, and security in the cloud. Weekly practical exercises using one or more cloud infrastructure technologies.

**Course Number** : 314209 A  
**Course Title** : Programming for Cybersecurity  
**Credit Hours** : 2  
**Prerequisites** : 311213A

Fundamentals of the Python language, creating and running programs, using threads, handling exceptions, utilizing network programming libraries, developing basic network functionalities, HTTP programming, secure programming, and forensic programming. The focus is on Twisted Python, Echo server, HTTP client, debugging, and security testing using Python, and writing programs in Python.

**Course Number** : 314209L  
**Course Title** : Programming for Cybersecurity Lab  
**Credit Hours** : 1  
**Prerequisites** : 314209 A

Training students on the fundamentals of Python programming for cybersecurity applications, including: Threading, exceptions, network programming, HTTP programming, secure programming, digital forensics, and security testing.



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**Course Number** : 314211A  
**Course Title** : Databases and Their Applications  
**Credit Hours** : 2  
**Prerequisites** : 311100

**Databases and Their Applications:** Basic concepts and terminologies related to databases, components of Database Management Systems (DBMS) and their applications, roles and responsibilities of a database administrator, characteristics and methodologies of databases, three-tier architecture of data schema, the entity-relationship model for describing databases and their applications, symbols, concepts, constraints, and operations related to the relational model, query languages, dependencies, normalization of schema design and redundancy removal, relational algebra, building a database from entity-relationship models, introduction to SQL, functional dependencies, simplification of database designs.

**Course Number** : 314211L  
**Course Title** : Databases and Their Applications Lab  
**Credit Hours** : 1  
**Prerequisites** : 314211A

Training on using software to create tables, enter and modify data, add records, update fields, and process constraints. Query tables, retrieve data, and sort results. Modify and delete tables, modify columns and remove tables.

**Course Number** : 314220  
**Course Title** : Communications and Computer Networks  
**Credit Hours** : 3  
**Prerequisites** : 311220

Introduction to the basic principles of data communication and computer networks, the fundamental principles of designing and operating computer networks, network reference models, interfaces and services, protocols, communication services, synchronization, flow control, error control, routing algorithms, network layer, transport layer, application layer protocols, description of the layered architecture of typical networks, and identification of different types of complexity in networks.



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**Course Number** : 314223  
**Course Title** : Data and Software Security  
**Credit Hours** : 3  
**Prerequisites** : 314121

On this course we will explore the foundations of software security. The course will consider important software vulnerabilities and attacks that exploit them, such as buffer overflows, SQL injection, and session hijacking. In addition, the course will consider defenses that prevent or mitigate these attacks, including advanced testing and program analysis techniques. Importantly, we take a "build security in" mentality, considering techniques at each phase of the development cycle that can be used to strengthen the security of software systems.

**Course Number** : 314242  
**Course Title** : Encryption  
**Credit Hours** : 3  
**Prerequisites** : 314121

An overview of modern cryptography, focusing on the fundamentals of basic cryptography for symmetric and asymmetric key encryption, hash functions, message authentication, RSA, Diffie-Hellman, certification authorities, digital signatures, generating pseudorandom numbers, and the basic protocols and their computational complexity requirements. Introduction to elliptic curve cryptography.





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جامعة عجلون الوطنية

**Course Number** : 314243A  
**Course Title** : Data Analysis in Cybersecurity and Cloud Computing  
**Credit Hours** : 2  
**Prerequisites** : 314211A

This course combines data analysis concepts and Cybersecurity and cloud computing techniques, showing how big data capabilities can be leveraged to address security risks. Students learn how to detect, analyze and mitigate internal threats, as well as identify targeted attacks from external parties and persistent cyber risks. The course also includes a number of related areas in information technology and cloud computing, such as using statistical methods to identify patterns and make inferences, and applying machine learning techniques in threat detection and monitoring abnormal behaviors. The course also focuses on the standard approach to data analysis operations, SIEM techniques and Security Operations Centers (SOC), and identifying risks and vulnerabilities in computers and networks of companies and government institutions.

**Course Number** : 314243L  
**Course Title** : Data Analysis in Cybersecurity and Cloud Computing Lab  
**Credit Hours** : 1  
**Prerequisites** : 314243A

Training students to work with data analysis libraries (Pandas, NumPy, Matplotlib, SciPy) and training them on Apache Kafka, for processing real-time streaming data for attacks in real time, Splunk, IBM QRadar.

**Course Number** : 314304A  
**Course Title** : Web Application Programming  
**Credit Hours** : 2  
**Prerequisites** : 311202

This course aims to provide students with advanced skills in designing and implementing websites. It covers the design and implementation of web applications and database-driven websites. The course also addresses advanced server-side programming (such as PHP) and its applications, as well as enhancing personal productivity concepts through web authoring. In addition, it covers topics related to security and access rights.





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**Course Number** : 314304L  
**Course Title** : Web Application Programming Lab  
**Credit Hours** : 1  
**Prerequisites** : 314304A

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. It also covers the design and implementation of fully database-driven websites using SQL. The course addresses advanced server-side programming (such as PHP) and aims to enable students to build secure and efficient web applications, with an emphasis on integration, security, and deployment on cloud servers.

**Course Number** : 314315  
**Course Title** : Analysis of Algorithms  
**Credit Hours** : 3  
**Prerequisites** : 311213A

An introduction to algorithms, design, construction, and analysis of computer algorithms, growth of function values, execution time and efficiency of algorithms, solutions to recurrence relations, design and analysis of various sorting algorithms (insertion, merge, quicksort, heap sort), search algorithms in structures (breadth-first search and depth-first search), minimum spanning trees in structures.

**Course Number** : 314316  
**Course Title** : Operating Systems for cyber security  
**Credit Hours** : 3  
**Prerequisites** : 314315

Definition of an operating system, the 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 problems, deadlock situations, scheduling of multipurpose processors, management of input/output units, file management.



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جامعة عجلون الوطنية

**Course Number** : 314320A  
**Course Title** : Infrastructure Security using Linux  
**Credit Hours** : 2  
**Prerequisites** : 314316

The course presents an introduction to Linux operating system concepts, including installation and maintenance. Emphasis is placed on operating system concepts, management, maintenance, and required resources. At the end of this course, students will be introduced to operating system concepts, installation, management, maintenance, and use of Linux operating systems, core Linux commands and programs, standard software development tools, such as Emacs, Compilers, Debuggers, the Make facility, and common system tasks using shell scripts and system administration. basic. The course also presents techniques for offensive or defensive targets in network, computer systems, and applications in order to discover potential vulnerabilities and suggest appropriate countermeasures. Topics covered include system memory regulators, CPU registers, assembly language basics, developing local and remote Linux exploits, writing Linux shell code, performing daemon attacks, network and wireless penetration techniques, and the ethical and legal implications of cyber-attacks.

**Course Number** : 314320L  
**Course Title** : Infrastructure Security using Linux lab  
**Credit Hours** : 1  
**Prerequisites** : 314320A

The laboratory focuses on training in writing scripts using Shell, system hardening, user and group policies, secure remote access, firewall configuration, SELinux, audit logs, and exploit mitigation mechanisms.

**Course Number** : 314331  
**Course Title** : Advanced Cloud Computing  
**Credit Hours** : 3  
**Prerequisites** : 314220

Exploration of cloud computing, establishment of cloud computing, exploring cloud computing services, their applications, and use cases, cloud computing practices, understanding how cloud computing assists users, developing infrastructure to support widespread use cases with development, innovation, and also innovative technologies.



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جامعة عجلون الوطنية

**Course Number** : 314340A  
**Course Title** : Ethical Hacking  
**Credit Hours** : 2  
**Prerequisites** : 311202A

Principles and techniques associated with the cybersecurity practice known as penetration testing or ethical hacking. Techniques used by hackers for breaching and the necessary tools for adopting a hacker's mindset to protect the network from future attacks. The differences between ethical and unethical penetration testing, phases of penetration testing including reconnaissance, scanning, enumeration, vulnerability assessment, exploitation, and covering tracks. Application of various tools and methods to conduct penetration tests to discover how to exploit system security vulnerabilities and potential countermeasures.

**Course Number** : 314340L  
**Course Title** : Ethical Hacking Lab  
**Credit Hours** : 1  
**Prerequisites** : 314340A

The laboratory aims to enable students to analyze the degrees that an ethical hacker needs to penetrate the target device, identify equipment and techniques to conduct penetration testing, compare protection techniques used to protect system and user data.

**Course Number** : 314341A  
**Course Title** : Artificial Intelligence in Cybersecurity and Cloud Computing  
**Credit Hours** : 2  
**Prerequisites** : 314315

This course aims to introduce students to how to employ artificial intelligence techniques in Cybersecurity, with focus on applied and research aspects. The course covers the use of machine learning and deep learning algorithms for detecting cyber attacks, analyzing network traffic, monitoring threats, detecting malware, and recognizing abnormal patterns. The course also includes a review of intrusion detection and prevention systems (IDS/IPS), cyber behavior analysis techniques, and modern research trends in integrating artificial intelligence with protection systems. The course requires students to complete an applied or research project that demonstrates how to build or evaluate an intelligent Cybersecurity system.





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جامعة عجلون الوطنية

**Course Number** : 314341L  
**Course Title** : Artificial Intelligence in Cybersecurity and Cloud Computing Lab  
**Credit Hours** : 1  
**Prerequisites** : 314341A

Hands-on training in applying machine learning and deep learning for cybersecurity. Students design and evaluate intrusion detection and malware detection systems. Practical use of cloud platforms for deploying AI security models. Exploration of deepfake detection and adversarial threats in cyberspace. Introduction to generative AI tools for both security defense and attack simulation.

**Course Number** : 314435  
**Course Title** : Network Security  
**Credit Hours** : 3  
**Prerequisites** : 314320A

This course covers the main tools and techniques used to protect computer networks from common attacks such as: firewalls and intrusion prevention systems (IPS) and intrusion detection systems (IDS) and virtual private networks (VPN) and access control lists (ACL) and authentication through AAA; second layer threats and mitigations such as: table attacks, DHCP attacks, address spoofing attacks, ARP attacks are also detailed.

**Course Number** : 314430  
**Course Title** : Cloud Computing Security  
**Credit Hours** : 3  
**Prerequisites** : 314331

The concept of securing the cloud ecosystem. Concepts and principles in bridging the gap between traditional and cloud architectures, considering the changing mindsets involved in enterprise risk management. Understanding standard cloud security network designs and architectural models, the complexity of cloud threat actors, technologies used to attack cloud computing infrastructure, the requirements necessary for securing data in the cloud, and the challenges in meeting those requirements.





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جامعة عجلون الوطنية

**Course Number** : 314321A  
**Course Title** : Digital Forensics Investigations  
**Credit Hours** : 2  
**Prerequisites** : 314243A

A general introduction to the field of digital forensic analysis, key topics in digital forensics, an overview of computers and digital media and storage formats, techniques for data acquisition and verification, forensic analysis methodologies, network traffic analysis, legal issues surrounding forensic investigations, professional competence and ethics, future developments in the field, and practices and standards related to incident response.

**Course Number** : 314321L  
**Course Title** : Digital Forensics Investigations Lab  
**Credit Hours** : 1  
**Prerequisites** : 314321A

Aims to provide students with the practical skills necessary to deal with digital crime scenes. The course covers collecting and preserving digital evidence while adhering to legal rules and chain of custody. It focuses on using specialized tools and techniques in disk analysis, data recovery, and network examination. It also includes training in simulating realistic scenarios of breaches and illegal activities. Students learn methods of documenting results and preparing technical reports that can be presented to judicial authorities. The course contributes to enhancing students' abilities in analysis, inference, and problem-solving in the field of cybercrimes.

**Course Number** : 314450  
**Course Title** : Graduation project  
**Credit Hours** : 3  
**Prerequisites** : Pass 90 credit hours

The project aims to develop real-world problem-solving skills, identify and analyze a problem, and implement the necessary programs. The project is carried out by a group of students under the supervision of a faculty member. Students are required to develop and implement the entire project object.



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جامعة عجلون الوطنية

**Course Number** : 314460  
**Course Title** : Field Training  
**Credit Hours** : 3  
**Prerequisites** : Pass 90 credit hours

The student undergoes training in a government or private institution under the supervision of an academic advisor, where they practically 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 which the trainee student belongs, which is later evaluated.



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جامعة عجلون الوطنية

### Elective Department Requirements (9 Credit Hours):

**Course Number** : 314244  
**Course Title** : Privacy Issues in Cloud Computing  
**Credit Hours** : 3  
**Prerequisites** : 314130

Cloud computing from a privacy perspective, assessing risks related to information security and privacy, ethical and legal viewpoints on information privacy in cloud computing, technical and administrative solutions for privacy and information security issues in cloud are computing.

**Course Number** : 314332  
**Course Title** : Cloud Computing and Virtualization Technology  
**Credit Hours** : 3  
**Prerequisites** : 314130

A deep understanding of the internal elements of virtualization, understanding cloud computing and related technologies, the history of computing, virtualization of resources and scheduling, virtualization within the operating system, how virtualization works, hardware trends: Moore's Law, and the economics of virtualization.

**Course Number** : 314343  
**Course Title** : Electronic crimes  
**Credit Hours** : 3  
**Prerequisites** : 314121

Concepts of technical, legal, and social issues related to cybercrimes, different types of cybercrimes, identifying cybercrime activities and responding to these problems from both private and public sectors, accurately describing and identifying cybercrime activities and choosing the appropriate response to deal with the problem.





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جامعة عجلون الوطنية

**Course Number** : 314344 A  
**Course Title** : Cryptanalysis  
**Credit Hours** : 2  
**Prerequisites** : 314242 A

Basic concepts in cryptography such as encryption and decryption, sender verification, data reliability, non-repudiation, classification of attacks (cipher text-only, known plaintext, chosen plaintext, chosen cipher text), symmetric encryption (DES and AES algorithms), asymmetric encryption (RSA algorithm), information theory-based security (one-time pad, Shannon's theory), key exchange, and digital signatures.

**Course Number** : 314344 L  
**Course Title** : Cryptanalysis lab  
**Credit Hours** : 1  
**Prerequisites** : 314344 A

Training students on the implementation and analysis of cryptographic techniques, including symmetric algorithms (DES, AES) and asymmetric algorithms (RSA). Emphasis is placed on simulating and evaluating attack models such as cipher text-only, known plaintext, chosen plaintext, and chosen cipher text. Students are trained to apply information-theoretic security concepts like the one-time pad and Shannon's theory, as well as to practice key exchange methods and digital signatures in practical laboratory settings.

**Course Number** : 314345  
**Course Title** : Confidentiality and Privacy of Data  
**Credit Hours** : 3  
**Prerequisites** : 314130

An overview of data security concepts and technologies, discussing new trends in data security in the context of internet information management, data application security models, privileges, passwords, roles, secure data auditing, XML access control, trust management and privacy protection, secure multi-level relational model and polyinstantiation, auditing in relational databases, advanced topics such as SQL injection, database management security issues like securing the Database Management System (DBMS), enforcing access control mechanisms, and related issues.





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جامعة عجلون الوطنية

**Course Number** : 314402A  
**Course Title** : Secure Network Programming  
**Credit Hours** : 2  
**Prerequisites** : 314220

Introduction to network programming, transport layer protocols, TCP, UDP, and SCTP, client-server model, TCP sockets, UDP sockets, SCTP sockets, multiplexing I/O, DNS resolution and address translation, thread programming, RPC, database connectivity, distributed programming, network security. One or more internet application protocols: TELNET, HTTP, SMTP, POP, IMAP, FTP, and web programming (CGI, Servlets, XML).

**Course Number** : 314402L  
**Course Title** : Secure Network Programming Lab  
**Credit Hours** : 1  
**Prerequisites** : 314402A

Training students on secure network programming through practical implementation of transport layer protocols (TCP, UDP, SCTP) and the client-server model. Emphasis is placed on developing applications using TCP, UDP, and SCTP sockets with input/output multiplexing, DNS resolution, and address handling. Students are trained in thread programming, RPC, database binding, and distributed programming with integrated security considerations. The course also covers Internet application protocols such as TELNET, HTTP, SMTP, POP, IMAP, and FTP, along with secure web programming using CGI, Servlets, and XML.

**Course Number** : 314431  
**Course Title** : Secure Software Engineering  
**Credit Hours** : 3  
**Prerequisites** : 313160

Security and safety in software development throughout all stages of the software lifecycle: analysis, design, coding, testing, and maintenance. Key security principles to follow in software development, threat modeling, defensive programming, web security, database security, and related security issues.



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جامعة عجلون الوطنية

**Course Number** : 314432A  
**Course Title** : Internet of Things (IoT) Security  
**Credit Hours** : 2  
**Prerequisites** : 314121

Fundamental theoretical and practical concepts in IoT, hardware platforms, embedded programming and debugging, IoT network models, secure operation, cloud integration, and basic data analytics, fundamentals of protecting devices and networks connected in IoT, basics of integrating security aspects into the design of IoT networks.

**Course Number** : 314432L  
**Course Title** : Internet of Things (IoT) Security lab  
**Credit Hours** : 1  
**Prerequisites** : 314432A

Training students on the practical aspects of Internet of Things (IoT) security, including hardware platforms, embedded programming, and debugging. Emphasis is placed on secure IoT network models, cloud integration, and lightweight data analytics. Students are trained to configure and secure IoT communication using protocols such as MQTT and CoAP, and to implement protection mechanisms for connected devices and networks. The course also covers the integration of security into IoT system design, from edge devices to the cloud.

**Course Number** : 314433  
**Course Title** : Special Topics in Cloud Computing  
**Credit Hours** : 3  
**Prerequisites** : Pass 60 credit hours

Providing a foundation in cloud computing and programming experience using virtual resources. This course will introduce cloud computing concepts. It will cover cloud computing models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).



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جامعة عجلون الوطنية

**Course Number** : 314434  
**Course Title** : Artificial Intelligence in Advanced Cloud Computing  
**Credit Hours** : 3  
**Prerequisites** : 314341A

Cloud computing concepts, supercomputing and artificial intelligence and DevOps, types of clouds: private, public, multi-cloud, and hybrid. Cloud data management (cloud storage services), the role of artificial intelligence in cloud computing | Nutanix, infrastructure to help automate routine operations and simplify workloads. Using AI tools to monitor, manage, and self-repair components in both public and private cloud environments.

**Course Number** : 314342  
**Course Title** : Secure communication protocols theoretical  
**Credit Hours** : 3  
**Prerequisites** : 314220

Fundamental security aspects in computer networks and wireless communications, security protocols for network access control and transport level security, wireless network security protocols, privacy and anonymity, applications of email security and IP security, and Internet authentication.

**Course Number** : 314468  
**Course Title** : Information Security and Network  
**Credit Hours** : 3  
**Prerequisites** : 314220

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.





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جامعة عجلون الوطنية

**Course Number** : 314446  
**Course Title** : Special Topics in Cybersecurity  
**Credit Hours** : 3  
**Prerequisites** : Pass 60 credit hours

Introducing new topics in the fields of cybersecurity and cloud computing, a series of advanced topics in cybersecurity and cloud computing, diverse subjects covering technological updates related to a specific pathway in cybersecurity and cloud computing, in-depth study of topics covered in other courses, and an introduction to advanced concepts. The department is responsible for determining the content of this course.