



Ajloun National University

جامعة عجلون الوطنية

Faculty of Information Technology

Department of Data Science and Artificial Intelligence

**Study Plan for the Bachelor's Degree
in Data Science and Artificial Intelligence
Academic year 2023/2024**



Ajloun National University

جامعة عجلون الوطنية

Vision

Excellence and leadership in providing educational and research programs on artificial intelligence and Internet technology at the local, regional and global levels.

Mission

The mission of the Department of Data Science and Artificial Intelligence is to provide high-quality educational and research programs that seek to develop knowledge and skills in the fields of data science and artificial intelligence. The focus is on achieving academic and research excellence, with special emphasis on innovation and practical applications in these two advanced sectors.

Goals

- 1) Providing distinguished educational programs: It aims to develop high-quality educational programs that cover the fields of data science and artificial intelligence, and meet the needs of students and the requirements of the changing labor market.
- 2) Enhancing knowledge and skills: It seeks to develop basic and advanced knowledge and skills in the field of data science and artificial intelligence.
- 3) Achieving academic excellence: It focuses on achieving excellence in academic performance and developing study programs that reflect the latest developments in the fields of data science and artificial intelligence.
- 4) Promoting innovation and practical applications: It seeks to encourage students to innovate and apply acquired concepts and techniques to solve practical problems.
- 5) Directing scientific research: Promoting scientific research in the fields of data science and artificial intelligence to develop knowledge and make important contributions in these fields.
- 6) Preparing students for the labor market: It aims to develop study programs that suit the needs of the labor market and enhance employment opportunities for graduates.
- 7) Strengthening interaction with the community: It seeks to enhance interaction between the department, the local community and industry to update educational content and direct research to meet the needs of the community.
- 8) Promoting continuous learning: It encourages the spirit of continuous learning and provides skill development opportunities for faculty members and students.
- 9) Promoting Diversity and Inclusion: It seeks to promote diversity and inclusion in the learning and research environment to ensure a diverse representation of the community.



Ajloun National University

جامعة عجلون الوطنية

10) Achieving global impact: It aims to achieve global impact through the department's contributions in the fields of science.

Learning Outcomes

Knowledge

Understanding mathematical methods, algorithms, computer operating systems, and various tools for statistical analysis of data and application of data statistics.

Knowledge of programming methods and languages and how to build computer programs and smart applications.

An understanding of the basics of science, security, databases, and big data, and their mining and retrieval.

Describe the basic concepts of data science and artificial intelligence and understand the different methods and tools for dealing with them.

Skills

Solving mathematical problems and designing algorithms.

Design and develop computer programs and implement artificial intelligence solutions.

Classifying, processing and analyzing data and using data management and retrieval solutions.

Apply theories and concepts in data science and artificial intelligence, such as machine learning, neural networks, computer vision, and robotics.

Competencies

Employing concepts and theories for exploratory data analysis and providing smart and innovative software solutions.

Commitment to ethics related to data science and artificial intelligence.

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

Work collaboratively to apply acquired knowledge, develop communication skills, and work in a team spirit through the experience of building smart projects.



Ajloun National University

جامعة عجلون الوطنية

Contents of the Study Plan

The study plan for the bachelor's degree in Data Science and Artificial Intelligence of (132) credit hours distributed as follows:

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

Certified Electronic (1+1, An hour and a half synchronous Electronic + campus learning).

Certified Blended (1+1, An hour and a half synchronous Blended + campus learning).

Number	Type of Requirement	Credit Hours	percentage%
First	University Requirements	27	20.45%
Second	Faculty Requirements	18	13.64 %
Third	Supportive Requirements	06	04.55 %
Fourth	Department Compulsory Requirements	69	52.27 %
	Department Elective Requirements	09	06.82 %
Fifth	Elective Free Requirements	03	02.27%
Total		132	100%

University Coding System

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

3

15

0 Remedial

1 First

2 Second

3 Third

4 Fourth



Ajloun National University

جامعة عجلون الوطنية

Knowledge Area

Knowledge Number	Knowledge Area	Number of Credit Hours
0	Programming	18
1	Computer Science and Algorithms	18
2	Fundamentals of Data science & Artificial intelligence	18
	Special topics in data science & Artificial intelligence	
3	Fundamentals of cloud computing	30-15
4	Graduation Project	3
5	Field Training	3



Ajloun National University

جامعة عجلون الوطنية

First: University Requirements (27) Credit Hours

University Compulsory Requirement (12) Credit Hours

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

University Elective Requirements (15) Credit Hours

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



Ajloun National University

جامعة عجلون الوطنية

Second: Faculty Requirements (18) Credit Hours

A. Faculty Compulsory Requirements (18) Credit Hours

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

Third: Supportive Requirements (6) Credit Hours

Course code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
601131	Principles of Statistics	3	-		√	
601241	Linear Algebra (1)	3	601101			√



Ajloun National University

جامعة عجلون الوطنية

Fourth: Department Requirements (78) Credit Hours

A. Department Compulsory Requirements (69) Credit Hours

Course code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
315120	Fundamentals of Data Science	3	-	√		
315130	Probability and Statistics for Data Science	3	601131			√
315202	Advanced Topics in Programming	3	311202			√
315204	Data Science and Artificial Intelligence Programming	3	311202			√
315211	Fundamentals of Digital Logic	3	311100			√
315213	Data Structures	3	311202			√
315214	Computing Systems for Data Science and Artificial Intelligence	3	315120		√	
315220	Database Systems	3	311100		√	
315222	Fundamentals of Artificial Intelligence	3	315213			√
315230	Data Engineering and Analysis	3	315120		√	
315309	Robotics Programming	3	315204			√
315315	Analysis and Design of Algorithms	3	315213			√
315316	Fundamentals of Operating Systems	3	315315		√	
315320	Machine Learning and Neural Networks	3	315222			√
315321	Big Data	3	315230		√	
315330	Data modeling and Simulation	3	315222+ 315130		√	
315331	Data Mining and Warehousing	3	315230	√		
315424	Advanced Artificial Intelligence	3	315222			√
315431	Deep Learning	3	315320		√	
315432	Natural Language Processing	3	315222			√
315433	Data Visualization	3	315220			
315440	Graduation Project	3	Pass of 90 hours	√		
315450	Field Training	3	Pass of 90 hours	√		



Ajloun National University

جامعة عجلون الوطنية

B. Department Elective Requirements (9) Credit Hours

Course code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
315205	Introduction to Website Design	3	311101		√	
315212	Multimedia Systems	3	311101		√	
315233	Introduction to Computer Networks	3	315211		√	
315334	Data Management and Governance	3	315331			√
315335	Business Intelligence	3	315230			√
315336	Internet of Things	3	315222		√	
315435	Information Retrieval	3	315230			√
315436	Pattern Recognition	3	315424			√
315437	Special Topics in Data Science	3	Pass of 60 hours		√	
315438	Special Topics in Artificial Intelligence	3	Pass of 60 hours		√	

Fifth: Free Elective Requirements (03) Credit Hours

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



Ajloun National University

جامعة عجلون الوطنية

Advisement Plan for obtaining a bachelor's degree in Data Science and Artificial Intelligence

First Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
311100	Introduction to Computer Programming	3	-
313160	Introduction to Software Engineering	3	-
315120	Fundamentals of Data Science	3	-
601131	Principles of Statistics	3	-
-	Compulsory University Requirement	1	-
-	Compulsory University Requirement	2	-
Total		15	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
311101	Programming Language (1)	3	311100
311210	Discrete Mathematics for IT Students	3	601101
315130	Probability and Statistics for Data Science	3	601131
601101	Calculus (1)	3	-
601241	Linear Algebra (1)	3	601101
-	Compulsory University Requirement	1	-
-	Compulsory University Requirement	2	-
Total		18	



Ajloun National University

جامعة عجلون الوطنية

Second Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
311202	Object-oriented Programming	3	311101
315211	Fundamentals of Digital Logic	3	311100
315220	Database Systems	3	311100
315230	Data Engineering and Analysis	3	315120
-	Compulsory University Requirement	1	-
-	Compulsory University Requirement	2	-
-	Elective University Requirement	3	-
Total		18	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
315202	Advanced Topics in Programming	3	311202
315204	Data Science and Artificial Intelligence Programming	3	311202
315213	Data Structures	3	311202
315214	Computing Systems for Data Science and Artificial Intelligence	3	315120
-	Elective Free Requirement	3	-
-	Elective University Requirement	3	-
Total		18	



Ajloun National University

جامعة عجلون الوطنية

Third Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
315222	Fundamentals of Artificial Intelligence	3	315213
315315	Analysis and Design of Algorithms	3	315213
315316	Fundamentals of Operating Systems	3	315315
315321	Big Data	3	315230
-	Elective Compulsory Requirement	3	-
-	Elective University Requirement	3	-
Total		18	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
315309	Robotics Programming	3	315204
315320	Machine Learning and Neural Networks	3	315222
315330	Data modeling and Simulation	3	315130+315222
315331	Data Mining and Warehousing	3	315230
-	University Compulsory Requirement	3	-
-	Elective Department Requirement	3	-
Total		18	



Ajloun National University

جامعة عجلون الوطنية

Fourth Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
315424	Advanced Artificial Intelligence	3	315222
315431	Deep Learning	3	315320
315432	Natural Language Processing	3	315222
315433	Data Visualization	3	315220
-	Elective University Requirement	3	-
Total		15	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
315440	Graduation Project	3	Pass of 90 hours
315450	Field Training	3	Pass of 90 hours
-	Elective Department Requirement	3	-
-	Elective University Requirement	3	-
Total		12	



Ajloun National University

جامعة عجلون الوطنية

Courses Description

Faculty Compulsory Requirements (18 Credit Hours)

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

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

Course Number	: 311101
Course Title	: Programming Language1
Credit Hours	: 3
Prerequisites	: 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.

Course Number	: 311202
Course Title	: Object-Oriented Programming
Credit Hours	: 3
Prerequisites	: 311101

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



Ajloun National University

جامعة عجلون الوطنية

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

Introduction to logic, propositional logic, conventional and unconventional proofs, sets, set operations, functions, countable and uncountable sets, integers and remainder arithmetic, sequences, series, mathematical induction, recursion, counting, permutations, combinations, probabilities, relations, graph theory, trees.

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

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

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

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



Ajloun National University

جامعة عجلون الوطنية

supportive Requirements (6 Credit Hours):

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

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

Course Number : 601241
Course Title : Linear Algebra (1)
Credit Hours : 3
Prerequisites : 601101

Linear systems of equations, matrices and operations on matrices, homogeneous and non-homogeneous systems, Gaussian elimination method, elementary matrices, matrix transpose, matrix inverse, determinants and their properties and calculation methods, Cramer's rule, vector spaces, subspaces, linear independence, bases, dimensions, row spaces, column spaces, null space, rank and nullity, eigenvalues and eigenvectors, diagonalization problem, linear transformations, kernel and range.



Ajloun National University

جامعة عجلون الوطنية

Compulsory Department Requirements (78 Credit Hours):

Course Number : 315120
Course Title : **Fundamentals of Data Science**
Credit Hours : 3
Prerequisites : -

The principles and fundamental tools, concepts, and techniques of data science, including data collection, integration, exploratory data analysis, predictive modeling, descriptive modeling, creating data programs, evaluation, and effective communication. These topics will be addressed broadly, with a focus on integrating and synthesizing concepts and how to apply them to problem-solving.

Course Number : 315130
Course Title : **Probability and Statistics for Data Science**
Credit Hours : 3
Prerequisites : 601131

Development and understanding of modern intensive computational methods for statistical inference and exploratory data analysis. Advanced computational methods for statistics, including univariate and multivariate optimization methods, integrative methods, and simulation techniques. Demonstrating how to draw inferences about the population of interest in data mining problems. Theory of sample distributions, principles of data reduction, interval estimation, point estimation, sufficiency statistics, order statistics, hypothesis testing, and correlation and regression.

Course Number : 315202
Course Title : **Advanced Topics in Programming**
Credit Hours : 3
Prerequisites : 311202

This course introduces advanced programming concepts using Python. It assumes basic knowledge of control structures in Python, functions, files, data structures, and the NumPy library. The course covers data collection from various sources, including web scraping, web APIs, CSV, and other structured data files, as well as databases. It includes data analysis using the Pandas library, regular expressions, and other string processing methods, classes, object-oriented programming, and building real-world software applications.



Ajloun National University

جامعة عجلون الوطنية

Course Number : 315204
Course Title : **Data Science and Artificial Intelligence Programming**
Credit Hours : 3
Prerequisites : 311202

Implementation of data science models and artificial intelligence models using programming languages and/or tools for data science and artificial intelligence such as Python, SAS, and WEKA at different stages of the model development process, including data preprocessing, exploratory data analysis, descriptive statistics, model development, and model evaluation.

Course Number : 315211
Course Title : **Fundamentals of Digital Logic**
Credit Hours : 3
Prerequisites : 311100

Binary system: Digital computer systems, binary numbers, conversion of numbers to octal and hexadecimal systems, one's and two's complements; Logical algebra and logic gates: Basic definitions of logical algebra, theories of logical algebra, theories of digital logic gates, functions of logic gates, families of integrated circuits; Simplification of logical function: Karnaugh map, 3-variable, 4-variable, 5-variable. Sum of products, product of sums, essential prime implicants; Combinational logic: Integrated combinational circuits, sequential circuits, flip-flops, registers, counters, memory units.

Course Number : 315213
Course Title : **Data Structures**
Credit Hours : 3
Prerequisites : 311202

Basic concepts, an introduction to algorithms, and methods of data representation. Topics include pointers and symbolic chains, queues, stacks, circular linked list structure, linear linked list structure, and multilinked linked list structure. Additionally, tree structures, sorting algorithms, and search algorithms are covered.



Ajloun National University

جامعة عجلون الوطنية

Course Number : 315214
Course Title : **Computing systems for data science and artificial intelligence**
Credit Hours : 3
Prerequisites : 315120

The goal of this course is to provide students an overview of the various programs and equipment that help data scientists analyze their data. These technologies include R, Hadoop, Spark, and more. It also provides an introduction to big data, cloud, and Internet of Things computing.

Course Number : 315220
Course Title : **Database Systems**
Credit Hours : 3
Prerequisites : 311100

Basic concepts and terminology of databases, database administrator, database management systems. Characteristics and methodology of the database, the three-level architecture of the data schema, the canonical relational model for describing databases: symbols and concepts. Concepts, constraints, and operations related to the relational model, relational algebra, building a database from canonical relational models, overview of SQL language, functional dependencies, simplifying database designs.

Course Number : 315222
Course Title : **Fundamentals of Artificial Intelligence**
Credit Hours : 3
Prerequisites : 315213

The course covers the basic principles, techniques, and applications of artificial intelligence. It explores topics such as knowledge representation, logic, inference and problem-solving, search algorithms, game theory, perception, learning, and planning methods. The course also includes discussions on knowledge representation, computational logic, knowledge engineering, expert systems, and natural language processing. Machine learning will be introduced, and important programming languages such as Python and R will be covered.



Ajloun National University

جامعة عجلون الوطنية

Course Number : 315230
Course Title : **Data Engineering and Analysis**
Credit Hours : 3
Prerequisites : 315120

Basic concepts of data science, its analysis, and applications. The topics covered in this course include data acquisition, cleaning, aggregation, exploration, and presentation, as well as building and analyzing models and verifying them. It also covers the statistical and mathematical foundations of data science. This course addresses the data lifecycle in a data science project, covering types of data such as structured, semi-structured, and unstructured data, different data formats, techniques used, and exploration using visualization or basic review techniques for data.

Course Number : 315309
Course Title : **Robot Programming**
Credit Hours : 3
Prerequisites : 315204

This course aims to provide students with the skills to program, modify, and operate robots. It introduces the robot operating system and several commonly used tools in robot programming, with a focus on autonomous mobile robots. The course emphasizes creating user programs that interact with sensors and actuators of mobile robot devices, implementing motion control algorithms. It also covers debugging programs using available tools, testing them through simulation tools, and executing them on mobile robots.

Course Number : 315315
Course Title : **Analysis and Design of Algorithms**
Credit Hours : 3
Prerequisites : 315213

Introduction to algorithms; algorithm design techniques, algorithm analysis: the concept of basic operations, the concept of the best, average, and worst-case analysis, complexity analysis: Theta Big, Omega Big, O Big notations, recurrence equations, recursive algorithms, basic search algorithms, basic sorting algorithms, concept of flowcharts, and algorithm flowcharts.



Ajloun National University

جامعة عجلون الوطنية

Course Number : 315316
Course Title : **Fundamentals of Operating Systems**
Credit Hours : 3
Prerequisites : 315315

This course covers the fundamental concepts and mechanisms of modern operating systems. It includes a historical overview of operating systems, computer structures and operating systems, key issues in concurrency, thread management, deadlock control, synchronization, scheduling, memory management, and process management. The course also addresses multi-threading concepts.

Course Number : 315320
Course Title : **Machine Learning and Neural Networks**
Credit Hours : 3
Prerequisites : 315222

Fundamentals of machine learning, algorithms, and their applications. Topics include supervised learning, unsupervised learning, deep learning, and reinforcement learning. This course focuses on practical applications of machine learning and artificial intelligence, including computer vision, data extraction, speech recognition, text processing, and bioinformatics. Various computer architectures designed for efficient machine learning will be covered.

Course Number : 315321
Course Title : **Big Data**
Credit Hours : 3
Prerequisites : 315230

This course provides the data science students with understanding of the Big Data and its role in data analysis. It provides the terminology and the core concepts behind big data problems, applications, and systems. It provides an introduction to one of the most common frameworks, Hadoop and Spark that have made big data analysis easier and more accessible. Also, it will provide you with the necessary skill in manipulating big data distributed over a cluster using functional concepts and in-memory distributed collections framework written in Scala or Spark. We'll cover Spark's programming model in detail, being careful to understand how and when it differs from familiar programming models, like shared-memory parallel collections or sequential collections. Through hands-on examples in Spark and Scala, student learns when important issues related to distribution like latency and network communication should be considered and how they can be addressed effectively for improved performance.



Ajloun National University

جامعة عجلون الوطنية

Course Number : 315330
Course Title : **Data Modeling and Simulation**
Credit Hours : 3
Prerequisites : 315130+ 315222

Data modeling and simulation deals with statistical description of data, data fitting methods, regression analysis, analysis of variance, and goodness of fit. Probability and random processes, discrete and continuous distributions, central limit theorem, measure of randomness, Monte Carlo methods. Stochastic processes, Markov chains, time series models. Modeling and Simulation Concepts, Discrete Event Simulation: Event Scheduling/Verification of Advance Time Algorithms and Validation of Simulation Models. Continuous simulation: modeling using stochastic differential equations and their simulation.

Course Number : 315331
Course Title : **Data Mining and Warehousing**
Credit Hours : 3
Prerequisites : 315230

This course covers fundamental concepts in data mining and data warehousing. Topics include knowledge discovery from databases, applications of data mining, techniques and models in data mining, issues related to privacy and ethics in data mining, major data mining methods, data warehouses, data cleaning, grouping, and classification. The course also explores recent developments in web data mining.

Course Number : 315424
Course Title : **Advanced Artificial Intelligence**
Credit Hours : 3
Prerequisites : 315222

Advanced Artificial Intelligence covers the types and domains of artificial intelligence, how to build an application that behaves intelligently, advanced applications of artificial intelligence, search methods, knowledge representation, problem-solving methods, and machine learning methods specific to artificial intelligence such as patterns. The course includes the completion of a practical application or research project by students.



Ajloun National University

جامعة عجلون الوطنية

Course Number : 315431
Course Title : Deep Learning
Credit Hours : 3
Prerequisites : 315320

This course provides an understanding of the fundamental principles of deep learning. It covers feedforward neural networks, convolutional neural networks (CNN), recurrent neural networks (RNN), sequence modeling, and reinforcement learning, along with other core concepts and techniques. The course will also teach students the underlying computations behind deep learning. By the end of the course, students are expected to be able to build, train, and apply fully connected deep neural networks, know how to implement efficient neural networks using common deep learning libraries such as Keras, PyTorch, and Tensor Flow. This course will also introduce students to a wide range of real-world applications of deep learning in various domains.

Course Number : 315432
Course Title : Natural Language Processing
Credit Hours : 3
Prerequisites : 315222

Natural Language Processing (NLP) focuses on the interaction of human languages with computers, specifically how to program computers to analyze and process large amounts of text. The course covers linguistic topics, language rules and structures, natural language processing, sentence construction in programming languages and their structures, flow control, text encoding, text normalization, understanding the structure of text sentences, summarizing text, information extraction, feature matrices, unique value analysis, automatic document summarization, and semantic analysis.

Course Number : 315433
Course Title : Data Visualization
Credit Hours : 3
Prerequisites : 315220

Design and create graphical representations of data based on the available data and the tasks required to be accomplished. Topics include data modeling, data processing, data exploration, linking between data properties and visualization properties, and dashboard development. The focus is on identifying patterns, trends, and differences in data across categories, space, and time. Students will learn to evaluate the effectiveness of visual representations and think critically about each design decision, such as color selection and visual encoding.



Ajloun National University

جامعة عجلون الوطنية

Course Number : 315440
Course Title : **Graduation Project**
Credit Hours : 3
Prerequisites : Pass of 90 credit hours

The graduation project is designed to enhance the student's skills and ability to solve real-world problems, study and analyze them, and develop the necessary software to address these challenges. This is achieved through a comprehensive project that the student, as part of a team, will develop under the supervision of a faculty member. The student is required to fulfill the project's objectives and submit a final report. The project is then discussed and evaluated by a committee of faculty members.

Course Number : 315450
Course Title : **Field Training**
Credit Hours : 3
Prerequisites : Pass of 90 credit hours

This internship course is designed for students majoring in Data Science and Artificial Intelligence. The students will undergo practical training at a government or private institution under the supervision of an academic mentor. During the internship, students will apply the knowledge and skills acquired during their university studies. The hosting institution will be responsible for providing a pre-prepared report to evaluate the performance of the intern, based on the department's guidelines. This course aims to bridge the gap between academic learning and real-world application, allowing students to gain hands-on experience in their field of study.



Ajloun National University

جامعة عجلون الوطنية

Elective Department Requirements (9 Credit Hours):

Course Number : 315205
Course Title : Introduction to Web Design
Credit Hours : 3
Prerequisites : 311101

This course provides fundamental concepts in internet applications, web browsers, and the basics of web design. It covers web page languages, with a focus on XHTML. Students will learn about text, styles, colours, images, lists, tables, and encoding structures in XHTML. The course also includes an introduction to scripting languages such as VBScript and JavaScript. Students will explore web deployment, principles of web evaluation, and web page building tools like FrontPage and Dreamweaver.

Course Number : 315212
Course Title : Multimedia Systems
Credit Hours : 3
Prerequisites : 311101

This course covers the principles and modern technologies in designing multimedia systems, with a focus on gaining practical experience in this field. Topics include the design of multimedia systems, multimedia devices and software, and issues related to the representation, processing, and transmission of multimedia data such as text, graphics, audio, music, images, and video.

Course Number : 315233
Course Title : Introduction to computer Networks
Credit Hours : 3
Prerequisites : 315211

Ideas and terminology of data communication, computer networks, physical design, logical design of computer networks, network architecture, and information transfer media used in computer networks. Open Systems Interconnection (OSI) Reference Model, TCP/IP Reference Model, Physical Layer, Data Link Layer, Network Layer, Passing Layer, Conversation Layer, Presentation Layer, Application Layer. The ALOHA protocol, CSMA protocols, computer local area networks, standard standards, IEEE protocols (Token Ring, Token Bus, and Ethernet), the basics of the physical layer, the data link layer, frame protocols, error detection and correction, routing algorithms, data flow control in networks, and congestion control algorithms in networks. Personal computer networks.



Ajloun National University

جامعة عجلون الوطنية

Course Number : 315334
Course Title : **Data Management and Governance**
Credit Hours : 3
Prerequisites : 315331

This course covers the fundamentals of data governance and management, including establishing a data governance strategy, leveraging data governance, implementing data governance, and managing, monitoring, and measuring data governance efforts. Students will learn about roles and responsibilities in data governance, the challenges of data governance, the distinction between data governance and data management.

Course Number : 315335
Course Title : **Business Intelligence**
Credit Hours : 3
Prerequisites : 315230

Understanding the basics of business intelligence; an introduction and overview of business intelligence for supply chain and marketing, business intelligence and big data from the business perspective, understanding OLAP, developing dashboards, predictive analytics, descriptive analytics, creating a business intelligence project, data extraction, and creating queries and data extraction reports.

Course Number : 315336
Course Title : **Internet of things**
Credit Hours : 3
Prerequisites : 315222

This course describes several issues related to the Internet of Things, including introduction to the Internet of Things, solution patterns for the Internet of Things, the IoT edge, the cloud, and IoT applications.

Course Number : 315435
Course Title : **Information Retrieval**
Credit Hours : 3
Prerequisites : 315230

This course focuses on the components, design, and implementation of text-based information retrieval systems and various techniques for building information systems based on text analysis, indexing, and retrieval. Topics covered include text indexing, logical retrieval models, vector space retrieval models, and text extraction. The course also addresses text classification, evaluation, analysis, compression techniques, and methods for optimizing data indexing for large datasets, taking into consideration memory constraints and available space.



Ajloun National University

جامعة عجلون الوطنية

Course Number : 315436
Course Title : **Pattern Recognition**
Credit Hours : 3
Prerequisites : 315424

This course introduces the basics of creating computational algorithms for recognizing patterns within data of various forms and analyzing them. The course covers algorithms, fractal geometry, and classification methods such as random forests and deep learning approaches. State-of-the-art tools like Python, Tensor flow, and programming languages will be used to study patterns in nature, noisy data, and real-world sources such as images, social media, and biomedical signals.

Course Number : 315437
Course Title : **Special Topics in Data Science**
Credit Hours : 3
Prerequisites : Pass of 60 credit hours

The aim of this course is to introduce students to various areas within the field of data science. This is achieved by presenting new tools, techniques, and diverse research areas in the field of data science. The course covers domains and specializations that utilize data science for data analysis, knowledge extraction, and the application of various algorithms and tools in these domains.

Course Number : 315438
Course Title : **Special Topics in Artificial Intelligence**
Credit Hours : 3
Prerequisites : Pass of 60 credit hours

This course aims to introduce new and emerging topics in artificial intelligence (AI) and their applications in information technology. The specific content and requirements for this course are determined by the departmental council based on the latest developments and trends in the field of AI.