The University of Jordan   الجامعة الاردنية

Form:	**Form Number**	EXC-01-03-02A
Study Plan-	**Issue Number and Date**	2/3/24/2022/2963 2022/12/05
Bachelors	**Number and Date of Revision or Modification**	15/10/2023
	Deans Council Approval Decision Number	265/2024/24/3/2
	The Date of the Deans Council Approval Decision	2024/1/23
	Number of Pages	32

1.	School	Science
2.	Department	Mathematics
3.	Program title (Arabic)	بكالوريوس الإحصاء وعلم البيانات
4.	Program title (English)	B.Sc. Statistics and Data Science

5. Components of Curriculum:

The curriculum for the bachelor's degree in Statistics and Data Science consists of (132) credit hours distributed as follows

Number	Type of requirement	Type of learning	credit hours
First	University Requirements	Online and blended	27
Second	Faculty Requirements	Face to face, blended, and online	21
Third	Specialty Requirements	Face to face, blended, and online	84
Total			**132**

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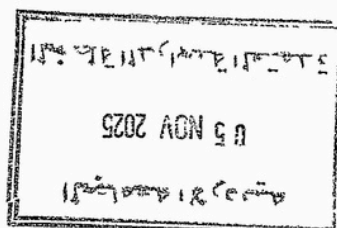
6. Numbering System:

A- Department number

Department	Number
Mathematics	1
Physics	2
Chemistry	3
Biological Sciences	4
Geology	5
Medical Sciences	6
Basic Sciences	9

B- Course number

| Domain number	Domain title	Domain number	Domain title
0	Calculus and General Mathematics	5	Foundation of Mathematics
1	Analysis	6	Geometry and Topology
2	Differential Equations	7	Applied mathematics and Actuarial Science
3	Statistics and Probability	8	Teaching mathematics and History of Mathematics
4	Algebra	9	Seminar and Research

C- Course number consists of 7 digits

School		Department		Level	Serial number	
0	3	0	1	2	4	1
		3	1	3	4	1
		4	1	4	3	2
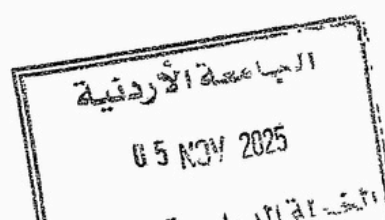
First: University Requirements (27) Credit Hours:

Preparation Program Requirements	
All students admitted to the university must apply for a degree examination in Arabic and English and the computer is prepared or approved by the university to determine their level. Based on the results of the examinations, either the student will study one or more of the requirements of the preparatory program	

			(0 - 15 Credit Hours)		
No.	**Course Title**	**Course No.**	**Credit Hours**	**Prerequisites**	**Notes**
1	Community service	0700150	0		
2	Computer skills placement test	1902098	0		
3	Basics of computing	1932099	3	1902098	blended
4	Arabic Language (level 1)	3201001	3	3211098	
5	Arabic Language (level 2)	3201002	3	3201001	
6	English language (level 1)	3202001	3	3212098	
7	English language (level 2)	3202002	3	3202001	
8	Arabic placement test	3211098	0		
9	English placement test	3212098	0		

			Compulsory Requirements		
			(18 Credit Hours)		
No.	**Course Title**	**Course No.**	**Credit Hours**	**Prerequisites**	**Notes**
1	Military sciences	2220100	3		On Line
2	English language (level 3)	3202003	3	3202002	
3	National culture	3400100	3		On Line
4	Ethics and Social Responsibility	3420100	3		blended
5	Entrepreneurship, Innovation, and Leadership	3420101	3		blended
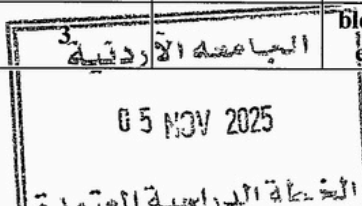
| 6 | Communication and Soft Skills (in English language) | 3420103 | 3 | 3202003 or 3202103 | |

Electives (9 Credit Hours)
Elective courses: (9) credit hours to be chosen from the first, second and third groups mentioned below. The student has to choose one course from each of the groups.

(First Group)

No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Environmental culture and development	0359102	3		blended
2	Islamic culture	0400102	3		blended
3	Health Culture	0309100	3		blended
4	Legal culture	1000102	3		Face to face
5	Physical fitness culture	1100100	3		blended
6	Introduction to philosophy and critical thinking	3400103	3		online
7	Tourism culture	3400111	3		blended

(Second Group) (3 credits hour)

No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Islam and contemporary issues	0400101	3		blended
2	Social media	0309101	3		blended
3	Appreciation of arts	2000100	3		blended
4	Foreign language	2200103	3		blended
5	Arab-Islamic civilization	2300101	3		blended
6	Jordan: history and civilization	2300102	3		blended
7	Special subject	3400106	3		blended
8	Great books	3400107	3		blended
9	Jerusalem	3400108	3		blended

Electives (3) credits hour

(Third Group)
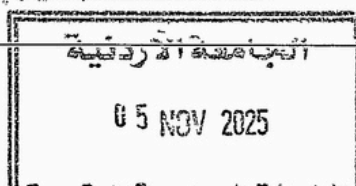
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No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Specialized Topics in Digital Skills	0309104	3	0309103	
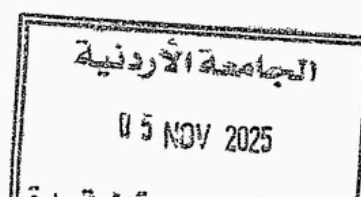
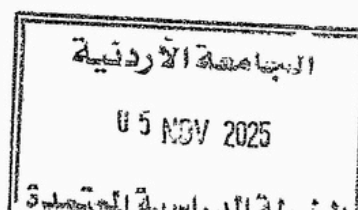**Second:** School courses: distributed as follows:
- A. Obligatory school courses: (21) credit hours.
- B. Elective school courses: (None) credit hours.

A. Obligatory school courses: (21) credit hours:

Course Number	Course Title	Type of learning (face-to-face | blended | online)	Contact Hours		Credit Hours	Pre-requisite
			Theoretical	Practical		
0319101	Calculus-1	face-to-face	3	-	3	-
0319131	Principles of Statistics	online	3	-	3	-
0329101	General Physics-1	face-to-face	3	-	3	-
0339101	General Chemistry-1	face-to-face	3	-	3	-
0349101	General Biology-1	face-to-face	3	-	3	-
0309103	Modern Digital Skills	blended	3	-	3	1932099
1902224	Database Management Systems	face-to-face	3	-	3	1915111

B. Elective school courses: (0) credit hours:

Course Number	Course Title	Type of learning (face-to-face | blended | online)	Contact Hours		Credit Hours	Pre-requisite
			Theoretical	Practical		

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Third: Specialty courses: (84) credit hours distributed as follows:

   B. Obligatory specialty courses: (69) credit hours
   C. Elective specialty courses: (15) credit hours

   B. Obligatory specialty courses: (69) credit hours:

Course Number	Course Title	Type of learning (face-to-face | blended | online)	Contact Hours		Credit Hours	Pre-requisite
			Theoretical	Practical		
0319102	Calculus II	face-to-face	3		3	0319101
0301152	Discrete Mathematics	face-to-face	3		3	0319101
0319201	Calculus III	face-to-face	3		3	0319102
0301241	Linear Algebra I	face-to-face	3		3	0319101
0341332	Statistical Techniques	face-to-face	3		3	0319131
0301333	Probability Theory	face-to-face	3		3	0319201
0331334	Stochastic Processes	face-to-face	3		3	0301333
0331338	Regression analysis	face-to-face	3		3	0341332
0301371	Mathematical Optimization	face-to-face	3		3	0301241
0301374	Theory of Algorithms	blended	3		3	0301152
0331431	Mathematical Statistics	face-to-face	3		3	0301333
0331432	Time Series	face-to-face	3		3	0341332
1915111	AI Programming **	face-to-face	1	2	3	--
1915121	Principles of Data Science	blended	3		3	--
1905222	Data Mining **	face-to-face	1	2	3	0341332+1915111
1915231	Data Engineering and Analytics **	face-to-face	1	2	3	1915121
1915441	Data Visualization **	face-to-face	1	2	3	0301374+1905222
0301494	Employability Readiness 1	face-to-face	3	6	9	Completing at least 90 credits
0301495	Employability Readiness 2	face-to-face	3	6	9	Completing at least 90 credits

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** Course Taught Theoretical and Practical in the Lab

C. Elective specialty courses: (15) credit hours:

Course Number	Course Title	Type of learning (face-to-face | blended | online)	Contact Hours		Credit Hours	Pre-requisite
			Theoretical	Practical		
0301274	Mathematics for Finance	face-to-face	3		3	0319102
0331301	Advanced Calculus	face-to-face	3		3	0319201
0341336	Design and Analysis of Experiments	face-to-face	3		3	0301332
0301338	Applied Probability	online	3		3	0301333
0301343	Computational Linear Algebra **	face-to-face	3		3	0301241
0301344	Combinatorics and Graphs for Data Science	blended	3		3	0301152+0301241
0301376	Risk Theory	face-to-face	3		3	0301333
0331362	Topological Data Analysis	face-to-face	3		3	0301152+0301241
0331437	Multivariate Analysis	face-to-face	3		3	0341332
0301446	Cryptography Theory	online	3		3	0301152+0301241
0331476	Decision Making	face-to-face	3		3	0301333+0301371
1905220	Ethics of Artificial Intelligence and Data Science	online	3		3	1915121
1915232	Data Management and Governance **	face-to-face	1	2	3	1905222
1915331	NoSQL Databases **	face-to-face	2	1	3	1915231
1915370	Machine Learning and Neural Networks **	face-to-face	2	1	3	0301374+1905222
1904371	Business Intelligence **	face-to-face	2	1	3	1915111
1905380	Natural Language Processing **	face-to-face	1	2	3	1915111
1915431	Big Data **	face-to-face	1	2	3	0301374+1905222

| 1915352	Healthcare and Medical Data Analytics	face-to-face	2	1	3	1905222
1915341	Social Network Analysis	face-to-face	2	·1	3	1905222+0301374
1915499	Special Topics in Data Science	online		3	3	0301374+1905222

** Course Taught Theoretical and Practical in the Lab

Fourth: Courses offered by other faculties/schools and departments:

Course Number	Course Title	Type of learning (face-to-face | blended | online)	Contact Hours		Credit Hours
			Theoretical	Practical	
1915111	AI Programming	face-to-face	1	2	3
1915121	Principles of Data Science	blended	1	2	3
1905220	Ethics of Artificial Intelligence and Data Science	online	3		3
1905222	Data Mining	face-to-face	1	2	3
1915231	Data Engineering and Analytics	face-to-face	1	2	3
1915232	Data Management and Governance	face-to-face	2	1	3
1915331	NoSQL Databases	face-to-face	1	2	3
1915370	Machine Learning and Neural Networks	face-to-face	2	1	3
1904371	Business Intelligence	face-to-face	1	2	3
1905380	Natural Language Processing	face-to-face	2	1	3
1915431	Big Data	face-to-face	2	1	3
1915441	Data Visualization	face-to-face	1	2	3
1915352	Healthcare and Medical Data Analytics	face-to-face	1	2	3
1915341	Social Network	face-to-face	1	2	3

	Analysis				
1915499	Special Topics in Data Science	online	3		3

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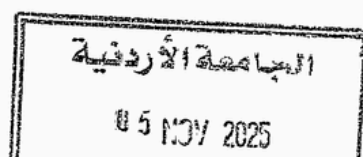
Fifth: Advisory Study Plan

(First) Year

(First) Semester			(Second) Semester		
Course Number	Course Title	Credit Hours	Course Number	Course Title	Credit Hours
0319101	Calculus I	3	0319102	Calculus II	3
0319131	Principles of Statistics	3	0301152	Discrete Mathematics	3
0309103	Modern Digital Skills	3	1915111	AI Programming	3
	College Requirement	3		College Requirement	3
	University Requirement	3		University Requirement	3
	Total	15		Total	15

First Year (Summer Semester)

Course No.	Course Name	Credit Hours
	University Requirement	3
	College Requirement	3
	Total	6
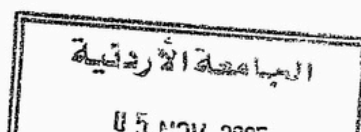
(Second) Year

(First) Semester			(Second) Semester		
Course Number	Course Title	Credit Hours	Course Number	Course Title	Credit Hours
0319201	Calculus III	3	0301333	Probability Theory	3
0301241	Linear Algebra I	3	0301371	Mathematical Optimization	3
0341332	Statistical Techniques	3	1915121	Principles of Data Science	3
	College Requirement	3	0301374	Theory of Algorithms	3
	University Requirement	3		College Requirement	3
	University Requirement	3			
Total		18	Total		15
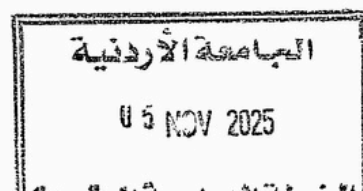
(Third) Year

(First) Semester			(Second) Semester		
Course Number	Course Title	Credit Hours	Course Number	Course Title	Credit Hours
0301338	Regression Analysis	3	0301334	Stochastic Processes	3
1905222	Data Mining	3	0331431	Mathematical Statistics	3
1915231	Data Engineering and Analytics	3	0331432	Time Series	3
	University Requirement	3		Elective Specialization Requirement	3
	Elective Specialization Requirement	3	1915441	Data Visualization	3
	Elective Specialization Requirement	3			
Total		18	Total		15
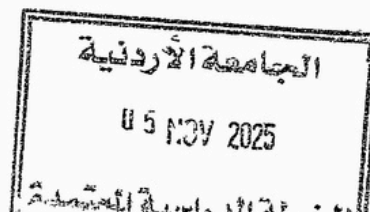
(Fourth) Year

	(First) Semester			(Second) Semester	
Course Number	Course Title	Credit Hours	Course Number	Course Title	Credit Hours
0301494	Employability Readiness 1 (Employability Skills + Training)	9	0301495	Employability Readiness 2 (Graduation Project + Training)	9
	Elective Specialization Requirement (online)	3		Elective Specialization Requirement (online)	3
	University Requirement (online)	3		University Requirement (online)	3
Total		15	Total		15

1. In the fourth year, the student completes the remaining university requirements and elective major requirements. Courses are offered online, and students register for a maximum of 6 credit hours in addition to the Employability Readiness course.

2. In Employability Readiness 1, the student learns labor market skills and undergoes three months of internship training. Students are evaluated based on their CVs, presentations, and a report on the first internship period. This report is evaluated by their academic and internship supervisors.

3. In Employability Readiness 2, the student learns scientific research skills and completes a graduation project in coordination between their academic and internship supervisors. They undergo three months of internship training. The student is evaluated based on a final report on the internship period and a report from their academic and internship supervisors. Regarding the graduation project, the student presents their research project in writing and is evaluated orally before a committee of academics and interns.

4. Practical training takes place every day of the week, from Sunday to Thursday, for a minimum of 6 hours per day, throughout the semester, at a specialized institution in coordination with the University of Jordan and under the supervision of the program's practical training coordinators.

5. The tasks for which students are trained in the labor market are determined in coordination between the academic supervisor and employers. The academic supervisor monitors the student's commitment to training through attendance and absence forms and field visits. He also monitors the students' seriousness in training and their ability to complete the required tasks.

6. If a student fails in some subjects during the first three years, they can make up for it by registering for 9 credit hours in the summer semester, 18 credit hours in the regular semester, or the summer semester in the fourth year.
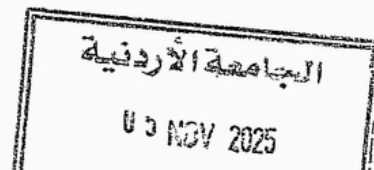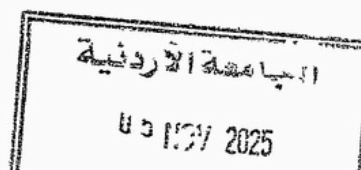
Course Description

Course Number 0319101	Course Title: Calculus I	Face to face	Credit Hours
Prerequisite: (None)			3

Course Description

Functions: domain, operations on functions, graphs of functions; trigonometric functions; limits: meaning of a limit, computational techniques, limits at infinity, infinite limits; continuity; limits and continuity of trigonometric functions; the derivative: techniques of differentiation, derivatives of trigonometric functions; the chain rule; implicit differentiation; differentials; Roll's Theorem; the mean value theorem; Hospital's rule; increasing and decreasing functions; concavity; maximum and minimum values of a function; graphs of functions including rational functions; antiderivatives; the indefinite integral; the definite integral; the fundamental theorem of calculus ;transcendental functions: inverse functions, logarithmic and exponential functions; derivatives and integrals; limits (the indeterminate forms); hyperbolic functions; inverse trigonometric functions.

Course Number 0319102	Course Title: Calculus II	Face to face	Credit Hours
Prerequisite: (0319101)			3

Course Description

Techniques of integration; application of definite integral: volumes, length of a plane curve, area of a surface of revolution polar coordinates, graphs in polar coordinates, area in polar coordinates; infinite series: sequences, infinite series, convergence tests, absolute convergence, conditional convergence; alternating series; power series: Taylor and McLaurin series, differentiation and integration of power series, representing functions using power series.

Course Number 0319131	Course Title: Principles of Statistics	Online	Credit Hours
Prerequisite: (None)			3

Course Description

Describing statistical data by tables, graphs and numerical measures, Chebychev's inequality and the empirical rule, counting methods, combinations, permutations, elements of probability and random variables, the binomial, the Poisson, and the normal distributions, sampling distributions, elements of testing hypotheses, statistical inference about one and two populations parameters.

Course Number 0301152	Course Title: Discrete Mathematics	Face to face	Credit Hours
Prerequisite: (0319101)			3

Course Description

Propositional and first-order logic, logical operators (negation, conjunction, disjunction, implication; logical normal forms, predicates, quantifiers, methods of proofs, mathematical induction, algebra of sets: set membership, the powerset, manipulating sets; relations: equivalence relations, ordering relations; partitions, functions: domain and range, classes of functions: 1-1 and onto; graph of a function, graphs and trees, graph properties, isomorphism of graphs, Eulerian and Hamiltonian graphs, graph coloring, directed graphs, recurrence relations, recurrence-solving techniques: generating function method, recursion-tree method, number theoretic concepts, divisibility, binary and base-n representation of integers, primes and factorization, congruences, modular operations, Euler's theorem.

Course Number 0319201	Course Title: Calculus III	Face to face	Credit Hours
Prerequisite: (0319102)			3

Course Description

Three dimensional space rectangular coordinates in 3-space; vectors: dot product, cross product, parametric equations of lines. planes in 3-spaces; vector -valued functions: calculus of vector valued functions, arc length, curvature, functions of two or more variable: domain, limits, and continuity; partial derivatives; differentiability; total differentials; the chain rule; the gradient; directional derivatives; tangent planes; normal lines; maxima and minima of functions of two variables; Lagrange multipliers; multiple integrals: double integral, double integrals in polar coordinates; triple integrals; triple integrals in cylindrical and spherical coordinates.

Course Number 0301241	Course Title: Linear Algebra I	Face to face	Credit Hours
Prerequisite: (0319101)			3

Course Description

Systems of linear equations; matrices and matrix operations; Gaussian elimination; elementary matrices and a method for finding A^{-1}; determinants, General vector spaces; subspaces; basis; dimension; row space; column space; null space of a matrix; rank and nullity; inner product spaces; eigenvalues and diagonalization; linear transformations.

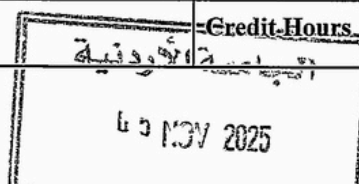| Course Number	Course Title: Mathematics for Finance	Face to face	Credit Hours

0301274			
Prerequisite: (0319102)			3

Mathematical and Statistical techniques in compound interest, discounted cash flow, valuation of cash flows of insurance contracts, analysis and valuation of annuities, bonds, loans and other securities. Yield curves and immunization. Stochastic interest rate models. Actuarial applications.

Course Number 0301301	Course Title: Advanced Calculus	Face to face	Credit Hours
Prerequisite: (0319201)			3

Course Description

Vector differential calculus: gradient, divergence, curl, curvilinear coordinates; vector integral calculus: line integral, surface integral volume integral, Green's theorem, Stoke's theorem, divergence theorem; implicit and inverse function theorems; Leibnitz theorem; calculus of variations (functionals of one variable).

Course Number 0341332	Course Title: Statistical Techniques	Face to face	Credit Hours
Prerequisite: (0319131)			3

Course Description

Simple and multiple regression, correlation coefficient, the analysis of variance of one and two-factor experiments, Chi square test for homogeneity, independences, and goodness of fit, non-parametric statistics: the sign test, Wilcoxon rank sum test, Wilcoxon signed rank test, and Mann-Whiteny test, Spearman correlation coefficient.

Course Number 0301333	Course Title: Probability Theory	Face to face	Credit Hours
Prerequisite: (0319201)			3

Course Description

Distributions of random variables, conditional probability and stochastic independence, some special distributions (discrete and continuous distributions), univariate, bivariate and multivariate distributions, distributions of functions of random variables (distribution function method, moment generating function method, and the Jacobian transformation method), limiting distributions.

Course Number	Course Title: Stochastic Processes	Face to face	Credit Hours

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0331334			
Prerequisite: (0301333)			3

Course Description

Markov chains, transition probability, classification of states, branching and queueing chains, stationary distributions of Markov chain, Markov pure jump processes, second order processes, mean and covariance functions, Gaussian process and Wiener process.

Course Number 0301338	Course Title: Regression Analysis	Face to face	Credit Hours
Prerequisite: (0341332)			3

Course Description

Fundamental concepts of regression analysis, covering simple and multiple linear regression models, logistic and generalized linear models, multicollinearity, residual analysis, outliers, influential observations, model selection techniques. A statistical package such as MINITAB, SPSS, or R will be utilized throughout the course to apply these methods to real-world data.

Course Number 0341336	Course Title: Design and Analysis of Experiments	Blended	Credit Hours
Prerequisite: (0301332)			3

Course Description

Randomization, blocking and replication, one way completely randomized design for fixed/random effects experiments, analysis of variance, comparison of multiple treatment means and the generalized type I error rate, orthogonal contrasts, simple linear regression and the analysis of covariance, hierarchical (nested) designs. randomized complete and incomplete block designs, latin square and cross.

Course Number 0301338	Course Title: Applied Probability	Online	Credit Hours
Prerequisite: (0301333)			3

Course Description

Revision of probability distributions and statistical inference, queueing theory (Poisson process, birth-death processes), reliability theory(life distributions, composite systems, repairable systems), quality control and acceptance sampling, information theory and coding.

Course	Course Title: Computational	Face to face	Credit Hours

Number 0301343	Linear Algebra		
Prerequisite: (0301241)			3

Course Description

Basic linear Algebra tools for data science, quadratic forms, QR-decomposition, best approximation, least square problems, singular value decomposition, Cholesky decomposition, dimensionality reduction, data transformation and image processing.

Course Number 0301344	Course Title: Combinatorics and Graphs for Data Science	Blended	Credit Hours
Prerequisite: (0301152+0301241)			3

Course Description

Basics of counting, permutations and combinations, pigeonhole principle, generalized permutations and combinations, inclusion and exclusion principle, review of graphs, directed graphs and graph isomorphism, subgraphs and types of graphs, properties of trees, spanning trees and characterization of bipartite graphs, matching and job assignment, distance and connectivity in graphs, graph coloring, independence sets and applications, graphs and matrices, planner graphs, directed graphs and networks, applications.

Course Number 0331362	Course Title: Topological Data Analysis	Blended	Credit Hours
Prerequisite: (0301152)			3

Course Description

Metric spaces, topological spaces, continuous functions and homeomorphisms, topological properties, simplicial complexes, filtered simplicial complexes, cycles and boundaries, homology of simplicial complexes, Betti numbers, point clouds and associated spaces, birth and death of cycles, persistent homology, algorithmic aspects of persistence, persistent diagrams, spaces of barcodes, topological data analysis in machine learning, topological data analysis in neuroscience and imaging.

Course Number 0301371	Course Title: Mathematical Optimization	Face to face	Credit Hours
Prerequisite: (0301241)			3

Course Description

Formulation of linear optimization problems, the graphical method, geometry of linear programming, the simplex method for linear optimization, duality in linear programming, integer programming formulation, the Gomory cutting-plane method, gradient methods for nonlinear optimization, the steepest descent method.

Course Number 0301374	Course Title: Theory of Algorithms	Blended	Credit Hours
Prerequisite: (0301152)			3

Course Description

Definition of an algorithm, analysis of algorithms, asymptotic analysis, Big Oh, Omega and Theta notations, recurrence equations, recursive and nonrecursive algorithms, the concept of worst, best, and average case performance analysis, the complexity class NP-complete, applications on matrix algorithms, searching and sorting algorithms, Euclid's algorithm; introduction to graphs; elementary graph algorithms.

Course Number 0301376	Course Title: Risk Theory	Face to face	Credit Hours
Prerequisite: (0301333)			3

Course Description

Severity of risks (losses), aggregate claims, convolutions and mixtures models for loss severity, effect of policy modifications, tail behavior, compound Poisson models, ruin probability, Brownian motion for risk process, policy limits, policy deductibles, combined policy limit, various premium principle.

Course Number 0331431	Course Title: Mathematical Statistics	Face to face	Credit Hours
Prerequisite: (0301333)			3

Course Description

Method of estimation including non-Bayesian andBayes estimation, confidence intervals, pivotal statistics, sufficient statistics and its properties, complete statistics exponential family, Fisher information and the Rao-Cramer inequality, most powerful (MP) test, uniformly MP test, likelihood ratio tests, sequential test.

Course Number 0331432	Course Title: Time Series	Face to face	Credit Hours
Prerequisite: (0301333)			3

Course Description

Descriptive techniques, types of variations: trend, cycle and seasonal fluctuations, autocorrelation, probability models for time series, stationary processes; autocorrelation function, estimation in time

domain, fitting an autoregressive process, fitting a moving average process, forecasting, box and Jenkin's methods, stationary processes in the frequency domain, spectral analysis.

Course Number 0301437	Course Title: Multivariate Analysis	Face to face	Credit Hours
Prerequisite: (0341332)			3

Course Description

Theory and applications of multivariate statistical methods, enabling students to analyze datasets involving multiple variables, exploratory data analysis, the multivariate normal distribution, and hypothesis testing for mean vectors, multivariate analysis of variance (MANOVA), multivariate regression models, data reduction techniques such as principal component analysis and factor analysis. A statistical software package, such as MINITAB, SPSS, or R, will be used throughout the course to implement these methods with real-world datasets.

Course Number 0301446	Course Title: Cryptography Theory	Online	Credit Hours
Prerequisite: (0301152+0301241)			3

Course Description

Classical Cryptosystems such as: Shift ciphers, Affine ciphers, The Vigen'ere cipher, Substitution ciphers, The Playfair cipher, ADFGX cipher, and Block ciphers. One time pad, Pseudo-Random Bit Generation, and Linear feedback shift register. World War II ciphers such as: Enigma and Lorenz. Public key cryptosystems, The RSA, Primality testing and attack on RSA, The AlGamal Public key cryptosystem. Symmetric block cipher systems such as: DES and Rijndael. Digital Signatures such as: RSA signatures, The AlGamal signature scheme, and Hash functions. Elliptic curves and elliptic curves cryptosystems.

Course Number 0331476	Course Title: Decision Making	Face to face	Credit Hours
Prerequisite: (0301333+0301371)			3

Course Description

An exploration of decision-making in the presence of uncertainty, integrating the theoretical

foundations and practical applications of Bayesian analysis, formulating decision problems, quantifying their components, applying Bayesian methods to analyze and evaluate these problems, prior and posterior distributions, parameter estimation, constructing confidence regions, hypothesis testing within the Bayesian framework, characterizing and finding optimal decisions, leveraging computational tools such as Monte Carlo integration and Markov Chain Monte Carlo to solve complex problems, techniques and computational methods for practical implementation, constructing and analyzing Bayesian models in real-world decision-making scenarios to evaluate them.

Course Number 1915111	Course Title: AI Programming	Face to face	Credit Hours 3

Prerequisite: (None)

Course Description

This course builds programming skills for students which is required develop and implement applications and algorithms of Artificial Intelligence and data science. This course will focus on programming using Python 3 https://www.python.org/. Python is high-level programming language like Java, C++, or C#. This course provides students with the required skills to solve problems by implementing programs using Python. Topics include: fundamentals of Python programming, Object-Oriented programming using Python, Data Structures and Algorithms, and Python packages. This course is a lab-based course which includes in-class practical assignments and tasks. The course will also briefly introduce other programming languages such as Lisp and Prolog. This course will use a combination of lectures, group discussions, case studies analysis, and hands-on work.

Course Number 1915121	Course Title: Principles of Data Science	Blended	Credit Hours 3

Prerequisite: (None)

Course Description

This will be an introductory course in data science and data analytics. The objective of the course is to give students a broad overview of the various aspects of data science such as accessing, cleansing, modelling, visualizing, and interpreting data. Students will perform hands-on learning
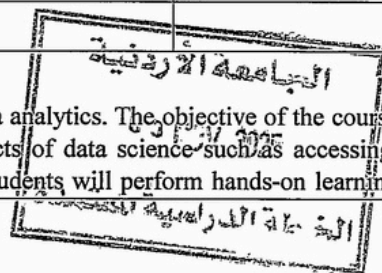
of data analytic topics, using technologies such as Python, and open-source analytic tools. The focus in the treatment of these topics will be on breadth rather than depth. The student acquires the concepts and skills needed for programming in the Python language as well as statistical inference, and related mathematics along with the practical analysis of real-life data sets. The course briefly addresses the social and legal issues surrounding data analysis, including privacy and data ethical issues. This course will use a combination of lectures, group discussions, programming assignments, case studies analysis, and hands-on work.

Course Number 1905220	Course Title: Ethics of Artificial Intelligence and Data Science	Online	Credit Hours 3
Prerequisite: (1915121)			.

Course Description

This course focuses on ethical issues in computing special in Artificial Intelligence (AI) and Data Science (DS). The main themes are privacy, fairness/bias, and explainability in AI and DS. The objectives are to learn how to identify and measure these aspects in the outputs of algorithms, and how to build algorithms that correct these issues. The course will follow a case-study-based approach, where we will examine these aspects by considering real-world case studies for each of these ethical issues. It is intended to give students a chance to reflect on the ethical, social, and cultural impact of AI by focusing on the issues faced by and brought about by professionals in AI but also by citizens, institutions, and societies. Specific topics addressed in the course include the technical, safety-related, and economic implications of AI-enabled automation. Specific sub-areas include transportation, manufacturing, journalism, legal advising, and military applications; AI-endowed advisory tools in areas such as environmental and resource planning; biases and mediocrities in AIs, which can reinforce human prejudice. Furthermore, this course covers ethical writing through many practical skills including referencing styles, citation (i.e., Endnote, Mendeley, RefWorks, and Zotero), quotation, and also through the awareness of the good document requirements, plagiarism forms, copyrights, fair use, creative commons, and intellectual property rights. This course will use a combination of lectures, class discussions, reading and writing assignments, case studies analysis, and hands-on work.

| Course Number 1905222	Course Title: Data Mining	Face to face	Credit Hours 3
Prerequisite: (0341332+1915111)			
Course Description			
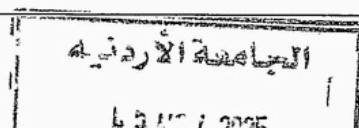
This course provides the students with an introduction to data mining and knowledge discovery (KDD). The course will focus on issues relating to the feasibility, usefulness, effectiveness, and scalability of techniques for the discovery of patterns hidden in large data sets. The students will learn the basic concepts of data pre-processing, frequent pattern mining and association rules, sequential patterns, and sub-graph patterns; and explore their applications, Classification methods, such as decision trees, k-nearest neighbour, and Naïve Bayes, ensemble learning methods such as random forest …etc., outlier detection methods, such as Simple Statistical Methods and local outlier factor (LOF), cluster analysis techniques, such as k-means, hierarchical methods, and density-based methods. Active learning methodologies will be applied through role playing, presentations and problem-solving exercises.

Course Number 1915231	Course Title: Data Engineering and Analytics	Face to face	Credit Hours 3
Prerequisite: (1915121)			

Course Description

This course will examine the typical Data Engineering pipeline includes architecting data platforms, designing data stores, ETL, data collection, importing, wrangling, querying, and analysing data. It also includes performance monitoring and finetuning to ensure systems are performing at optimal levels. In addition, Data modelling and design techniques, Data storage and warehousing. Also, the course will discuss the popular data engineering tools such as Airflow. Furthermore, this course introduces you to the core concepts, processes, and tools you need to know to get a foundational knowledge of data engineering. You will gain an understanding of the modern data ecosystem and the role Data Engineers, Data Scientists, and Data Analysts play in this ecosystem. This course will discuss the exploratory data analysis, feature generation and extraction. The course also includes hands-on labs and assignments that guide you to create and load data into the different types of databases, and perform some basic querying operations that help you understand your dataset. Lectures will be given in the lab for practical application. This course is assessed through exams, practical tests and assignments.

Course Number 1915232	Course Title: Data Management and Governance	Face to face	Credit Hours 3
Prerequisite: (1905222)			

Course Description

This course introduces the fundamentals of data governance, and management, creating a data
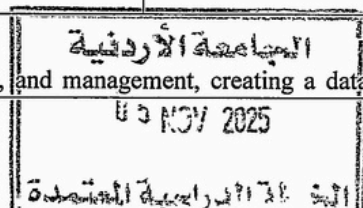
governance strategy, benefits from data governance, data governance implementations, managing, monitoring, and measuring data governance efforts. The student will learn about the roles & responsibilities in a data Governance, data Governance challenges, the difference between data governance and data Management, setting up a data governance Framework, data governance tools and techniques, data governance implementations, and best practices of data governance and data management. Delivery will combine traditional lectures with other active teaching methodologies, such as group discussions, group solving problems, analysis of cases and debates, case study from different domains, and assignments. In addition, The course will host a number of experts in the field of data management from the local market to cover the practical side of the course and share their first-hand experience with students.

Course Number 1915331	Course Title: NoSQL Databases	Face to face	Credit Hours 3
Prerequisite: (1915231)			

Course Description

This course explores the origins of NoSQL databases and the characteristics that distinguish them from traditional relational database management systems. Core concepts of NoSQL databases will be presented, followed by an exploration of how different database technologies implement these core concepts. It gives a closer look at 1-2 databases from each of the four main NoSQL data models (key-value, column family, document, and graph), highlighting the business needs that drive the development and use of each database. This course will introduce some examples of NoSQL databases such as Cassandra, MongoDB, Apache Hive, HBase, and Neo4j. Finally, it presents criteria that decision makers should consider when choosing between relational and non-relational databases and techniques for selecting the NoSQL database that best addresses specific use cases. The course contains a practical application on NoSQL databases through small projects and weekly assignments.

Course Number 1915341	Course Title: Social Network Analysis	Face to face	Credit Hours 3
Prerequisite: (1901341+1905222)			

Course Description

This course provides a basic understanding of social network analysis and its application. It will cover current knowledge on the construction and analysis of large social and information networks, and the models and algorithms that extract their essential properties. Students will learn about the structure and evolution of social networks, how to practically analyze and reason about

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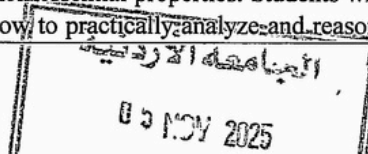
large-scale network data, and how to analyze it. Topics covered in this course include graph theory, link prediction, recommender systems, graph mining, discovering communities in networks, graph visualization, graph data science, information dissemination on the Internet, and connections to work in the social sciences and economics.

Course Number 1915352	Course Title: Healthcare and Medical Data	Face to face	Credit Hours 3
Prerequisite: (1905222)			

Course Description

This course introduces the characteristics of medical data and the data mining challenges associated with this type of data. It focuses on the study of data science techniques in the context of concrete healthcare applications such as predictive modeling, virtual computational modeling, patient similarity, and disease detection. In this course, students will learn how data analysis can improve health and healthcare, and how data analytics-based solutions can lead to better diagnosis and care. In healthcare, large amounts of heterogeneous medical data have become available across various healthcare organizations (payers, providers, and pharmaceuticals). This data can be a powerful source for extracting insights to improve care delivery and reduce waste and costs. Conversely, the sheer volume and complexity of this data pose significant challenges for subsequent analysis and application in a practical clinical setting. All the fundamentals of data mining will be discussed in the context of a variety of healthcare settings, as well as the types of data analysis challenges likely to be encountered when collecting, classifying, analyzing, and finally visualizing medical data. The course will host several experts in the field of medical data analytics from the local market to cover the practical aspects of the course and share their firsthand experience with the students.

Course Number 1915370	Course Title: Machine Learning and Neural networks	Face to face	Credit Hours 3
Prerequisite: (0301374+1905222)			

Course Description

This course will help students to develop basic understanding of principles of learning theory, theoretical and mathematical foundations of the machine learning and derive practical solutions using predictive analytics. In addition, it explains what machine learning is and how it is related to

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statistics and data analysis. The class will cover topics in regression, classification, mixture models, neural networks, basic deep learning, ensemble methods and reinforcement learning, hidden Markov models, and Bayesian networks, generative/discriminative learning, parametric/non-parametric learning, support vector machines, unsupervised learning, expectation maximization, dimensionality reduction, and kernel methods. The course will also discuss recent applications of machine learning, autonomous navigation, bioinformatics, speech recognition, and text and web data processing. Delivery will combine traditional lectures with other active teaching methodologies, such as group discussions, group solving problems, analysis of cases and debates, case study from different domains, and assignments.

Course Number 1904371	Course Title: Business Intelligence	Face to face	Credit Hours 3
Prerequisite: (1915111)			

Course Description

Business Intelligence Systems have become increasingly important in today's competitive environment. According to recent studies, companies that use BI and manage their data as a strategic resource and invest in its quality are already pulling ahead in terms of reputation and profitability. This course will examine Business Intelligence (BI) technologies that help a company to improve its business. It discusses BI topics from both managerial and technical perspectives. Managerial perspectives discuss how BI affects the organization's decision-making process, while technical perspectives discuss the foundation for an intelligent system (i.e., Machine learning, Warehousing, Online Analytical Processing, Data Mining). Practical exercises and projects will be assigned to enhance students' experience in business intelligent systems. Weekly lab session.

Course Number 1905380	Course Title: Natural Language Processing	Face to face	Credit Hours 3
Prerequisite: (1915111)			

Course Description

The aim of the course is to introduce students to the concepts of Natural Language Processing and its applications. It discusses linguistic theories and computational techniques. The course covers the topics of Origins of Natural Language Processing (NLP); Language structure representation; The role of knowledge; Knowledge representation; Parsing techniques; Finite-state techniques; Recursive and augmented transition networks; Language ambiguity; Well-Formed constructs;
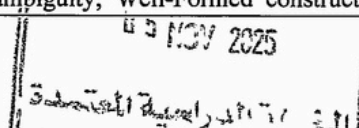
Features and the lexicon; Language semantics; and Applications. Examples of NLP applications that are covered by this course include; machine translation, information retrieval, text summarization, reference resolution, question answering, parsing, sense disambiguation, morphological analysis, speech analysis and synthesis. Active learning methodologies will be applied through role playing, presentations and problem-solving exercises. Moreover, hands-on practice on using NLTK (Natural Language Toolkit) is weekly practiced in the lab. In addition, guest speakers belonging to the Jordan's ICT will demonstrate state-of-the-art practices and application of NLP.

Course Number 1915431	Course Title: Big Data	Face to face	Credit Hours 3
Prerequisite: (0301374+1905222)			

Course Description

This course shall first introduce the overview Big Data applications, market trend, and the things to learn. Then, will introduce the fundamental platforms, such as MapReduce, Hadoop ecosystem, Spark, H2O Framework, Apache Storm, and other tools. Afterwards, the course will introduce several data storage methods and how to upload, distribute, and process them. This shall include HDFS, HBase, Pig, and Hive, document database, and graph database. The course will go on to introduce different ways of handling data analytics algorithms on different platforms. Then, the course will introduce visualization issues on Big Data. It also provides a first hands-on experience in handling and analyzing large, complex structured, semi-structured, and unstructured data. Students will then have fundamental knowledge on Big Data to handle various real-world challenges. The course will zoom in to discuss large-scale machine learning methods, and related big data frameworks. The course contains a set of homeworks and weekly tasks. The course hosts several experts in the field of big data from the local market to cover the practical side of the course and to share their first-hand experience with students.

Course Number 1915441	Course Title: Data Visualization	Face to face	Credit Hours 3
Prerequisite: (0301374+1905222)			

Course Description

This course will give you the skills you need to leverage data to reveal valuable insights and advance your career. The course will focus on studying algorithms for creating effective visualizations capable of promoting data comprehension and analysis. The course discusses the
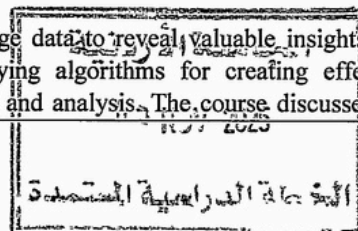
key techniques and theory used in visualization, including data models, graphical perception, and visual encoding and interaction. Students will learn about the variety of existing approaches and systems in data visualization and develop skills in evaluating different visualization techniques as applied to particular tasks. Also, these visualization techniques will be used to display data through static and interactive forms and graphics that help in understanding relationships and communicating with non-specialists. The course also discusses visual representation methods, such as graph drawing, parallel coordinates, tree mapping, and encourages students to design new innovative visualizations and experiment their potentials on case studies of various data sources. In addition, the course will introduce the popular packages in python programming and other open sources visualization tools.

Delivery will combine traditional lectures with other active teaching methodologies, such as group discussions, group solving problems, analysis of cases and debates, case study from different domains, and assignments.

Course Number 191599	Course Special Topics in Data Science	Face to face	Credit Hours
Prerequisite: (0301374+1905222)			6

Course Description
This course introduces selected topics and methods in data science and its applications, including data mining and practical applications of data science in the labor market, advanced statistical methods, data representation, and analytical, optimization, and classification algorithms. Furthermore, the course introduces fundamental methods for analyzing big data and applications of data science in remote sensing. It includes an examination of data science tools and software that can assist analysts in various ways. For example, they can analyze large amounts of data on behalf of the user, provide insights, train, or educate the user, and monitor events for the user, helping them understand information and make data-driven decisions. This approach enables analysts to extract valuable insights from data, solve complex problems, and deal with the unknown, enhancing organizations' ability to make informed strategic decisions.

Course Number 0301494	Course Title: Employability Readiness 1	Face to face	Credit Hours
Prerequisite: (Completing at least 90 credit hours)			9

Course Description
This course aims to provide students with the basic skills that will enable them to excel in facing and adapting to the academic and professional challenges they may encounter in the job market. This is achieved through a variety of topics, including academic and practical technological skills, such as the use of mathematical and statistical software, and mathematical writing software. The course also aims to introduce students to graduate programs and their various tracks, both locally and internationally. The course includes enhancing professional and personal skills, including writing a professional CV, preparing for job interviews, enhancing effective communication skills, and training to work effectively within a team. It includes practical training in a field related to the

specialization for a period of three months, with no less than 150 training hours. It also includes a dual assessment by an institutional supervisor and an academic supervisor, regular feedback sessions, and the submission of a portfolio and a final presentation that reflects the training experience and acquired skills.

Course Number 0301495	Course Title: Employability Readiness 2	Face to face	Credit Hours
Prerequisite: (Completing at least 90 credit hours)			9

Course Description
A comprehensive project in which students apply and integrate what they have learned in various courses throughout their studies to conduct research in a specific area of specialization. It highlights practical application and teamwork, and is presented in the form of a written report and a public lecture. It also includes practical training in a field related to the specialization for a period of three months, with a minimum of 150 training hours. It also includes a dual assessment by an institutional supervisor and an academic supervisor, regular feedback sessions, and the submission of a portfolio and a final presentation reflecting the training experience and acquired skills.
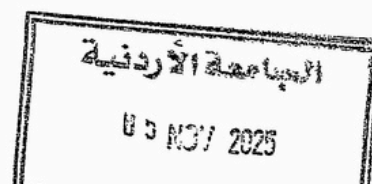
Inclusion rates in the program:

A. Courses that will be taught on the principle of full online:

Total hours that will be taught on the principle of full online in this program: (15 hour).

The percentage achieved for the courses that will be taught on the principle of full online in this program: (11.3%)

B. Subjects to be taught on the blended learning principle:

The total number of hours that will be taught on the principle of blended learning in this program: (27 hour)

Percentage achieved for s courses that will be taught on the principle of blended learning in this program: (20.5%)

C. Face-to-face learning courses:

Number of hours of face-to-face education: (90 hour).

Percentage	Number of Hours	Elective Specialty Requirement	Obligatory Specialty Requirement	Obligatory School Requirement	Elective University Requirement	Obligatory University Requirement	
%68.2	90	6	63	15	0	6	Face – to - face
%11.3	15	6	0	3	0	6	On line
%20.5	27	3	6	3	9	6	Blended
%100	132	15	72	21	9	18	Number of Hours