University of Mosul
جامعة الموصل

First Cycle – Bachelor's Degree (B.Sc.) – Statistics and Informatics

بكالوريوس – علوم في الإحصاء والمعلوماتية
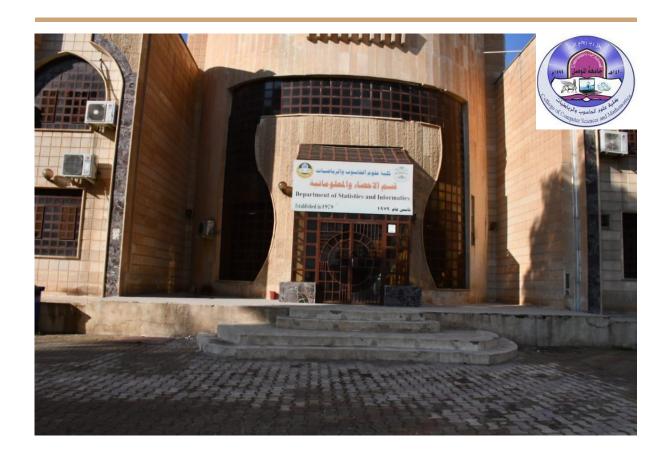
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1. Overview

This catalogue is about the courses (modules) given by the program of Science in Statistics and Informatics to gain the Bachelor of Science degree. The program delivers (48) Modules with (5900) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظره عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج علوم في الإحصاء والمعلوماتية للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (48) مادة دراسية، مع (6000) إجمالي ساعات حمل الطالب و 240 إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Courses 2023-2024

Module 1

Code	Course/Module Title	ECTS	Semester
STAT101	Elementary Statistics I	7	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	3	93	82
Description			
familiarize students with the basics of statistics, its fields of application. The statistical method in scientific research, methods of data collection. Classification and presentation for the purpose of obtaining the necessary information to make appropriate decisions and the possibility of using this data in prediction, in addition to developing students. Skills in research design method. Bringing the student to a level where he has the ability to interpret the results and turn them into a practical reality.			

Module 2

Code	Course/Module Title	ECTS	Semester
STAT102	Calculus I	7	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	3	93	82
Description			

Part A - Preliminaries
Understanding the concept of limits; Evaluating limits algebraically and graphically; One-sided limits and infinite limits; Defining continuity and its properties; Identifying discontinuities and types of discontinuities. [18 hrs.]
Part B - Derivatives
Basic rules and techniques of differentiation; Derivatives of exponential, logarithmic, and trigonometric functions; Derivatives of exponential, logarithmic, and trigonometric functions; Applications of Differentiation (Optimization problems). [36 hrs.]
Part C - Fundamental Theorem of Calculus
Understanding the connection between differentiation and integration and evaluating definite integrals using the Fundamental Theorem of Calculus. [6 hrs.]
Part D - Integration
Antiderivatives and indefinite integrals; Definite integrals and their properties; Techniques of integration, including substitution and integration by parts; Applications of Integration, including Area under a curve and the average value of a function, the average value of a function. [30 hrs.]

Module 3

Code	Course/Module Title	ECTS	Semester
STAT103	Basic Programming	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	87
Description			

The objective is to learn the student the fundamental of programming through practical application using the C++ programming language. In this course, students will learn about: The basic programming and OOPs concepts. Creating C++ programs, Tokens, expressions and control structures in C++. Arranging same data systematically with arrays. Classes and objects in C++. Constructors and destructors in C++. Files management and templates in C++. Handling exceptions to control errors.

Module 4

Code	Course/Module Title	ECTS	Semester
STAT104	Linear Algebra	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	87
Description			

Part(1) - Definition of matrix, its types, algebraic operations on matrices and determinants, methods of finding the determinant and their properties. [13 hours]
Part(2) - inverse and methods of finding the inverse of a matrix and its properties. [11 hours]
Part(3) - Linear Equations and Methods for Solving Linear Equations. [14 hours]
Part(4) - rank of matrix , The canonical form and equivalent matrices, and rank relation with equations. [14 hours]
Part(5) - Latent roots, vectors, algebraic operations on vectors, linear composition, distance and Euclidean length. [11 hours]

Module 5

Code	Course/Module Title	ECTS	Semester
STAT105	Democracy & Human Rights	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2		33	17
Description			

The strategies related to human rights revolve around three main areas:

General Strategy: Introducing the university student to the concept of human rights from global, humanitarian, scientific, and religious perspectives in an objective manner, away from political, ideological, and sectarian influences, etc.

Specific Strategy: Striving to bring about a change in student behavior in line with the general objective by directing attention to the true substance of human rights and their legal dimensions, studying international declarations and conventions, and analyzing the impact of flagrant violations of these principles that affect people's lives or dignity, especially considering that human rights are universal and apply to all human societies.

Module 6

Code	Course/Module Title	ECTS	Semester
STAT106	Arabic Language	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2		33	17
Description			
In this chapter, we focus on Arabic grammar by its divisions and the marks of each section. We aim to recognize linguistic skills to develop linguistic taste and improve the style of learners, as well as to overcome common mistakes made by speakers and writers through studying the original and derived case endings (i'rāb). Additionally, we study the Arabic verb, which is divided according to soundness and weakening, as well as transitivity and intransitivity in relation to tense. There are many details that we will cover in this academic chapter.			

Module 7

Code	Course/Module Title	ECTS	Semester
STAT107	Elementary Statistics II	7	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	3	93	82
Description			
familiarize students with the basics of statistics, its fields of application. the statistical method in scientific research, methods of data collection. classification and presentation for the purpose of obtaining the necessary information to make appropriate decisions and the possibility of using this data in prediction, in addition to developing students. skills in research design method. bringing the student to a level where he has the ability to interpret the results and turn them into a practical reality.			

Module 8

Code	Course/Module Title	ECTS	Semester
STAT108	Calculus II	7	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	3	93	82
Description			

Part A - Techniques of Integration
In this part, students learn various techniques to evaluate integrals more effectively. They explore methods such as integration by substitution, integration by parts, and trigonometric and hyperbolic substitutions. They also delve into partial fraction decomposition, which involves breaking down rational functions into simpler fractions. [42 hrs.]
Part B - Infinite Series
Infinite series plays a significant role in Calculus II. Students investigate the convergence and divergence of series and learn about important series, such as geometric series. Additionally, they encounter power series and Taylor series, which expand functions as infinite polynomials. [30 hrs.]
Part C - Vectors
Vectors and their properties are examined in this part. Students learn about vector operations, including addition, subtraction, and scalar multiplication. They explore the dot product and cross product, understanding their geometric and algebraic interpretations. [12 hrs.]
Part D - Moments, Centers of Mass
The students understand how to calculate moments using the cross-product and explore the concept of moments in different contexts. Students study the definition of the center of mass.[6 hrs.]

Module 9

Code	Course/Module Title	ECTS	Semester
STAT109	Information Technology	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	87
Description			

Although the information technology specialization is one of the most demanded fields currently in all global markets, some specializations range from stagnant to saturated and required, so you should study the market well before choosing a specialization. But if you are looking for the best majors that have a future in the field of information technology, then they are as follows:
Network security major in programming - software engineering - 3D printing - data science major - Artificial Intelligence - Computer Science - Aerospace Engineering

Module 10

Code	Course/Module Title	ECTS	Semester
STAT110	MATLAB programming	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	87
Description			

Part - Introduction to the MATLAB
Introduction to the MATLAB program and the Windows program, clarifying some important instructions and commands, writing data in the program, matrices in the matlab program, and creating matrices based on the instructions. [12 hrs]
Part - Create matrices in MATLAB
Writing the matrix in the program, some instructions used in the matrix, creating a row, column, or vector matrix with consecutive elements, some other instructions for creating matrices finding the inverse, determinant, and rank of the matrix in matlab, and reshaping matrices. [12 hrs]
Part – Algebraic operations in matlab
Algebraic operations on matrices in matlab, matrix elevation, finding the square root of a matrix and also boolean signs in matlab. [12 hrs]
Part - Boolean directives in MATLAB
Using (and), (or) between arrays whose elements are (1,0), and how to write input and output statements. [12 hrs]
Part - Writing programs in MATLAB language
And how to write a simple program based on writing the program using (for -end), drawing in MATLAB, conditional cases (if-end), using dashes (for the end) and (if the end) together. [15 hrs]

Module 11

Code	Course/Module Title	ECTS	Semester
STAT111	English Language	2	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2		33	17
Description			

The general methodological principles adopted for this course are based on integrating all four skills (reading, writing, speaking and listening) into highly motivational activities. Meaningful learning is brought to be through activities are based on the students' interests with the aim of fostering motivation. Another key methodological concept is that of the autonomous learner. Recently, due to the effects of changes in language teaching strategies, great importance has been given to the need for teachers to promote and motivate self study, through continuous evaluation.
The student will have constant feedback on his/her progress with the aim of modifying, when necessary, his/her learning. Therefore, course contents will be made up of activities that consolidate the linguistic abilities of students, in such a way that they not only learning theoretical knowledge, but create for students the necessary tools for students to continue their language learning through self study techniques studied along the course.

Module 12

Code	Course/Module Title	ECTS	Semester
STAT112	Democracy	2	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	3	33	17
Description			

The specific strategies in democracy focus on two main points:
General Strategy: To introduce university students to the essence of the democratic system from global, humanitarian, scientific, and religious perspectives in an objective manner, away from political and ideological influences, while emphasizing the importance of these influences on the mechanisms and functioning of the political system and the independence of political governance.
Specific Strategy: To strive to change the students' way of thinking in line with the general objective by directing their attention to the true content of the democratic system and its benefits, which reflect positively on economic and social fields, as well as highlighting the important role of the general will in steering governance through the exercise of political rights.

Module 13

Code	Course/Module Title	ECTS	Semester
STAT201	Probability I	7	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	3	93	82
Description			

To develop the student's problem-solving skills by getting acquainted with sets theory and some of its basic theories and understanding its laws. Developing the student's abilities on counting methods to reach sets theory as well as the binomial expansion law. Developing skills in applying probability theory and understanding its axioms, its laws and application. Identify the random experiment and the accidents that will appear in the experiment in order to obtain a sample space. Learn about independent events and how to identify them, in addition to conditional probability and its connection to Bayes' theory. Provide a solid foundation for advanced work on probability and its applications, and is essential to understanding many applied fields.

Module 14

Code	Course/Module Title	ECTS	Semester
STAT202	Sampling Theory I	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	2	78	72
Description			

Basic concepts and definitions about sampling - Sampling methods- The sample selection process in simple random sampling- Simple estimation in simple random sampling [12 hrs]

Simple Random Sampling With Replacement or simply SRSWR sampling - Simple Random Sampling and Without Replacement or simply SRSWOR sampling - Pseudo Random Numbers (PRN)- Probability sampling -Qualitative random variable-Quantitative random variable [12 hrs]

experiments and surveys, steps in planning a survey; randomization approach to sampling and estimation, sampling distribution of estimator, expected values, variances, generalization of probability sampling; prediction approach, inadequacies of approach, decomposition of population total [12 hrs]

Under SRSWR sampling, while estimating population mean (or total) - The covariance between two sample means - The probability for any population unit to get selected in the sample at any particular draw is equivalent to inverse of the population size [12 hrs]

Simple random sampling with associated estimation and confidence interval methods- Estimating proportions - Ratio estimation [12 hrs]

Selecting sample sizes -Estimation of the sample size [12 hrs]

Module 15

Code	Course/Module Title	ECTS	Semester
STAT203	Numerical Analysis I	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
Description			

Indicative content includes the following.

Part A – Basic concepts of numerical analysis:

Reasons of using numerical analysis, problem that we typically face in numerical analysis, problem identification before utilizing numerical methods. [12 hrs.]

Part B – Linear and non-linear equations:

Implementation of numerical algorithms to solve linear and non-linear equations/systems. [28 hrs.]

Part C – Interpolation:

Building interpolants using different interpolation approaches. [20 hrs.]

Module 16

Code	Course/Module Title	ECTS	Semester
STAT204	Calculus III	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
Description			

Part A - Linear Differential Equations
The part on Linear Differential Equations covers fundamental concepts and techniques related to linear differential equations. Students will study first-order differential equations, including separable equations, exact equations, and linear equations. The course explores second-order linear differential equations, focusing on homogeneous and non-homogeneous equations with constant coefficients. [20 hrs.]
Part B - Partial derivatives, and differentiability.
The course focuses on understanding the gradient vector and directional derivatives, enabling students to analyze the behavior of multivariable functions. [20 hrs.]
Part C - Directional Derivatives and Gradients
The part focuses on understanding the gradient vector and directional derivatives, enabling students to analyze the behavior of multivariable functions. It further extends to multiple integrals, encompassing double and triple integrals, and their applications in computing areas, volumes, center of mass, and moments of inertia. [20 hrs.]

Module 17

Code	Course/Module Title	ECTS	Semester
STAT205	Demography	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
Description			

Population statistics definition, sources of population data, types of population communities, calculation of demographic indicators, and rate standardization.
Methods for detecting errors in population data and techniques for refining population data.
Population forecasting.
Construction and analysis of ordinary and clinical life tables.
Calculation of life rates and measures of association between life factors, relative risk and its types and rates, survival data analysis, and survival patterns.

Module 18

Code	Course/Module Title	ECTS	Semester
STAT206	English Language	2	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2		33	17
Description			

This is a course for students have a solid foundation in the language. They may have recently completed an elementary course or they may be returning to language learning after a break and need to revise key language before being able to progress further.

New language is introduced systematically, allowing students to extend and consolidate their knowledge of the language. New vocabulary is introduced regularly and this is followed by controlled practice activities, allowing students to immediately activate the language in a supported way. There are also freer practice activities where students can focus on their fluency, so that students feel able to actively participate in conversations and discussions.

The course also aims at helping learners to achieve an overall English language proficiency leading to professing at language, and it also helps developing conversational skills, expressing ideas, and helping learners deal with problems and situations successfully.

Module 19

Code	Course/Module Title	ECTS	Semester
STAT207	Probability II	7	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	3	93	82
Description			

Developing the student's problem-solving skills by identifying random, intermittent and continuous variables based on group theory. Developing the student's abilities on counting methods to reach the probability mass function and study its properties, as well as the probability density function and study its properties. Developing skills in finding the distribution function for each of the probability mass function and the probability density function based on random variables and distinguishing between functions. Developing the student's role in benefiting from the generated functions and developing problem-solving skills through these functions. Identify some of the distributions commonly used in various fields of operation, including intermittent and continuous ones. To provide a solid foundation for advanced work on probabilities and their applications, essential to an understanding of many applied fields

Module 20

Code	Course/Module Title	ECTS	Semester
STAT208	Sampling Theory II	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	2	78	72
Description			

Stratification and Stratified Random Sampling - What Is a Stratified Random Sample - How to Take a Stratified Random Sample - Why Stratified Sampling [12 hrs]

Population Parameters for Strata-Sample Statistics for Strata-Estimation of Population Parameters from Stratified Random Sampling [12 hrs]

Estimation of Population Parameters- Allocation of Sample to Strata-Proportional Allocation- Optimal Allocation-Construction of Stratum Boundaries and Desired Number of Strata [12 hrs]

Ratio & Regression Estimation in Stratified Random Sampling- Estimation with Mean & Totals Probabilities- Determination of Sample Size [12 hrs]

How To Take a Systematic Sample-Estimation of Population Characteristics-Variance of Estimates-Efficiency of Systematic Sampling [12 hrs]

Two-Phase Sampling for Estimation-Difference Method of Estimation-Procedure for construction of estimators of the total[12 hrs]

Module 21

Code	Course/Module Title	ECTS	Semester
STAT209	Numerical Analysis II	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
Description			

Part A – Numerical differentiation:

Learning about backward, forward, and central approaches of finding derivative of functions. Additionally, finding the numerical derivatives of numerical interpolants [16 hrs.]

Part B – Numerical integration:

Approximating finite integrals of functions using trapezoidal rule, Simpson's rule, Romberg integration, and Gaussian integration. Double integrals and integration of interpolants are briefly interduce as well. [24 hrs.]

Part C – Numerical solutions of ordinary differential equations:

Euler's method, Runge-Kutta methods, second order ordinary differential equations. [12 hrs.]

Part D – Numerical solutions of partial differential equations:

Finite difference methods for elliptic, parabolic, and hyperbolic equations. Finite element methods for solving partial differential equations. [8 hrs.]

Module 22

Code	Course/Module Title	ECTS	Semester
STAT210	Data Base	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
Description			

The ability to interact with future systems. One of the most important goals of database design is to plan the database to allow modifications and improvements to it without the need to modify application programs or reorganize files. Designing the data so that it is free of repetition and can be retrieved, modified and added to without the problems that can occur with the presence of repetition in it. Reducing the total cost of storage requirements. The physical and logical organization of data so that it can meet expected inquiries at the appropriate speed, as well as unplanned inquiries or to produce non-routine reports.

Module 23

Code	Course/Module Title	ECTS	Semester
STAT211	Time Series Analysis	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
Description			

Indicative content includes the following.
Part A - Basic Concepts of Time Series:
Definition of time series, the purpose of using series, types of series, mathematical models of time series, and analysis of regular and irregular main components. [10 hrs]
Part B - Estimating of Regular and Irregular Main Compounds:
Methods for measuring the linear and non-linear general trend and removing its effect from the studied phenomenon, measuring the seasonal, cyclical and random compounds and removing their effect, as well as using the Minitab program to implement the methods for estimating the four compounds presented [30 hrs].
Part C - Box Jenkins models:
Studying the stationary of time series, non-stationary processing, and identifying correlation functions represented by autocorrelation and partial autocorrelation functions to determine model ranks and model building stages with application. [20 hrs]

Module 24

Code	Course/Module Title	ECTS	Semester
STAT212	Research Methodology	2	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2		33	17
Description			

Part A:Study of the modern scientific method and the way to construct scientific theory using scientific laws; explanation of the concept of scientific research, its types, objectives, characteristics, and the steps of preparing scientific research.
Part B:Explanation of scientific research methodologies, qualities of a successful researcher, data collection tools in scientific research, sampling methods in scientific research, along with the classification of sample types.
Part C:Understanding the main criteria and foundations for selecting the study sample, the key reasons for choosing the study sample, methods for selecting the research topic, exploratory readings with information gathering and analysis, studying methods of documenting scientific research sources and references, types of documentation, the most important ways to document sources and references, additional guidelines for writing the list of sources and references, and the use of reliable documentation methods available to the scientific researcher such as Harvard method, MLA method, and APA method.

Module 25

Code	Course/Module Title	ECTS	Semester
STAT301	Mathematical Statistics I	7	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	2	78	97
Description			

Indicative content includes the following.
1. Probability mass, density functions with theorems and proofs, some examples and discussions
2. Expectations different kinds of moments, generating functions properties and theorems with proofs exercises and homework's. (3 weals).
3. Theoretical definitions of mode, median, harmonic mean, geometric mean, variance mean deviation, measures of skewness and kurtosis with properties and examples (3 weaks).
4. Definition of joint probability mass, density, cumulative and marginal functions , stochastic independence with different theorems and examples (2 weals).
5. Joint moments, marginal moments, moments of functions of random variables, properties with examples. (1 weak).
6. Conditional distributions and conditional moments with theorems and examples 2 weaks).
7. Joint generating fans cumulant functions, marginal generating and cumulants (1 weak).
8. Definition of covariance, simple and partial correlation coefficients with properties, theorems with proofs and examples. (1 weak).

Module 26

Code	Course/Module Title	ECTS	Semester
STAT302	Regression Analysis I	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	3	78	72
Description			

Indicative content includes the following.

An introduction to simple linear regression analysis. Regression assumptions. Estimation of regression parameters using the least squares method. Some properties of the regression line equation. Estimate the variance of model parameters and the average response. Hypothesis testing and confidence limits in regression models. Equivalence between the F test and the t test,. Determination coefficient $R2$, its maximum value, correlation coefficient and its relationship to the regression coefficient. Non-conformity test. Regression through the origin. Test hypotheses related to the correlation coefficient Appreciation in the manner of the greatest possibility. Matrix method in simple linear regression. Irregularities or defects in the assumptions of analysis. The difference between correlation and regression

Module 27

Code	Course/Module Title	ECTS	Semester
STAT303	Operation Research	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
Description			

Part(1) - Definition of operation research, Build &solve the model of linear programming, methods of finding the optimal solution using graph, simplex, M- Technique and dual simplex. [16 hours]
Part(2) Sensitivity Analysis . [9 hours]
Part(3) - balance and solve Transportation problem and test of initial solution . [14 hours]
Part(4) - Network Analysis to minimize total project cost and minimize total project duration .
Part(5) - Game theory, optimal solution of Two-persons zero- sum Games &Solution of mixed strategy Games . [13 hours]

Module 28

Code	Course/Module Title	ECTS	Semester
STAT304	Data Mining	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
Description			
Data Mining, definition, and introduction. Basics of Types of Data. Histogram, Scatter plot, and Box-plot., Quantiles and Probability Plot. Time series data mining. Data Transformations, Box-Cox Transformation. Time series models, definition and introduction. Measures of distance, Measures of Similarity. Clustering, definition and introduction. Hierarchical methods for clustering. Non-Hierarchical methods for clustering. Multiple linear regression, definition and introduction. Goodness of fits and error measurements.			

Module 29

Code	Course/Module Title	ECTS	Semester
STAT305	Hypothesis Testing	4	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	1	48	52
Description			
Indicative content includes the following. 1. Identify the types of hypothesis testing (parametric and non-parametric) 2. How to determine the appropriate hypothesis for the available data. 3. Formulate the hypothesis. 4. Types of hypotheses. 5. How is the decision to accept or reject the hypothesis taken? 6. Knowing the quality of the data and the distribution of the community from which the sample that will be tested is taken until the correct hypothesis is developed.			

Module 30

Code	Course/Module Title	ECTS	Semester
STAT306	Computer Applications	3	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	12
Description			

Indicative content includes the following.
Part A - basic concepts of statistical analysis
 dealing with program destinations, data entry methods, definition of variables and their types.
Part B - Statistical Tests
Application of Statistical Tests, graphics, Generate data for statistical distributions, Time Series Analysis. [20 hours.]
Part C – Distributions
Introduction to spss program ,Compare means, Linear Regression Model Analysis. [16 hours]

Module 31

Code	Course/Module Title	ECTS	Semester
STAT307	Mathematical Statistics II	7	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	2	78	97
Description			

Indicative content includes the following
Discrete probability distributions with their properties and applications, discussions, open book exams, homeworks, and, quizzes (3.25 WEALS).
Important continuous probability distributions : statistical properties, relations between distributions, their applications, distributions of linear and nonlinear functions of random variables (mgf, cdf, transformation technique). There are many discussions, quizez, open book exams). (4.75 weals).
Distributions of nonlinear independent Randi variables(1 weak).
Transformation technique in discrete random variables (1 weak)
Sampling distributions : chi square, t, and, F distributions properties relations between them, applications. (3 weals).
Order statistics with different distributions, properties and applications (2 weals).
Central limit theorem, the importance, and it's application (1 weak).

Module 32

Code	Course/Module Title	ECTS	Semester
STAT308	Regression Analysis II	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	3	78	72
Description			
Indicative content includes the following: Multiple linear regression. properties of estimators. Analysis of Variance. Additional sum of squares. Sequential sources of variation. the use of the Doolittle method. choosing the best linear regression equation (1). choosing the best linear regression equation (2). dummy variables (1). dummy variables (2). Simple nonlinear regression. Determine the degree of regression equation. Multiple nonlinear regression. choosing the best Non-linear regression equation. Regression Analysis using SPSS.			

Module 33

Code	Course/Module Title	ECTS	Semester
STAT309	Biostatistics	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	2	78	72
Description			
Indicative content includes the following. Determine the types of life tables and how to analyze their data. Studying life rates of all kinds. The possibility of monitoring and determining the accuracy of laboratory analyzes. The possibility of determining the extent of correspondence between the results of two health units through the results of pathological analyzes. How is the risk function determined for data tracking one of the life distributions?			

Module 34

Code	Course/Module Title	ECTS	Semester
STAT310	Quality and Reliability	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
Description			

Indicative content includes the following.
Quality concept, basic statistics and quality terms and specification six sigma limits. Statistical control of operation, control charts for variables, Control charts for attributes[12 hr].
The reliability function, mean time to failure ,hazard function bath tube function, The conditional reliability-design life and failure mode, their relationship of all these function.[8 hr].
Constant failure function-The exponential reliability function –Failure with CFR-Memory lessens-Failure modes-Failure modes with CFR, Failure on demand-redundancy and CFR model –applications[12 hr].
Time dependent failure models-The Weibull distribution- Design median and mode-Burn-in screening , Failure modes-Identical Weibull process. [10 hr].
Derive all the characteristic functions related to the reliability of time dependent models , Derive reliability system for CFR and Weibull if components are independent or independent and identical.
System structure function ,minimal cut and minimal paths(optimal), System structure function ,minimal cut and minimal paths(optimal) [10 hr]

Module 35

Code	Course/Module Title	ECTS	Semester
STAT311	Statistical Learning	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	37
Description			

Statistical Prediction, definition, and introduction. Statistical forecasting in time series. Statistical forecasting in linear regression. Statistical Classification, definition, and introduction. Logistic Regression, definition, and introduction. Prediction and classification in Classification and regression trees. Prediction and classification in Random Forest. Prediction and classification in SVM and SVR. K-Nearest neighbor. Gaussian Kernel. Artificial Neural Networks.

Module 36

Code	Course/Module Title	ECTS	Semester
STAT312	English Language	2	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2		33	17
Description			

Reading, writing, speaking, and listening are all integrated into highly motivating exercises as part of the overall methodological ideas used for this course. Activities that are centered on the interests of the students are used to provide meaningful learning with the intention of increasing motivation. The independent learner is yet another crucial methodological idea. Due to the effects of recent developments in language teaching methodologies, educators now place a high priority on the necessity of encouraging and motivating self-study through ongoing evaluation.

The student will have constant feedback on his/her progress with the aim of modifying, when necessary, his/her learning. Therefore, course contents will be made up of activities that consolidate the linguistic abilities of students, in such a way that they not only learning theoretical knowledge, but create for students the necessary tools for students to continue their language learning through self study techniques studied along the course.

This course aims at accomplishing its goal in a full academic module through developing students' all language skills. SLO (Students Learning Outcomes) achievement is also aimed within this course. So the students learning outcomes (what students will know and be able to do with the language at the end of the instruction) are listed in detail on a skill base.

Module 37

Code	Course/Module Title	ECTS	Semester
STAT401	Stochastic Processes I	7	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	3	78	97
Description			

Indicative content includes the following.
Part A – Basic concepts of probability generating function:
Generating functions and probability generating functions are mathematical tools used in probability theory and combinatorics to study the distribution of random variables and sequences. [20 hrs.]
Part B – Introduction to Stochastic processes:
The Stochastic Processes course is designed to provide students with a comprehensive understanding of stochastic modeling and analysis. [20 hrs.]
Part C – Markov Chain and transition probability matrix:
Markov chains are widely used to model systems that exhibit a specific probabilistic property known as the Markov property. The objective is to accurately capture the dynamics of a system where the future state depends only on the current state and is independent of the past states, given the current state. By studying Markov chains, we aim to understand and analyze the behavior and evolution of such systems over time. [35 hrs.]

Module 38

Code	Course/Module Title	ECTS	Semester
STAT402	Statistical Inference I	7	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	3	78	97
Description			

Indicative content includes the following.
Construction the confidence intervals about the mean ,the difference between two means, the variance , the ratio between two variances, and the proportions and applications, discussions, open book exam, homeworks, and quizzes(4 weeks)
The testing of hypothesis about the mean, the difference between two means ,the variance ,the ratio between two variances, and the proportions applications, discussions, open book exam, homeworks, and quizzes(3 weeks)
The types of errors, type one error and type two error and how to calculate them. Applications
Create a critical region. Application(1 week)
Calculate the power function for the statistical test and determine the best critical region. applications, discussions, open book exam, homeworks, and quizzes(4 weeks)
The sequential test for the statistical hypothesis. Application(1 week)

Module 39

Code	Course/Module Title	ECTS	Semester
STAT403	Multivariate Analysis	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
Description			

Indicative content includes the following:
Basic concepts and Characteristic root and vectors and their properties and Quadratic forms and The Multivariate normal distribution, Bivariate normal distribution (11hr)
linearity property in multivariate and Marginal distributions, Distribution of linear combination of normal variates (11h)
The conditional distribution and Moment generating function (10hr)
Parameter estimation by Maximum Likelihood Method and Sufficient statistic (11hr)
Multivariate regression(8hr)
Parameter estimation of multivariate linear regression by L.S.M and Parameter estimation of multivariate linear regression by m.l.e

Module 40

Code	Course/Module Title	ECTS	Semester
STAT404	Computational Statistics	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
Description			

Indicative content includes the following.
Part A – Computational Statistics to R , Basic Syntax R , Formula Specification in RGraphics in R and Using Packages[15 hrs]
Part B – Probability and Statistics ,Probability Density Function,Cumulative Distribution Function, Introduction to Simulation, Discrete-Event System Simulation, Generating Random Numbers, Testing Randomness ,Testing Uniformity ,Testing Independence [15 hrs]
Part C – Generating Random Variables ,Random Variable Generation for Continuous Distributions, Random Variable Generation for Discrete Distributions [15 hrs]
Part D – Monte Carlo Integration, Monte Carlo Methods in Inference. The Bootstrap ,Bootstrap Estimation of Standard Error,Bootstrap Estimation of Bias ,The Standard Normal Bootstrap Confidence Interval [15 hrs]

Module 41

Code	Course/Module Title	ECTS	Semester
STAT405	Design and Analysis of Experiments I	4	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	1	48	52
Description			

Indicative content includes the following.
Part A - Basic concepts in designing experiments and handling simple one-factor experiments Dealing with a completely randomized design and identifying the mathematical model and the analysis of variance table for the design in the case of equal and unequal frequencies and in the case of recording one observation and more than one observation of the experimental unit. [16 hours]
Part B - Dealing with experimental units in the event of heterogeneity and in one direction using the complete random design and identifying the mathematical model and the analysis of variance table for the designs and studying the relative efficiency and showing the effect of losing observations on the analysis in the case of recording one observation and more than one observation of the experimental unit. [16 hours.]
Part C - Dealing with the experimental units in the case of inconsistency and in two directions using the Latin square design and the Greek Latin square design, identifying the mathematical model and the analysis of variance table for the designs, studying the relative efficiency of the Latin square design, and showing the effect of losing observations on the analysis. [12 hours.]
Part D - The use of multiple comparisons through the application of tests (LSD, Duncan and Dunnett) to indicate the most important (significant) factor. [16 hours.]

Module 42

Code	Course/Module Title	ECTS	Semester
STAT406	English Language	2	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2		33	17
Description			

This material study helps students to have a base in the language should. This course helps the student who need to review important vocabulary before moving on. The methodical introduction of new language enables students to expand and solidify their language skills. Regular vocabulary introductions are followed by supervised practice exercises that let students use the new words in a supportive way right away. In order to feel comfortable taking part in conversations and discussions, there are also more liberated practice sessions where students can concentrate on improving their fluency.

The student will have constant feedback on his/her progress with the aim of modifying, when necessary, his/her learning. Therefore, course contents will be made up of activities that consolidate the linguistic abilities of students, in such a way that they not only learning theoretical knowledge, but create for students the necessary tools for students to continue their language learning along the course. Meaningful learning is brought to be through activities are based on the students' interests with the aim of fostering motivation. Another key methodological concept is that of the autonomous learner.

Module 43

Code	Course/Module Title	ECTS	Semester
STAT407	Stochastic Processes II	7	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	3	78	97
Description			

Indicative content includes the following.
Part A – Classification of state of a Markov chain:
Reasons of using numerical analysis, problem that we typically face in numerical analysis, problem identification before utilizing numerical methods. [25 hrs.]
Part B Poisson process and its properties:
Learn how to model events that occur randomly over time using the Poisson process. [30 hrs.]
Part C – Application of stochastic processes:
Understand the fundamental concepts and principles of each stochastic process. And identify and classify the different types of states or behaviors within each process.

Module 44

Code	Course/Module Title	ECTS	Semester
STAT408	Statistical Inference II	7	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	3	78	97
Description			

Indicative content includes the following.
Basic concepts of statistical inference. (1 week). Unbiasedness property of estimators. (1 week). Consistency property. (1 week). Sufficiency property (4 weeks). Efficiency property. (2 weeks). Minimum Variance Unbiased Estimate. (2 weeks). Estimation theory (point estimation methods), maximum likelihood method, moments method. (4 weeks).

Module 45

Code	Course/Module Title	ECTS	Semester
STAT409	Statistical Modeling	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
Description			

This course deals with the problems that regression models suffer from and how to deal with them when analytical hypotheses are violated, which leads to affecting the estimators of the parameters using the least squares method and thus not achieving the best characteristic of an unbiased linear estimator BLUE. Among the problems that the course will address are the problem of Heteroscedasticity Problem, Multi-Colliearity Problem, and Autocorrelation Problem. The course will also deal with residual analysis and detection of unusual values in the data. In addition, the methods of estimating regression models to face these types of problems will be dealt with such that Weighted Regression, Ridge Regression, Principal Component Regression, Robust Regression.

Module 46

Code	Course/Module Title	ECTS	Semester
STAT410	Non-parametric Statistics	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
Description			

Indicative content includes the following.
Part A – Introduction, The Nonparametric Statistical , State the Null and Research Hypotheses ,Compute the Test Statistic ,Ranking Data ,testing data for normality, Computing the Kolmogorov–Smirnov One-Sample Test , Computing the Wilcoxon Signed Rank Test Statistic , Computing the Sign Test [20 hrs]
Part B – Computing the Mann-Whitney U-Test Statistic, Computing the Kolmogorov–Smirnov Two-Sample Test Statistic, Computing the Kolmogorov–Smirnov Two-Sample Test Statistic, Computing the Friedman Test Statistic, Computing the Friedman Test Statistic, RANK-ORDER, POINT-BISERIAL, AND BISERIAL CORRELATIONS[20 hrs]
Part C – The χ^2 Goodness-of-Fit Test ,Computing the χ^2 Goodness-of-Fit Test Statistic , The χ^2 Test for Independence ,Computing the χ^2 Test for Independence, The Fisher Exact Test , Computing the Fisher Exact Test for 2 × 2 Tables , The Runs Test for Randomness ,Sample Runs Test[20 hrs]

Module 47

Code	Course/Module Title	ECTS	Semester
STAT411	Design and Analysis of Experiments II	4	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	1	48	52
Description			

Indicative content includes the following.
Part A - Basic concepts of some one-factor designs
Dealing with Cross-over designs and Youden Square and getting acquainted with the mathematical model of the designs. [20 hours]
Part B - Factorial experiments
Analyzing experiments that contain more than one factor and identifying the appropriate mathematical model. [20 hours.]
Part C – Confounding experiment
Identify Split-plot designs and Nested experiments and the types of Confounding experiments.

Module 48

Code	Course/Module Title	ECTS	Semester
STAT412	Project	2	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/sem)
	2	33	17
Description			

A project module is a distinct component of a higher education curriculum that aims to provide students with an opportunity to apply their knowledge and skills in a practical setting. The project module typically occurs towards the end of a program of study and serves as a culmination of the learning experience.

The project module is designed to allow students to integrate and apply the knowledge, skills, and competencies they have acquired throughout their academic program. It provides them with an opportunity to work on a substantial project, either individually or in groups, under the supervision of a faculty member or industry mentor.

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