University of Mosul

B.Sc. - Operations Research and Intelligent Technologies

بكالوريوس – علوم في بحوث العمليات والتقنيات الذكائية

Table of Contents

1. Overview

This catalogue is about the courses (modules) given by the program of Operations Research and Intelligence Technologies to gain the Bachelor of Science degree. The program delivers (48) Modules with (6000 total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

2. Undergraduate Courses 2024-2025

Module 1

Code	Course/Module Title	ECTS	Semester
OR101	operations research (1)	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			

Operations Research (OR) is a field in which people use mathematical and engineering methods to study optimization problems in Business and Management, Economics, Computer Science, Civil Engineering, Industrial Engineering, etc. This course introduces frameworks and ideas about various types of optimization problems in the business world. In particular, we focus on how to formulate real business problems into mathematical models that can be solved by computers.

1-1 Fundamentals of operations research and development
1-2 Scientific methods in operations research
1-3 Operations research and its relationship to decision-making
1-4 Linear programming of the general form
1-5 Building linear programming models
1-6 The canonical and standard form of linear programming

2-1 Simplex method
3-1 Special cases in linear programming
4-1 Big M method
5-1 Corresponding(dual) model
6-1 The relationship between the normal and the corresponding model
7-1 The corresponding(dual) optimal solution
8-1 The corresponding(dual) simplex method

Module 2

Code	Course/Module Title	ECTS	Semester
OR102	Calculus (1)	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			
Sets–set representation–general review on real numbers–intervals and their types – linear and nonlinear inequalities – functions – types of functions – algebraic operations on functions – composition of functions– inverse of functions – definition of limit – computing limits – the concept of continuity – theorems in continuity–continuity at a point– continuity on an interval– properties of continuous functions – derivatives-derivative rules– higher order derivatives– implicit functions and their derivatives– L'Hôpital's first and second rule– Rolle's theorem–Mean value theorem–critical points – extremes values – increasing and decreasing functions – first derivative test – second derivative test – concavity – inflection points – drawing curves – applications to extreme values– integration– integration rules– definite integral– the Fundamental Theorem of Calculus– applications of definite integral in finding the area.			

Module 3

Code	Course/Module Title	ECTS	Semester
OR103	Programming (1)	5	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	4	93	107
Description			
لغة الماتلاب (MATLAB) هي لغة برمجة عالية المستوى وبيئة تطوير متكاملة (IDE) يتم استخدامها في الحوسبة العلمية والهندسية. تتميز لغة الماتلاب بقدراتها الفائقة في معالجة البيانات الرقمية، حيث يمكن استخدامها في تحليل وتصميم الأنظمة الديناميكية، وإجراء العمليات الإحصائية والتحليل العاملي والتعلم الآلي. تتضمن لغة الماتلاب العديد من الأدوات والوظائف المتخصصة، مثل الرسم البياني والتحليل العاملي والإحصاء ومعالجة الإشارات والتحكم، وبالإضافة إلى ذلك، فإن لغة الماتلاب تدعم البرمجة الكائنية والبرمجة الوظيفية. يتم استخدام لغة الماتلاب في العديد من المجالات العلمية والهندسية، مثل الرياضيات والفيزياء والكيمياء والهندسة وعلوم الحاسوب. وتستخدم بشكل واسع في الأبحاث العلمية وصناعات التصنيع والطب وغيرها من المجالات التقنية. يمكن كتابة البرامج في لغة الماتلاب باستخدام نافذة التحرير(Editor) ، حيث يمكن للمستخدم إضافة الأوامر والتعليمات وتنفيذها، كما يمكن تشغيل البرنامج بالكامل أو خطوة بخطوة باستخدام .Debugging mode وتتميز لغة الماتلاب بسهولة استخدامها واحتوائها على توثيق شامل ومفصل يتضمن العديد من الأمثلة والتوضيحات.			

Module 4

Code	Course/Module Title	ECTS	Semester
OR104	Linear algebra	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			
المصفوفات المفاهيم الأساسية وتعريف المصفوفات وانواعها - العمليات الحسابية على المصفوفات (جمع،طرح،ضرب) والخواص على تلك العمليات- اثر المصفوفة وتطبيقاتها في العمليات الحسابية- الاعداد المركبة والعمليات الحسابية عليها مع خواصها- الاعداد المركبة والعمليات الحسابية عليها مع خواصها- الاعداد المركبة والعمليات الحسابية عليها مع خواصها- ايجاد المحددات للمصفوفات ذات السعة الكبيرة- خواص المحددات- المعكوس للمصفوفات(باستخدام التحويلات الابتدائية - الحذف لكاوس)- خواص معكوس المصفوفات- طرق حل أنظمة المعادلات الخطية الغير متجانسة باستخدام طريقة كاوس وكاوس جوردن وكرامر وعندما المحدد للمصفوفة لا يساوي صفر- المصفوفات المتكافئة وأنواع الحل للمعادلات الخطية- ايجاد رتبة المصفوفات باستخدام التكافؤ- الصيغة التشكلية او القمعية- تعريف الفضاء الاقليدي النوني وبعض النظريات الخاصة به- تعريف التركيب الخطي والطول الاقليدي والمسافة الاقليدية بين متجهين في الفضاء الاقليدي النوني –إيجاد الجذور المميزة والمتجهات المميزة			

Module 5

Code	Course/Module Title	ECTS	Semester
UOM1040	Democracy & Human Rights	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	1	33	17
Description			
توصف مادة حقوق الانسان بانها من المواد القانونية في اطارها العام وحقوقية في اطارها الخاص اذ تمزج في آن واحد ماهية الحقوق التي يجب التي يجب ان يتمتع بها الفرد , من حقوق مدنية واساسية مثل حق الحياة وحق المأكل والملبس والمأوى وحقوق اجتماعية تتعلق بحق ممارسة الحياة الاجتماعية حق التعبير عن الرأي وحق العقيدة وحق الديانة والمعتقد وحقوق سياسية مثل حق الانتخاب والترشيح وغيرها من الحقوق التي تتطور حسب تطور الحياة مثل حق السعادة والعيش في بيئة نظيفة وحق المحافظة على تلك الحقوق من الانتهاك وضمانات منح تلك وضمانات المحافظة عليها من الانتهاك . فالغاية من تدريس هذه المادة هو تنوير الفكر المعرفي والجامعي في التناغم تلك الحقوق مع متطلبات الحياة وعلى جميع الاصعدة .			

Module 6

Code	Course/Module Title	ECTS	Semester
UOM1021	English Language 1	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	1	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 7

Code	Course/Module Title	ECTS	Semester
OR107	operations research (2)	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			
The course deals with the use of mathematical models for planning of corporate and governmental activities. Most of the planning problems will consist of an economic objective which we want to maximize under scarce resources. Operations Research consists of: - limiting and defining the current problem, - formulating a mathematical model of the problem, - calculating an optimal solution of the model, -and finally interpreting and implementing the found solution. 1-1 Dual Model 1-2 Definition of the Dual Problem 1-3 Solution of the Dual Problem 1-4 Relationship Between Primal and Dual Objective Values 1-5 Dual Simplex Method 1-6 Economic interpretation of the corresponding model 2-1 Interpreting the Simplex Tableau: Sensitivity Analysis 2-2 Post optimal or Sensitivity Analysis			

2-2-1 Changes Affecting Optimality

2-2-2 Changes Affecting Feasibility

2-2-3 Changes Affecting Optimality and Feasibility

2-3 Parametric Linear Programming

2-3-1 Changes in C

2-3-2 Changes in B

2-3-3 Changes in Pj

2-3-4 Simultaneous Changes in C and b

3-1 Mathematical Foundations

2-1-1 Standard LP Model in Matrix Form

2-1-2 Basic Solution and Bases

2-1-3 The Simplex Tableau in Matrix Form

3-2 Revised (Primal) Simplex Method

2-2-1 Product Form of the Inverse

2-2-2 Steps of the Primal Revised Simplex Method

Module 8

Code	Course/Module Title	ECTS	Semester
OR108	Calculus (2)	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			

In this course, the following will be studied:

Trigonometric functions: differentiation of trigonometric functions, integral of trigonometric functions, inverse trigonometric functions, derivatives of inverse trigonometric functions, integrals resulting in inverse trigonometric functions.
Exponential functions: derivatives of exponential functions, integration of exponential functions.
Logarithmic functions: basic properties of logarithms, derivatives of logarithmic functions.
Hyperbolic trigonometric functions: derivatives of hyperbolic trigonometric functions, integration of hyperbolic trigonometric functions.
Integration methods: integration by parts, integration by partial fractions, integrals of powers of trigonometric functions, trigonometric substitutions, integrals of quadratic formulas, integration by substitution, other substitutions.
Multivariable functions: functions in two variables, finding domain and range.
Partial Derivatives: The partial derivative of functions in two variables.
Double integration: applications of double integration (calculate volume, area, mass, centers of mass, and …)
Polar coordinates: polar coordinates, relationship between polar and cartesian coordinates, curves in polar coordinates, calculating areas using polar coordinates.

Module 9

Code	Course/Module Title	ECTS	Semester
OR109	Programming (2)	8	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	4	93	107
Description			

لغة الماتلاب (MATLAB) هي لغة برمجة عالية المستوى وبيئة تطوير متكاملة (IDE) يتم استخدامها في الحوسبة العلمية والهندسية. تتميز لغة الماتلاب بقدراتها الفائقة في معالجة البيانات الرقمية، حيث يمكن استخدامها في تحليل وتصميم الأنظمة الديناميكية، وإجراء العمليات الإحصائية والتحليل العاملي والتعلم الآلي.

تتضمن لغة الماتلاب العديد من الأدوات والوظائف المتخصصة، مثل الرسم البياني والتحليل العاملي والإحصاء ومعالجة الإشارات والتحكم، وبالإضافة إلى ذلك، فإن لغة الماتلاب تدعم البرمجة الكائنية والبرمجة الوظيفية.

يتم استخدام لغة الماتلاب في العديد من المجالات العلمية والهندسية، مثل الرياضيات والفيزياء والكيمياء والهندسة وعلوم الحاسوب. وتستخدم بشكل واسع في الأبحاث العلمية وصناعات التصنيع والطب وغيرها من المجالات التقنية.

يمكن كتابة البرامج في لغة الماتلاب باستخدام نافذة التحرير(Editor) ، حيث يمكن للمستخدم إضافة الأوامر والتعليمات وتنفيذها، كما يمكن تشغيل البرنامج بالكامل أو خطوة بخطوة باستخدام .Debugging mode وتتميز لغة الماتلاب بسهولة استخدامها واحتوائها على توثيق شامل ومفصل يتضمن العديد من الأمثلة والتوضيحات.

Module 10

Code	Course/Module Title	ECTS	Semester
OR110	مبادئ الإحصاء	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	47
Description			

يتعرف الطالب في هذه المادة على المفاهيم الأساسية لمادة مبادئ الإحصاء التي تتضمن مفهوم الإحصاء تطبيقه في الحياة الواقعية وفي البحوث العلمية وكذل طريقة جمع البيانات وتبويبها والعينات وانواعها وأيضا يتعرف الطالب على البيانات وانواعها
ويتعرف الطالب في هذه المادة على المفاهيم الإحصائية مثل الوسط الحسابي والهندسي والتوافقي والتربيعي والعلاقة بين هذه الأوساط ومزاياها وعيوبها وأيضا الوسط الحسابي الموزون وكيفية استخراجها للبيانات غير المبوبة والمبوبة وكذلك التباين والانحراف المعياري وأيضا الوسيط والمنوال للبيانات غير المبوبة والمبوبة وكيفية تمثيل البيانات باستخدام المدرج والمضلع التكراري والدائرة البيانية ويتعرف الطالب على مفهوم التماثل والالتواء لأشكال التوزيع التكراري ويتعلم الطالب التباديل والتوافيق والعلاقة بينهما والذي يشكل مدخلا لموضوع الاحتمالات الذي سيطلع عليه الطالب في المرحلة الثانية

Module 11

Code	Course/Module Title	ECTS	Semester
UOM1011	اللغة العربية 1	2	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	1	32	18
Description			
الهدف من هذه المادة هو معرفة الطالب لأقسام الكلام من اسم وفعل وحرف كما وتعرف على الجملة العربية واقسامها من جملة اسمية وفعلية كذلك تعليمهم للمسائل اللغوية والنحوية والتعبيرية لكي يتعلموا كيفية كتابة بحث علمي رصين.			

Module 12

Code	Course/Module Title	ECTS	Semester
UOM1031	Computer 1	3	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	2	48	27
Description			
This course provides a comprehensive introduction to computer science, covering the fundamental principles of hardware and software and how their components interact to perform computing tasks. The course discusses the basic structure of computers, digital data representation, algorithms, operating systems, networks, cybersecurity, and programming fundamentals. It also offers an overview of modern trends in information technology, such as artificial intelligence and cloud computing.			

Module 13

Code	Course/Module Title	ECTS	Semester
OR201	Integer & Dynamic Programming	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
This course aims to introduce students to how to solve integer and dynamic programming models, through different methods of solving and how to deal with time in dynamic models, An integer programming problem, is an linear programming problem where in Some of all of the decision Variables are restricted to be integer valued pure integer programming, A pure Integer programing is one in which all the Variables are restricted to be integers. Mixed integer programming, A mixed Integer programming restricts Some of the variables to be integers while others can assume Continuous (fractional values). Methods of Integer programming problem 1-Branch and Bound method. 2- Cutting Plane method (Gomory's cutting plane) D Approximation Implicit enumeration method Methods of Integer programming problem 1- approximation method 2-Branch and Bound method. 3- Cutting Plane method (Gomory's cutting plane). 4-implicit enumeration method Dynamic Programming: Dynamic programming is a mathematical technique dealing with the optimization of multistage decision problems. The technique was originated in 1952 by Richard Bellman Dynamic programming problem (DPP) is a decision making problem in i variables, the problem being Subdivided into n sub problems.			

Module 14

Code	Course/Module Title	ECTS	Semester
OR202	Probability Theory (1)	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			
This module covers the fundamental concepts of set theory, including subsets, complements, unions, intersections, and set partitioning. Exploring theorems and proofs deepens understanding. It extends to sequences, and limits, and introduces De Morgan's theory with compelling proofs. Combinatorics involves counting and tree diagrams, with the fundamental principle of counting and methods like arrangements, permutations, and combinations. Multinomial expansion enhances counting techniques. Probability topics include binomial theorems, connections to random experiments, and definitions of sample space and events. The Classical and Axiomatic approaches define probability, utilizing tools like dice and playing cards for independent events. Conditional probability, axioms, and practical calculation methods are covered. The introduction of Bayes' theory provides valuable tools for providing a firm basis for advanced work on probability and its applications.			

Module 15

Code	Course/Module Title	ECTS	Semester
OR203	**numerical analysis (1)**	**6**	**3**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	**3**	**78**	**72**
Description			
In this course, a curriculum has been developed to enable the student to understand the topic of numerical analysis and its uses. And to clarify the types of numerical errors And to facilitate the solution of linear differential equations in different ways And solve nonlinear equations by numerical methods. And also to compare the analytical solution with the numerical solution of differential equations And to learn how to apply programming using numerical methods. In the beginning, we got to know the types of errors and how to derive them. And the use of simple methods in the numerical solution, such as drawing. Also, the use of the method of changing the sign in solving the differential equation. Newton Raphson's simple method for solving. And Newton Raphson's method for solving nonlinear equations. and find the value of the root. And find the reciprocal of the number using Newton Raphson's method.			

Module 16

Code	Course/Module Title	ECTS	Semester
OR204	**مسائل تتابعية**	4	**3**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	48	5**2**
Description			
يتضمن هذا الكورس التعرف على مسألة الجدولة وأنواعها ومعايير الجدولة وكذلك مواضيع بارزة في إدارة العمليات الأنتاجية والتحكم فيها ، وعادة في الحالات التي يجب فيها تخصيص الموارد النادرة للأنشطة بمرور الوقت. يركز على نماذج الجدولة التحديدية او المحددة **(Deterministic scheduling models)** . تتضمن الموضوعات الرئيسية نتائج التعقيد وبعض خوارزميات الأمثلية والجدولة المهمة المستخدمة في بحوث العمليات والحاسبات لمسائل على الماكنة الواحدة ، والماكنات المتوازية ، المهمة المتعددة المعالجات ، والورش المفتوحة ، والورشة الأنسيابية ، وورش الأعمال ، وجدولة المشاريع المقيدة بالمصادر لمعالجة التتابع وتطبيقات الجدولة في الحياة الواقعية.			

Module 17

Code	Course/Module Title	ECTS	Semester
OR205	معادلات تفاضلية	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
In this course, we introduce many of the basic concepts and definitions that are encountered in a typical differential equations course. We will also take a look at direction fields and how they can be used to determine some of the behavior of solutions to differential equations. In this section some of the common definitions and concepts in a differential equations course are introduced including order, linear vs. nonlinear, initial conditions, initial value problem and interval of validity. In this section we discuss direction fields and how to sketch them. We also investigate how direction fields can be used to determine some information about the solution to a differential equation without actually having the solution. In this section we give a couple of final thoughts on what we will be looking at throughout this course. we will look at several of the standard solution methods for first order differential equations including linear, separable, exact and Bernoulli differential equations. We also take a look at intervals of validity, equilibrium solutions and Euler's Method. In addition we model some physical situations with first order differential equations.			

Module 18

Code	Course/Module Title	ECTS	Semester
UOM2050	جرائم نظام البعث في العراق	2	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	1	32	18
Description			
تهدف هذه المادة إلى تعريف الطلبة بجرائم النظام البعثي في العراق وتأثيراته الكارثية على المجتمع والدولة، مع التركيز على الفرق بين الأنظمة الديمقراطية والدكتاتورية. يتناول المقرر جرائم المقابر الجماعية، أساليب التعذيب والاضطهاد، الجرائم البيئية مثل حرق آبار النفط وتجفيف الأهوار، إضافة إلى قرارات المحكمة الجنائية العراقية بحق رموز النظام السابق. كما يسلط الضوء على الجرائم التي ارتكبت في السجون السرية، مع تحليل الأثر القانوني والإنساني لهذه الجرائم. توفر المادة للطلبة فهماً عميقاً للعدالة الانتقالية ودورها في محاسبة المجرمين وضمان عدم تكرار مثل هذه الانتهاكات مستقبلاً.			

Module 19

Code	Course/Module Title	ECTS	Semester
UOM2022	English Language 2	2	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	1	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 20

Code	Course/Module Title	ECTS	Semester
OR207	Probability Theory (2)	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			
This module covers the concept of random variables, including discrete and continuous ones, along with their associated probability functions and distribution functions. We learn how to obtain the probability mass function (p.m.f.) for discrete random variables and the probability density function (p.d.f.) for continuous random variables. Various examples of discrete distributions, such as the uniform, Bernoulli, binomial, Poisson, geometric, hypergeometric, and negative binomial distributions, are explored. Additionally, continuous distributions like the uniform continuous, exponential, normal, gamma, and beta distributions are discussed. The module also covers mathematical expectations, including definitions, properties, and calculations for both discrete and continuous distributions. Lastly, we explore moments, central moments, and their applications using the moment-generating function (MGF).			

Module 21

Code	Course/Module Title	ECTS	Semester
OR208	Numerical Analysis (2)	**6**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	**3**	**78**	**72**
Description			
In this course, the student will increase and develop information on the topic of numerical analysis and its uses. And to facilitate the solution of a system of linear and nonlinear differential equations in different ways. Learn about improved methods in numerical analysis. And how to apply programming on numerical methods. And on how to improve the numerical methods to improve the output and reduce the number of iterations. And finding differential equations by giving data values and function values at the given points and using inclusion, interpolation and Lagrange formulas. And the use of trigonometric analysis by using matrices to solve. And the use of general and special methods to find the solution to the system of linear equations. And the use of matrices in special methods of solution, such as Jacobi's special method and Kaus Seidel's special method.			

Module 22

Code	Course/Module Title	ECTS	Semester
OR209	Assignment Problems	**4**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	**2**	**63**	**37**
Description			
التعرف على مسألة النقل وأنواعها وطرق أيجاد الحل الأولي واختبار الأمثلية ومسائل التخصيص والطرق المختلفة لحلها وكذلك التعرف على الحالات الخاصة في مسائل التخصيص وكيفية صياغة مصفوفة التخصيص وأنواع مسائل التخصيص ومسألة البائع المتجول.			

Module 23

Code	Course/Module Title	ECTS	Semester
OR210	Reliability theory	4	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	37
Description			
Describes the system's ability to complete the task for which it is responsible in a given time. It is the one that helps to improve the work of systems and reduce the chances of their failure, and these systems include aircraft, linear accelerators, health systems and any other product. It has been developed using probability and statistics. It was used in the nineteenth century in the field of marine navigation and the field of life insurance in exchange for sums of money from its customers. Even today, the failure rate and risk rate are still verbal. Similarly, this theory is used in cases of failure of mechanical devices such as ships, trains, and automobiles. Statistical models suitable for any of these topics are called "time-to-event" models, and failure or death cases are called the even			

Module 24

Code	Course/Module Title	ECTS	Semester
OR211	Game Theory	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
يهدف هذا المقرر الى تعريف الطلبة على كيفية حل نماذج المباراة التعاونية وغير التعاونية وخاصة عندما يكون الزمن والكلفة والجودة عنصر مهم في الحل حيث يتم التطرق الى انواع المباراة لكل من المباراة التعاونية ا(التنافسية) وغير تعاونية او ما تسمى غير التنافسية حيث هناك طرق حل مختلفة منها الطريقة الحسابية عندما تكون المباراة تنافسية وحجم مصفوفة الدفع 2*2 اما اذا كانت المباراة تعاونية غير تنافسية وأيضا حجم مصفوفة الدفع 2*2 يستخدم طريقة الاحتمالات التعاونية اما اذا كان مباراة تنافسية واحد اللاعبين له ستراتجيتين والأخر اكثر من ستراتجيتين فيستخدم طريقة الرسم اما اذا كانت تعاونيه وبنفس الحجم فاننا نستخدم طريقة الازالة لجعل المصفوفة مربعة وهكذا اذا كانت مربعة وحجم مصفوفة الدفع 3*3 والمباراة تنافسية يستخدم طريقة البرمجة الخطية ويقابلها بالمباراة غير التنافسية التعاونية اسلوب ناش لايجان التوازن وهكذا لبقية الطرائق			

Module 25

Code	Course/Module Title	ECTS	Semester
UOM2012	اللغة العربية 2	2	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	1	33	17
Description			
يتعرف في هذه المادة على علاقة اللغة بالمجتمع واهميتها في حياتنا ومعرفة اللغات واللهجات والفرق بينهما وكيف يميز بين اسلوب المتكلم وقصده.			

Module 26

Code	Course/Module Title	ECTS	Semester
UOM2032	Computer 2	3	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	2	48	27
Description			

This course is designed to provide students with a comprehensive understanding of fundamental computing tasks and their practical applications. Topics covered include:

1. **Utilization of Computers for Fundamental Tasks:** Students will gain proficiency in performing basic computing functions such as file management, operating system navigation, and utilizing essential software tools to complete everyday tasks efficiently.
2. **Identification and Discussion of Hardware Components:** This section focuses on familiarizing students with the key hardware components of a computer system, including the central processing unit (CPU), memory units, storage devices, input/output peripherals, and network interfaces, alongside their respective functions and interactions within the system.
3. **Document Creation and Presentation Development:** Students will develop skills in creating, formatting, and editing documents using a word processor, as well as designing effective presentations using presentation software. Emphasis will be placed on both technical proficiency and effective communication through these mediums.
4. **Conducting Internet-Based Research:** Students will be introduced to advanced research techniques using the internet, including the use of academic databases, search engines, and online resources. Critical evaluation of information sources will also be emphasized to ensure quality and reliability in research findings.
5. **Introduction to Artificial Intelligence:** An introductory overview of artificial intelligence (AI) concepts will be presented. Topics will include the fundamentals of machine learning, natural language processing, and problem-solving techniques, with a focus on the potential applications and ethical considerations surrounding AI technologies.

Module 27

Code	Course/Module Title	ECTS	Semester
OR301	Unconstrained optimization (1)	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72

Description

Basic concepts:

Optimization, Statement of an optimization problem, One variable unconstrained optimization problem, Definition: local minimum value, local maximum value , global minimum value , global maximum value, Concave and convex functions of a one variable, Necessary and sufficient conditions of a one variable functions , Taylor' s series expansions . Methods of One variable unconstrained optimization problem. Dichotomous method, introduction , Algorithm, examples. Interval halving method , introduction , Algorithm, examples. Fibonacci method, introduction , Algorithm, examples. Golden section method , introduction , Algorithm, examples. Quadratic interpolation method , introduction , Algorithm, examples. Cubic interpolation method , introduction , Algorithm, examples. Newton method , introduction , Algorithm, examples. Quasi newton method , introduction , Algorithm, examples. Secant method , introduction , Algorithm, examples.

Module 28

Code	Course/Module Title	ECTS	Semester
OR302	Inventory Models(1)	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			

The main purpose of studying inventory models is to determine the rules and foundations through which the management can use them to minimum total costs of inventory that result from the storage process to cover customer demands, and the presence of an amount of inventory that protects the management from any unexpected decrease in the volume of production, as it remains able to respond to customer requests By addressing Definition of Inventory and Model, Objective of Inventory System ,Concepts and characteristic of inventory system and type of storage Knowing the meaning of demand in inventory models and its classifications ,Identify all costs related to inventory systems:

A:unit cost, B:setup cost, C:holding cost, D:shortage cost, E:order quantity , F:reorder point

G:safety stock, H:lead time, I:demand, J:constraints ,K:maximum level of shortage and inventory control hypotheses and Classification of inventory model and definition of Deterministic inventory model included Model(1) purchase model without shortage, Model(2) purchase model with shortage ,Model(3) production model without shortage ,Model (4) production model with shortage, and static order deterministic of one item.

Module 29

Code	Course/Module Title	ECTS	Semester
OR303	**تقنيات ذكائية (1)**	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			

التعرف على مصطلح الذكاء الأصطناعي و المفاهيم الأساسية ومكوناته وما يتضمنه من تطبيقات متنوعة لحل العديد من المسائل في بحوث العمليات والأمثلية. التعرف على مفاهيم مثل تمثيل المعرفة بالمنطق . أيضاً يتناول هذا المقرر طرق البحث وخوارزميات البحث (أو برامج حاسوبية) تحاكي القدرات الذهنية البشرية أو غيرها من أنماط سلوكية لتكسب الحاسوب القابلية على التعلم والأستنتاج لحالات لم تعلمها الآلة . استخدام الخوارزميات الحدسية metaheuristics لإيجاد الحل الأمثل لمسائل بحوث العلميات والأمثلية.

Module 30

Code	Course/Module Title	ECTS	Semester
OR304	Fuzzy logic (1)	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
In this Course we study the generalize traditional two-value logic, to infer in uncertain circumstances. And an easy way to describe and represent the human experience through one of the mysterious theories and techniques through which systems can be built, which are expert systems or artificial intelligence, and they are used as a better way to process data in programming systems and deal with inaccurate human-like information, in a way that reflects people's thinking as a model for our sense of words that we trade and use, enabling us to decide and give a closer picture of how these things are represented in computer software. It is how the degree of affiliation is determined. It also offers practical solutions to realistic problems, as effective and reasonable solutions, compared to other solutions that provide other technologies.			

Module 31

Code	Course/Module Title	ECTS	Semester
OR305	English Language	2	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	1	32	18
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 32

Code	Course/Module Title	ECTS	Semester
OR306	Modeling and simulation	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			
In this course, the student will be able to understand the topic of modeling and simulation and its applications in public life matters. The aim of the modeling and simulation course is to introduce students to mathematical modeling and how to build a model using differential and differential equations and practical applications on it. And how to generate random numbers in different ways Facilitating the development of models for any problem, its solution and simulation. To learn how to apply and use programming on modeling and simulation.			

Module 33

Code	Course/Module Title	ECTS	Semester
OR307	Unconstrained optimization (2)	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			
Basic concepts: Unconstrained optimization , Multi variable unconstrained optimization , Hessian matrix , Test the matrix is positive , negative definite or indefinite, Concave and convex functions of multi variable functions , Necessary and sufficient conditions of a multi variable functions. Definition: rth differential of function , Taylor's method . Methods of Multi variables unconstrained optimization problem. Steepest descent (Cauchy) method. Conjugate gradient methods. Hestenes – Stiefel method (HS). Fletcher – Reeves method (FR). Polak – Ribiere method (PR). Newton's method. Marquardt method. Quasi newton method. Davidon – Fletcher – Powell method (DFP). Broyden – Fletcher – Goldfarb – Shanno method (BFGS)			

Module 34

Code	Course/Module Title	ECTS	Semester
OR308	Inventory Models (2)	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			
Definition of Inventory Models ,Objective of Inventory System ,Concepts and characteristic of inventory system Knowing the meaning of demand in inventory ABC distribution ABC Analysis classifies inventory items into three categories based on their value and importance to the business: A (high-value items), B (medium-value items), and C (low-value items). The A items typically the most expensive and most important should be managed with extra care and attention. ,Planning and management of spare parts, General goals for planning and management of spare parts, Scientific method to control of stock ABC distribution and find economic order quantity in Break price model, Probabilistic model ,Review inventory (A continuous model) and single period model,Uniform demand setup cost equal to zero and examples ,Constraints storage and represented The Constraints for investment capital, the Constraints for storage space, the Constraints for the number of orders,an addition to other restrictions represented in the holding cost, the cost of preparing the order, and the cost of one unit, whether it is the cost of consumption or production ,Multiple unit inventory system, Multiple item static model with shortage limitation and form Special case when we have only one constraint .			

Module 35

Code	Course/Module Title	ECTS	Semester
OR309	**تقنيات ذكائية (2)**	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
تقديم نظرة عامة حول الخوارزميات والتطورية ومنها الخوارزمية الجينية ومفاهيمها ومكوناتها والتطبيقات وكذلك موضوع ذكاء السرب (SI) ، بما في ذلك ذكاء السرب السلوكي وتطبيقات SI. سيتعلم الطلاب خوارزميات ذكاء أسراب مختلفة مستوحاة من أنظمة طبيعية مثل سرب الطيور وسيقوم الطلاب بتنفيذ هذه الخوارزميات ، وتطبيقها لحل مسائل حقيقية في بحوث العمليات والأمثلية.			

Module 36

Code	Course/Module Title	ECTS	Semester
OR310	Fuzzy logic(2)	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
In this Course we study the generalize traditional two-value logic, to infer in uncertain circumstances. And an easy way to describe and represent the human experience through one of the mysterious theories and techniques through which systems can be built, which are expert systems or artificial intelligence, and they are used as a better way to process data in programming systems and deal with inaccurate human-like information, in a way that reflects people's thinking as a model for our sense of words that we trade and use, enabling us to decide and give a closer picture of how these things are represented in computer software. It is how the degree of affiliation is determined. It also offers practical solutions to realistic problems, as effective and reasonable solutions, compared to other ·solutions that provide other technologies			

Module 37

Code	Course/Module Title	ECTS	Semester
OR311	Neural Network	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	48	52
Description			
تعد الشبكات العصبية الاصطناعية من المواضيع البالغة الأهمية و اسلوبا من أساليب التقنيات الذكائية التي يمكن استخدامه كأداة بحثية في وصف البيانات وتحليلها وتدريب الشبكات عليها للوصول الى الهدف المحدد من قبل الدارس او الباحث حيث انها تستخدم في طريقة حلها الأساليب البرمجة التي من شانها الإسراع في الوصول الى النتائج المرجوة . وتضم الشبكات العصبية الاصطناعية بالعموم ثلاث مراحل لحلها وهي طبقة المدخلات (البيانات قيد الدراسة) والطبقة المخفية (المعادلات المستخدمة) وطبقة المخرجات والتي تمثل(النتائج المستحصلة من تدريب الشبكة). كما وان الشبكات العصبية يمكن حلها بأشراف او من دون اشراف حيث انه اذا كان هناك هدفا محددا من قبل الباحث او الدارس يبغى الوصول الية حينها تدعى بالشبكات المدربة بأشراف في حين خلو الشبكة من أي هدف تدعى حينها الشبكة العصبية من دون اشراف . والشبكات العصبية تضم عدة أنواع منها الشبكة ذات الطبقة الوحيدة والشبكات ذات الطبقات المتعددة والشبكات ذات الاتجاه الخلفي وشبكات الانتشار الامامي . وكل مما سبق سوف نتطرق الية بشكل مفصل خلال الفصل الدراسي المحدد			

Module 38

Code	Course/Module Title	ECTS	Semester
OR312	نظرية القرار	4	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	37

Description

تهتم هذه المادة باعطاء الطلاب فكرة عن نظرية القرار واستخداماتها في الحياة الواقعية وتدريبهم على اتخاذ القرار الأمثل باستخدام المعايير المختلفة مثل المعيار التفاؤلي والتشاؤمي ومعيار لابلاس والقيمة المتوقعة ومعيار الندم والفرص الضائعة والقيمة المتوقعة للفرص الضائعة بعد الاطلاع على المعلومات المتعلقة بمسألة ما كمثال كيفية تحديد القرار الأمثل في حالة الربح والخسارة أي ان الطالب يتعلم كيفية اخذ القرار الذي يعطي اقل خسارة واتخاذ القرار الذي يعطي اعلى ربح في حالة ان المسألة هي مسألة أرباح وكذلك وضع نسبة المخاطرة التي يتم توقعها من خلال المعلومات المتوفرة لكل مسألة معطاة .

وتهتم هذه المادة أيضا بتعريف الطالب بمحافظ الاستثمار وماهي هذه المحافظ وطريقة استعمالها في الحياة الواقعية .

وأيضا عملية عشوائية القرارات وسيعلم الطالب كيفية ربط المعلومات الرياضية والإحصائية التي تعرف عليها الطالب في المرحلة الثانية مثل التكامل المحدد الذي تعرف عليه الطالب في موضوع التفاضل والتكامل وأيضا المعدل والتباين والقيمة المتوقعة التي تعرف عليها الطالب في المرحلة الثانية في موضوع نظرية الاحتمالات

Module 39

Code	Course/Module Title	ECTS	Semester
OR401	Constrained Optimization (1)	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
This course is concerned with studying how to find the optimal solution for nonlinear problems .Using optimization to find the lowest cost and ffinding the optimal solution for non-linear problems by using algorithms and flowcharts to solve them .Solving nonlinear problems using optimization and programming also using matlab language and the ideal solution for non-linear problems for all direct and indirect methods .The general formula, the solution method, and the algorithm for the Lagrangian inequality function. The general formula, solution method and algorithm for the Lagrangian equality function. Solving nonlinear problems using optimization and using numerical programming			

Module 40

Code	Course/Module Title	ECTS	Semester
OR402	Queueing theory (1)	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			
This module shows the properties of queueing models and the efficiency metrics. Types of queueing models and Kendall's notation introduce to the students. Arrival and departure processes are explained and derived. Differential-Difference equations of (M/M/1):(GD/∞/∞) Model is derived and then the probability distribution of Pn is introduced. The expected number of units and waiting time distribution in queue and system are presented and discussed. Numerical examples for (M/M/1) :(GD/ ∞/∞) are solving to illustrate the efficiency metrics. Differential-Difference equations of (M/M/1) :(GD/N/∞) Model is derived and then the probability distribution of Pn is introduced. The expected number of units and waiting time distribution in queue and system are presented and discussed. Numerical examples for (M/M/1):(GD/ N/∞) are solving to illustrate the efficiency metrics.			

Module 41

Code	Course/Module Title	ECTS	Semester
OR403	Stochastic Process (1)	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
The theory of stochastic processes deals with systems which develop in time or space in accordance with probabilistic laws. The stochastic processes has many applications in diverse fields such as statistical physics, management science (operations research), communication and control theory, and time series analysis. And other applications in astronomy, biology, industry and medicine.			

Module 42

Code	**Course/Module Title**	**ECTS**	**Semester**
OR404	Regression Analysis (1)	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
This course covers the basic concepts of regression analysis through definition of regression analysis, uses of regression analysis, causal relationship, types of regression, general model, assumptions of analysis, estimation of regression parameters, Least Square. In addition, the characteristics of the regression line equation will be entered, and what is related to errors, unbiasedness, estimation of community variance, estimation of regression coefficient variances, estimation of variance of the average response and covariance. Analysis of variance, Confidence intervals, Regression through the origin, Coefficient of Determination, Correlation coefficient, Hypothesis testing will also be discussed. The irregularities or imbalances in the analysis Assumptions will also be understood, A test of lack of fit, Test of homogeneity of error variance, Test of autocorrelation between errors with application.			

Module 43

Code	Course/Module Title	ECTS	Semester
OR405	Pattern Recognition	5	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	62
Description			
In this course, the student will familiarize himself with the scientific concepts related to pattern recognition like how to specify fingerprints, handwriting, human face and the DNA chain. It is also concerned with studying and distinguishing patterns, studying random vectors and the quadratic formula for vectors, finding eigenvalues for functions, and using Bayes classification in classification for data taken from real life. These data may be medical or industrial. As well as the use of Fisher's classification to classify the data and use Bayesian threshold in the classification, and study clustering And methods of clustering to find the cluster such as single –link method, complete-link method ward method and learn the student how to use matlab program in clustering and distances like Euclidean distance, maximum distance, etc.			

Module 44

Code	Course/Module Title	ECTS	Semester
OR406	Scientific Research Method	2	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
1	1	32	18
Description			
An understanding of the nature and importance of scientific knowledge. Knowing the different types of scientific research. Learn how to identify and define the research problem. Developing skills in evaluating research problems. Learning how to choose an appropriate research methodology for a particular study. Developing skills in collecting and organizing research data			

Module 45

Code	Course/Module Title	ECTS	Semester
OR407	Constrain Optimization (2)	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
This course is contained Definitions and basic principles of the penalty function and the barrier together.The necessary and sufficient condition, the penalty and the barrier function together Basic theories of the penalty and barrier function together.The general formula, the solution method, and the algorithm is the inequality barrier function . The general formula, the solution method, and the algorithm, the penalty function for equality constraints .G.P.P and S.P.P, Q.P.P. General formula, method of solution and algorithm Applications using MATLAB for Inequality Constraints Applications using MATLAB for Constraints			

Module 46

Code	Course/Module Title	ECTS	Semester
OR408	Queueing theory (2)	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			
In this course, Differential-Difference equations and probability distribution of Pn for (M/M/C):(GD/∞/∞) are derived. Expected number of units and waiting time in queue and system are presented. Numerical examples are solved. Differential-Difference equations and probability distribution of Pn for (M/M/C) :(GD/N/∞) are derived. Expected number of units and waiting time in queue and system are presented. Numerical examples are solved. Differential-Difference equations and probability distribution of Pn for (M/M/1):(GD/N/∞) are derived. Expected number of units and waiting time in queue and system are presented. Numerical examples are solved. Differential-Difference equations and probability distribution of Pn for (M/M/C):(GD/N/N) are derived. Expected number of units and waiting time in queue and system are presented. Numerical examples are solved. Differential-Difference equations and probability distribution of Pn for (M/M/∞):(GD/∞/∞) are derived. Expected number of units and waiting time in queue and system are presented. Numerical examples are solved.			

Module 47

Code	Course/Module Title	ECTS	Semester
OR409	Stochastic process (2)	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			
This section is dealing with Poisson Process .Poisson Process is defined as stochastic process and it used in many subjects like customers services and Queues analysis Student learns how to use Poisson process in the life			

Module 48

Code	Course/Module Title	ECTS	Semester
OR410	Regression Analysis (2)	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
This course includes the basic concepts of multiple linear regression, Teach the student all the skills of multiple regression analysis, as there will be several independent variables in the regression model, The student will be taught data description, graphical representation, mathematical model, understanding of analysis assumptions of multiple linear regression, parameter estimation using the least squares method, understanding the properties of least squares estimators, analysis of variance table, explanation of the multiple correlation coefficient, partial correlation coefficient, Standard partial regression coefficient, estimation of a confidence interval for a linear function, simple for several partial coefficients, estimation of a confidence interval for the average response, Additional sum of squares, selection of the best regression equation using several criteria, reverse elimination method, forward elimination method, gradient regression method, principal component analysis Path analysis.			

Module 49

Code	Course/Module Title	ECTS	Semester
OR411	English Language	2	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	1	32	18
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 50

Code	Course/Module Title	ECTS	Semester
OR412	Project مشروع بحث	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
0	3	48	77
Description			
The idea behind scientific research work is to systematically explore and investigate specific topics or questions using rigorous methods. It involves formulating hypotheses, conducting experiments, analyzing data, and drawing meaningful conclusions. Scientific research aims to expand knowledge, address gaps in existing understanding, and contribute to the body of scientific literature. It often involves collaboration, peer review, and replication to ensure reliability. The ultimate goal is to provide evidence-based insights that can inform further studies and practical applications. Scientific research fosters innovation, advances disciplines, and plays a vital role in solving complex problems and improving the quality of life for individuals and societies. The ideas of scientific research for the projects of graduate students in our department revolve around the topics of operations research, in addition to the intelligent techniques and how to use them in these topics. The aim of the graduation project is to train the student to understand the steps of the mechanism of scientific research in order to prepare him for future postgraduate studies.			

Contact

Program Manager:

Niam Abdulmunim Abdulmajeed | Ph.D. in Operations Research and Intelligent Techniques | Assistant Professor
Email: niam.munim@uomosul.edu.iq
Mobile no.: 07510638779

Program Coordinator:

Administration of Department:

Manal Salim Hamdi| PHD. in Applied Mathematics | Lecturer
Email: manalsalim@uomosul.edu.iq
Mobile no.: 07703009264