MODULE DESCRIPTION FORM

2023-2024

**Stage 2 course 1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ت** | **الاسم** | | **رمز المادة** | **نوع المادة** | **عدد الساعات** | | | | **عدد الوحدات** |
| **نظري** | **عملي** | **مناقشة** | **المجموع** |
| **1** | **البرمجة الصحيحة والحركية** | **Integer and Dynamic Programming** | **CMOR23-F2111** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **2** | **نظرية الاحتمالات (1)** | **Probability Theory (1)** | **CMOR23-F2121** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **3** | **تحليل عددي (1)** | **Numerical Analysis (1)** | **CMOR23-F2131** | **اجباري كلية** | **2** | **2** | **ـــــ** | **4** | **3** |
| **4** | **معادلات تفاضلية** | **Differential Equations** | **CMOR23-F2141** | **اختياري كلية** | **3** | **\_\_** | **1** | **4** | **3** |
| **5** | **سيطرة نوعية** | **Quality Control** | **CMOR23-F2151** | **اختياري قسم** | **2** | **ـــــ** | **1** | **3** | **2** |
| **6** | **نظرية المباراة** | **Game Theory** | **CMOR23-F2161** | **اجباري قسم** | **2** | **ـــــ** | **1** | **3** | **2** |
| **7** | **مسائل تتابعية** | **Sequencing Problems** | **CMOR23-F2171** | **اجباري قسم** | **2** | **ـــــ** | **ـــــ** | **2** | **2** |
| **المجموع** | | | | | **17** | **2** | **5** | **24** | **18** |

**Course Description Form**

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| 1. Course Name numerical Analysis (1) | |
|  | |
| 1. Course Code: **CMOR23-F2131** | |
|  | |
| 1. Semester / Year:1nd | |
|  | |
| 1. Description Preparation Date:2023/2024 | |
|  | |
| 1. Available Attendance Forms: In presence | |
|  | |
| 1. Number of Credit Hours (Total)::4/ Number of Units (Total): 3 | |
|  | |
| 1. Course administrator's name (mention all, if more than one name) | |
| Name: asmaa abdulmunem abdullh  Email: **asmaa.abd@uomosul.edu.iq**  **D. manal salim**  **Email: manalsalim@uomosul.edu.iq** | |
| 1. Course Objectives | |
| **To enable the student to understand the subject of numerical analysis and its uses**  **To facilitate the solution of linear differential equations in different ways**  **To facilitate the solution of nonlinear equations using numerical methods** | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** |
| 1. Teaching and Learning Strategies | |
| **A- Knowledge and understanding**  A1- The student should mention the previous laws  A2- The student should write some terms  A3- The student should be familiar with numerical methods  A4- The student should distinguish between numerical methods  A5- The student explains numerical methods  A6- The student summarizes the steps for solving numerical methods  **B - Subject-specific skills**  B1 - That the student can solve differential equations  B2 - The student should reveal the amount of error between the real and numerical solution.  **C- Thinking skills**  C1- The student should propose solutions to linear equations and systems  C2-The student should compare analytical and numerical solution methods  C3- To plan how to use the appropriate method in the solution  **D - General and transferable skills (other skills related to employability and personal development).**  D1- That the student implements the method followed by manual and computer solutions  D2- To verify the method and the validity of the results  D3- Enabling the student to program numerical methods |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **4** | A | **Introduction to numerical analysis, sources of errors, circular cutting error, turning and cutting error** | Lecture and discussion | Assignments and Observation (H.W) | | **2** | **4** | A | **Rounding decimal numbers using rotation, rounding integers, types of errors** | Lecture and discussion | اAssignments and Observation (H.W) | | **3** | **4** | A&B | **Absolute error, relative error, mathematical operations on errors, comprehensive and diverse examples of the above** | ا Lecture and discussion | Assignments and Observation (H.W) | | **4** | **4** | A&B | **Solving nonlinear equations using iterative methods, methods for finding the initial point of any nonlinear equation, drawing method** | Lecture and problem solving | Written tests | | **5** | **4** | **B&A** | **change the sign method (algorithm - flow chart - practical example - practical program in Mathlab language)** | Lecture and problem solving | Written tests | | **6** | **4** | **A & C** | **Numerical iterative methods for solving nonlinear equations - bisection method (method algorithm - flow chart - applied example - practical program)** | Lecture and discussion | Assignments and Observation (H.W) | | **7** | **4** | **B & C** | **Iteration and repetition method (solid point method) ((Method algorithm - Flow chart - Practical example - Practical program in Mathlab language) Electronic lecture** | Lecture and discussion | Assignments and Observation (H.W) | | **8** | **4** | **A& C** | **False position method (method algorithm - flow chart - applied example - practical program in Mathlab language)** | Lecture and discussion | Assignments and Observation (H.W) | | **9** | **4** | **B & C** | **Newton Raphson's method for solving a nonlinear equation (algorithm - flow chart - practical example - practical program in Mathlab language)** | Lecture and problem solving | Presentation (power point) | | **10** | **4** | B | **Disadvantages of Newton-Raphson method**  **- Finding the square root using Newton Raphson (practical examples, practical program in Mathlab language)** | ا Lecture and discussion | Assignments and Observation (H.W) | | **11** | **4** | D |  | Lecture and Project | Project(Report) | | **12** | **4** | **A&B** | **The general law for finding the reciprocal of a number using Newton Raphson (practical examples, practical program in Mathlab language** |  |  | | **13** | **4** | A &C | **Finding the nth root using Newton Raphson (practical examples, practical program in Mathlab language)** | **Lecture and problem solving** | Assignments and Observation (H.W) | | **14** | **4** | **A& C** | **Hornes method for solving nonlinear polynomial equations** | Lecture and discussion | Assignments and Observation (H.W) | | **15** | **4** | C&D | **Solutions to the problems for the numerical methods above** | **Lecture and interrogation** | TEST | |  |  |  |  |  |  | | |
| 1. Course Evaluation | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | |
| 1. Learning and Teaching Resources | |
| Required textbooks (curricular books, if any): حسن مجيد حسون الدلفي و محمود عطا الله مشكور"التحليل الهندسي والعددي التطبيقي". |  |
| Main references (sources): Fast algorithms for solving a system of linear equations  Math and logic | Operation Research (2011) gupta |
| Recommended books and references (scientific journals, reports...) |  |
| Electronic References, Websites: https://www.bacldung.com/cs/category/core-concepts/math-logic) | www.gametheory.net |

**Course Description Form**

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| 1. Course Name: integer and Dynamic Programming | | |
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| 1. Course Code: **CMOR23-F2241** | | |
|  | | |
| 1. Semester / Year:1st | | |
|  | | |
| 1. Description Preparation Date:2023/2024 | | |
|  | | |
| 1. Available Attendance Forms: In presence | | |
|  | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) | | |
|  | | |
| 1. Course administrator's name (mention all, if more than one name) | | |
| Name: dr.mohammed alkailany  Email: alkailanym@uomosul.edu.iq | | |
| 1. Course Objectives | | |
| **Course Objectives** | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | |
| **A- Knowledge and understanding**  A1- The student should mention the previous laws  A2- The student should write some terms  A3- The student should describe the model  A4- The student should distinguish between the models  A5- The student explains the mathematical formula  A6- The student summarizes the steps to solve the mathematical formula  **B - Subject-specific skills**  B1 - The student applies the model to a real situation  B2 - The student must reveal the error in the form.  B3 - The student tabulates the results  **C- Thinking skills**  C1- The student poses a problem based on reality  C2- The student should compare the solution methods  C3- To rearrange the solution method  C4- To plan how to use the appropriate method in the solution  **D - General and transferable skills (other skills related to employability and personal development).**  D1- That the student implements the method used by the proof  D2- That the student improves the method used in the solution  D3- Verify the method  D4- Enabling the student to solve the results | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **3** | A | **Introduction** | Lecture and discussion | Assignments and Observation (H.W) | | **2** | **3** | A | **Branch and Bound method** | Lecture and discussion | اAssignments and Observation (H.W) | | **3** | **3** | A&B | **Cutting Plane method** | ا Lecture and discussion | Assignments and Observation (H.W) | | **4** | **3** | A&B | **Gomory's cutting plane** | Lecture and problem solving | Written tests | | **5** | **3** | **B&A** | **Approximation Implicit enumeration method Methods** | Lecture and problem solving | Written tests | | **6** | **3** | **A & C** | **approximation method** | Lecture and discussion | Assignments and Observation (H.W) | | **7** | **3** | **B & C** | **Graphically methods** | Lecture and discussion | Assignments and Observation (H.W) | | **8** | **3** | **A& C** | **implicit enumeration method Dynamic Programming** | Lecture and discussion | Assignments and Observation (H.W) | | **9** | **3** | **B & C** | **Equion method** | Lecture and problem solving | Presentation (power point) | | **10** | **3** | B | **Building integer Linear programing** | ا Lecture and discussion | Assignments and Observation (H.W) | | **11** | **3** | D | Project(Report) | Lecture and Project | Project(Report) | | **12** | **3** | **A&B** | **decision making of dynamic** | **exam** | **exam** | | **13** | **3** | A &C | **backward** | **Lecture and problem solving** | Assignments and Observation (H.W) | | **14** | **3** | **A& C** | **forward** | Lecture and discussion | Assignments and Observation (H.W) | | **15** | **3** | C&D | **Test** | **Lecture and interrogation** | TEST | |  |  |  |  |  |  | | | |
| 1. Course Evaluation | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | | |
| 1. Learning and Teaching Resources | | |
| Required textbooks (curricular books, if any) |  | |
| Main references (sources) | Operation Research (2011) gupta | |
| Recommended books and references (scientific journals, reports...) |  | |
| Electronic References, Websites | www.gametheory.net | |

**Course Description Form**

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| 1. Course Name: Sequencing problems | | | | | | | | |
|  | | | | | | | | |
| 1. Course Code: **CMOR23-F2171** | | | | | | | | |
|  | | | | | | | | |
| 1. Semester / Year:First / 2024 | | | | | | | | |
|  | | | | | | | | |
| 1. Description Preparation Date:1-4-2024 | | | | | | | | |
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| 1. Available Attendance Forms: In presence | | | | | | | | |
|  | | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) 2/2 | | | | | | | | |
|  | | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | | |
| Name: Assist.Prof.Dr.Niam Abdulmunim Abdulmajeed  Email: niam.munim@uomosul.edu.iq | | | | | | | | |
| 1. Course Objectives | | | | | | | | |
| **Course Objectives** | | | | | | Identify sequential problems and their concepts, the scheduling problem and its types, scheduling criteria, and the most important scheduling problems for single-machine problems and parallel machines, the multi-processor task, open workshops, the flow workshop, business workshops, and scheduling resource-constrained projects, in addition to the important optimization and scheduling algorithms used in operations research.  Obtain sufficient training in formulating sequential problems, various scheduling, and algorithms to solve these problems.  Presenting many real-life problems that can be formulated, such as sequential and tabulation problems. | | |
| 1. Teaching and Learning Strategies | | | | | | | | |
| **Strategy** | | 1. Students can learn about scheduling and sequencing problems.  2. Students are able to deal with sequencing problems.  3. Students can deal with scheduling problems.  4. Identify the optimization and scheduling algorithms used for machine and workshop scheduling problems.  5. Recognize the importance of scheduling problems and algorithms in solving practical problems in industry and production.  6. Modeling scheduling and sequencing problems.  7. Enabling the student to write and understand algorithms, solve problems, interpret results, and be able to make the optimal decision in using scheduling algorithms and applying them in real life.  8. Keeping pace with developments in the field of specialization.  9. The use of different types of algorithms that solve scheduling problems and how to develop and improve them. | | | | | | |
| 1. Course Structure | | | | | | | | |
| **Week** | **Hours** | | **Required Learning Outcomes** | **Unit or subject name** | | | **Learning method** | **Evaluation method** |
| 1 | 2 | |  | Sequencing problems, sequence, scheduling, Directed Acyclic Graph Model, homogeneous and heterogeneous processors, types of scheduling, scheduling criteria | | | Lecture, discussion and interrogation | written tests |
| 2 | 2 | |  | The resource-constrained project scheduling problem with examples | | | Lecture, discussion and interrogation | written tests |
| 3 | 2 | |  | Machine scheduling, basic concepts, machine scheduling problems | | | Lecture, discussion and interrogation | written tests |
| 4 | 2 | |  | Single machine (processor) scheduling algorithms ,First Come First Server Scheduling Algorithm  Short Job First Scheduling algorithm | | | Lecture, discussion and interrogation | written tests |
| 5 | 2 | |  | Priority Scheduling Algorithm , Round Robin Scheduling Algorithm | | | Lecture, discussion and interrogation | written tests |
| 6 | 2 | |  | Earliest Due Date Scheduling Algorithm , Moore's Algorithm | | | Lecture, discussion and interrogation | written tests |
| 7 | 2 | |  | Parallel Machine Scheduling | | | Lecture, discussion and interrogation | written tests |
| 8 | 2 | |  | Multi-machine (multiprocessor) scheduling algorithms, Independent Jobs scheduling algorithms Longest Processing Time Scheduling Algorithm, Shortest Processing Time Scheduling Algorithm | | | Lecture, discussion and interrogation | written tests |
| 9 | 2 | |  | Multiprocessor Scheduling Algorithms With Out Communication Cost  Highest Level First With Estimated Time) Scheduling Algorithm | | | Lecture, discussion and interrogation | written tests |
| 10 | 2 | |  | Smallest Co – Level First With Estimated Time Scheduling Algorithm  CP/ MISF (Critical Path/ Most Immediate Successors First) Scheduling Algorithm | | | Lecture, discussion and interrogation | written tests |
| 11 | 2 | |  | Shop Scheduling  Flow Shop Scheduling | | | Lecture, discussion and interrogation | written tests |
| 12 | 2 | |  | Johansen's algorithm for the n/2/F//Fmax  problem | | | Lecture, discussion and interrogation | written tests |
| 13 | 2 | |  | Open Shop Scheduling | | | Lecture, discussion and interrogation | written tests |
| 14 | 2 | |  | Multi-Processor task Scheduling | | | Lecture, discussion and interrogation | written tests |
| 15 | 2 | |  | A week of preparation before the final exam | | |  |  |
| 1. Course Evaluation | | | | | | | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W.) | | | | | | | | |
| 1. Learning and Teaching Resources | | | | | | | | |
| Required textbooks (curricular books, if any) | | | | | Lectures prepared by the lecturer | | | |
| Main references (sources) | | | | | P.K. Gupta & D.S.Hira,2008,Operations Research, S.Chand & Company Ltd. New Delhi. | | | |
| Recommended books and references (scientific journals, reports...) | | | | |  | | | |
| Electronic References, Websites | | | | | <https://www.youtube.com/watch?v=pGRZ8laY-2U> | | | |

**Course Description Form**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| 1. Course Name: Differential equations | | | | | | | |
|  | | | | | | | |
| 1. Course Code: COMOR23-F2141 | | | | | | | |
|  | | | | | | | |
| 1. Semester / Year: The first semester of the second stage | | | | | | | |
|  | | | | | | | |
| 1. Description Preparation Date: 4/2/2024 | | | | | | | |
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| 1. Available Attendance Forms: Recording the student’s attendance in theoretical lectures | | | | | | | |
|  | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total): 60 hours of theory (4 hours per week for 15 weeks, 2 theory, 2 discussion)/number of units (3) | | | | | | | |
|  | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | |
| Name: Manal Salim Hamdi  Email: E-mail manalsalim@uomosul.edu.iq | | | | | | | |
| 1. Course Objectives | | | | | | | |
| **Course Objectives** | | | | | 1- Enabling the student to recognize the types of differential equations.  2- To have an excellent tool to feel the close relationship between pure mathematics and the physical or engineering sciences.  3- Interpreting some laws of natural phenomena and working to solve their problems...... | | |
| 1. Teaching and Learning Strategies | | | | | | | |
| **Strategy** | | | How to give a lecture  1- Using the blackboard to explain differential equations and solve questions.  2- Continuous discussion by asking questions and answers in the hall and motivating the student to self-think and thus to self-learning.  3- Requesting assignments and discussions to be sent via the online class, Google Classroom.  4- Requiring the writing of scientific reports in the specialty, discussing those reports, and pointing out their strengths and weaknesses to achieve the desired goal. | | | | |
| 1. Course Structure | | | | | | | |
| **Week** | **Hours** | **Required Learning Outcomes** | | **Unit or subject name** | | **Learning method** | **Evaluation method** |
| 1 | 3 | Re-explaining the methods of integrals (partial) | | Examples with exercises | | Lecture using  the blackboard | Short exams, and  Quarterly and final |
| 2 | 3 | Fractional, radical | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 3 | 3 | Definition of differential equations (degree and rank) general solution and special solution | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 4 | 3 | Prove the solution to the differential equation | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 5 | 3 | Linear differential equations (including separable, homogeneous | | Examples with exercises | | The blackboard  The blackboard | Short exams, and  Quarterly and final |
| 6 | 3 | (complete, incomplete) | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 7 | 3 | Differential and linear equations of first order and first order | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 8 | 3 | Bernoulli equations | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 9 | 3 | Re-explaining the methods of integrals (partial) | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 10 | 3 | Reduced order differential equation Equations that can be solved by direct integration | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 11 | 3 | Reducing the rank of the differential equation is the case in which the dependent variable does not appear | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 12 | 3 | Reducing the rank of the differential equation is the case in which the independent variable does not appear | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 13 | 3 | Differential equations of order n, case one, two, and three | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 14 | 3 | The linear coefficients of order n are heterogeneous in the first and second cases | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 15 | 3 | Examples of applications of differential equations | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 1. Course Evaluation | | | | | | | |
| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc | | | | | | | |
| 1. Learning and Teaching Resources | | | | | | | |
| Required textbooks (curricular books, if any) | | | |  | | | |
| Main references (sources) | | | |  | | | |
| Recommended books and references (scientific journals, reports...) | | | | Parman and Gupta ,Differential equations and Differential geometry,(2008) | | | |
| Electronic References, Websites | | | | 1<http://www.alfreedph.com/2017/06/Ordinary->  -2 <https://download-learning-pdf-ebooks.com/12099-free-book> | | | |

**Course Description Form**

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| 1. Course Name: | | | | | | | | |
| Probability theory 1 | | | | | | | | |
| 1. Course Code: | | | | | | | | |
| CMOR23-F2121 | | | | | | | | |
| 1. Semester / Year: | | | | | | | | |
|  | | | | | | | | |
| 1. Description Preparation Date: | | | | | | | | |
| 1/4/2024 | | | | | | | | |
| 1. Available Attendance Forms: | | | | | | | | |
| In presence | | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) | | | | | | | | |
| 4 hours 3 / units | | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | | |
| Name: **Saifuldeen Dheyauldeen Saeed Alrefaee** Email: [**saifldeen.alrefaee@uomosul.edu.iq**](mailto:saifldeen.alrefaee@uomosul.edu.iq) | | | | | | | | |
| 1. Course Objectives | | | | | | | | |
| **Course Objectives** | | | | 1. Grasp the set theory fundamentals: Learn subsets, complements, unions, intersections, and set partitioning. Explore theorems and proofs for deeper understanding. 2. Developing the student's abilities on counting methods to reach sets theory as well as the binomial expansion law. 3. Acquire probability theory knowledge: Introduce concepts like sample space, events, and connections to random experiments. Explore Classical and Axiomatic approaches and utilize tools for understanding the events. 4. Realization of conditional probability and axioms: Learn theoretical foundations, practical calculations, and their application in problem-solving. 5. Explore Bayes' theory and applications: Introduce valuable tools for advanced probability work and real-world utilization. 6. Provide a solid foundation for advanced work on probability and its applications, and is essential to understanding many applied fields.   Overall, the objectives of this module include building a strong foundation in set theory, developing proficiency in combinatorics and probability, and introducing advanced topics like conditional probability and Bayes' theory. | | | | |
| 1. Teaching and Learning Strategies | | | | | | | | |
| **Strategy** | | The main strategy that will be adopted in introducing this unit is to encourage students to participate in the exercises while improving and expanding their critical thinking skills at the same time by getting acquainted with the theory of probability, in the first part and expanding the student's mind. This will be achieved through classes and interactive educational programs to learn about sets theory and counting methods for it, and through learning about the random experiment and sample space in forming sets, as well as using basic probabilistic laws in application in its various forms, which will be the basis for the student for his future stages. | | | | | | |
| 1. Teaching and learning outcomes | | | | | | | | |
| A- Knowledge and understanding  A1- The student should mention the previous laws and terminology  A2- The student should distinguish between the types of probability, including conditional and unconditional  A3- That the student understands the special formulas and proofs used in probability  A4- The student should summarize the steps of the solution | | | | | | | | |
| B - Subject-specific skills  B1 - The student applies it to a real situation  B2 - The student must reveal the error in the solution, if any.  B3 - The student tabulates the results | | | | | | | | |
| C- Thinking skills  C1- The student poses a problem based on reality  C2-The student should compare the solution methods  C3- The student must determine the appropriate method for the solution  C4- That the student applies the correct rules in the solution | | | | | | | | |
| D - General and transferable skills (other skills related to employability and personal development).  D1- The student implements the method used by the proof  D2- The student improves the method used in the solution  D3- Verify the method | | | | | | | | |
| 1. Course Structure | | | | | | | | |
| **Week** | **Hours** | | **Required Learning Outcomes** | | **Unit or subject name** | | **Learning method** | **Evaluation method** |
| 1 | 4 | | A | | Introduction of the Probability and Basic set theory. | | Lecture and discussion | Note |
| 2 | 4 | | A | | Basic Set theory, definitions of set theory. | | Lecture and discussion | Note |
| 3 | 4 | | A & B | | Some Fundamental Theorems, Fundamental laws of set theory with theorems. | | Lecture and interrogation | Oral exams |
| 4 | 4 | | A & B | | Sequence and limits, with theorems. | | Lecture and problem-solving | Written tests |
| 5 | 4 | | A & B & C | | Field, -Field, and Power of the set. | | Lecture and discussion | Note |
| 6 | 4 | | A & B & C | | Techniques of Counting, Tree Diagrams, and Arrangement | | Lecture and discussion | Note |
| 7 | 4 | | A & B & C | | Techniques of Counting, Permutations. | | Lecture and interrogation | The exams Editorial |
| 8 | 4 | | A & B | | Techniques of Counting, Combinations with theorems. | | Lecture and problem-solving | Note |
| 9 | 4 | | B & C | | Combinations and Binomial theorem and Multinomial Expansion. | | Lecture and discussion | Note |
| 10 | 4 | | B & C | | Probability Introduction, Random Experiment, Events Kinds, Sample Space, and Probability a law. | | Lecture and discussion | Note |
| 11 | 4 | | B & C | | Axiomatic Approach of Probability | | Lecture and discussion | Observation and written tests |
| 12 | 4 | | A & B & D | | Probabilistic models according to the basic laws of set theory with theorems. | | Lecture and problem-solving | Note |
| 13 | 4 | | B & C | | Independent events, Conditional Probability. | | Lecture and discussion | Note |
| 14 | 4 | | A & B & C | | Conditional Probability, Bayes' law, and Bayes' Theorem | | Lecture and interrogation | Oral exams |
| 15 | 4 | | A & B & C & D | | Applications of Bayes' Theorem. | | discussion | Note |
| 1. Course Evaluation | | | | | | | | |
| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc | | | | | | | | |
| 1. Learning and Teaching Resources | | | | | | | | |
| Required textbooks (curricular books, if any) | | | | | | 1. 1-Introduction to probability theory, Dr. Dhafir H. Rasheed,1999,2-nd edition, Baghdad University 2. probability, Dr.kubais S. A Fahady Dr. Pirlanty J. Shamoon, Ministry of Higher Education and Scientific Research University of Mosul | | |
| Main references (sources) | | | | | | 1. A first course in probability, Sheldon Ross, 2010, Eighth edition. | | |
| Recommended books and references (scientific journals, reports...) | | | | | | 1. Probability, scheme series | | |
| Electronic References, Websites | | | | | | 1. https://www.coursera.org/learn/probability-theory-foundation-for-data-science? 2. <https://www.khanacademy.org/math/statistics-probability> | | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **C** | **الاسم** | | **رمز المادة** | **نوع المادة** | **عدد الساعات** | | | | **عدد الوحدات** |
| **نظري** | **عملي** | **مناقشة** | **المجموع** |
| **1** | **نظرية الاحتمالات (2)** | **Probability Theory (2)** | **CMOR23-F2211** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **2** | **تحليل عددي (2)** | **Numerical Analysis (2)** | **CMOR23-F2221** | **اختياري كلية** | **2** | **2** | **\_\_** | **4** | **3** |
| **3** | **مسائل التخصيص** | A**ssignment Problems** | **CMOR23-F2231** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **4** | **تنقيب بينات** | **Data Mining** | **CMOR23-F2241** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **5** | **سلاسل زمنية** | **Time Series** | **CMOR23-F2251** | **اختياري قسم** | **2** | **ـــــ** | **2** | **4** | **2** |
| **6** | **مبادئ الاقتصاد** | **Elementary of Economic** | **CMOR23-F2261** | **اختياري جامعة** | **2** | **ـــــ** | **\_\_** | **2** | **2** |
| **7** | **لغة انكليزية (2)** | **English Language (2)** | **CMOR23-F2271** |  | **2** | **ـــــ** | **ـــــ** | **2** | **2** |
| **المجموع** | | | | | **17** | **2** | **5** | **24** | **18** |

**Stage 2 course 2**

**Course Description Form**

|  |  |  |
| --- | --- | --- |
| 1. Course Name numerical Analysis (2) | | |
|  | | |
| 1. Course Code: **CMOR23-F2221** | | |
|  | | |
| 1. Semester / Year:2nd | | |
|  | | |
| 1. Description Preparation Date:2023/2024 | | |
|  | | |
| 1. Available Attendance Forms: In presence | | |
|  | | |
| 1. Number of Credit Hours (Total)::4/ Number of Units (Total): 3 | | |
|  | | |
| 1. Course administrator's name (mention all, if more than one name) | | |
| Name: asmaa abdulmunem abdullh  Email: **asmaa.abd@uomosul.edu.iq**  **D. manal salim**  **Email:** [**manalsalim@uomosul.edu.iq**](mailto:manalsalim@uomosul.edu.iq) | | |
| 1. Course Objectives | | |
| **To enable the student to understand the subject of numerical analysis and its uses**  **To facilitate the solution of linear differential equations in different ways**  **To facilitate the solution of nonlinear equations using numerical methods** | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | |
| **A- Knowledge and understanding**  A1- The student should mention the previous laws  A2- The student should write some terms  A3- The student should be familiar with numerical methods  A4- The student should distinguish between numerical methods  A5- The student explains numerical methods  A6- The student summarizes the steps for solving numerical methods  **B - Subject-specific skills**  B1 - That the student can solve differential equations  B2 - The student should reveal the amount of error between the real and numerical solution.  **C- Thinking skills**  C1- The student should propose solutions to linear equations and systems  C2-The student should compare analytical and numerical solution methods  C3- To plan how to use the appropriate method in the solution  **D - General and transferable skills (other skills related to employability and personal development).**  D1- That the student implements the method followed by manual and computer solutions  D2- To verify the method and the validity of the results  D3- Enabling the student to program numerical methods | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **4** | A | **Cramer's method (practical examples - practical program)** | Lecture and discussion | Assignments and Observation (H.W) | | **2** | **4** | A | **Newton Raphson's method for solving a system of nonlinear equations using the Jacobi matrix (algorithm - flow chart - applied examples - practical program in Mathlab)** | Lecture and discussion | اAssignments and Observation (H.W) | | **3** | **4** | A&B | **The improvement Newton-Raphson method for solving a system of nonlinear equations (algorithm - flow chart - applied examples - practical program in Mathlab)** | ا Lecture and discussion | Assignments and Observation (H.W) | | **4** | **4** | A&B | **ـــ Trigonometric analysis method (explanation of the method - applied examples)** | Lecture and problem solving | Written tests | | **5** | **4** | **B&A** | **Jacobi's general method (explanation of the method - applied examples, a practical program in the Mathlab language** | Lecture and problem solving | Written tests | | **6** | **4** | **A & C** | **Jacobi's special (trigonometric) method (explanation of the method - applied examples, a practical program in the Mathlab language)** | Lecture and discussion | Assignments and Observation (H.W) | | **7** | **4** | **B & C** | **General causs-Seidel method (explanation of the method - applied examples, practical program in Mathlab language)** | Lecture and discussion | Assignments and Observation (H.W) | | **8** | **4** | **A& C** | **ـــ causs-Seidel's method practical (explanation of the method - applied examples, practical program in Mathlab language)** | Lecture and discussion | Assignments and Observation (H.W) | | **9** | **4** | **B & C** | **Inclusion and interpolation: polynomials (quadratic inclusion, cubic inclusion)** | Lecture and problem solving | Presentation (power point) | | **10** | **4** | B | **Inclusion and interpolation: polynomials (quadratic inclusion, cubic inclusion)**  **language)** | ا Lecture and discussion | Assignments and Observation (H.W) | | **11** | **4** | D |  | Lecture and Project | Project(Report) | | **12** | **4** | **A&B** | Lagrange Inclusion Parametric (Explanation of the method, example, practical program in Mathlab language |  |  | | **13** | **4** | A &C | Solutions to the numerical methods problems above | **Lecture and problem solving** | Assignments and Observation (H.W) | | **14** | **4** | **A& C** | **Solutions to the numerical methods problems above** | Lecture and discussion | Assignments and Observation (H.W) | | **15** | **4** | C&D | **Solutions to the numerical methods problems above** | **Lecture and interrogation** | TEST | |  |  |  |  |  |  | | | |
| 1. Course Evaluation | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | | |
| 1. Learning and Teaching Resources | | |
| Required textbooks (curricular books, if any): حسن مجيد حسون الدلفي و محمود عطا الله مشكور"التحليل الهندسي والعددي التطبيقي". |  | |
| Main references (sources): Fast algorithms for solving a system of linear equations  Math and logic | Operation Research (2011) gupta | |
| Recommended books and references (scientific journals, reports...) |  | |
| Electronic References, Websites: https://www.bacldung.com/cs/category/core-concepts/math-logic) | www.gametheory.net | |

**Course Description Form**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| 1. Course Name: Time Series | | | | | | | |
|  | | | | | | | |
| 1. Course Code: COMOR23-F2251 | | | | | | | |
|  | | | | | | | |
| 1. Semester / Year: The first semester of the second stage | | | | | | | |
|  | | | | | | | |
| 1. Description Preparation Date: 4/2/2024 | | | | | | | |
|  | | | | | | | |
| 1. Available Attendance Forms: Recording the student’s attendance in theoretical lectures | | | | | | | |
|  | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total): 60 hours of theory (4 hours per week for 15 weeks, 2 theory, 2 discussion)/number of units (3) | | | | | | | |
|  | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | |
| Name: Manal Salim Hamdi  Email: E-mail [manalsalim@uomosul.edu.iq](mailto:manalsalim@uomosul.edu.iq) | | | | | | | |
| 1. Course Objectives | | | | | | | |
| **Course Objectives** | | | | | 1- Enabling the student to recognize the types of time series so that he has an excellent tool to feel the close relationship between time series and their applications in different journals.  2- Interpreting some laws of natural phenomena and working to solve their problems. | | |
| 1. Teaching and Learning Strategies | | | | | | | |
| **Strategy** | | | How to give a lecture  1- Using the blackboard to explain differential equations and solve questions.  2- Continuous discussion by asking questions and answers in the hall and motivating the student to self-think and thus to self-learning.  3- Requesting assignments and discussions to be sent via the online class, Google Classroom.  4- Requiring the writing of scientific reports in the specialty, discussing those reports, and pointing out their strengths and weaknesses to achieve the desired goal. | | | | |
| 1. Course Structure | | | | | | | |
| **Week** | **Hours** | **Required Learning Outcomes** | | **Unit or subject name** | | **Learning method** | **Evaluation method** |
| 1 | 4 | Introduction to time series | | Examples with exercises | | Lecture using  the blackboard | Short exams, and  Quarterly and final |
| 2 | 4 | Types of time series | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 3 | 4 | Time series models | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 4 | 4 | Measure the general trend | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 5 | 4 | The general nonlinear trend (part one) | | Examples with exercises | | The blackboard  The blackboard | Short exams, and  Quarterly and final |
| 6 | 4 | The general non-linear trend (Part Two) | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 7 | 4 | Excluding the effect of the general trend (Part One) | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 8 | 4 | Excluding the effect of the general trend (Part Two) | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 9 | 4 | Seasonal changes (part one) | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 10 | 4 | Seasonal changes (Part Two) | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 11 | 4 | Periodic changes (part one) | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 12 | 4 | Periodic changes (Part Two) | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 13 | 4 | Random changes (part one) | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 14 | 4 | Random changes (part two) | | Examples with exercises | | Lecture using  The blackboard | Short exams, and  Quarterly and final |
| 1. Course Evaluation | | | | | | | |
| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc | | | | | | | |
| 1. Learning and Teaching Resources | | | | | | | |
| Required textbooks (curricular books, if any) | | | |  | | | |
| Main references (sources) | | | |  | | | |
| Recommended books and references (scientific journals, reports...) | | | | Parman and Gupta ,Differential equations and Differential geometry,(2008) | | | |
| Electronic References, Websites | | | | 1<http://www.alfreedph.com/2017/06/Ordinary->  -2 <https://download-learning-pdf-ebooks.com/12099-free-book> | | | |

**Course Description Form**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. Course Name: Assignment Problems | | | | | | | | |
|  | | | | | | | | |
| 1. Course Code: **CMOR23-F2231** | | | | | | | | |
|  | | | | | | | | |
| 1. Semester / Year: Second / 2024 | | | | | | | | |
|  | | | | | | | | |
| 1. Description Preparation Date: 1-4-2024 | | | | | | | | |
|  | | | | | | | | |
| 1. Available Attendance Forms: In presence | | | | | | | | |
|  | | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) 4/3 | | | | | | | | |
|  | | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | | |
| Name: Assist.Prof.Dr.Niam Abdulmunim Abdulmajeed  Email: niam.munim@uomosul.edu.iq | | | | | | | | |
| 1. Course Objectives | | | | | | | | |
| **Course Objectives** | | | | | | Identify the different types of transportation and assignment problems.  Developing drafting skills in transportation models and finding optimal solutions.  Understanding ways to solve various transportation and assignment problems. | | |
| 1. Teaching and Learning Strategies | | | | | | | | |
| **Strategy** | | 1. The use of transportation and assignment models in industry and business.  2. Formulating the transportation and assignment problems.  3. Knowledge of the assignment problem and its assumptions.  4. Solve the assignment problem using the Hungarian method.  5. Know and determine whether the optimal solution includes alternative or multiple solutions.  6. How to deal with the state of degenerate and imbalance in transportation and assignment problems.  7. Application of transportation and assignment models in business and real-life application.  8. Recognize the importance of transportation and assignment problems in solving practical problems in industry and production.  9. Interpret solutions of transportation and assignment models and derive solutions to real-world problems. | | | | | | |
| 1. Course Structure | | | | | | | | |
| **Week** | **Hours** | | **Required Learning Outcomes** | **Unit or subject name** | | | **Learning method** | **Evaluation method** |
| 1 | 4 | |  | Transportation Problems (Models)  Definitions and basic concepts, formulation of the transportation problem (model), mathematical model | | | Lecture, discussion and interrogation | written tests |
| 2 | 4 | |  | Methods for finding the feasible basic solution to the transportation problem  North west corner method, least cost method | | | Lecture, discussion and interrogation | written tests |
| 3 | 4 | |  | Vogel's method | | | Lecture, discussion and interrogation | written tests |
| 4 | 4 | |  | Methods for finding the optimal solution to the transportation problem (optimality test)  Multipliers Method | | | Lecture, discussion and interrogation | written tests |
| 5 | 4 | |  | Stepping Stone Method | | | Lecture, discussion and interrogation | written tests |
| 6 | 4 | |  | Assignment Problems  Definitions, basic concepts and applications | | | Lecture, discussion and interrogation | written tests |
| 7 | 4 | |  | Methods of solving assignment problems  Complete enumeration method | | | Lecture, discussion and interrogation | written tests |
| 8 | 4 | |  | Hungarian Method | | | Lecture, discussion and interrogation | written tests |
| 9 | 4 | |  | Linear programming method, Transportation method | | | Lecture, discussion and interrogation | written tests |
| 10 | 4 | |  | Special cases of assignment problems  Maximization Problems  Unbalanced Problems  Handing unaccepted Assignment | | | Lecture, discussion and interrogation | written tests |
| 11 | 4 | |  | A job-Assignment Problem | | | Lecture, discussion and interrogation | written tests |
| 12 | 4 | |  | Formulating the assignment matrix | | | Lecture, discussion and interrogation | written tests |
| 13 | 4 | |  | Standard assignment problem (typical) | | | Lecture, discussion and interrogation | written tests |
| 14 | 4 | |  | Travelling Salesman Problem  Basic concepts, Traveling salesman idea, mathematical model, applications | | | Lecture, discussion and interrogation | written tests |
| 15 | 4 | |  | A week of preparation before the final exam | | | Lecture, discussion and interrogation | written tests |
| 1. Course Evaluation | | | | | | | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W.) | | | | | | | | |
| 1. Learning and Teaching Resources | | | | | | | | |
| Required textbooks (curricular books, if any) | | | | | Lectures prepared by the lecturer | | | |
| Main references (sources) | | | | | P.K. Gupta & D.S.Hira,2008,Operations Research, S.Chand & Company Ltd. New Delhi | | | |
| Recommended books and references (scientific journals, reports...) | | | | |  | | | |
| Electronic References, Websites | | | | | <https://www.youtube.com/watch?v=rfu2Zbjc7q8> | | | |

**Course Description Form**

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| --- | --- | --- |
| 1. Course Name: Data Mining | | |
|  | | |
| 1. Course Code: CMOR23-F2161 | | |
|  | | |
| 1. Semester / Year:2nd | | |
|  | | |
| 1. Description Preparation Date:2023/2024 | | |
|  | | |
| 1. Available Attendance Forms: In presence | | |
|  | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total)/2 | | |
|  | | |
| 1. Course administrator's name (mention all, if more than one name) | | |
| Name: Lec. Ahmed N. Alkhateeb  Email: ahmed.alkhateeb@uomosul.edu.iq | | |
| 1. Course Objectives | | |
| **Course Objectives** | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | |
| **A- Knowledge and understanding**  A1- The student should mention the previous laws  A2- The student should write some terms  A3- The student should describe the model  A4- The student should distinguish between the models  A5- The student explains the mathematical formula  A6- The student summarizes the steps to solve the mathematical formula  **B - Subject-specific skills**  B1 - The student applies the model to a real situation  B2 - The student must reveal the error in the form.  B3 - The student tabulates the results  **C- Thinking skills**  C1- The student poses a problem based on reality  C2- The student should compare the solution methods  C3- To rearrange the solution method  C4- To plan how to use the appropriate method in the solution  **D - General and transferable skills (other skills related to employability and personal development).**  D1- That the student implements the method used by the proof  D2- That the student improves the method used in the solution  D3- Verify the method  D4- Enabling the student to solve the results | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **3** | A | **Origin of data mining** | Lecture and discussion | Assignments and Observation (H.W) | | **2** | **3** | A | **Classification** | Lecture and discussion | اAssignments and Observation (H.W) | | **3** | **3** | A&B | **Clustering** | ا Lecture and discussion | Assignments and Observation (H.W) | | **4** | **3** | A&B | **Types of data** | Lecture and problem solving | Written tests | | **5** | **3** | **B&A** | **Samples, feature selection** | Lecture and problem solving | Written tests | | **6** | **3** | **A & C** | **Data transformation** | Lecture and discussion | Assignments and Observation (H.W) | | **7** | **3** | **B & C** | **Measures distance** | Lecture and discussion | Assignments and Observation (H.W) | | **8** | **3** | **A& C** | **Similarity measures** | Lecture and discussion | Assignments and Observation (H.W) | | **9** | **3** | **B & C** | **Skewness** | Lecture and problem solving | Presentation (power point) | | **10** | **3** | B | **Kurtosis** | ا Lecture and discussion | Assignments and Observation (H.W) | | **11** | **3** | D | **Half exam** | Lecture and Project | Project(Report) | | **12** | **3** | **A&B** | **Clustering analysis (1)** |  |  | | **13** | **3** | A &C | **Clustering analysis (2)** | **Lecture and problem solving** | Assignments and Observation (H.W) | | **14** | **3** | **A& C** | **Hierarchical Clustering** | Lecture and discussion | Assignments and Observation (H.W) | | **15** | **3** | C&D | **Non-Hierarchical Clustering** | **Lecture and interrogation** | TEST | |  |  |  |  |  |  | | | |
| 1. Course Evaluation | | |
| Written tests  Assignments and Observation (H.W) | | |
| 1. Learning and Teaching Resources | | |
| Required textbooks (curricular books, if any) |  | |
| Main references (sources): Data Mining: Concepts and techniques 2012 | Operation Research (2011) gupta | |
| Recommended books and references (scientific journals, reports...): Artificial Intelligence in Data  Mining\_ Theories and Applications-Elsevier\_ Academic Press (2021) |  | |
| Electronic References, Websites | www.gametheory.net | |

**Course Description Form**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. Course Name: | | | | | | | | |
| Probability theory 2 | | | | | | | | |
| 1. Course Code: | | | | | | | | |
| CMOR23-F2211 | | | | | | | | |
| 1. Semester / Year: | | | | | | | | |
|  | | | | | | | | |
| 1. Description Preparation Date: | | | | | | | | |
| 1/4/2024 | | | | | | | | |
| 1. Available Attendance Forms: | | | | | | | | |
| In presence | | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) | | | | | | | | |
| 4 hours 3 / units | | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | | |
| Name: **Saifuldeen Dheyauldeen Saeed Alrefaee** Email: [**saifldeen.alrefaee@uomosul.edu.iq**](mailto:saifldeen.alrefaee@uomosul.edu.iq) | | | | | | | | |
| 1. Course Objectives | | | | | | | | |
| **Course Objectives** | | | | 1. Gain a clear understanding of the concept of random variables, including discrete and continuous types, and learn about their probability and distribution functions in this module. 2. Acquire the skills to compute the probability mass function (p.m.f.) for discrete random variables and the probability density function (p.d.f.) for continuous random variables. This module covers the necessary formulas and techniques for calculating these functions. 3. Discover discrete and continuous distributions. Learn their characteristics and applications. 4. Gain insight into mathematical expectation by studying definitions, properties, and calculations for various distributions, and explore related properties. 5. Developing the student's role in benefiting from the generated functions and developing problem-solving skills through these functions. 6. Provide a solid foundation for advanced work on probability and its applications, and is essential to understanding many applied fields.   Overall, the objectives of this module include gaining a solid understanding of random variables, probability functions, and distribution functions. Students will learn to calculate p.m.f. and p.d.f., explore various discrete and continuous distributions, understand mathematical expectations, and work with moments and the moment-generating function (MGF) to analyze random variables. | | | | |
| 1. Teaching and Learning Strategies | | | | | | | | |
| **Strategy** | | The main strategy that will be adopted in introducing this unit is to encourage students to participate in the exercises while improving and expanding their critical thinking skills at the same time by getting acquainted with the theory of probability, in the first part and expanding the student's mind. This will be achieved through classes and interactive educational programs to learn about random variables and their distributions, and more through learning about the mathematical expectation and moment generating function as well as using it in some random distributions its various forms, which will be the basis for the student for his future stages. | | | | | | |
| 1. Teaching and learning outcomes | | | | | | | | |
| A- Knowledge and understanding  A1- The student should mention the previous laws and terminology  A2- The student should distinguish between the types of probability, including conditional and unconditional  A3- That the student understands the special formulas and proofs used in probability  A4- The student should summarize the steps of the solution | | | | | | | | |
| B - Subject-specific skills  B1 - The student applies it to a real situation  B2 - The student must reveal the error in the solution, if any.  B3 - The student tabulates the results | | | | | | | | |
| C- Thinking skills  C1- The student poses a problem based on reality  C2-The student should compare the solution methods  C3- The student must determine the appropriate method for the solution  C4- That the student applies the correct rules in the solution | | | | | | | | |
| D - General and transferable skills (other skills related to employability and personal development).  D1- The student implements the method used by the proof  D2- The student improves the method used in the solution  D3- Verify the method | | | | | | | | |
| 1. Course Structure | | | | | | | | |
| **Week** | **Hours** | | **Required Learning Outcomes** | | **Unit or subject name** | | **Learning method** | **Evaluation method** |
| 1 | 4 | | A | | The concept of Random variable. | | Lecture and discussion | Note |
| 2 | 4 | | A | | Discrete Random variable, Probability mass function (p.m.f), and its Distribution function (c.d.f). | | Lecture and discussion | Note |
| 3 | 4 | | A & B | | ContinuousRandom variable, Probability  densityfunction (p.d.f), and its Distribution function (c.d.f). | | Lecture and interrogation | Oral exams |
| 4 | 4 | | A & B | | Some discrete distribution; Uniform &  Bernoulli distribution. | | Lecture and problem-solving | Written tests |
| 5 | 4 | | A & B & C | | Some discrete distributions; Binomial &  Poisson distribution. | | Lecture and discussion | Note |
| 6 | 4 | | A & B & C | | Some discrete distributions; Geometric, Hypergeometric distribution & Negative Binomial. | | Lecture and discussion | Note |
| 7 | 4 | | A & B & C | | Some Continuous distribution; Uniform continuous distribution. | | Lecture and interrogation | The exams Editorial |
| 8 | 4 | | A & B | | Some Continuous  distribution; Exponential distribution. | | Lecture and problem-solving | Note |
| 9 | 4 | | B & C | | Some Continuous distribution; Normal distribution. | | Lecture and discussion | Note |
| 10 | 4 | | B & C | | Some Continuous distribution; Gamma &  Beta distribution. | | Lecture and discussion | Note |
| 11 | 4 | | B & C | | Mathematical expectation. | | Lecture and discussion | Observation and written tests |
| 12 | 4 | | A & B & D | | Mean and Variance. | | Lecture and problem-solving | Note |
| 13 | 4 | | B & C | | The moment and central moment. | | Lecture and discussion | Note |
| 14 | 4 | | A & B & C | | The moment generating function (m.g.f). | | Lecture and interrogation | Oral exams |
| 15 | 4 | | A & B & C & D | | Applications of the moment generating  function on Some distribution (m.g.f). | | discussion | Note |
| 1. Course Evaluation | | | | | | | | |
| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc | | | | | | | | |
| 1. Learning and Teaching Resources | | | | | | | | |
| Required textbooks (curricular books, if any) | | | | | | 1. 1-Introduction to probability theory, Dr. Dhafir H. Rasheed,1999,2-nd edition, Baghdad University 2. probability, Dr.kubais S. A Fahady Dr. Pirlanty J. Shamoon, Ministry of Higher Education and Scientific Research University of Mosul | | |
| Main references (sources) | | | | | | 1. A first course in probability, Sheldon Ross, 2010, Eighth edition. | | |
| Recommended books and references (scientific journals, reports...) | | | | | | 1. Probability, scheme series | | |
| Electronic References, Websites | | | | | | 1. https://www.coursera.org/learn/probability-theory-foundation-for-data-science? 2. <https://www.khanacademy.org/math/statistics-probability> 3. <https://www.coursearena.io/topic/free-probability-theory-courses> | | |

**Course Description Form**

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| --- | --- | --- | --- |
| 1. Course Name: game theory | | | |
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| 1. Course Code: CMOR23-F2271 | | | |
|  | | | |
| 1. Semester / Year:2nd | | | |
|  | | | |
| 1. Description Preparation Date:2023/2024 | | | |
|  | | | |
| 1. Available Attendance Forms: In presence | | | |
|  | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) | | | |
|  | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | |
| Name: Zainab Qusay Ahmed Taqi AL Oraibi  Email: Zainab.q@uomosul.edu.iq | | | |
| 1. Course Objectives | | | |
| **Course Objectives**  • To be able to read books with understanding  • To be able to speak English  • To be able to compose freely and independently in speech and writing | | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | | |
| **A- Speaking skill**  A1- He must have the ability to think and speak in English  A2- The ability to speak English fluently  A3- The ability to formulate sentences correctly  **B - Reading skill**  B1 - The ability to read sentences correctly  B2 - Correct pronunciation of words.  **C- Writing skill**  C1- The ability to write sentences in English correctly  The ability to express ideas through writing  **D - Listening skills.**  D1- Developing the student’s listening skill  D2-The ability to distinguish words while listening | | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **2** | A | Introduction: Review about Study materials. | Lecture and discussion | Observation | | **2** | **2** | A | Quantities, wh- questions and answers. | Lecture and problem-solving | Assignments and Observation | | **3** | **2** | A&B | Articles, reading (about shopping). | Lecture and discussion | Assignments and Observation | | **4** | **2** | A&B | Vocabulary: Shopping, prices. | Lecture and discussion | Observation and participation | | **5** | **2** | **B&A** | Grammar: Verb patterns, making questions. | Lecture and problem-solving | Observation and participation | | **6** | **2** |  | Mid-term Exam |  |  | | **7** | **2** | **B & C** | Future: Going to/will, practices, reading (Hollywood kids). | Lecture and discussion | Assignments and Observation | | **8** | **2** | **A& C** | Grammar: hot verbs, listening, everyday English: how do you feel?. | Lecture and discussion | Presentation and Observation | | **9** | **2** | **B & C** | Grammar: What ….. like? , Comparative and superlative adjectives big, bigger, practices. | Lecture and problem-solving | Presentation | | **10** | **2** | B | Vocabulary: Synonyms and antonyms. | ا Lecture and discussion | Assignments and Observation | | **11** | **2** | D | everyday English about directions, listening and reading, and practices. | Lecture  and  discussion | Presentation | | **12** | **2** | **A&B** | Present tense, simple present, present continuous, practices. | **Lecture and problem-solving** | Presentation  and Observation | | **13** | **2** | A &C | Grammar: for/ since, practices, questions. | **Lecture and problem-solving** | Assignments and Observation | | **14** | **2** | **A& C** | Adverbs, word pairs, practices. | Lecture and discussion | Assignments and Observation | | **15** | **2** | C&D | Everyday English about short answers (Question tags). | **Lecture and interrogation** | TEST | |  |  |  |  |  |  | | | | |
| 1. Course Evaluation | | | |
| Written tests  Participate  Assignments and Observation | | | |
| 1. Learning and Teaching Resources | | | |
| Required textbooks (Headway pre-intermediate plus student's book (john and Lize Soars)) |  | | |
| Main references (sources) | Operation Research (2011) gupta | | |
| Recommended books and references (Headway pre-intermediate plus work's book) |  | | |
| Websites | www.gametheory.net | | |

Stage 3 course 1

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| **ت** | **الاسم** | | **رمز المادة** | **نوع المادة** | **عدد الساعات** | | | | **عدد الوحدات** |
| **نظري** | **عملي** | **مناقشة** | **المجموع** |
| **1** | **امثلية غير مقيدة(1)** | **Unconstrained Optimization (1)** | **CMOR23-F3111** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **2** | **عمليات تصادفية(1)** | **Stochastic Processes (1)** | **CMOR23-F3121** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **3** | **منطق مضبب (1)** | **Fuzzy Logic (1)** | **CMOR23-F3131** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **4** | **تقنيات ذكائية (1)** | **Intelligent Techniques (1)** | **CMOR23-F3141** | **اختياري كلية** | **2** | **2** | **ـــــ** | **4** | **3** |
| **5** | **نماذج الخزين (1)** | **Inventory Models (1)** | **CMOR23-F3151** | **اجباري قسم** | **2** | **\_\_** | **1** | **3** | **2** |
| **6** | **تحليل الانحدار (1)** | **Regression Analysis (1)** | **CMOR23-F3161** | **اجباري قسم** | **2** | **\_\_** | **1** | **3** | **2** |
| **7** | **نظرية القرارات** | **Decision Theory** | **CMOR23-F3171** | **اجباري قسم** | **2** | **\_\_** | **1** | **3** | **2** |
| **المجموع** | | | | | **17** | **2** | **6** | **25** | **18** |

**Course Description Form**

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| 1. Course Name: Stochastic process(1) | | |
|  | | |
| 1. Course Code: **CMOR23-F3121** | | |
|  | | |
| 1. Semester / Year:1nd | | |
|  | | |
| 1. Description Preparation Date:2023/2024 | | |
|  | | |
| 1. Available Attendance Forms: In presence | | |
|  | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) | | |
|  | | |
| 1. Course administrator's name (mention all, if more than one name) | | |
| Name: Hind talaat  Email: hindtalaat48@uomosul.edu.iq  hind talaat48@uomosul.edu.iq | | |
| 1. Course Objectives | | |
| **Course Objectives**  Introducing the student to the stochastic process and its characteristics  • Enable the student to solve Markov chain models  • Introducing the student to the simple and higher transition probability matrix  • Introducing the student to the concept of primary distribution and solving illustrative examples of it  • Introducing the student to the properties of Markov chains  • Enable the student to classify Markov chains and their states.  • Introducing the student to the stationary distribution of Markov chains and solving examples of it | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | |
| **A- Knowledge and understanding**  A1- The student should know the stochastic process and mention its most prominent characteristics  A2- The student knows the Markov chain and cites an example that explains it  A3- The student solves a Markov chain model  A4- The student should distinguish between the matrix of simple and higher transitional probabilities  A5- The student should solve examples of the transitional probability matrix  A6- State the characteristics of the Markov chain  A7- Find the stability distribution of the Markov chain  B - **Subject-specific skills**  B1 - To classify the given Markov chain  B2 - To classify the states of the Markov chain for the given transition matrix  B3 - The student should test whether the given Markov chain has a stable distribution  **C- Thinking skills**  C1- The student solves a real-life problem using a Markov chain  C2- The student should compare the solution methods  C3- To rearrange the solution method  C4- To plan how to use the appropriate method in the solution  **D - General and transferable skills (other skills related to employability and personal dev**elopment).  D1- That the student implements the method used in the proof  D2- That the student improves the method used in the solution  D3- To verify the method  D4- Enabling the student to solve the results | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **4** | A | Review of probability theory | Lecture and discussion | Assignments and Observation (H.W) | | **2** | **4** | A | Definitions of stochastic processes .  Specification of Stochastic processes . | Lecture and discussion | اAssignments and Observation (H.W) | | **3** | **4** | A&B | Examples of stochastic processes  Properties of stochastic process | Lecture and discussion | Assignments and Observation (H.W) | | **4** | **4** | A&B | Markov Chain .  Definition and examples of Markov Chain . | Lecture and problem solving | Written tests | | **5** | **4** | **B&A** | The one and m-steps transition probabilities .  Transition probability matrix with examples .  Complete proof for the theorem about specification of homogenous Markov chain by its transition probability and the initial distribution | Lecture and problem solving | Written tests | | **6** | **4** | **A & C** | Introduction of Random walk  Definition and examples of Random walk | Lecture and discussion | Assignments and Observation (H.W) | | **7** | **4** | **B & C** | **Mid-term Exam.**  Higher transition probability . | Lecture and discussion | Assignments and Observation (H.W) | | **8** | **4** | **A& C** | Theorems for the n-th step transition matrix with two states (complete proof )  Derivation of chapman - kolmogrov equation . | Lecture and discussion | Assignments and Observation (H.W) | | **9** | **4** | **B & C** | Initial distribution  Theorem about Prob. distribution of the system or process after n-step later.  Examples of initial distribution | Lecture and problem solving | Presentation (power point) | | **10** | **4** | B | Transition Diagram & Transition Tree  Classification of Chains  accessible and communicate states with examples . | ا Lecture and discussion | Assignments and Observation (H.W) | | **11** | **4** | D | Properties of communicate states .  Irreducible chain , closed set of states , absorbing state, irreducible and reducible chain  Remarks | Lecture and Project | Project(Report) | | **12** | **4** | **A&B** | Examples of how to classify a Markov chain |  |  | | **13** | **4** | A &C | Classification of States  Definitions of First Passage and mean recurrence time  Recurrent and Transient states ,Positive and null recurrent periodic and aperiodic states , Ergodic with examples .  Remarks | **Lecture and problem solving** | Assignments and Observation (H.W) | | **14** | **4** | **A& C** | Examples of how to classify states of a Markov chain | Lecture and discussion | Assignments and Observation (H.W) | | **15** | **4** | C&D | Stationary distribution of a Markov chain .  Definition of stationary distribution and theorem and examples | **Lecture and interrogation** | TEST | |  |  |  |  |  |  | | | |
| 1. Course Evaluation | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | | |
| 1. Learning and Teaching Resources | | |
| Required textbooks (curricular books, if any) |  | |
| Main references (sources) | Operation Research (2011) gupta | |
| Recommended books and references (scientific journals, reports...) |  | |
| Electronic References, Websites | www.gametheory.net | |

**Course Description Form**

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| 1. Course Name: Fazzy logic | |
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| 1. Course Code: **CMOR22-F3231** | |
|  | |
| 1. Semester / Year:3nd | |
|  | |
| 1. Description Preparation Date:2023/2024 | |
|  | |
| 1. Available Attendance Forms: In presence | |
|  | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) | |
|  | |
| 1. Course administrator's name (mention all, if more than one name) | |
| Name: dr.neaam alfahady  Email: neam.alfahady@uomosul.edu.iq | |
| 1. Course Objectives | |
| **Course Objectives**: • his course deals with the basic concept of fuzzy logic and classical.  • Enable the student to recognize fuzzy logic.  • To have a basic idea of why fuzzy logic is used  • Identify the types of fuzzy functions, their representation in life problems.  • Interpreting some life problems and working on making decisions and solving their problems | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** |
| 1. Teaching and Learning Strategies | |
| **A- Knowledge and understanding**  A.1.Know the difference between fuzzy logic and classical logic.  A.2. An answer to the question: Why is fuzzy logic used?  A.3. Recognize classic collections and distinctive function.  A.4. Identify fuzzy sets and their properties.  A.5 Identify organic functions and ways to represent them.  A.6. Identify the types of organic functions.  **B - Subject-specific skills**  B 1. Modeling life problems for decision making using functions.  B.2. To learn about operations in fuzzy sets.  B.3. Solve problems using classical and fuzzy relationships  **C- Thinking skills**  C.1. Use Cartesian multiplication for the fuzzy relationship.  C.2. The difference between operations in classical relations and operations in fuzzy relations  **D - General and transferable skills (other skills related to employability and personal development).**  D.1 Know what mixed relationships are in fuzzy logic.  D.2- Dealing with fuzzy matrices.  D.3- Programming chapter topics in MATLAB |  |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **3** | A | The concept of fuzzy logic and classical logic. | Lecture and discussion | Assignments and Observation (H.W) | | **2** | **3** | A | Why is fuzzy logic used? | Lecture and discussion | اAssignments and Observation (H.W) | | **3** | **3** | A&B | Mystery collection and classic collections | ا Lecture and discussion | Assignments and Observation (H.W) | | **4** | **3** | A&B | Membership function | Lecture and problem solving | Written tests | | **5** | **3** | **B&A** | Fuzzy group | Lecture and problem solving | Written tests | | **6** | **3** | **A & C** | Types of membership | Lecture and discussion | Assignments and Observation (H.W) | | **7** | **3** | **B & C** | Operations in a fuzzy set. | Lecture and discussion | Assignments and Observation (H.W) | | **8** | **3** | **A& C** | Classic and blurry relationships | Lecture and discussion | Assignments and Observation (H.W) | | **9** | **3** | **B & C** | Cartesian multiplication of the fuzzy relation. | Lecture and problem solving | Presentation (power point) | | **10** | **3** | B | Processes in classical relations and processes in fuzzy relations. | ا Lecture and discussion | Assignments and Observation (H.W) | | **11** | **3** | D | Characteristics of classic and ambiguous relationships. | Lecture and Project | Project(Report) | | **12** | **3** | **A&B** | Mixed relations in fuzzy logic. | **exam** | **exam** | | **13** | **3** | A &C | Mysterious matrix | **Lecture and problem solving** | Assignments and Observation (H.W) | | **14** | **3** | **A& C** | Examples of arrays | Lecture and discussion | Assignments and Observation (H.W) | | **15** | **3** | C&D | A week of preparation before the final exam | **Lecture and interrogation** | TEST | |  |  |  |  |  |  | | |
| 1. Course Evaluation | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | |
| 1. Learning and Teaching Resources | |
| Required textbooks (curricular books, if any) |  |
| Main references (sources) | Operation Research (2011) gupta |
| Recommended books and references (scientific journals, reports...) |  |
| Electronic References, Websites | www.gametheory.net |

**Course Description Form**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. Course Name: Intelligent Techniques (1) | | | | | | | | |
|  | | | | | | | | |
| 1. Course Code: CMOR23-F3141 | | | | | | | | |
|  | | | | | | | | |
| 1. Semester / Year:First / 2024 | | | | | | | | |
|  | | | | | | | | |
| 1. Description Preparation Date: 1-4-2024 | | | | | | | | |
|  | | | | | | | | |
| 1. Available Attendance Forms: In presence | | | | | | | | |
|  | | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) 4/3 | | | | | | | | |
|  | | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | | |
| Name: Assist.Prof.Dr.Niam Abdulmunim Abdulmajeed  Email: niam.munim@uomosul.edu.iq | | | | | | | | |
| 1. Course Objectives | | | | | | | | |
| **Course Objectives** | | | | | | Learn about the term artificial intelligence, its basic concepts, its components, and the various applications it includes to solve many problems.  This course deals with research methods and search algorithms (or computer programs) that simulate human mental abilities or other behavioral patterns to give the computer the ability to learn and deduce situations that the machine has not learned.  Learn about artificial intelligence algorithms (metaheuristics algorithms) and their applications to find the optimal solution in scientific and optimization research. | | |
| 1. Teaching and Learning Strategies | | | | | | | | |
| **Strategy** | | 1. Knowledge in the field of artificial intelligence and intelligent technologies and their importance.  2. Employing intelligent technologies and artificial intelligence to serve society.  3. Introducing the applications of intelligent technologies.  4. Use search algorithms and intuitive and supra-intuitive algorithms.  5. The student graduates as Agent.  Marathi output  6. Knowledge skills.  7. Memorization and analysis skills.  8. Skills for use and development.  9. Publishing research and participating in local and international conferences.  10. Participation in seminars and workshops.  11. Keeping pace with developments in the field of specialization.  12. Analysis of artificial intelligence technologies, benefits and challenges.  13. Enabling the student to write programs in artificial intelligence and its algorithms, solve problems, interpret results, and be able to make the optimal decision in using algorithms in operations research and optimization. | | | | | | |
| 1. Course Structure | | | | | | | | |
| **Week** | **Hours** | | **Required Learning Outcomes** | **Unit or subject name** | | | **Learning method** | **Evaluation method** |
| 1 | 4 | |  | Artificial Intelligence, basic definitions and concepts | | | Lecture, discussion and interrogation | written tests |
| 2 | 4 | |  | Simon-Noel model, data, information and knowledge | | | Lecture, discussion and interrogation | written tests |
| 3 | 4 | |  | representing knowledge by logic | | | Lecture, discussion and interrogation | written tests |
| 4 | 4 | |  | Logical deduction, semantic networks | | | Lecture, discussion and interrogation | written tests |
| 5 | 4 | |  | Search Methods Basic concepts with examples | | | Lecture, discussion and interrogation | written tests |
| 6 | 4 | |  | Water Jug Problem  Problem 8-Puzzle | | | Lecture, discussion and interrogation | written tests |
| 7 | 4 | |  | Search Strategies  Basic concepts | | | Lecture, discussion and interrogation | written tests |
| 8 | 4 | |  | Blind Search Algorithms – basic concepts  Depth-First Search Algorithm – Basic concepts with examples  Apply Depth-First search algorithm to 8-puzzle problem | | | Lecture, discussion and interrogation | written tests |
| 9 | 4 | |  | Breadth-First Search Algorithm – Basic concepts with examples | | | Lecture, discussion and interrogation | written tests |
| 10 | 4 | |  | Apply Breath-First search algorithm to 8-puzzle problem | | | Lecture, discussion and interrogation | written tests |
| 11 | 4 | |  | Heuristic Search Algorithms Hill Climbing Algorithm | | | Lecture, discussion and interrogation | written tests |
| 12 | 4 | |  | Apply Hill Climbing algorithm to 8-puzzle problem | | | Lecture, discussion and interrogation | written tests |
| 13 | 4 | |  | Best-First Search Algorithm  Apply Best-First Search algorithm to 8-puzzle problem | | | Lecture, discussion and interrogation | written tests |
| 14 | 4 | |  | A\* Algorithm  Game Playing algorithms  MINIMAX Algorithm, Alpha-Beta Pruning Algorithm | | | Lecture, discussion and interrogation | written tests |
| 15 | 4 | |  | A week of preparation before the final exam | | |  |  |
| 1. Course Evaluation | | | | | | | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W.) | | | | | | | | |
| 1. Learning and Teaching Resources | | | | | | | | |
| Required textbooks (curricular books, if any) | | | | | Lectures prepared by the lecturer | | | |
| Main references (sources) | | | | | S.sumathi&Surekha P.,2010,Computational Intelligence Paradigms Theory and Applications Using MATLAB,CRC Press. | | | |
| Recommended books and references (scientific journals, reports...) | | | | |  | | | |
| Electronic References, Websites | | | | | <https://www.youtube.com/watch?v=qv0iE8nmxRU> | | | |

**Course Description Form**

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| 1. Course Name: unconstrained optimization (1) | | |
|  | | |
| 1. Course Code: CMOR23-F3111 | | |
|  | | |
| 1. Semester / Year: | | |
|  | | |
| 1. Description Preparation Date:2023/2024 | | |
|  | | |
| 1. Available Attendance Forms: In presence | | |
|  | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) 4 Hours / 3 Units | | |
|  | | |
| 1. Course administrator's name (mention all, if more than one name) | | |
| Name: Ghalya tawfeeq Basheer  Email: [ghalia.tawfeek@uomosl.edu.iq](mailto:ghalia.tawfeek@uomosl.edu.iq) | | |
| 1. Course Objectives | | |
| **Providing the student with skills in solving unconstrained optimization problems with one variable**  **using different methods** | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | |
| **A- Knowledge and understanding**  A1- The student should mention the basic definitions  A2-The student should write some optimization formulas  A3- The student should describe the method  A4- The student should distinguish between optimization methods  A5- The student explains the mathematical formula of the method  A6- The student should summarize the steps to solve the method  **B - Subject-specific skills**  B1 - The student applies the method to a numerical problem  B2 - The student should reveal the error in the method.  B3 - The student tabulates the results  **C- Thinking skills**  C1- That the student chooses the best method.  C2-The student should compare the solution methods.  C3- That the student converts the method and steps for solving the problem from one form to another.  C4- To plan how to use the appropriate method in the solution  **D - General and transferable skills (other skills related to employability and**  **personal development).**  D1- That the student can discover errors himself and solve them.  D2- That the student improves the method used in the solution  D3- Enabling the student to analyze the results | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **4** | A | **Basic concepts** | Lecture and discussion | Observation | | **2** | **4** | A | **Taylor’ s series expansions necessary and sufficiency conditions** | Lecture and discussion | Observation | | **3** | **4** | A&B | **Statement of an optimization problem** | Lecture and interrogation | (H.W) | | **4** | **4** | A&B | **one variable unconstrained optimization problems** | Lecture problem solving | Written tests | | **5** | **4** | B&C | **Concave and convex functions of one variable** | Lecture and discussion | Written tests | | **6** | **4** | B&C | **Necessary and sufficient condition of one variable** | Lecture and discussion | Observation | | **7** | **4** | B&C | **Dichotomous search method** | Lecture and discussion | Observation | | **8** | **4** | B&C | **Interval halving method** | Lecture and discussion | Observation | | **9** | **4** | A&B | **Fibonacci method** | Lecture and problem solving | Observation | | **10** | **4** | B&C | **Golden section method** | Lecture and discussion | (H.W) | | **11** | **4** | B | **Quadratic interpolation method** | Lecture and project | Observation | | **12** | **4** | D | **Cubic interpolation method** | Lecture and discussion | (H.W) | | **13** | **4** | A&B | **Newton's method** | Lecture and problem solving | Observation | | **14** | **4** | A&C | **Quasi newton method** | Lecture and discussion | Observation | | **15** | **4** | A&C | **Secant method** | Lecture and interrogation | TEST | |  |  |  |  |  |  | | | |
| 1. Course Evaluation | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | | |
| 1. Learning and Teaching Resources | | |
| Required textbooks (curricular books, if any) Operation Research (2011) gupta |  | |
| Main references (sources) Engineering optimization theory and practice (2009) Rao | Operation Research (2011) gupta | |
| Recommended books and references (scientific journals, reports...) |  | |
| Electronic References, Websites | www.gametheory.net | |

**Course Description Form**

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| 1. Course Name: Regression Analysis (1) | | | | | | | | |
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| 1. Course Code: **CMOR23-F3161** | | | | | | | | |
|  | | | | | | | | |
| 1. Semester / Year: first course | | | | | | | | |
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| 1. Description Preparation Date: 1/9/2024 | | | | | | | | |
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| 1. Available Attendance Forms: In presence | | | | | | | | |
|  | | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total): 2 | | | | | | | | |
|  | | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | | |
| Name: Salih Mooaed Shaker  Email: salih.mooaed@uomosul.edu.iq | | | | | | | | |
| 1. Course Objectives | | | | | | | | |
| **Course Objectives** | | | | | | * **Determine relationships between variables** * **Estimate regression parameters** * **Prediction of the estimated model** * **Controlling dependent variables** | | |
| 1. Teaching and Learning Strategies | | | | | | | | |
| **Strategy** | | 1- Identify the concepts of regression analysis  2- Determine the analysis hypotheses  3- Data modeling and analysis using estimation methods  4- Characteristics of capabilities  5- Create a variance analysis table  6- Identify the formation of confidence limits and the path of the regression line  7- Identify the correlation coefficient and the coefficient of determination  8- Testing hypotheses and identifying deviations in analysis assumptions  9- Testing the extent to which the model matches the data  10- Testing homogeneity and independence of errors | | | | | | |
| 1. Course Structure | | | | | | | | |
| **Week** | **Hours** | | **Required Learning Outcomes** | **Unit or subject name** | | | **Learning method** | **Evaluation method** |
| 1 | 3 | | 1 | Definition of regression analysis, uses and causal relationships | | | Lecture and discussion | watching |
| 2 | 3 | | 2 | Analysis assumptions that must be met In the linear model | | | Lecture and discussion | watching |
| 3 | 3 | | 3 و4 | Estimating regression parameters and the characteristics of capabilities | | | Lecture and exercises | watching |
| 4 | 3 | | 5 | Hypothesis testing and table Analysis of variance | | | Lecture and exercises | watching |
| 5 | 3 | | 6 | Estimate confidence intervals. | | | Lecture and exercises | Oral exams |
| 6 | 3 | | 6 | Regression through the origin | | | Lecture and exercises | watching |
| 7 | 3 | | 7 | Coefficient of determination and correlation coefficient  Simple and its characteristics | | | Lecture and exercises | watching |
| 8 | 3 | | 7 | Correlation coefficient: its relationship to the regression coefficient | | | Lecture and exercises | watching |
| 9 | 3 | | 8 | Violations and defects in the analysis assumptions | | | Lecture and exercises | watching |
| 10 | 3 | | 8 | Test whether the analysis hypotheses Generally available | | | Lecture and exercises | Written tests |
| 11 | 3 | | 9 | Test whether the relationship between...  Variables X and y linear | | | Lecture and exercises | watching |
| 12 | 3 | |  | Mid-course exam | | |  |  |
| 13 | 3 | | 9 | Lack of fit test | | | Lecture and exercises | watching |
| 14 | 3 | | 10 | Test whether the error variance  Stable and homogeneous | | | Lecture and exercises | watching |
| 15 | 3 | | 10 | Test whether the errors are independent | | | Lecture and exercises | watching |
| 1. Course Evaluation | | | | | | | | |
| Written tests  the report  Assignments and Observation (H.W) | | | | | | | | |
| 1. Learning and Teaching Resources | | | | | | | | |
| Required textbooks (curricular books, if any) | | | | | Al-Rawi, Khashi Mahmoud, 1987, Introduction to Regression Analysis, University of Mosul, Iraq. | | | |
| Main references (sources) | | | | | 1-Draper, N. R. and Smith H. 1981. Applied Regression Analysis, 2nd.ED. | | | |
| Recommended books and references (scientific journals, reports...) | | | | |  | | | |
| Electronic References, Websites | | | | | https://www.coursera.org/learn/predictive-modeling-model-fitting-regression-analysis | | | |

**Course Description Form**

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| 1. Course Name: game theory | | |
|  | | |
| 1. Course Code: CMOR23-F3171 | | |
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| 1. Semester / Year:3 rd | | |
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| 1. Description Preparation Date:2023/2024 | | |
|  | | |
| 1. Available Attendance Forms: In presence | | |
|  | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) | | |
|  | | |
| 1. Course administrator's name (mention all, if more than one name) | | |
| Name: Zainab Qusay Ahmed Taqy ALOraibi  Email: [Zainab.q@uomosul.edu.iq](mailto:Zainab.q@uomosul.edu.iq) | | |
| 1. Course Objectives | | |
| **Course Objectives**  • To be able to speak English.  • To be able to compose freely and independently in speech and writing.  • To be able to read books with understanding | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | |
| **A- Speaking skill**  A1- He must have the ability to think and speak in English  A2- The ability to speak English fluently  A3- The ability to formulate sentences correctly  **B - Reading skill**  B1 - The ability to read sentences correctly  B2 - Correct pronunciation of words.  **C- Writing skill**  C1- The ability to write sentences in English correctly  The ability to express ideas through writing  **D - Listening skills.**  D1- Developing the student’s listening skill  D2-The ability to distinguish words while listening | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **2** | A | Introduction: about study materials of Headway Pre-intermediate Plus. | Lecture and discussion | Assignments and Observation | | **2** | **2** | A, B, D | Grammar: Have (got) to, practices. | Lecture and discussion | Assignments and Observation | | **3** | **2** | A, B, D | Should/must, questions and answers. Reading. | Lecture and discussion | Assignments and Observation | | **4** | **2** | A, B | Vocabulary: words that go together, everyday English at the doctor. | Lecture | Written tests | | **5** | **2** | **A, D** | Grammar: verb patterns and infinitives, practices. | Lecture and problem-solving | Assignments and Observation | | **6** | **2** | **A, D** | Time and conditional clauses, practices (when, as soon as). listening and speaking/ life in 2050. | Lecture and discussion | Assignments and Observation | | **7** | **2** |  | Mid-term Exam |  |  | | **8** | **2** | **B, D** | Reading and speaking/ the world’s first megalopolis. | Lecture and discussion | Assignments and Observation | | **9** | **2** | **B, C** | Vocabulary: Hot verbs/ take- get- do and make. | Lecture and problem-solving | Assignments and Observation | | **10** | **2** | B | Vocabulary: -ed/ -ing adjective, reading about (Into the wild). | Lecture and discussion | Assignments and Observation | | **11** | **2** | **A, D** | Expressions about exclamations with so and such. | Lecture and discussion | Assignments and Observation | | **12** | **2** | **A, B** | Grammar: actives and passives voice, practices. |  |  | | **13** | **2** | **A, C** | Verbs and nouns that go together, practices. | **Lecture and problem-solving** | Assignments and Observation | | **14** | **2** | **A, B** | Reading: about the discovery of DNA., expressions about(notices). | Lecture and discussion | Assignments and Observation | | **15** | **2** | **D, C** | Study material review | **Lecture** | Observation | |  |  |  |  |  |  | | | |
| 1. Course Evaluation | | |
| Written tests  Assignments and Observation (H.W) | | |
| 1. Learning and Teaching Resources | | |
| Required textbooks (Headway pre-intermediate plus student's book (john and Lize Soars)) |  | |
| Main references (Headway pre-intermediate plus work's book) | Operation Research (2011) gupta | |
| references (scientific journals, reports...) |  | |
| Websites <https://7esl.com/> , <https://worldenglishblog.com/hasnt-vs-doesnt-have-pdf/> | www.gametheory.net | |

**Stage 3 course 2**

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| **ت** | **الاسم** | | **رمز المادة** | **نوع المادة** | **عدد الساعات** | | | | **عدد الوحدات** |
| **نظري** | **عملي** | **مناقشة** | **المجموع** |
| **1** | **امثلية غير مقيدة(2)** | **Unconstrained Optimization (2)** | **CMOR23-F3211** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **2** | **عمليات تصادفية(2)** | **Stochastic Processes (2)** | **CMOR23-F3221** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **3** | **منطق مضبب (2)** | **Fuzzy Logic (2)** | **CMOR23-F3231** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **4** | **تقنيات ذكائية (2)** | **Intelligent Techniques (2)** | **CMOR23-F3241** | **اجباري قسم** | **2** | **2** | **ـــــ** | **4** | **3** |
| **5** | **نماذج الخزين (2)** | **Inventory Models (2)** | **CMOR23-F3251** | **اختياري قسم** | **2** | **\_\_** | **1** | **3** | **2** |
| **6** | **تحليل الانحدار (2)** | **Regression Analysis (2)** | **CMOR23-F3261** | **اختياري قسم** | **2** | **\_\_** | **1** | **3** | **2** |
| **7** | **لغة انكليزية (3)** | **English Language (3)** | **CMOR23-F3271** |  | **2** | **\_\_** | **\_\_** | **2** | **2** |
| **المجموع** | | | | | **17** | **2** | **5** | **24** | **18** |

**Course Description Form**

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| 1. Course Name: Stochastic process(2) | | |
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| 1. Course Code: **CMOR23-F3221** | | |
|  | | |
| 1. Semester / Year:2nd | | |
|  | | |
| 1. Description Preparation Date:2023/2024 | | |
|  | | |
| 1. Available Attendance Forms: In presence | | |
|  | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) | | |
|  | | |
| 1. Course administrator's name (mention all, if more than one name) | | |
| Name: Hind talaat  Email: hindtalaat48@uomosul.edu.iq  hind talaat48@uomosul.edu.iq | | |
| 1. Course Objectives | | |
| **Course Objectives**  Enable the student to solve Markov chains using MATLAB  • Enable the student to solve the profit analysis problem and the traveling salesman problem using the MATLAB program  • Introducing the student to the counting process, the Poisson process, and its hypotheses  • Enable the student to solve problems related to the Poisson process  • Introducing the student to the distributions associated with the Poisson process with proof  • Introducing the student to the characteristics of the Poisson process with proofs  • Enable the student to employ the characteristics of the Poisson process in solving various problems of this process.  • Introducing the student to the heterogeneous Poisson process | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | |
| **A- Knowledge and understanding**  A1- Write a program to calculate the transition matrix, solve the profit analysis problem, or solve the traveling salesman problem  A2- That the student knows the counting process and mentions its most prominent characteristics  A3- The student should know the Poisson process and mention its most prominent characteristics  A4- The student should mention the distributions associated with the Poisson process  A5- To compare the structure of the Poisson process and the difference between two Poisson processes, whether they follow the Poisson distribution or not.  A6- The student should mention when the Poisson distribution is the Binomel distribution  A7- Explain the nonhomogeneous Poisson process  **B - Subject-specific skills**  B1 - The student must prove the distribution mechanism of the Poisson process  B2 - The student should solve problems related to the homogeneous and heterogeneous Poisson process  B3 - To prove that the time between the occurrence of two Poisson distribution events is distributed exponentially  B4- Prove that the waiting time follows a kamma distribution  **C- Thinking skills**  C1- The student solves a real-life problem using the Poisson distribution  C2- The student should compare the solution methods  C3- To rearrange the solution method  C4- To plan how to use the appropriate method in the solution  **D - General and transferable skills (other skills related to employability and personal development).**  D1- That the student implements the method used in the proof  D2- That the student improves the method used in the solution  D3- To verify the method  D4- Enabling the student to solve the results | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **4** | A | Calculating the higher order transition matrix using MATLAB  Calculate the initial distribution using MATLAB  A program to compute a Markovian chain consisting of numbers  A program to calculate a Markovian chain consisting of symbols  Explain the topic of profit analysis and write a program to solve the problem | Lecture and discussion | Assignments and Observation (H.W) | | **2** | **4** | A | Explain the subject of the traveling salesman problem and write a program for it  Definition and examples about Counting Process | Lecture and discussion | اAssignments and Observation (H.W) | | **3** | **4** | A&B | Poisson process .  Assumption of Poisson Process.  Derivation the P. d. f. of a Poisson process (complete proof ) . | Lecture and discussion | Assignments and Observation (H.W) | | **4** | **4** | A&B | Examples of Poisson Process | Lecture and problem solving | Written tests | | **5** | **4** | **B&A** | Distributions Related with Poisson process  Theorem about the interval time between two events of a Poisson process has an exponential distribution (complete proof ) . | Lecture and problem solving | Written tests | | **6** | **4** | **A & C** | Theorem about the waiting time has gamma distribution (complete proof ) . | Lecture and discussion | Assignments and Observation (H.W) | | **7** | **4** | **B & C** | **Mid-term Exam**  Properties of a Poisson process . | Lecture and discussion | Assignments and Observation (H.W) | | **8** | **4** | **A& C** | Additive property (complete proof ) .  Difference of two independent Poisson process (complete proof) | Lecture and discussion | Assignments and Observation (H.W) | | **9** | **4** | **B & C** | Decomposition of a Poisson process (complete proof) | Lecture and problem solving | Presentation (power point) | | **10** | **4** | B | Poisson process and binomial distribution (with proof) . | ا Lecture and discussion | Assignments and Observation (H.W) | | **11** | **4** | D | Examples about the Properties of a Poisson process | Lecture and Project | Project(Report) | | **12** | **4** | **A&B** | Non –Homogeneous  Poisson process.  Exercises . |  |  | | **13** | **4** | A &C | Some special stochastic processes  Bernoulli Process  Examples about Bernoulli Process | **Lecture and problem solving** | Assignments and Observation (H.W) | | **14** | **4** | **A& C** | Winer Process  Examples about Winer Process | Lecture and discussion | Assignments and Observation (H.W) | | **15** | **4** | C&D | **Preparatory week before the final Exam** | **Lecture and interrogation** | TEST | |  |  |  |  |  |  | | | |
| 1. Course Evaluation | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | | |
| 1. Learning and Teaching Resources | | |
| Required textbooks (curricular books, if any) |  | |
| Main references (sources) | Operation Research (2011) gupta | |
| Recommended books and references (scientific journals, reports...) |  | |
| Electronic References, Websites | www.gametheory.net | |

**Course Description Form**

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| 1. Course Name: Intelligent Techniques (2) | | | | | | | | |
|  | | | | | | | | |
| 1. Course Code: CMOR23-F3241 | | | | | | | | |
|  | | | | | | | | |
| 1. Semester / Year: Second / 2024 | | | | | | | | |
|  | | | | | | | | |
| 1. Description Preparation Date: : 1-4-2024 | | | | | | | | |
|  | | | | | | | | |
| 1. Available Attendance Forms: : In presence | | | | | | | | |
|  | | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) 4/3 | | | | | | | | |
|  | | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | | |
| Name: Assist.Prof.Dr.Niam Abdulmunim Abdulmajeed  Email: niam.munim@uomosul.edu.iq | | | | | | | | |
| 1. Course Objectives | | | | | | | | |
| **Course Objectives** | | | | | | 1-Learn about algorithms inspired by nature, including evolutionary algorithms, swarm intelligence, basic concepts and components, and the various applications they contain to solve many problems.  2- This course deals with the genetic algorithm, its components, particle swarm optimization, and basic concepts.  3- Employing genetic algorithm, particle swarm optimization, and applications to find the optimal solution in optimization and operation research. | | |
| 1. Teaching and Learning Strategies | | | | | | | | |
| **Strategy** | | 1. Knowledge in the field of intelligent techniques and algorithms.  2. Employing intelligent techniques to serve society.  3. The student has knowledge of individual intelligent agents for modeling industrial, social, and biological systems.  4. Use evolutionary algorithms and heuristic and metaheuristic algorithms.  5. The student graduates as Agent.  6. Knowledge of modeling evolutionary algorithmic agents and social swarm intelligence agents in complex designs and problems.  7. Knowledge of evolutionary algorithms and swarm intelligence inspired by different natural systems.  8. The student has skills in using and developing intelligent individual agents to solve optimization problems with complex structures.  9. The student has skills in developing simulation models based on swarms of intelligent agents or agents.  10. Skills in using evolutionary algorithms (genetic algorithm) and swarm intelligence algorithms to solve operations research problems and real optimization problems | | | | | | |
| 1. Course Structure | | | | | | | | |
| **Week** | **Hours** | | **Required Learning Outcomes** | **Unit or subject name** | | | **Learning method** | **Evaluation method** |
| 1 | 4 | |  | Evolutionary algorithms - definition of evolutionary algorithms, concept of genetic algorithm, idea of genetic algorithm, basic (biological) terms of genetic algorithm, basic steps of genetic algorithm, flow chart | | | Lecture, discussion and interrogation | written tests |
| 2 | 4 | |  | Elements of genetic algorithm, encoding and its types with examples | | | Lecture, discussion and interrogation | written tests |
| 3 | 4 | |  | Fitness Function with examples | | | Lecture, discussion and interrogation | written tests |
| 4 | 4 | |  | Selection and selection methods with examples | | | Lecture, discussion and interrogation | written tests |
| 5 | 4 | |  | Crossover and its types with examples | | | Lecture, discussion and interrogation | written tests |
| 6 | 4 | |  | Mutation and its types with examples, stopping measures | | | Lecture, discussion and interrogation | written tests |
| 7 | 4 | |  | Applications and examples of genetic algorithm in operations research and optimization | | | Lecture, discussion and interrogation | written tests |
| 8 | 4 | |  | Swarm Intelligence – basic concepts, idea of swarm intelligence, historical development of swarm intelligence | | | Lecture, discussion and interrogation | written tests |
| 9 | 4 | |  | Principles of collective behavior in swarms, types of swarm intelligence | | | Lecture, discussion and interrogation | written tests |
| 10 | 4 | |  | Particle swarm optimization algorithm – definitions, idea of PSO | | | Lecture, discussion and interrogation | written tests |
| 11 | 4 | |  | Advantages, disadvantages and applications of particle swarm optimization algorithm | | | Lecture, discussion and interrogation | written tests |
| 12 | 4 | |  | Basic components of the particle swarm optimization algorithm, basic concepts of the particle swarm optimization algorithm | | | Lecture, discussion and interrogation | written tests |
| 13 | 4 | |  | Parameters of the particle swarm optimization algorithm  Basic steps and flowchart of particle swarm optimization algorithm | | | Lecture, discussion and interrogation | written tests |
| 14 | 4 | |  | Applications and problems in operations research and optimization | | | Lecture, discussion and interrogation | written tests |
| 15 | 4 | |  | A week of preparation before the final exam | | |  |  |
| 1. Course Evaluation | | | | | | | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W.) | | | | | | | | |
| 1. Learning and Teaching Resources | | | | | | | | |
| Required textbooks (curricular books, if any) | | | | | Lectures prepared by the lecturer | | | |
| Main references (sources) | | | | | Xin-She Yang,2020,Nature-Inspired Optimization Algorithms, Second edition, Elsevier. | | | |
| Recommended books and references (scientific journals, reports...) | | | | |  | | | |
| Electronic References, Websites | | | | | <https://www.youtube.com/watch?v=wQm9mFw02mU> | | | |

**Course Description Form**

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| 1. Course Name: Queuing theory (2) | | | | | |
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| 1. Course Code: **CMOR23-F4221** | | | | | |
|  | | | | | |
| 1. Semester 2 / 2024 | | | | | |
|  | | | | | |
| 1. Description Preparation Date:1/4/2024 | | | | | |
|  | | | | | |
| 1. Available Attendance Forms: In presence | | | | | |
|  | | | | | |
| 1. Number of Credit Hours (4) / Number of Units (3) | | | | | |
|  | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | |
| Name: Asst. Prof. Dr. Ghazwan Hani Mahmood Email: [ghazwan.alsoufi@uomosul.edu.iq](mailto:ghazwan.alsoufi@uomosul.edu.iq)  Name: Dr. Oday Abdulrahman Jarjies Email: [odayjarjies@uomosul.edu.iq](mailto:odayjarjies@uomosul.edu.iq) | | | | | |
| 1. Course Objectives | | | | | |
| 1. **To develop problem solving skills and an understanding of queuing theory through applying formulas to**   **solve some examples.**   1. **To recognize different kind of queuing models.** 2. **To understand the efficiency metrics for different types of queuing models.** 3. **To analysis some the queuing models.** 4. **To perform some the queuing models.** 5. **This is the advance subject for all types of queuing models.** | | | | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | | | | |
| **A- Knowledge and understanding**  A1- The student should mention the previous laws  A2- The student should write some terms  A3- The student should describe the model  A4- The student should distinguish between the models  A5- The student explains the mathematical formula  A6- The student summarizes the steps to solve the mathematical formula  **B - Subject-specific skills**  B1 - The student applies the model to a real situation  B2 - The student must reveal the error in the form.  B3 - The student tabulates the results  **C- Thinking skills**  C1- The student poses a problem based on reality  C2- The student should compare the solution methods  C3- To rearrange the solution method  C4- To plan how to use the appropriate method in the solution  **D - General and transferable skills (other skills related to employability and personal development).**  D1- That the student implements the method used by the proof  D2- That the student improves the method used in the solution  D3- Verify the method  D4- Enabling the student to solve the results | | | | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **4** | **A** | **Differential-Difference equations of (M/M/C) :( GD//) Model.** | **Lecture and discussion** | **Assignments and Observation (H.W)** | | **2** | **4** | **A** | **Probability distribution of Pn.** | **Lecture and discussion** | **اAssignments and Observation (H.W)** | | **3** | **4** | **A&B** | **Expected number of units in queue and system.** | **ا Lecture and discussion** | **Assignments and Observation (H.W)** | | **4** | **4** | **A&B** | **Waiting time distribution in queue and system.** | **Lecture and problem solving** | **Written tests** | | **5** | **4** | **B&A** | **Numerical examples.** | **Lecture and problem solving** | **Written tests** | | **6** | **4** | **A & C** | **Differential-Difference equations of (M/M/C) :( GD/N/) Model.** | **Lecture and discussion** | **Assignments and Observation (H.W)** | | **7** | **4** | **B & C** | **Probability distribution of Pn and expected number of units in queue and system.** | **Lecture and discussion** | **Assignments and Observation (H.W)** | | **8** | **4** | **A& C** | **Waiting time distribution in queue and system.** | **Lecture and discussion** | **Assignments and Observation (H.W)** | | **9** | **4** | **B & C** | **Numerical examples.** | **Lecture and problem solving** | **Presentation (power point)** | | **10** | **4** | **B** | **Probability distribution of Pn for (M/M/1) :( GD//N) Model** | **ا Lecture and discussion** | **Assignments and Observation (H.W)** | | **11** | **4** | **D** | **Expected number of units and waiting time in queue and system.** | **Lecture and Project** | **Project(Report)** | | **12** | **4** | **A&B** | **Numerical examples.** |  |  | | **13** | **4** | **A &C** | **Probability distribution of Pn for (M/M/C):(GD/N/N) Model and expected number of units for model.** | **Lecture and problem solving** | **Assignments and Observation (H.W)** | | **14** | **4** | **A& C** | **Waiting time in queue and system and numerical examples.** | **Lecture and discussion** | **Assignments and Observation (H.W)** | | **15** | **4** | **C&D** | **Probability distribution of Pn for (M/M/) :(GD//) Model and Numerical example.** | **Lecture and interrogation** | **TEST** | | | | | | |
| 1. Course Evaluation | | | | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | | | | | |
| 1. Learning and Teaching Resources | | | | | |
| Required textbooks (curricular books, if any) | |  |  | | |
| Main references (sources) | **- جزاع، عبد ذياب. (1986). بحوث العمليات. وزارة التعليم العالي، جامعة بغداد. الطبعة الثانية.**  **2- الشمرتي، حامد سعد نور. والزبيدي، علي خليل. (2007). مدخل الى بحوث العمليات. المملكة الاردنية الهاشمية. دار مجدلاوي للنشر والتوزيع.** | | Operation Research (2011) gupta | | |
| Recommended books and references (scientific journals, reports...) | 1- Adan, I., & Resing, J. (2002). Queueing theory.  2- Sztrik, János, (2012). Basic queueing theory.  *University of Debrecen, Faculty of Informatics* | |  | | |
| Electronic References, Websites | <https://samehar.files.wordpress.com/2022/03/queueing-theory-1.pdf> | | www.gametheory.net | | |

**Course Description Form**

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| 1. Course Name: unconstrained optimization (2) | | |
|  | | |
| 1. Course Code: CMOR23-F3211 | | |
|  | | |
| 1. Semester / Year:2nd | | |
|  | | |
| 1. Description Preparation Date:2023/2024 | | |
|  | | |
| 1. Available Attendance Forms: In presence | | |
|  | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) 4 Hours / 3 Units | | |
|  | | |
| 1. Course administrator's name (mention all, if more than one name) | | |
| Name: Ghalya tawfeeq Basheer  Email: [ghalia.tawfeek@uomosl.edu.iq](mailto:ghalia.tawfeek@uomosl.edu.iq) | | |
| 1. Course Objectives | | |
| **Providing the student with skills in solving unconstrained multivariate optimization problems using**  **different methods** | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | |
| **A- Knowledge and understanding**  A1- The student should mention the basic definitions  A2-The student should write some optimization formulas  A3- The student should describe the method  A4- The student should distinguish between optimization methods  A5- The student explains the mathematical formula of the method  A6- The student should summarize the steps to solve the method  **B - Subject-specific skills**  B1 - The student applies the method to a numerical problem  B2 - The student should reveal the error in the method.  B3 - The student tabulates the results  **C- Thinking skills**  C1- That the student chooses the best method.  C2-The student should compare the solution methods.  C3- That the student converts the method and steps for solving the problem from one form to another.  C4- To plan how to use the appropriate method in the solution  **D - General and transferable skills (other skills related to employability and**  **personal development).**  D1- That the student can discover errors himself and solve them.  D2- That the student improves the method used in the solution  D3- Enabling the student to analyze the results | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **4** | A | **Multivariable unconstrained optimization** | Lecture and discussion | Observation | | **2** | **4** | A | **Basic concepts** | Lecture and discussion | Observation | | **3** | **4** | A&B | **Necessary and sufficient condition of Multivariable unconstrained optimization** | Lecture and interrogation | (H.W) | | **4** | **4** | A&B | **Concave and convex of Multivariable unconstrained optimization** | Lecture problem solving | Written tests | | **5** | **4** | B&C | **rth differential of function** | Lecture and discussion | Written tests | | **6** | **4** | B&C | **Taylor’s method** | Lecture and discussion | Observation | | **7** | **4** | B&C | **Steepest descent method** | Lecture and discussion | Observation | | **8** | **4** | B&C | **Conjugate gradient method (FR)** | Lecture and discussion | Observation | | **9** | **4** | A&B | **Conjugate gradient method (HS)** | Lecture and problem solving | Observation | | **10** | **4** | B&C | **Conjugate gradient method (PR)** | Lecture and discussion | (H.W) | | **11** | **4** | B | **Newton's method** | Lecture and project | Observation | | **12** | **4** | D | **Marquardt method** | Lecture and discussion | (H.W) | | **13** | **4** | A&B | **Quasi newton method** | Lecture and problem solving | Observation | | **14** | **4** | A&C | **Davidon-Fletcher-Powell method** | Lecture and discussion | Observation | | **15** | **4** | A&C | **Broyden- Fletcher-Goldfarb-shanno method** | Lecture and interrogation | TEST | |  |  |  |  |  |  | | | |
| 1. Course Evaluation | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | | |
| 1. Learning and Teaching Resources | | |
| Required textbooks (curricular books, if any) Operation Research (2011) gupta |  | |
| Main references (sources) Engineering optimization theory and practice (2009) Rao | Operation Research (2011) gupta | |
| Recommended books and references (scientific journals, reports...) |  | |
| Electronic References, Websites | www.gametheory.net | |

**Course Description Form**

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| 1. Course Name: Decision Theory | | | | | | | |
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| 1. Course Code: CMOR23-F3271 | | | | | | | |
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| 1. Semester / Year: 3nd | | | | | | | |
|  | | | | | | | |
| 1. Description Preparation Date:10/04/2024 | | | | | | | |
|  | | | | | | | |
| 1. Available Attendance Forms: In presence | | | | | | | |
|  | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) 3/2 | | | | | | | |
|  | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | |
| Name: dr.Zahraa Abed Al-Aziz Al-nuaimi  Email: [zahraaalnuaimi2017@uomosul.edu.iq](mailto:zahraaalnuaimi2017@uomosul.edu.iq)  Name: Neam Hazim Ahmed  Email: neam.alfahady@uomosul.edu.iq | | | | | | | |
| 1. Course Objectives | | | | | | | |
| **Course Objectives** | | | | **1- Identify decision theory and its uses in real life**  **2- Identify the criteria used to determine the optimal**  **decision**  **3- The student learns how to distinguish between the best criteria for decision-making**  **4- The student learns about the concept**  **of investment portfolios and what they mean** | | | |
| 1. Teaching and Learning Strategies | | | | | | | |
| **Strategy** | | A: Knowledge and understanding  1a- The student learns to distinguish between the best criteria for making a decision  2a- The student learns to distinguish between different standards after trying more than one standard  3a- The student learns that he must take more than one criterion and then make the decision that gives the same results in two or more criteria  4a- The student learns about the criteria that are preferable to use in the case of profit as well as in the case of loss and determines the optimal decision  B- Subject-specific skills  1b- The student learns about the concept of expected value and how to benefit from this concept in decision making  2 The student learns to make use of definite integration in finding the expected expected value and thus determining the optimal decision  3b-The student will be able to deal with different issues in terms of determining the optimal decision for each case  C- Thinking skills  1c- The student learns to apply the standards he has learned to a realistic issue  2c-The student solves this problem and determines the optimal decision  D - General and transferable skills  (other skills related to employability and personal development).  D1- That the student implements the standards  D2- Choose the best standard  D3- Analyze the results  D4- Giving the final decision | | | | | |
| 1. Course Structure | | | | | | | |
| **Week** | **Hours** | | **Required Learning Outcomes** | **Unit or subject name** | | **Learning method** | **Evaluation method** |
| 1 | 3 | | A | Basic elements in decision making | | Lecture and discussion | Lecture and  discussion |
| 2 | 3 | | A | States of nature | | Lecture and discussion | Lecture and  discussion |
| 3 | 3 | | A&B | Decision or parts, value function and utility function table and utility table | | Lecture and discussion | Lecture and  discussion |
| 4 | 3 | | A&B | The function of remorse or regret and the table of remorse and regret | | Lecture and problem solving | Lecture and  problem solving |
| 5 | 3 | | **B&A** | Returns table | | Lecture and problem solving | Lecture and  problem solving |
| 6 | 3 | | **A & C** | Characteristics of decision-making situations | | Lecture and discussion | Lecture and  discussion |
| 7 | 3 | | **B & C** | Decision making  criteria in case of uncertainty | | Lecture and discussion | Lecture and  discussion |
| 8 | 3 | | **A& C** | Optimistic  criterion,  pessimistic  criterion,  Laplace criterion | | Lecture and discussion | Lecture and  discussion |
| 9 | 3 | | **B & C** | Missed opportunities, regret standard,  Hrouz standard | | Lecture and  problem solving | Presentation  (power point) |
| 10 | 3 | | B | Decision making  criteria | | Lecture and discussion | Assignments  and Observation  (H.W) |
| 11 | 3 | | D | Mid-course exam | |  |  |
| 12 | 3 | | **A&B** | Standard expected  value and variance | | Lecture and  Project | Project(Report) |
| 13 | 3 | | A &C | Most likely  probability criterion | | **Lecture and problem solving** | Assignments  and Observation  (H.W) |
| 14 | 3 | | **A& C** | Complete  information standard | | Lecture and discussion | Assignments  and Observation  (H.W) |
| 15 | 3 | | C&D | Investment portfolios | | **Lecture and interrogation** | TEST |
| 1. Course Evaluation | | | | | | | |
| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc  Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | | | | | | | |
| 1. Learning and Teaching Resources | | | | | | | |
| Required textbooks (curricular books, if any) | | | | | نظرية القرار. د.قبيس سعيد عبد الفتاح.دار الكتب  للطباعة والنشر. جامعه الموصل 1994 | | |
| Main references (sources) | | | | | محاضرات في مادة اتخاذ القرار  في . د. دلفوف سفيان . كلية العلوم الاقتصادية والتجارية وعلوم التيسير: قسم العلوم الاقتصادية . الجزائر . 2021/2022 | | |
| Recommended books and references (scientific journals, reports...) | | | | |  | | |
| Electronic References, Websites | | | | | <http://www.aspu.edu.sy/laravel> . Pdf. | | |

**Course Description Form**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. Course Name: Regression Analysis (2) | | | | | | | | |
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| 1. Course Code: **CMOR23-F3261** | | | | | | | | |
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| 1. Semester / Year: Second course | | | | | | | | |
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| 1. Description Preparation Date: 1/4/2024 | | | | | | | | |
|  | | | | | | | | |
| 1. Available Attendance Forms: In presence | | | | | | | | |
|  | | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total): 2 | | | | | | | | |
|  | | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | | |
| Name: Salih Mooaed Shaker  Email: salih.mooaed@uomosul.edu.iq | | | | | | | | |
| 1. Course Objectives | | | | | | | | |
| **Course Objectives** | | | | | | **1-Define the multiple linear regression model**  **2- Estimating regression parameters for the multiple model**  **3-Additional sum of squares control**  **4-Methods for choosing the best regression equation** | | |
| 1. Teaching and Learning Strategies | | | | | | | | |
| **Strategy** | | 1- Define the linear model  2- Parameter estimation, properties of estimators  3- Create a variance analysis table  4- Identify the multiple partial correlation coefficient and the standard partial regression coefficient  5- Find the additional sum of squares  6- Methods for choosing the best regression equation  7- Significant or expressive variables  8- The case of a qualitative independent variable  9- Other multivariate methods  10- Path analysis | | | | | | |
| 1. Course Structure | | | | | | | | |
| **Week** | **Hours** | | **Required Learning Outcomes** | **Unit or subject name** | | | **Learning method** | **Evaluation method** |
| 1 | 3 | | 1 | **Matrices, linear model** | | | Lecture and discussion | watching |
| 2 | 3 | | 2 | **Parameter estimation, properties of estimators** | | | Lecture and discussion | watching |
| 3 | 3 | | 3 | **Analysis of variance table** | | | Lecture and exercises | watching |
| 4 | 3 | | 4 | **Partial multiple correlation coefficient And the standard partial regression coefficient** | | | Lecture and exercises | watching |
| 5 | 3 | | 5 | **Additional sum of squares**  **And the coefficient of partial determination** | | | Lecture and exercises | Oral exams |
| 6 | 3 | | 6 | **Choose the best equation**  **Regression using several criteria** | | | Lecture and exercises | watching |
| 7 | 3 | | 6 | **Backword deletion method** | | | Lecture and exercises | watching |
| 8 | 3 | | 6 | **Forward deletion method** | | | Lecture and exercises | watching |
| 9 | 3 | | 6 | **Stepwise regression method** | | | Lecture and exercises | watching |
| 10 | 3 | | 8 | **Significant or expressive variables** | | | Lecture and exercises | Written tests |
| 11 | 3 | |  | **Mid Exame** | | |  |  |
| 12 | 3 | | 7 | **The general concept of function variables, in The condition of having one qualitative independent variable**  **In the regression equation** | | | Lecture and exercises | watching |
| 13 | 3 | | 9 | **Some other methods are multiple Variables, principal components analysis** | | | Lecture and exercises | watching |
| 14 | 3 | | 10 | **Path analysis** | | | Lecture and exercises | watching |
| 1. Course Evaluation | | | | | | | | |
| Written tests  the report  Assignments and Observation (H.W) | | | | | | | | |
| 1. Learning and Teaching Resources | | | | | | | | |
| Required textbooks (curricular books, if any) | | | | | Al-Rawi, Khashi Mahmoud, 1987, Introduction to Regression Analysis, University of Mosul, Iraq. | | | |
| Main references (sources) | | | | | 1-Draper, N. R. and Smith H. 1981. Applied Regression Analysis, 2nd.ED. | | | |
| Recommended books and references (scientific journals, reports...) | | | | |  | | | |
| Electronic References, Websites | | | | | https://www.coursera.org/learn/predictive-modeling-model-fitting-regression-analysis | | | |

**Course Description Form**

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| 1. Course Name: Fazzy logic | | | |
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| 1. Course Code: **CMOR22-F3231** | | | |
|  | | | |
| 1. Semester 2/ Year:3nd | | | |
|  | | | |
| 1. Description Preparation Date:2023/2024 | | | |
|  | | | |
| 1. Available Attendance Forms: In presence | | | |
|  | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) | | | |
|  | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | |
| Name: dr.neaam alfahady  Email: neam.alfahady@uomosul.edu.iq | | | |
| 1. Course Objectives | | | |
| **Course Objectives**:  This course deals with the basic concept of the properties of fuzzy logic and the fuzzy number  • Enable the student to recognize and use the mysterious number.  • Have a basic idea about using the fuzzy number in real life.  • Identify the types of ambiguous rules in MATLAB, how to use them, and make the appropriate decision | | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | | |
| **A- Knowledge and understanding**  A.1. Identify the properties of fuzzy sets  A.2. Convex fuzzy logic test  A.3. Learn about the concept of fuzzy numbers  A.4. Knowledge of mysterious period processes  A.5. Know the properties of arithmetic operations in closed periods  **B - Subject-specific skills**  B 1. Testing the interval of a truncated fuzzy number in the form α.  B.2. Knowledge of fuzzy number operations  B.3. Programming fuzzy numbers in MATLAB  **C- Thinking skills**  C.1. Know the use of rounding mysterious triangle numbers  C.2. Recognizing fuzzy and classical rules  C.3. To apply the rules of fuzzy logic  C.4 Using a fuzzy inference system  **D - General and transferable skills (other skills related to employability and personal development).**  D.1. Using fuzzy logic rules in MATLAB to program chapter topics in MATLAB  D.2. Fuzzy logic programming in MATLAB | | |  |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **3** | A | Properties of fuzzy sets | Lecture and discussion | Assignments and Observation (H.W) | | **2** | **3** | A | Convex fuzzy logic | Lecture and discussion | اAssignments and Observation (H.W) | | **3** | **3** | A&B | Fuzzy number concept | ا Lecture and discussion | Assignments and Observation (H.W) | | **4** | **3** | A&B | Play time lapse | Lecture and problem solving | Written tests | | **5** | **3** | **B&A** | Exam | Lecture and problem solving | Written tests | | **6** | **3** | **A & C** | Characteristics of arithmetic operations in closed periods | Lecture and discussion | Assignments and Observation (H.W) | | **7** | **3** | **B & C** | α-cut interval fuzzy number | Lecture and discussion | Assignments and Observation (H.W) | | **8** | **3** | **A& C** | Play fuzzy number | Lecture and discussion | Assignments and Observation (H.W) | | **9** | **3** | **B & C** | Fuzzy triple number | Lecture and problem solving | Presentation (power point) | | **10** | **3** | B | Playing fuzzy ternary number | ا Lecture and discussion | Assignments and Observation (H.W) | | **11** | **3** | D | Approximation of a fuzzy triangular number | Lecture and Project | Project(Report) | | **12** | **3** | **A&B** | Classic and fuzzy rules | **exam** | **exam** | | **13** | **3** | A &C | Fuzzy logical reasoning | **Lecture and problem solving** | Assignments and Observation (H.W) | | **14** | **3** | **A& C** | Fuzzy logic rules in matlab | Lecture and discussion | Assignments and Observation (H.W) | | **15** | **3** | C&D | Exam | **Lecture and interrogation** | TEST | |  |  |  |  |  |  | | | | |
| 1. Course Evaluation | | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | | | |
| 1. Learning and Teaching Resources | | | |
| Required textbooks (curricular books, if any) |  | | |
| Main references (sources) | Operation Research (2011) gupta | | |
| Recommended books and references (scientific journals, reports...) |  | | |
| Electronic References, Websites | www.gametheory.net | | |

**Stage 4 course 1**

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| **ت** | **الاسم** | | **رمز المادة** | **نوع المادة** | **عدد الساعات** | | | | **عدد الوحدات** |
| **نظري** | **عملي** | **مناقشة** | **المجموع** |
| **1** | **امثلية مقيدة (1)** | **Constrained Optimization (1)** | **CMOR23-F4111** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **2** | **نظرية الطوبير(1)** | **Queuing Theory (1)** | **CMOR23-F4121** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **3** | **شبكات عصبية(1)** | **Neural Networks (1)** | **CMOR23-F4131** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **4** | **نمذجة** | **Modeling** | **CMOR23-F4141** | **اجباري قسم** | **2** | **2** | **ـــــ** | **4** | **3** |
| **5** | **تمييز الانماط** | **Pattern Recognition** | **CMOR23-F4151** | **اختياري قسم** | **2** | **\_\_** | **1** | **3** | **2** |
| **6** | **نظرية المعولية** | **Reliability Theory** | **CMOR23-F4161** | **اختياري قسم** | **2** | **\_\_** | **1** | **3** | **2** |
|  | **منهج البحث العلمي** | **Scientific Search Method** | **CMOR23-F4171** | **اجباري كلية** | **2** | **\_\_** | **\_\_** | **2** | **2** |
| **المجموع** | | | | | **17** | **2** | **5** | **24** | **18** |

**Course Description Form**

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| 1. Course Name: Modeling | | | |
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| 1. Course Code: **CMOR23-F4141** | | | |
|  | | | |
| 1. Semester / Year:1nd | | | |
|  | | | |
| 1. Description Preparation Date:2023/2024 | | | |
|  | | | |
| 1. Available Attendance Forms: In presence | | | |
|  | | | |
| 1. Number of Credit Hours (Total)4 / Number of Units (Total)3 | | | |
|  | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | |
| Name: asmaa abdulmunem abdullah  Email: asmaa.abd@uomosul.edu.iq | | | |
| 1. Course Objectives | | | |
| **Course Objectives** | | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | | |
| **A- Knowledge and understanding**  A1- To enable the student to understand the subject of modeling  A2- The goal of the modeling course is to introduce the student to mathematical  modeling and how to build the model using differential and differential equations  and practical applications on them.  **B - Subject-specific skills**  B1 - The student applies the model to a real situation  B2 - The student should be able to solve the model mathematically  **C- Thinking skills**  C1- The student takes a problem from reality  C2- The student should compare the methods of solving  differential equations and differential equations for the same problem  C3- To plan how to use the appropriate method in the solution  **D - General and transferable skills (other skills related to employability**  **and personal development).**  D1- The student should improve the method used in the solution  D2- The student should improve the method used in the solution  D3- To verify the method | | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **4** | A | **An introductory introduction to models, types of models - scientific modeling, components of the model - types of models,** | Lecture and discussion | Assignments and Observation (H.W) | | **2** | **4** | A | **mathematical modeling - classification of mathematical models** | Lecture and discussion | اAssignments and Observation (H.W) | | **3** | **4** | A&B | **Stages of building a mathematical model, using differential equations in building population models** | ا Lecture and discussion | Assignments and Observation (H.W) | | **4** | **4** | A&B | **Modeling change using difference equations, sequences** | Lecture and problem solving | Written tests | | **5** | **4** | **B&A** | **An easy model for modeling change - various examples, difference equations** | Lecture and problem solving | Written tests | | **6** | **4** | **A & C** | **Solving difference equations - examples, case studies** **in deterministic modeling of change** | Lecture and discussion | Assignments and Observation (H.W) | | **7** | **4** | **B & C** | **Modeling Newton's law of cooling,** | Lecture and discussion | Assignments and Observation (H.W) | | **8** | **4** | **A& C** | **modeling savings certificates** | Lecture and discussion | Assignments and Observation (H.W) | | **9** | **4** | **B & C** | **Modeling the decay of radium and its half-life** | Lecture and problem solving | Presentation (power point) | | **10** | **4** | B | **, modeling digoxin in the blood** | ا Lecture and discussion | Assignments and Observation (H.W) | | **11** | **4** | D | **Exam** | Lecture and Project | Project(Report) | | **12** | **4** | **A&B** | **Logistic model with applications, growth in a cetacean community,** |  |  | | **13** | **4** | A &C | **modeling the relationship between two animal communities** | **Lecture and problem solving** | Assignments and Observation (H.W) | | **14** | **4** | **A& C** | **modeling the relationship between two animal communities** | Lecture and discussion | Assignments and Observation (H.W) | | **15** | **4** | C&D | **Exam** | **Lecture and interrogation** | TEST | |  |  |  |  |  |  | | | | |
| 1. Course Evaluation | | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | | | |
| 1. Learning and Teaching Resources | | | |
| Required textbooks (curricular books, if any): **مدخل الى النمذجة الرياضية بأستخدام ال matlb ( الجزء الاول)**  **مدخل الى النمذجة الرياضية بأستخدام ال matlb ( الجزء الثاني)**  **تأليف : الاستاذ الدكتور باسل يونس ذنون** |  | | |
| Main references (sources):Modeling and simulation | Operation Research (2011) gupta | | |
| Recommended books and references (scientific journals, reports...) |  | | |
| Electronic References, Websites: [https://www.arageek.com/l/%d8%a7%d9%84%d9%86%d9%85%](https://www.arageek.com/l/%d8%a7%d9%84%d9%86%d9%85%25)  d8%b0%d8%ac%d8%a9-%d9%88%d8%a7%d9%84%d9%85%d8%ad%d8%a7%d9%83%d8%a7%d8 | www.gametheory.net | | |

**Course Description Form**

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| 1. Course Name: Pattern Recognition | | | | | | | |
|  | | | | | | | |
| 1. Course Code: CMOR23-F4151 | | | | | | | |
|  | | | | | | | |
| 1. Semester / Year: 4nd | | | | | | | |
|  | | | | | | | |
| 1. Description Preparation Date:10/04/2024 | | | | | | | |
|  | | | | | | | |
| 1. Available Attendance Forms: In presence | | | | | | | |
|  | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) 3/2 | | | | | | | |
|  | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | |
| Name: dr.Zahraa Abed Al-Aziz Al-nuaimi  Email: [zahraaalnuaimi2017@uomosul.edu.iq](mailto:zahraaalnuaimi2017@uomosul.edu.iq)  Name: Neam Hazim Ahmed  Email: neam.alfahady@uomosul.edu.iq | | | | | | | |
| 1. Course Objectives | | | | | | | |
| **Course Objectives** | | | | 1. Recognizing the topic of pattern recognition. 2. Identifying the areas in which the topic of pattern recognition applies. 3. The student learns to link between probability theory and calculus, and recognizing patterns. 4. The student becomes familiar with the concept of distance and its use in pattern recognition. 5. The student becomes familiar with the concept of classification and its types. 6. The student becomes familiar with the topic of clustering and its methods. 7. The student becomes familiar with decision trees and their divisions. 8. Finding the ranks for the tree. | | | |
| 1. Teaching and Learning Strategies | | | | | | | |
| **Strategy** | | A: Knowledge and understanding  1A- The student learns how to use probability theory, differentiation, and integration to find the expected value.  2A- And the student learns to find the variance and covariance matrix and the relationship between them.  3A- The student learns how to use matrices in pattern recognition.  4A-The student becomes acquainted with the concept of classification and its types.  Top of Form  B- Subject-specific skills  1B- The student becomes familiar with the concept of eigenvectors, eigenvalues, and the quadratic form.  2B- The student learns about distances and their types, and how to utilize them in pattern recognition.  3B- The student learns to use Bayesian theory in classification as well as the Fisher technique used in classification.  4B- The student becomes acquainted with decision trees, their types, and their uses in pattern recognition.  Top of Form    C- Thinking skills  1CThe student learns how to determine the optimal method for classification.  2C- The student applies classification methods to real-world problems.  3C- The student learns clustering, its methods, and how to use it in classification.  4C- The student learns decision trees, their divisions, and how to find the best tree  D - General and transferable skills  (other skills related to employability and personal development).  1D- The student executes various classification methods.  2D- The student executes clustering methods.  3D- The student writes a computer program to calculate distances and clustering.  D4- Providing the final classification.  Top of Form | | | | | |
| 1. Course Structure | | | | | | | |
| **Week** | **Hours** | | **Required Learning Outcomes** | **Unit or subject name** | | **Learning method** | **Evaluation method** |
| 1 | 3 | | A | Formulating pattern recognition problems: | | Lecture and discussion | Lecture and  discussion |
| 2 | 3 | | A | * Main categories of pattern recognition problems: Decision recognition problems * Automatic pattern recognition systems | | Lecture and discussion | Lecture and  discussion |
| 3 | 3 | | A&B | Random vectors and their distributions,  quadratic formulas, | | Lecture and discussion | Lecture and  discussion |
| 4 | 3 | | A&B | multivariate normal distribution, | | Lecture and problem solving | Lecture and  problem solving |
| 5 | 3 | | **B&A** | linear transformation. | | Lecture and problem solving | Lecture and  problem solving |
| 6 | 3 | | **A & C** | Properties of eigenvalues and eigenvectors,. | | Lecture and discussion | Lecture and  discussion |
| 7 | 3 | | **B & C** | Bayes classifier,  Fisher classifier | | Lecture and discussion | Lecture and  discussion |
| 8 | 3 | | **A& C** | Parametric classifiers, non-parametric classifiers.  Top of Form | | Lecture and discussion | Lecture and  discussion |
| 9 | 3 | | **B & C** | Dissimilarity measure, hierarchical methods. | | Lecture and  problem solving | Presentation  (power point) |
| 10 | 3 | | B | Single-linkage  Complete linkage | | Lecture and discussion | Assignments  and Observation  (H.W) |
| 11 | 3 | | D | Mid-course exam | |  |  |
| 12 | 3 | | **A&B** | Decision tree algorithm,  types of decision trees | | Lecture and  Project | Project(Report) |
| 13 | 3 | | A ,C&D | split criterion,  secondary splits for categorical variables | | **Lecture and problem solving** | Assignments  and Observation  (H.W) |
| 14 | 3 | | **A& C** | recording splits for continuous  response variable | | Lecture and discussion | Assignments  and Observation  (H.W) |
| 15 | 3 | | C&D | determining the  best decision  tree, determining the  best  classification method. | | **Lecture and interrogation** | TEST |
| 1. Course Evaluation | | | | | | | |
| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc  Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | | | | | | | |
| 1. Learning and Teaching Resources | | | | | | | |
| Required textbooks (curricular books, if any) | | | | |  | | |
| Main references (sources) | | | | | 1-Andrew R Webb,'' Statistical Pattern recognition'' second edition, John Wiley and Sons, LTD 2002  2- J.P.Marques de sa, "Pattern Recognition'' ,Concepts, Methods and Applications, 2001  3- Keinosuke Fukunaga ''Introduction to Statistical Pattern Recognition'' Second Edition Academic Press, New York, 1999  4-Richard O.Duda, Peter E.Hart and David G.Strok,''Pattern Classification'' Second Edition [WWW.edition](http://WWW.edition) , 2007  5- Pattern Recognition and Classification. An Introduction . Geoff Doughety .Springer.2013  6- Essential of Pattern Recognition. Jianxin Wu Nanjing University. China 2020 | | |
| Recommended books and references (scientific journals, reports...) | | | | |  | | |
| Electronic References, Websites | | | | | <http://www.pattern> recobnition . Pdf. | | |

**Course Description Form**

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| 1. Course Name: Queuing theory (1) | | | | | |
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| 1. Course Code: **CMOR23-F4121** | | | | | |
|  | | | | | |
| 1. Semester 1 / 2024 | | | | | |
|  | | | | | |
| 1. Description Preparation Date:1/4/2024 | | | | | |
|  | | | | | |
| 1. Available Attendance Forms: In presence | | | | | |
|  | | | | | |
| 1. Number of Credit Hours (4) / Number of Units (3) | | | | | |
|  | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | |
| Name: Asst. Prof. Dr. Ghazwan Hani Mahmood Email: [ghazwan.alsoufi@uomosul.edu.iq](mailto:ghazwan.alsoufi@uomosul.edu.iq)  Name: Dr. Oday Abdulrahman Jarjies Email: [odayjarjies@uomosul.edu.iq](mailto:odayjarjies@uomosul.edu.iq) | | | | | |
| 1. Course Objectives | | | | | |
| 1. **Introduce the queuing theory.** 2. **To recognize the properties of queuing models.** 3. **To understand the efficiency metrics of queuing models.** 4. **To recognize the types of queuing models and Kendall's notation.** 5. **To realize pure birth and death process.** 6. **This course deals with two different models of queuing theory.** 7. **This is the basic subject for all types of queuing models.** 8. **To develop problem solving skills and an understanding of queuing theory through applying formulas to solve**   **some examples.** | | | | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | | | | |
| **A- Knowledge and understanding**  A1- The student should mention the previous laws  A2- The student should write some terms  A3- The student should describe the model  A4- The student should distinguish between the models  A5- The student explains the mathematical formula  A6- The student summarizes the steps to solve the mathematical formula  **B - Subject-specific skills**  B1 - The student applies the model to a real situation  B2 - The student must reveal the error in the form.  B3 - The student tabulates the results  **C- Thinking skills**  C1- The student poses a problem based on reality  C2- The student should compare the solution methods  C3- To rearrange the solution method  C4- To plan how to use the appropriate method in the solution  **D - General and transferable skills (other skills related to employability and personal development).**  D1- That the student implements the method used by the proof  D2- That the student improves the method used in the solution  D3- Verify the method  D4- Enabling the student to solve the results | | | | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **4** | **A** | **The properties of queuing models.** | **Lecture and discussion** | **Assignments and Observation (H.W)** | | **2** | **4** | **A** | **The efficiency metrics of queuing models.** | **Lecture and discussion** | **اAssignments and Observation (H.W)** | | **3** | **4** | **A&B** | **Types of queuing models and Kendall's notation.** | **ا Lecture and discussion** | **Assignments and Observation (H.W)** | | **4** | **4** | **A&B** | **Arrival process.** | **Lecture and problem solving** | **Written tests** | | **5** | **4** | **B&A** | **Departure process.** | **Lecture and problem solving** | **Written tests** | | **6** | **4** | **A & C** | **Differential-Difference equations of (M/M/1) :( GD/∞ / ∞) Model.** | **Lecture and discussion** | **Assignments and Observation (H.W)** | | **7** | **4** | **B & C** | **Probability distribution of Pn.** | **Lecture and discussion** | **Assignments and Observation (H.W)** | | **8** | **4** | **A& C** | **Expected number of units in queue and system.** | **Lecture and discussion** | **Assignments and Observation (H.W)** | | **9** | **4** | **B & C** | **Expected waiting time in queue and system.** | **Lecture and problem solving** | **Presentation (power point)** | | **10** | **4** | **B** | **Numerical examples.** | **ا Lecture and discussion** | **Assignments and Observation (H.W)** | | **11** | **4** | **D** | **Differential-Difference equations of (M/M/1) :( GD/N/ ∞) Model.** | **Lecture and Project** | **Project(Report)** | | **12** | **4** | **A&B** | **Probability distribution of Pn.** |  |  | | **13** | **4** | **A &C** | **Expected number of units in queue and system.** | **Lecture and problem solving** | **Assignments and Observation (H.W)** | | **14** | **4** | **A& C** | **Waiting time distribution in queue and system.** | **Lecture and discussion** | **Assignments and Observation (H.W)** | | **15** | **4** | **C&D** | **Numerical examples.** | **Lecture and interrogation** | **TEST** | | | | | | |
| 1. Course Evaluation | | | | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | | | | | |
| 1. Learning and Teaching Resources | | | | | |
| Required textbooks (curricular books, if any) | |  |  | | |
| Main references (sources) | **- جزاع، عبد ذياب. (1986). بحوث العمليات. وزارة التعليم العالي، جامعة بغداد. الطبعة الثانية.**  **2- الشمرتي، حامد سعد نور. والزبيدي، علي خليل. (2007). مدخل الى بحوث العمليات. المملكة الاردنية الهاشمية. دار مجدلاوي للنشر والتوزيع.** | | Operation Research (2011) gupta | | |
| Recommended books and references (scientific journals, reports...) | 1- Adan, I., & Resing, J. (2002). Queueing theory.  2- Sztrik, János, (2012). Basic queueing theory.  *University of Debrecen, Faculty of Informatics* | |  | | |
| Electronic References, Websites | <https://samehar.files.wordpress.com/2022/03/queueing-theory-1.pdf> | | www.gametheory.net | | |

**Stage 4 course 2**

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| **ت** | **الاسم** | | **رمز المادة** | **نوع المادة** | **عدد الساعات** | | | | **عدد الوحدات** |
| **نظري** | **عملي** | **مناقشة** | **المجموع** |
| **1** | **امثلية مقيدة (2)** | **Constrained Optimization (2)** | **CMOR23-F4111** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **2** | **نظرية الطوبير(2)** | **Queuing Theory (2)** | **CMOR23-F4121** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **3** | **شبكات عصبية(2)** | **Neural Networks (2)** | **CMOR23-F4131** | **اجباري قسم** | **3** | **\_\_** | **1** | **4** | **3** |
| **4** | **محاكاة** | **Modeling** | **CMOR23-F4141** | **اجباري قسم** | **2** | **2** | **ـــــ** | **4** | **3** |
| **5** | **لغة انكليزية (4)** | **Pattern Recognition** | **CMOR23-F4151** |  | **2** | **\_\_** | **\_\_** | **2** | **2** |
| **6** | **مشروع التخرج** | **Search Project** | **CMOR23-F4161** | **اختياري قسم** | **\_\_** | **4** | **\_\_** | **4** | **2** |
| **المجموع** | | | | | **13** | **6** | **3** | **22** | **16** |

**Course Description Form**

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| --- | --- | --- | --- |
| 1. Course Name: simulation | | | |
|  | | | |
| 1. Course Code: **CMOR23-F4241** | | | |
|  | | | |
| 1. Semester / Year:2nd | | | |
|  | | | |
| 1. Description Preparation Date:2023/2024 | | | |
|  | | | |
| 1. Available Attendance Forms: In presence | | | |
|  | | | |
| 1. Number of Credit Hours (Total) 4 / Number of Units (Total) 3 | | | |
|  | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | |
| Name: asmaa abdulmunem abdullah  Email: asmaa.abd@uomosul.edu.iq | | | |
| 1. Course Objectives | | | |
| **Course Objectives:--to enable the student to understand the subject of simulation and its applications**  **Public life matters**  **- How to build a simulation model and generate random numbers** | | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | | |
| **A- Knowledge and understanding**  A1- How to generate random numbers in different ways  A2- Facilitating the development of models for any problem,  its solution, and creating simulations for it.and practical applications on them.  A3-- To learn how to apply and use programming in modeling and simulation  **B - Subject-specific skills**  B1 - The student applies the simulation model to a real situation  B2 - The student should be able to perform manual simulation  **C- Thinking skills**  C1- The student takes a problem from reality  C2- The student will compare between manual and computer simulation methods  C3- To plan how to use the appropriate method in the solution  **D - General and transferable skills (other skills related to employability**  **and personal development).**  D1- That the student implements the methods used in solving the simulation  D2- The student should improve the method used in the solution  D3- To verify the method | | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **4** | A | **Knowing simulation, simulation using computer - -** | Lecture and discussion | Assignments and Observation (H.W) | | **2** | **4** | A | **objectives of simulation, - advantages of simulation** | Lecture and discussion | اAssignments and Observation (H.W) | | **3** | **4** | A&B | **disadvantages of simulation models,** | ا Lecture and discussion | Assignments and Observation (H.W) | | **4** | **4** | A&B | **The Monte Carlo method, , ,.** | Lecture and problem solving | Written tests | | **5** | **4** | **B&A** | **methods for generating random numbers** | Lecture and problem solving | Written tests | | **6** | **4** | **A & C** | **the mean method of multiplication** | Lecture and discussion | Assignments and Observation (H.W) | | **7** | **4** | **B & C** | **the mean square method** | Lecture and discussion | Assignments and Observation (H.W) | | **8** | **4** | **A& C** | **, the inverse method** | Lecture and discussion | Assignments and Observation (H.W) | | **9** | **4** | **B & C** | **Decision simulation, manual simulation - applied examples** | Lecture and problem solving | Presentation (power point) | | **10** | **4** | B | **Simulation method** | ا Lecture and discussion | Assignments and Observation (H.W) | | **11** | **4** | D | **Exam** | Lecture and Project | Project(Report) | | **12** | **4** | **A&B** | **Simulation method for inventory control, Monte Carlo integration simulation** |  |  | | **13** | **4** | A &C | **One-dimensional Monte Carlo integration, acceptance and rejection method** | **Lecture and problem solving** | Assignments and Observation (H.W) | | **14** | **4** | **A& C** | **Multidimensional Monte Carlo integration** | Lecture and discussion | Assignments and Observation (H.W) | | **15** | **4** | C&D | **Exam** | **Lecture and interrogation** | TEST | |  |  |  |  |  |  | | | | |
| 1. Course Evaluation | | | |
| Written tests  Project(Report)  Presentation (power point)  Assignments and Observation (H.W) | | | |
| 1. Learning and Teaching Resources | | | |
| Required textbooks (curricular books, if any): **مدخل الى النمذجة الرياضية بأستخدام ال matlb ( الجزء الاول)**  **مدخل الى النمذجة الرياضية بأستخدام ال matlb ( الجزء الثاني)**  **تأليف : الاستاذ الدكتور باسل يونس ذنون** |  | | |
| Main references (sources):Modeling and simulation | Operation Research (2011) gupta | | |
| Recommended books and references (scientific journals, reports...) |  | | |
| Electronic References, Websites: [https://www.arageek.com/l/%d8%a7%d9%84%d9%86%d9%85%](https://www.arageek.com/l/%d8%a7%d9%84%d9%86%d9%85%25)  d8%b0%d8%ac%d8%a9-%d9%88%d8%a7%d9%84%d9%85%d8%ad%d8%a7%d9%83%d8%a7%d8 | www.gametheory.net | | |

**Course Description Form**

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| --- | --- | --- |
| 1. Course Name: Reliability theory | | |
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| 1. Course Code: CMOR23-F4251 | | |
|  | | |
| 1. Semester / Year:4th | | |
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| 1. Description Preparation Date:2023/2024 | | |
|  | | |
| 1. Available Attendance Forms: In presence | | |
|  | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) | | |
|  | | |
| 1. Course administrator's name (mention all, if more than one name) | | |
| Name: Lec. Ahmed N. Alkhateeb  Email: ahmed.alkhateeb@uomosul.edu.iq | | |
| 1. Course Objectives | | |
| **Course Objectives** | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | |
| **A- Knowledge and understanding**  A1- The student should mention the previous laws  A2- The student should write some terms  A3- The student should describe the model  A4- The student should distinguish between the models  A5- The student explains the mathematical formula  A6- The student summarizes the steps to solve the mathematical formula  **B - Subject-specific skills**  B1 - The student applies the model to a real situation  B2 - The student must reveal the error in the form.  B3 - The student tabulates the results  **C- Thinking skills**  C1- The student poses a problem based on reality  C2- The student should compare the solution methods  C3- To rearrange the solution method  C4- To plan how to use the appropriate method in the solution  **D - General and transferable skills (other skills related to employability and personal development).**  D1- That the student implements the method used by the proof  D2- That the student improves the method used in the solution  D3- Verify the method  D4- Enabling the student to solve the results | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **3** | A | **Concept of Reliability** | Lecture and discussion | Assignments and Observation (H.W) | | **2** | **3** | A | **Elements of reliability** | Lecture and discussion | اAssignments and Observation (H.W) | | **3** | **3** | A&B | **Continuous distribution** | ا Lecture and discussion | Assignments and Observation (H.W) | | **4** | **3** | A&B | **Reliability function** | Lecture and problem solving | Written tests | | **5** | **3** | **B&A** | **Mean time to failure** | Lecture and problem solving | Written tests | | **6** | **3** | **A & C** | **Hazard funciotn** | Lecture and discussion | Assignments and Observation (H.W) | | **7** | **3** | **B & C** | **Cumulative function and failure rate** | Lecture and discussion | Assignments and Observation (H.W) | | **8** | **3** | **A& C** | **Reliability condition** | Lecture and discussion | Assignments and Observation (H.W) | | **9** | **3** | **B & C** | **Constant failure rate** | Lecture and problem solving | Presentation (power point) | | **10** | **3** | B | **Failure model** | ا Lecture and discussion | Assignments and Observation (H.W) | | **11** | **3** | D | **Half exam** | Lecture and Project | Project(Report) | | **12** | **3** | **A&B** | **Exponentail Distribution** |  |  | | **13** | **3** | A &C | **Weibull Distribution** | **Lecture and problem solving** | Assignments and Observation (H.W) | | **14** | **3** | **A& C** | **Types of systems** | Lecture and discussion | Assignments and Observation (H.W) | | **15** | **3** | C&D | **Systems diagram** | **Lecture and interrogation** | TEST | |  |  |  |  |  |  | | | |
| 1. Course Evaluation | | |
| Written tests  Assignments and Observation (H.W) | | |
| 1. Learning and Teaching Resources | | |
| Required textbooks (curricular books, if any) |  | |
| Main references (sources): An introduction to reliability and maintainability engineering by | Operation Research (2011) gupta | |
| Recommended books and references (scientific journals, reports...): Introduction to Reliability  Analysis Probability Models and Statistical Method |  | |
| Electronic References, Websites | www.gametheory.net | |

**Course Description Form**

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| --- | --- | --- | --- |
| 1. Course Name: English Language | | | |
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| 1. Course Code: CMOR23-F4261 | | | |
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| 1. Semester / Year:2nd | | | |
|  | | | |
| 1. Description Preparation Date:2023/2024 | | | |
|  | | | |
| 1. Available Attendance Forms: In presence | | | |
|  | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) | | | |
|  | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | |
| Name: Zainab Qusay AL-Oraibi  Email: Zainab.q@uomosul.edu.iq | | | |
| 1. Course Objectives | | | |
| **Course Objectives**   1. To think in English and then speak. 2. To be able to talk in English. 3. To be able to compose freely and independently in speech and writing. 4. To be able to read books with understanding. | | **• Finding optimal strategies**  **• How to build a competitive model**  **• Market competition rules** | |
| 1. Teaching and Learning Strategies | | | |
| **- Speaking skill**  A1- He must have the ability to think and speak in English  A2- The ability to speak English fluently  A3- The ability to formulate sentences correctly  **B - Reading skill**  B1 - The ability to read sentences correctly  B2 - Correct pronunciation of words.  **C- Writing skill**  C1- The ability to write sentences in English correctly  The ability to express ideas through writing  **D - Listening skills.**  D1- Developing the student’s listening skill  D2-The ability to distinguish words while listening | | |
| 1. Course Structure  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Hours** | **Required learning outcome** | **Unit or subject name** | **Learning method** | **Evaluation method** | | **1** | **3** | D | Introduction: about the study materials. | Lecture and discussion | Assignments and Observation | | **2** | **3** | A | Grammar: Verbs and nouns. Passive and active voices, and practices. | Lecture and discussion | اAssignments and Observation | | **3** | **3** | A&B | Second conditional, practices, questions, and short answers. | Lecture and discussion | Assignments and Observation | | **4** | **3** | A&B | Grammar: might, If I were you. | Lecture and problem-solving | Observation | | **5** | **3** | **B&C** | Vocabulary: phrasal verbs. | Lecture and problem-solving | Observation | | **6** | **3** | **A& B& D** | social expressions, practices. | Lecture and discussion | Observation | | **7** | **3** |  | Mid-term Exam |  |  | | **8** | **3** | **B& D** | Grammar: Present perfect continuous, practices. | Lecture and discussion | Assignments and Observation | | **9** | **3** | **A& B& D** | Grammar: Words formation, adverbs, reading. | Lecture and problem-solving | Observation | | **10** | **3** | **A& B& D** | Social expressions: Everyday English (telephoning), practices. | Lecture and discussion | Assignments and Observation | | **11** | **3** | **A& B& D** | Tenses: Past perfect practices, grammar, and pronunciation. | Lecture and discussion | Observation | | **12** | **3** | **A&B** | Report statement, practices. | Lecture and discussion | Observation | | **13** | **3** | A &C | Hot verbs (bring, take, come, go). | **Lecture and problem-solving** | Assignments and Observation | | **14** | **3** | **A& C** | Social expressions about (saying goodbye), practices. | Lecture and discussion | Assignments and Observation | | **15** | **3** | C&D | Study the material review | Lecture | Observation | |  |  |  |  |  |  | | | | |
| 1. Course Evaluation | | | |
| Written tests  Participate  Assignments and Observation | | | |
| 1. Learning and Teaching Resources | | | |
| Required textbooks (Headway pre-intermediate plus student's book (John and Lize Soars)) |  | | |
| Main references (Headway pre-intermediate plus work's book) | Operation Research (2011) gupta | | |
| Recommended books and references (scientific journals, reports...) |  | | |
| Websites <https://7esl.com/> | www.gametheory.net | | |