

**Ministry of Higher Education and Scientific Research
Scientific Supervision and Scientific Evaluation Apparatus
Directorate of Quality Assurance and Academic Accreditation
Accreditation Department**



Academic Program and Course Description Guide

2024

Introduction:

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

Concepts and terminology:

Academic Program Description: The academic program description provides a brief summary of its vision, mission and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

Course Description: Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

Program Vision: An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

Program Mission: Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

Program Objectives: They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

Curriculum Structure: All courses / subjects included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

Learning Outcomes: A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

Teaching and learning strategies: They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extra-curricular activities to achieve the learning outcomes of the program.

Academic Program Description Form

Description of The Academic Program

University Name: Mustansiriyah University

College/Institute: College of Science

Scientific Department: Department of Mathematics

Name of Academic or Professional Program: University Performance

Name of Final Degree: Bachelor of Mathematics

Study System: Semester

Description Preparation Date: 25/3/2024

File Filling Date: 25/3/2024

Signature:  

Name of Head of Department: Dr. Bogant J. J.

Date: 28/3/2024

Signature: 

Name of Scientific Assistant:

Date: Matheq Talib Gaata

File checked by Ali Jasim mahammed

Quality Assurance and University Performance Division

Name of Director of Quality Assurance and University Performance Division:

Date: 28/3/2024

Signature: 

1. Program Vision

The department of Mathematics at the College of Science - Mustansiriyah University seeks to prepare and develop scientific staff specialized in mathematical sciences, so that the department becomes a pioneering and distinguished academic system for preparing students for the labor market and developing their abilities to interact and communicate with others by highlighting the importance and beauty of mathematics.

2. Program Mission

The main objective of the department of Mathematics' mission is to continually work for achieving the department's goals by achieving the following primary tasks:

1. Providing an excellent learning environment for students, educating them with knowledge, preparing them for responsibilities in society, searching for and encouraging the distinguished energies of students.
2. Activating scientific research by involving faculty staff and students in preparing scientific discussions, conferences, mathematics research, and disseminating knowledge.
3. Effective contribution with other sciences in developing the local community by using mathematical applications to address the problems facing this community.

Active participation in international, regional and local conferences and development courses inside and outside Iraq for raise the efficiency of staff and keep pace with development.

3. Program Objectives

1. Develop the student's ability to think abstractly based on scientific foundations (analysis and inference) and expand his horizons and encourage to think objectively to solve any problem facing in scientific and social life, as mathematics is always interested in discussing all possible possibilities to solve various problems.
2. Stimulating the student's interest in the importance of mathematics and its applications in various fields of scientific life by highlighting its creative aspects and its close relationship with other sciences.

Providing the student with a sober scientific base of information that enables to continue his postgraduate studies and keep pace with modern trends in mathematics.

4. Program Accreditation

Does the program have program accreditation? No

5. Other external influences

- 1- Training courses, workshops, continuing education seminars and women empowerment.
- 2- Scientific visits.

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	44	176		Core course
College Requirements	44	176		
Department Requirements	44	176		
Summer Training	Summer training required			
Other	/			

* This can include notes whether the course is basic or optional.

7. Program Description

Year/Level	Course Code	Course Name	Credit Hours	
			theoretical	practical
Second stage (First semester) 2023-2024	54452114	Advanced Calculus	5	
	54452123	Linear Algebra 1	4	
	54452133	Probability 1	4	2
	54452144	Programming in Computer 1	2	
	54452153	Mathematical physics	4	
	-	English	2	
	-	Baath crimes	2	
Second stage (Second semester) 2023-2024	54452214	Methods of Solving ordinary Differential Equation	5	
	54452223	Linear Algebra 2	4	
	54452233	Probability 2	4	
	54452244	Programming in Computer 2	3	2
	-	Finite Mathematics	4	
Third stage/	54453114	Mathematical Analysis 1	4	

Pure mathematics (First semester) 2023-2024	54453144	Numerical Analysis 1	3	2
	54453183	Algebra	4	
	54453163	Data Theory	4	
	54453223	Operations Research	4	
Third stage/ Pure mathematics (Second semester) 2023-2024	54453114	Mathematical Analysis 2	5	
	54453144	Numerical Analysis 2	3	2
	54452223	Linear Algebra	4	
	54453163	Numerical Theory	4	
	54453253	Mathematical Statistic	4	
	-	Professional ethics	2	
	-	English	2	
Stage Three/ Applied Mathematics (First Semester) 2023-2024	54453114	Mathematical Analysis 1	4	
	54453144	Numerical Analysis 1	3	2
	54453124	Theory of Differential Equations	5	
	54453183	Algebra 1	4	
	54453173	Applied statistics	4	
Stage Three/ Applied Mathematics (Second Semester) 2023-2024	54453114	Mathematical Analysis 2	5	
	54453144	Numerical Analysis 2	3	2
	54453183	Algebra 2	4	
	54453223	Operations Research	4	
	-	Professional ethics	2	
	-	English	2	
Stage Three/ Statistics and Operations Research (First Semester) 2023-2024	54453153	Mathematical Statistic	4	
	54453114	Mathematical Analysis 1	5	
	54453144	Numerical Analysis 1	3	2
	54453183	Algebra 1	4	
	54453223	Operations Research	4	
Stage Three/ Statistics and Operations Research (Second Semester) 2023-2024	54453114	Mathematical Analysis 2	5	
	54453144	Numerical Analysis 2	3	2
	54452223	Algebra 2	4	
	54454113	Multivariate Analysis	4	
	54453223	Operations Research	4	
	-	Professional ethics	2	
	-	English	2	
Stage Four / Pure Mathematics (First Semester) 2023-2024	54454114	Complex Analysis 1	5	
	54454133	Topology 1	4	
	54454143	Functional Analysis 1	4	
	54454153	Module Theory 1	4	
	54454173	Measure Theory	4	
	-	Professional ethics	2	
	-	English	2	
Stage Four / Pure Mathematics (Second Semester)	54454214	Complex Analysis 2	5	
	54454233	Topology 2	4	
	54454243	Functional Analysis 2	4	

2023-2024	54454253	Module Theory 2	4	
	54454283	Approximation Theory	4	
	54454262	Project	2	
Stage Four / Applied Mathematics (First Semester) 2023-2024	54454113	Complex Analysis 1	5	
	54454133	Fuzzy Theory	4	
	54454143	Functional Analysis 1	4	
	54454294	Calculus Variations	4	
	-	Differential geometry	4	
	-	Professional ethics	2	
Stage Four / Applied Mathematics (Second Semester) 2023-2024	-	English	2	
	54454213	Complex Analysis 2	5	
	54454274	Numerical Solutions of Integral Equations	5	
	54454243	Functional Analysis 2	4	
	54454223	Applied Control Theory	4	
	54454283	Quantum Mechanics	3	
Stage Four / Statistics and Operations Research (First Semester) 2023-2024	54454262	Project	2	
	54454113	Multivariate Analysis	4	
	54454123	Statistical Inference 1	4	
	54454133	Design and Analysis of Experiments	4	
	-	Composite Optimization Problems	4	
	54453193	Problems in Scheduling 1	4	
Stage Four / Statistics and Operations Research (Second Semester) 2023-2024	-	English	2	
	54454273	Stochastic Process	4	
	54454223	Statistical Inference 2	4	
	-	Fuzzy Set	4	
	54453293	Problems in Scheduling 2	4	
	54454224	Simulation	2	2
	54454262	Project	2	

8. Expected learning outcomes of the program
Knowledge
1- Comprehending and understanding the material with regard to the required and programmed vocabulary.
2- Using the board, dry pen and smart board.
3- Preparing appropriate questions as weekly discussions that contribute to clarifying the study material more.
Skills
1- The ability to comprehend mathematics and apply it practically.
2- The student acquires quantitative and scientific thinking skills that can be applied mathematically
3- Using many scientific and applied examples.
4- Solving exercises from the prescribed book and from auxiliary sources.

Ethics

- 1- Developing students' abilities to share scientific ideas.
- 2- Developing students' abilities to understand the basic principles of mathematics.
- 3- Developing students' abilities to participate in dialogue, present ideas, and accept the opinions of others.
- 4- Developing students' abilities in scientific thinking.

9. Teaching and Learning Strategies

- 1- Explain the scientific material to the students in detail.
- 2- Involve students in solving mathematical problems.
- 3- Discuss and dialogue about vocabulary related to the topic.
- 4- Develop a plan for raising and setting questions and quick exams.
- 5- Assign the student some group activities and duties.

10. Evaluation methods

- 1- Adopting classroom discussions and active participation in the classroom is evidence of the student's commitment and responsibility.
- 2- Raising the problem and assigning students to find solutions.
- 3- Solving the questions asked.
- 4- Answering quick exams to evaluate the students' level.
- 5- Commitment to the specified date for submitting daily exercises, assignments and research.
- 6- Daily, weekly and monthly exams and the end of the semester exam.
- 7- Activating the visiting colleague's visit, periodic visits to all academic stages, filling out a form and submitting it to the relevant committee in the department.
- 8- Discussing students' graduation projects.

11. Faculty

Faculty Members					
Academic Rank	Specialization		Special Require ments/S kills (if applicab le)	Number of the teaching staff	
	General	Special		Staff	Lecturer

Bassam Jabbar Jasim	Mathematics	Differential and Difference equations	Head of Department	Staff		
Nadia Hashim Al-Noor	Statistics	Mathematical statistics		Staff		
Jamil A.Ali Al-Hawasy	Mathematics	Optimal Control Theory and Numerical		Staff		
Haider Jebur Ali	Mathematics	Topology		Staff		
Saad Abdulkadhim Alsaadi	Mathematics	Algebra - Module Theory		Staff		
Arkan Jasim Mohammed	Mathematics	Fractional Geometry		Staff		
Hanan A. Chachan	Mathematics	Operation Research		Staff		
Haytham Razooki Hassan	Mathematics	Homological Algebra		Staff		
Radhi Ali Zaboon	Mathematics	Dynamic system and optimal control theory		Staff		
Najm abdulzahra Makhrib	Mathematics	Number theory and algebraic geometry		Staff		
Emad Bakr Abdulkareem	Mathematics	Number Theory - Algebraic Geometry		Staff		
Nabaa N. Hasan	Mathematics	Approximation Theory		Staff		
Sabiha I. Mahmood	Mathematics	Topology		Staff		
Faez Hassan Ali	Mathematics	Operation Research and Cryptology		Staff		
Faria Ali Chechan	Mathematics	Fuzzy Functional Theory		Staff		
Huda Abdullah Rasheed	Statistics	Mathematical statistics		Staff		
Rabeaa Gatea Abtan	Mathematics	Algebraic topology - Arrangement theory		Staff		
Arwa Nazar Mustafa	Mathematics	Functional Analysis		Staff		
Sudad Khalil Abraheem	Mathematics	Mathematical statistics		Staff		
Shatha sami sejad	Mathematics	Complex Analysis		Staff		
Abdul khaleq Owaid Mazeel	Mathematics	Numerical Analysis		Staff		
Anmar Hashim Jasim	Mathematics	Deferential Equation		Staff		
Kasim Abbas Hussain	Mathematics	Applied Mathematics		Staff		

Zainab Esa Abdulnaby	Mathematics	Functional and Complex Analysis		Staff		
Zainab Shehab Hamed	Mathematics	Number Theory		Staff		
Zainab Mohammed Alwan	Mathematics	Differential Equations		Staff		
Wafaa Sayyid Hasanain	Statistics	Mathematical Statistics		Staff		
Zainab SHehab Hamed	Mathematics	Number Theory		Staff		
Ahmed Bakheet Saeed	Mathematics	Biomathematics		Staff		
Akbal Jabber Sultan	Mathematics	Mathematical statistics		Staff		
Lamyaa Hussein Ali	Mathematics	Numerical Analysis		Staff		
Jawad Kadhim Khalaf	Mathematics	Functional Analysis		Staff		
Khalid Hammood mohammedali	Mathematics	Applied Mathematics Delay Differential equations with Control Systems		Staff		
Zainab john kallaf	Mathematics	Partial Differential Equations		Staff		
Ghazwa faisal abd	Mathematics	Descriptor Systems		Staff		
Shurooq Ahmed Kareem	Mathematics	Mathematical statistics		Staff		
Ali H. Al-Saedi	Mathematics	Number Theory		Staff		
Mohammed Abdulhadi Sarhan	Mathematics	Optimal control for Numerical Solution		Staff		
Nadia Jaffa Fezaa	Mathematics	Mathematical statistics		Staff		
Saad Owaid Bedewi	Mathematics	Algebra and Computer Applications		Staff		
Umilkeram Qasim Obaid	Mathematics	Fuzzy Functional Analysis		Staff		
Suhear Saady Alwan	Mathematics	Algebraic Topology		Staff		
Niran Abbas Ali	Mathematics	Graph theory		Staff		
Laheeb Muhsen Noman	Mathematics	Differential Geometry		Staff		
Ahmed Hanun Abud	Mathematics	Applied Mathematics		Staff		
Manal Hashim Ibrahim	Mathematics	Operation Research		Staff		
Amer Ismael Mustafa	Mathematics	Topological Groups		Staff		
Shaymaa Noori Abdulridha	Mathematics	Modules		Staff		
Murtadha Jaber Shanwa	Mathematics	Algebraic Topology		Staff		

Mahdi Jasim Hasan	Mathematics	Applied Algebra		Staff		
Manal Ghassan Ahmed	Mathematics	Operation Research		Staff		
Hiba Ghassan Fareed	Mathematics	Mathematics		Staff		
Ahmed Shawki Jaber	Mathematics	Integral Equations		Staff		
Akeel Nasir Kadhim	Mathematics	Modules and Rings Theory		Staff		
Ali Abdulrasool Abdulhussein	Mathematics	Differential Equations		Staff		
Hateem Kareem Khdaire	Mathematics	Computational and Applied Mathematics		Staff		
Ayad Wali Ali	Mathematics	Differential Equations		Staff		
Amenah Hassan Ibraheem	Mathematics	Optimization Theory		Staff		
Sahar Ahmed Mohammed	Mathematics	Mathematical statistics		Staff		
Hasan Wasi Maktoof		Pure Mathematics				
Zainab Sadiq Jafar		Numerical Analysis				
Ahmed Najm abdulla		Mathematics				
Rasha Abdulmahdi M.Saleh		Functional Analysis				
Aliaa Adnan Kadhim		Mathematics				
Shimaa Mohammed Dawood		Dynamic system and control				
Alaa Malek Soady		Functional Analysis				
Israa Mohammed Hassoon		Image Processing & Pattern Recognition				
Faten Hashim Mohammed		Module Theory				
Doha Adel Abbas		Operation Research				

Professional Development

Mentoring new faculty members

- 1- Continuous and accurate follow-up of the program.
- 2- Proposing new scientific ideas and participating in developing the academic program.

Professional development of faculty members

- 1- Participation in scientific courses, seminars and discussion groups.
- 2- Following up on the latest scientific research within the specialization.
- 3- Conducting scientific visits to relevant government institutions and the private sector.

12.Acceptance Criterion

1. Adopting the conditions for accepting students according to the regulations of the Ministry of Higher Education and Scientific Research (central admission criteria).
 2. Successfully pass a special test or personal interview set by the college or university council.
 3. Be medically fit for the specialization applied for.
- The capacity of the scientific department.

13.The most important sources of information about the program

- 1- Curriculum books approved by the scientific committee in the department.
- 2- Auxiliary books.
- 3- International books and sources (sources in English).
- 4- Additional sources from the Internet.

14.Program Development Plan

- 1- Using new concepts in the field of mathematics and using electronic devices to display information and related issues.
- 2- Updating curricula by searching the latest approved global sources.
- 3- Developing laboratories by updating scientific experiments and using the latest laboratory equipment.
- 4- Diversifying lecture delivery methods by using modern teaching methods.

`1Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
2nd year 1st course 2023-2024	54452114	Advanced Calculus	Basic	√		√		√	√	√		√	√	√	√
	54452123	Linear Algebra 1	Basic	√		√		√	√	√		√	√	√	√
	54452133	Probability 1	Basic	√		√		√	√	√		√	√	√	√
	54452144	Programming in Computer 1	Basic	√		√		√	√	√		√	√	√	√
	54452153	Mathematical physics	Basic	√		√		√	√	√		√	√	√	√
	-	English	Basic	√		√									
	-	Baath crimes	Basic	√		√									
2nd year 1st course 2023-2024	54452214	Methods of Solving ordinary Differential Equation	Basic	√		√		√	√	√		√	√	√	√
	54452223	Linear Algebra 2	Basic	√		√		√	√	√		√	√	√	√
	54452233	Probability 2	Basic		√			√	√			√	√	√	√
	54452244	Programming in Computer 2	Basic		√			√	√			√	√	√	√

	-	Finite Mathematics	Basic	√		√		√	√			√	√	√	√
3rd year (pure) 1st course 2023-2024	54453114	Mathematical Analysis 1	Basic	√		√		√	√	√		√	√	√	√
	54453144	Numerical Analysis 1	Basic	√		√		√	√	√		√	√	√	√
	54453183	Algebra	Basic	√		√		√	√	√		√	√	√	√
	54453163	Data Theory	Basic	√		√		√	√	√		√	√	√	√
	54453223	Operations Research	Basic	√		√		√	√			√	√	√	√
3rd year (pure) 2nd course 2023-2024	54453114	Mathematical Analysis 2	Basic	√		√		√	√	√		√	√	√	√
	54453144	Numerical Analysis 2	Basic	√		√		√	√	√		√	√	√	√
	54452223	Linear Algebra	Basic	√		√		√	√	√		√	√	√	√
	54453163	Numerical Theory	Basic	√		√		√	√	√		√	√	√	√
	54453253	Mathematical Statistic	Basic	√		√		√	√	√		√	√	√	√
	-	Professional ethics	Basic	√		√									
	-	English	Basic	√		√									

3rd year (applied) 1st course 2023-2024	54453114	Mathematical Analysis 1	Basic	√		√		√	√	√		√	√	√	√
	54453144	Numerical Analysis 1	Basic	√		√		√	√	√		√	√	√	√
	54453124	Theory of Differential Equations	Basic	√		√		√	√	√		√	√	√	√
	54453183	Algebra 1	Basic	√		√		√	√	√		√	√	√	√
	54453173	Applied statistics	Basic	√		√		√	√	√		√	√	√	√
3rd year (applied) 2nd course 2023-2024	54453114	Mathematical Analysis 2	Basic	√		√		√	√	√		√	√	√	√
	54453144	Numerical Analysis 2	Basic	√		√		√	√	√		√	√	√	√
	54453183	Algebra 2	Basic	√		√		√	√	√		√	√	√	√
	54453223	Operations Research	Basic	√		√		√	√	√		√	√	√	√
	-	Professional ethics	Basic	√		√									
	-	English	Basic	√		√									
3rd year (Operation Research)	54453153	Mathematical Statistic	Basic	√		√		√	√	√		√	√	√	√
	54453114	Mathematical Analysis 1	Basic	√		√		√	√	√		√	√	√	√

and Statistics) 1st course 2023-2024	54453144	Numerical Analysis 1	Basic	√		√		√	√	√		√	√	√	√
	54453183	Algebra 1	Basic	√		√		√	√	√		√	√	√	√
	54453223	Operations Research	Basic	√		√		√	√	√		√	√	√	√
3rd year (Operation Research and Statistics) 2nd course 2023-2024	54453114	Mathematical Analysis 2	Basic	√		√		√	√	√		√	√	√	√
	54453144	Numerical Analysis 2	Basic	√		√		√	√	√		√	√	√	√
	54452223	Algebra 2	Basic	√		√		√	√	√		√	√	√	√
	54454113	Multivariate Analysis	Basic	√		√		√	√	√		√	√	√	√
	54453223	Operations Research	Basic	√		√		√	√	√		√	√	√	√
	-	Professional ethics	Basic	√		√									
	-	English	Basic	√		√									
4th year (pure) 1st course 2023-2024	54454114	Complex Analysis 1	Basic	√		√		√	√	√		√	√	√	√
	54454133	Topology 1	Basic	√		√		√	√	√		√	√	√	√
	54454143	Functional Analysis 1	Basic	√		√		√	√	√		√	√	√	√

	54454153	Module Theory 1	Basic	√		√		√	√	√		√	√	√	√
	54454173	Measure Theory	Basic	√		√		√	√	√		√	√	√	√
	-	Professional ethics	Basic	√		√									
	-	English	Basic	√		√									
4th year (pure) 2nd course 2023-2024	54454214	Complex Analysis 2	Basic	√		√		√	√	√		√	√	√	√
	54454233	Topology 2	Basic	√		√		√	√	√		√	√	√	√
	54454243	Functional Analysis 2	Basic	√		√		√	√	√		√	√	√	√
	54454253	Module Theory 2	Basic	√		√		√	√	√		√	√	√	√
	54454283	Approximation Theory	Basic	√		√		√	√	√		√	√	√	√
	54454262	Project	Basic	√		√		√	√	√		√	√	√	√
3rd year (applied) 1st course	54454113	Complex Analysis 1	Basic	√		√		√	√	√		√	√	√	√
	54454133	Fuzzy Theory	Basic	√		√		√	√	√		√	√	√	√
	54454143	Functional Analysis 1	Basic	√		√		√	√	√		√	√	√	√

2023-2024	54454294	Calculus Variations	Basic	√		√		√	√	√		√	√	√	√
	-	Differential geometry	Basic	√		√		√	√	√		√	√	√	√
	-	Professional ethics	Basic	√		√									
	-	English	Basic	√		√									
4th year (applied) 2nd Course 2023-2024	54454213	Complex Analysis 2	Basic	√		√		√	√	√		√	√	√	√
	54454274	Numerical Solutions of Integral Equations	Basic	√		√		√	√	√		√	√	√	√
	54454243	Functional Analysis 2	Basic	√		√		√	√	√		√	√	√	√
	54454223	Applied Control Theory	Basic	√		√		√	√	√		√	√	√	√
	54454283	Quantum Mechanics	Basic	√		√		√	√	√		√	√	√	√
	54454262	Project	Basic	√		√		√	√	√		√	√	√	√
4th year (Operation Research and Statistics) 1st course	54454113	Multivariate Analysis	Basic	√		√		√	√	√		√	√	√	√
	54454123	Statistical Inference 1	Basic	√		√		√	√	√		√	√	√	√
	54454133	Design and Analysis of Experiments	Basic	√		√		√	√	√		√	√	√	√

2023-2024	-	Composite Optimization Problems	Basic	√		√		√	√	√		√	√	√	√
	54453193	Problems in Scheduling 1	Basic	√		√		√	√	√		√	√	√	√
	-	English	Basic	√		√		√	√	√		√	√	√	√
4th year (Operation Research and Statistics) 2nd course 2023-2024	54454273	Stochastic Process	Basic	√		√		√	√	√		√	√	√	√
	54454223	Statistical Inference 2	Basic	√		√		√	√	√		√	√	√	√
	-	Fuzzy Set	Basic	√		√		√	√	√		√	√	√	√
	54453293	Problems in Scheduling 2	Basic	√		√		√	√	√		√	√	√	√
	54454224	Simulation	Basic	√		√		√	√	√		√	√	√	√
	54454262	Project	Basic	√		√		√	√	√		√	√	√	√

- Please tick the boxes corresponding to the individual program learning outcomes under evaluation.

Course Description Form

1. Course Name:					
2. Course Code:					
54452233					
3. Semester / Year:					
4. Description Preparation Date:					
5. Available Attendance Forms:					
6. Number of Credit Hours (Total) / Number of Units (Total)					
7. Course administrator's name (mention all, if more than one name)					
Name:					
Email:					
8. Course Objectives					
Course Objectives			• • •		
9. Teaching and Learning Strategies					
Strategy					
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
11. 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					
12. Learning and Teaching Resources					

Required textbooks (curricular books, if any)	
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

1-Course Name					
Probability					
2- Course Code					
54452133					
3- Semester/Year					
First course / 2024-2023					
4-Description Preparation Date					
15/10/2023					
5-Available Attendance					
Weekly attendance					
6- Number of Credit Hours (Total) / Number of Units (Total)					
4 hours per week / 60 hours per semester					
7-Course Administrators Name					
Asst. prof. Nadia Jaffer Fezea abualhassan76@yahoo.com Asst. prof. Dr. Ekbal Jabbar eqbaljabar2019@gmail.com					
8- Course Objective					
This subject provides an overview of the concepts in real probability theory and statistics which useful in widely and variety subjects in mathematical statistics and its applications. The learner will be able to determine all theoretical concepts of probability theory and statistics and solving all problems of probability and distribution functions.					
9-Teaching and Learning Strategies					
• Lectures • Oral discussions • Tests • Reports					
10- Course Structure					
Week	Hours	Required learning outcomes	Unit or subject name	Learning method	Evaluation method
1	4	A review of Permutation and Combination		Theoretical lectures	Test
2	4	Some Basic Concepts of Probability		Theoretical lectures	Homework
3	4	Properties of the Probability		Theoretical lectures	Oral Exam

4	4	Independent events, Independent of three events		Theoretical lectures	Homework
5	4	Daily exam		Theoretical lectures	Report
6	4	Conditional Probability		Theoretical lectures	Test
7	4	Total Probability theorem Bayes theorem		Theoretical lectures	Homework
8	4	Monthly exam		Theoretical lectures	Oral Exam
9	4	Random Variables; Probability mass function		Theoretical lectures	Homework
10	4	Probability density function		Theoretical lectures	Report
11	4	Cumulative Distribution Function		Theoretical lectures	Oral Exam
12	4	Mathematical Expectation		Theoretical lectures	Homework
13	4	The Variance , Moments		Theoretical lectures	Oral Exam
14	4	Moment generating function		Theoretical lectures	Homework
15	4	Monthly exam		Theoretical lectures	Homework
11- Course Evaluation					
[1] Probability and Statistics: A course for physicists and Engineers, BY Arak M.Mathai,Hans J. Haubold,2017					
[2]: Introduction to Probability, Charles M. Grinstead, James L. Snell,2012					
12-Learning and Teaching Resources					

Course Description Form

13. Course Name:
Theory of Ordinary Differential Equations I
14. Course Code:
54452114
15. Semester / Year:
First Semester / 2024-2023
16. Description Preparation Date:
17/10/2023
17. Available Attendance Forms:
Attendees Weekly
18. Number of Credit Hours (Total) / Number of Units (Total)
5 hours / 75 hours

19. Course administrator's name (mention all, if more than one name)					
Name: Assistant Professor Dr. Kasim Abbas Hussain Email: kasimabbas@uomustansiriyah.edu.iq					
20. Course Objectives					
Course Objectives		A detailed study in The existence and uniqueness theorems for first, second and higher order differential equations. The existence and uniqueness theorem of second and higher order linear nonhomogeneous differential equations. Linear homogeneous and nonhomogeneous systems: solution and verification of the solution.			
21. Teaching and Learning Strategies					
Strategy		• Lectures • Discussions • Tests			
22. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	5	First-Order Differential Equations	existence and uniqueness theorems	theoretical Lectures	Exam, tests, assignments
2	5	Linear Differential Equations of second Order ODEs	linear homogeneous equations	theoretical Lectures	Exam, tests, assignments
3	5	Linear Differential Equations of second Order ODEs	Theorems for the general solution of second and higher ODEs	theoretical Lectures	Exam, tests, assignments
4	5	Linear Differential Equations of second Order ODEs	Linear independence theorems for the solution of second and higher order	theoretical Lectures	Exam, tests, assignments
5	5	Linear Differential Equations of second Order ODEs	Second and Higher order linear nonhomogeneous equations	theoretical Lectures	Exam, tests, assignments
6	5	Linear Differential Equations of second Order ODEs	Wronskian determinant	theoretical Lectures	Exam, tests, assignments
7	5	Exam	Monthly Exam		Exam
8	5	Linear Differential Equations of second Order ODEs	Solution of second and higher order linear differential equations with constant coefficients	theoretical Lectures	Exam, tests, assignments
9	5	Linear Differential Equations of second Order ODEs	Reduction the order of linear differential equations of second and of higher order.	theoretical Lectures	Exam, tests, assignments
10	5	Linear Systems of Ordinary Differential Equations	Linear homogeneous and nonhomogeneous systems: solution and verification of the solution	theoretical Lectures	Exam, tests, assignments
11	5	Linear Systems of Ordinary Differential Equations	Reducing an initial value problem to a system of 1st order differential equations	theoretical Lectures	Exam, tests, assignments

12	5	Linear Systems of Ordinary Differential Equations	Linear homogeneous system: Solution matrix and fundamental matrix, theorems	theoretical Lectures	Exam, tests, assignments
13	5	Linear Systems of Ordinary Differential Equations	Fundamental matrix calculation: exponential method and the eigenvalue and eigenvector meth	theoretical Lectures	Exam, tests, assignments
14	5	Linear Systems of Ordinary Differential Equations	Linear nonhomogeneous system differential equations: particular solution	theoretical Lectures	Exam, tests, assignments
15	5	Exam	Monthly Exam		Exam

23. 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, etc

24. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Ordinary Differential Equations by Fred Brauer
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

25. Course Name:	
Theory of Ordinary Differential Equations II	
26. Course Code:	
54452214	
27. Semester / Year:	
Second Semester / 2024-2023	
28. Description Preparation Date:	
4-2-2024	
29. Available Attendance Forms:	
Attendees Weekly	
30. Number of Credit Hours (Total) / Number of Units (Total)	
5 hours / 75 hours	
31. Course administrator's name (mention all, if more than one name)	
Name: Assistant Professor Dr. Kasim Abbas Hussain Email: kasimabbas@uomustansiriyah.edu.iq	
32. Course Objectives	
Course Objectives	A detailed study in the existence and uniqueness theory of first order differential equation, boundary value problems, fixed (critical) points, orbits, phase portrait, stability and the Laplace transforms for solving linear system of differential equations.
33. Teaching and Learning Strategies	
Strategy	• Lectures

		• Discussions • Tests			
34. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	5	Existence and Uniqueness theory of first order differential equation	Existence of solution: successive approximation “ Picard approximations”, Lipsch condition, continuity	theoretical Lectures	Exam, tests, assignments
2	5	Existence and Uniqueness theory of first order differential equation	Gronwall inequality, Uniqueness solutions, Continuation of solution	theoretical Lectures	Exam, tests, assignments
3	5	Boundary Value Problems	Homogeneous and non Homogeneous boundary value problems; Green function	theoretical Lectures	Exam, tests, assignments
4	5	Boundary Value Problems	Self-Adjoint ; Sturm Liouville problems	theoretical Lectures	Exam, tests, assignments
5	5	Boundary Value Problems	Second and Higher order linear nonhomogeneous equations	theoretical Lectures	Exam, tests, assignments
6	5	Fixed (critical) points , Orbits, Phase portrait, Stability	Two dimensional linear systems differential equation: fixed points	theoretical Lectures	Exam, tests, assignments
7	5	Exam	Monthly Exam		Exam
8	5	Fixed (critical) points , Orbits, Phase portrait, Stability	General solution and Jordan canonical form for two dimensional homogeneous linear systems of differential equations	theoretical Lectures	Exam, tests, assignments
9	5	Fixed (critical) points , Orbits, Phase portrait, Stability	Classification for critical points and their stability for two dimensional homogeneous linear systems of differential equations: Types of Phase diagram	theoretical Lectures	Exam, tests, assignments
10	5	Fixed (critical) points , Orbits, Phase portrait, Stability	Classification for critical points and their stability for two dimensional nonhomogeneous linear systems of differential equations: Types of Phase diagram	theoretical Lectures	Exam, tests, assignments
11	5	Fixed (critical) points , Orbits, Phase portrait, Stability	Classification of critical points and their Stability for the nonlinear systems of 1st order by Jacobian method (linearization method): Phase diagram	theoretical Lectures	Exam, tests, assignments
12	5	Fixed (critical) points , Orbits, Phase portrait, Stability	Classification of critical points and their Stability for the Nonlinear systems of 1st order by Lypanovs	theoretical Lectures	Exam, tests, assignments

			Method: Phase diagram		
13	5	The Laplace Transforms for solving linear system of differential equations	Laplace transforms, Inverse of Laplace transforms	theoretical Lectures	Exam, tests, assignments
14	5	The Laplace Transforms for solving linear system of differential equations	Solving linear and linear systems differential equations with constant coefficients	theoretical Lectures	Exam, tests, assignments
15	5	Exam	Monthly Exam		Exam
35. 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. etc					
36. Learning and Teaching Resources					
Required textbooks (curricular books, if any)			Ordinary Differential Equations by Fred Brauer		
Main references (sources)					
Recommended books and references (scientific journals, reports...)					
Electronic References, Websites					

Course Description Form

1. Course Name:	
Theory of Differential Equations I	
2. Course Code:	
54454124	
3. Semester / Year:	
1 st Semester / 2024-2023	
4. Description Preparation Date:	
15-10-2023	
5. Available Attendance Forms:	
Weekly Attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
5 Hours per week (Total Number of Hours 75) / 4 Units	
7. Course administrator's name (mention all, if more than one name)	
Name: Professor Dr. Jamil Amir Ali Name: Asst. Prof. Lmyaa Hussian Ali Email: jhawassy17@uomustansiriyah.edu.iq Email: lmya_h2@uomustansiriyah.edu.iq	
8. Course Objectives	
Course Objective	Student will learn about the existence theorems of a unique solution for the ODEs order 1,2 till to order n. also will learn about the existence of a unique solution for the 2 nd order (and then nth order) linear nonhomogeneous ODEs. Wronskian Determinants and its relation with independence for the solutions of the 2 nd order linear homogeneous ODEs. Method of

	Variations of constants for solving 2 nd order (and then nth order) linear nonhomogeneous ODEs. Study of the existence theorem of a unique solution for nonhomogeneous linear system of 1 st order ODEs solution. Fundamental matrix, the particular solution nonhomogeneous linear system of 1 st order ODEs. Exponential matrix method and the eigenvalue method for solving homogeneous linear system of 1 st order ODEs. Lipschitz conditions, Picard successive approximation method for solving 1 st order ODEs, proof of the existence theorem for a solution of the 1 st order ODE in rectangular region and then extension this solution into any region in the plane general.
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9. Teaching and Learning Strategies

Strategy	Lectures Quizzes Examinations Reports
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10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	5	Test the existence for a unique solution of the for the ODEs of order 1,2 till to order n.	the existence theorems of a unique solution for the ODEs of order 1,2 till to order n.	Theoretical Lectures and Exercises for Solutions	Examinations, discussion, reports , homework
2	5	Find the solutions of the homogeneous ODEs with constant coefficients of 1 st , 2 nd , and nth order	Solutions of the homogeneous ODEs with constant coefficients of 1 st , 2 nd , and nth order .	=	
3	5	Test the interval of existence solution for linear ODEs of order 2 with variable coefficients	The existence theorem of a unique solution for linear ODEs of order 2 with variable coefficients	=	
4	5	Test the interval of existence solution For linear ODEs of order n with variable coefficients	Generalization for the existence theorem of a unique solution for linear ODEs of order n with variable coefficients	=	
5	5	Calculate the Wronskian determinants, and the Independence of the solutions of the 2 nd order linear homogeneous ODEs	Wronskian determinants and theorems about the relation between the independence for the solutions of the 2 nd order linear homogeneous ODEs		

6	5	Calculate the Wronskian determinants, and the Independence of the solutions of the n-th order linear homogeneous ODEs	Generalization for the Wronskian determinants and theorems about the relation between the independence for the solutions of the n-th order linear homogeneous ODEs		
7	5	Learn how they find the 2 nd independent solution from a given solution for linear homogeneous ODEs of 2 nd order	Find the second independent solution from a given solution for linear homogeneous ODEs of 2 nd order		
8	5		Monthly examination		
9	5	Learn how they find the solution of 2 nd , up to nth order linear nonhomogeneous ODEs.	Method of Variations of constants for solving 2 nd order (and then nth order) linear nonhomogeneous ODEs. The equivalent between the n th order ODEs and the linear system of 1 st order ODEs		
10	5	Find particular Solution for ofr nonhomogeneous linear system of 1 st order ODEs, the exponetional matrix	The particular solution for nonhomogeneous linear system of 1 st order ODEs, the exponetional matrix, and the solution of homogenous linear system of 1 st order ODEs.		
11	5	Find Eigenvalue and eigenvector method for solving linear homogeneous system of 1 st order ODEs	Eigenvalue and eigenvector method for solving linear homogeneous system of 1 st order ODEs		
12	5	Learn how they Transform the n-th Order ODEs to a system of 1 st order ODEs.	The equivalent between the n-th order and 1 st degree of ODEs and the integral equation		
13	5	Use the Picard method to solve the 1 st order ODEs	Picard successive approximation method for solving 1 st order and 1 st degree of ODEs		

14	5	Test the existence of a unique solution. Learn the technique of proof .	Proof of the 1 st order ODEs of 1 st degree in a rectangular region then generalization the existence solution to a general regions, the uniqueness of the solution.		
15	5		Monthly examination		
11. Course Evaluation					
Distributing the score out of 100 according to the tasks assigned to the student such as 20% monthly examinations 5% reports 5% home works 70% final examinations					
12. Learning and Teaching Resources					
Required textbooks (curricular books, if any)			A First course of Ordinary Differential Equations by F. Brauer and J. A. Nohel, 2nd edition 1973		
Main references (sources)			A textbook of ordinary differential equations, by Shair A. and Antonio A., 2nd edition, 2015 Springer.		
Recommended books and references (scientific journals, reports...)			Ordinary differential equations by George F. Simmons		
Electronic References, Websites			Students can have followed their academic profile		

Course Description Form

1. Course Name:	
Theory of Differential Equations II	
2. Course Code:	
54454125	
3. Semester / Year:	
2 nd Semester / 2024-2023	
4. Description Preparation Date:	
4-2-2024	
5. Available Attendance Forms:	
Weekly Attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
5 Hours per week(Total Number of Hours 75)/ 4 Units	
7. Course administrator's name (mention all, if more than one name)	
Name: Professor Dr. Jamil Amir Ali Name: Asst. Prof. Lmyaa Hussian Ali Email: jhawassy17@uomustansiriyah.edu.iq Email: lamya_h2@uomustansiriyah.edu.iq	
8. Course Objectives	
Course Objecti	Student will learn about the Eigenvalue problems for homogeneous boundary value problems, Eigenvalue problems for nonhomogeneous boundary value problems and

	the Green's functions, generalization of Green's functions. Sturm-Liouville problem and self adjoint operators. Phase portrait, stability for 1st order linear differential homogeneous 2x2 systems type 1,2,3,4 (Jordan Form) and their classifications. Stability for 1st order linear differential homogeneous 2x2 systems (non canonical matrix) and their classifications. stability for 1st order linear differential nonhomogeneous 2x2 systems and their classification stability for 1st order nonlinear differential 2x2 systems and their classifications (Jacobi method). stability for 1st order nonlinear differential 2x2 systems and their classifications (Lyapunov's method). Laplace transform for solving system of differential equations with constants coefficients.
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9. Teaching and Learning Strategies

Strategy	Lectures Quizzes Examinations Reports
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10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	5	Solution for the Eigenvalue problems for homogeneous BVPs	Eigenvalue problems for homogeneous boundary value problems (BVPs)	Theoretical Lectures and Exercises for Solutions	Examinations, discussion, reports, homework
2	5	Solution for the Eigenvalue problems for homogeneous BVPs	Eigenvalue problems for homogeneous BVPs	=	
3	5	Eigenvalue problems for nonhomogeneous BVPs and the Green's functions	Eigenvalue problems for Nonhomogeneous BVPs and the Green's functions.	=	
4	5	Generalization for the Green functions	Generalization for the Green functions	=	
5	5	Sturm-Liouville problems and self adjoint operators	Sturm-Liouville problems and self adjoint operators		
6	5		Monthly examination		
7	5	Find the type and stability for 1 st Order linear differential homogeneous 2x2 systems	Phase portrait, stability for 1 st order Linear differential homogeneous 2x2 systems type 1,2 (Jordan Form) and their classifications.		
8	5	Find the type and stability for 1 st Order linear	Phase portrait, stability for 1 st order linear differential homogeneous 2x2		

		differential homogeneous 2x2 systems	systems type 3,4 (Jordan Form) and their classifications.		
9	5	Find the type and stability for the 1 st order linear differential homogeneous 2x2 systems (noncanonical matrix)	stability for 1 st order linear differential homogeneous 2x2 systems (non canonical matrix) and their classifications.		
10	5	Find the type and stability for 1 st order linear differential nonhomogeneous 2x2 systems ..	stability for 1 st order linear differential nonhomogeneous 2x2 systems and their classifications.		
11	5	Use the Jacobi method to find the stability for 1 st order nonlinear differential 2x2 systems	stability for 1 st order nonlinear differential 2x2 systems and their classifications.(Jacob i method)		
12	5	Use the Lyapunov's method to find the stability for 1 st order nonlinear differential 2x2 systems	stability for 1 st order nonlinear differential 2x2 systems and their classifications (Lyapunov's method)		
13	5	Solving system of diff. eqs. with constants coefficients by Laplace transform	Laplace transform for solving system of diff. eqs. with constants coefficients		
14	5	Solving system of diff. eqs. with constants coefficients by Laplace transform	Laplace transform for solving a system of diff. eqs. with constants coefficients		
15	5		Monthly examination		
11. Course Evaluation					
Distributing the score out of 100 according to the tasks assigned to the student such as 20% monthly examinations 5% reports 5% home works 70% final examination					

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	A First course of Ordinary Differential Equations by Brauer and J. A. Nohel, 2nd edition 1973
Main references (sources)	A textbook of ordinary differential equations, by Shai A. and Antonio A., 2nd edition, 2015 Springer.
Recommended books and references (scientific journals, reports...)	Ordinary differential equations by George F. Simmons
Electronic References, Websites	Students can have followed their academic profile

Course Description Form

1-Course Name
Partial Differential Equations
2- Course Code
54453294
3- Semester/Year
Third class / First course / Applied Mathematics, 2024-2023
4-Description Preparation Date
15/10/2023
5-Available Attendance
Weekly attendance
6- Number of Credit Hours (Total) / Number of Units (Total)
4 hours per week / 60 hours per semester
7-Course Administrators Name
Asst. prof. Dr. Ghazwa Faisal Abd , Email: k.abd@uomustansiriyah.edu.iq Shamia mohammed Dawod Email: shamaa_84@uomustansiriyah.edu.iq
8- Course Objective
Understand the Fundamentals of PDEs: Students will learn the basic types of partial differential equations (such as elliptic, parabolic, and hyperbolic), their physical interpretations, and the underlying principles governing them. Mathematical Formulation: Develop the ability to model real-world problems from physics, engineering, and other fields using partial differential equations. Solution Methods: Master classical methods for solving PDEs, such as separation of variables, Fourier series, transform methods, and Green's functions. Boundary and Initial Conditions: Understand how to apply appropriate boundary and initial conditions to make problems well-posed and solvable. Application of PDEs in Various Fields: Apply PDEs to solve problems in fluid dynamics, heat transfer, wave propagation, quantum mechanics, and other areas
9-Teaching and Learning Strategies
• Lectures • Oral discussions • Tests • Reports
10- Course Structure

Week	Hours	Required learning outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Students will learn the basic types of partial differential equations (such as elliptic, parabolic, and hyperbolic	Basic concept in partial differential equation and Classification of partial differential equation.	Theoretical lectures	Test
2	4	Develop the ability to model real-world problems from physics, engineering, and other fields using partial differential equations	Standard form of partial differential equation and solution of partial differential equation.	Theoretical lectures	Homework
3	4	Enhance critical thinking skills by analyzing complex PDE problems and applying appropriate solution strategies	solve linear homogeneous partial differential equation of first order.	Theoretical lectures	Oral Exam
4	4	Develop a deeper theoretical understanding of the existence, uniqueness, and stability of solutions to PDEs.	higher order partial differential equation.	Theoretical lectures	Homework
5	4	Learning about : Cauchy's method, Charpit's method, Jacobi's method.	Nonlinear partial differential equation	Theoretical lectures	Report
6	4	Understanding the Theory of Nonhomogeneous PDEs: Classification: Students should be able to classify PDEs as elliptic, parabolic, or hyperbolic and understand how these	Nonhomogeneous partial differential equation.	Theoretical lectures	Test

		classifications apply to nonhomogeneous equations.			
7	4	Boundary and Initial Conditions: Handling Different Boundary Conditions: Understand how different types of boundary conditions (Dirichlet, Neumann, or mixed) affect the solution of nonhomogeneous PDEs. Solving with Given Initial Conditions: Solve time-dependent nonhomogeneous PDEs using appropriate initial conditions.	Initial-boundary value problem. Even and odd functions and The Hessian matrix.	Theoretical lectures	Homework
8	4	Learning Solution Techniques: Method of Separation of Variables: Apply separation of variables to solve nonhomogeneous problems, when possible. Fourier Series and Transforms: Use Fourier series and Fourier transforms to solve nonhomogeneous boundary and initial value problems.	Fourier series, Half-range sine and cosine Fourier series.	Theoretical lectures	Oral Exam
9	4	Use Fourier series Change interval	Fourier series: Change interval.	Theoretical lectures	Homework

		to solve nonhomogeneous boundary and initial value problems			
10	4	Fourier Series and Transforms: Use Fourier series and Fourier transforms to solve nonhomogeneous boundary and initial value problems.	Fourier transformation.	Theoretical lectures	Report
11	4	Interpreting Physical Meaning: Understand the physical implications of the terms in nonhomogeneous PDEs, particularly in models of heat, wave propagation, diffusion, or fluid dynamics.	Separation of variables: Heat-flow problem.	Theoretical lectures	Oral Exam
12	4	Particular Solution Techniques: Method of Undetermined Coefficients: Learn how to find particular solutions to nonhomogeneous PDEs using undetermined coefficients.	Non-homogenous Heat-flow problem.	Theoretical lectures	Homework
13	4	Solve real-world problems involving nonhomogeneous PDEs, such as heat conduction with a source term, wave	Wave problem.	Theoretical lectures	Oral Exam

		equations with external forcing, or fluid flow.			
14	4	Variation of Parameters: Use variation of parameters for solving nonhomogeneous PDEs.	Non-homogenous Wave problem.	Theoretical lectures	Homework
15	4	Interpreting Physical Meaning: Understand the physical implications of the terms in nonhomogeneous PDEs, particularly in models of heat, wave propagation, diffusion, or fluid dynamics.	Laplace equation in two dimensional space. Laplace equation in three dimensional space.	Theoretical lectures	Homework

11- Course Evaluation

The final grade is 100% and is divided as follows:

- Monthly exam 20 points
- Reports 5 points
- Tests and assignments 5 points
- Final exam 70 points

12-Learning and Teaching Resources

- [1] Partial Differential Equations for Scientists and Engineers, By Stanley J. Farlow,(1993).
 [2] Partial Differential Equations with Fourier series and Boundary value Problems, Second Edition, By Nakhle H. Asmar, (2005).
 [3] Introduction to Partial Differential Equations, By Peter J. Olver (2014).

Corse Description Form

1-Course Name
Calculus of variation
2- Course Code
54454294
3- Semester/Year
Fourth class / First course / Applied Mathematics, 2024-2023
4-Desacription Preparation Date
15/10/2023
5-Available Attendance
Weekly attendance

6- Number of Credit Hours (Total) / Number of Units (Total)					
4 hours per week / 60 hours per semester					
7-Course Administrators Name					
Prof. Dr. Radhi Ali Zaboon			Email: Radhizaboon@gmail.com		
Asst. prof. Dr. Ghazwa Faisal Abd			, Email: k.abd@uomustansiriyah.edu.iq		
8- Course Objective					
course aims to provide students with a deep understanding of the principles and methods used to find functions that optimize functionals, which typically depend on curves or surfaces. Students will: • Learn to formulate variational problems in mathematical and physical contexts. • Master the Euler-Lagrange equation and its applications to minimize or maximize functionals. • Explore both classical and modern methods of solving boundary value problems in variational calculus. • Apply these techniques to various fields such as physics, engineering, and economics, emphasizing practical problem-solving and theoretical insight.					
9-Teaching and Learning Strategies					
• Lectures • Oral discussions • Tests • Reports					
10- Course Structure					
Week	Hours	Required learning outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Students will understand the definition of functionals and norms and be able to solve basic variational problems involving functionals.	Functionals and some basic concept on norms, some simple variational problems	Theoretical lectures	Test
2	4	Students will learn to identify and apply the necessary conditions for finding extrema of functionals in variational problems.	The necessary condition for extremum	Theoretical lectures	Homework
3	4	Students will derive Euler's equation as a solution to the simplest variation problem and understand its significance in variational calculus	The simplest variation problem, Euler's equation	Theoretical lectures	Oral Exam
4	4	Students will analyze various examples that illustrate the application of Euler's	Examples and application of Euler's equation	Theoretical lectures	Homework

		equation in solving practical variational problems.			
5	4	Students will explore Ostrogradsky's equation in the context of variational calculus with two independent variables and understand its formulation.	The case of two independent variables ostrogradsky's equation	Theoretical lectures	Report
6	4	Students will solve specific examples of Ostrogradsky's equation, applying the theoretical concepts learned in class.	Examples on ostrogradsky's equation	Theoretical lectures	Test
7	4	Students will extend the principles of calculus of variations to functionals involving several independent variables and understand their complexities.	The case of several (n) independent variables	Theoretical lectures	Homework
8	4	Students will work through various examples to solidify their understanding of variational problems with multiple independent variables.	Examples on several case	Theoretical lectures	Oral Exam
9	4	Students will learn to formulate and approach fixed point problems in the context of unknown functions within variational frameworks.	Fixed point problem for unknown function	Theoretical lectures	Homework
10	4	Students will examine examples involving n dependent variables and apply variational principles to solve them.	Examples of (n) dependent variables	Theoretical lectures	Report
11	4	Students will understand the concept of geodesies in the context of calculus of variations and their	Geodesies	Theoretical lectures	Oral Exam

		importance in differential geometry.			
12	4	Students will analyze functionals that involve higher-order derivatives and understand the implications for the calculus of variations.	Functional depending on higher order derivatives	Theoretical lectures	Homework
13	4	Students will apply the concepts of higher-order derivatives in variational calculus to solve practical problems in physics and engineering.	Application of this case	Theoretical lectures	Oral Exam
14	4	Students will learn to handle functionals defined with free boundaries and understand the implications for variational problems.	Functional with free boundary { free end points}	Theoretical lectures	Homework
15	4	Students will explore illustrations of functionals with free end points, enhancing their understanding of the complexities involved in these scenarios.	Some illustration on the Functional free end points	Theoretical lectures	Homework
11- Course Evaluation					
The final grade is 100% and is divided as follows: • Monthly exam 20 points • Reports 5 points • Tests and assignments 5 points • Final exam 70 points					
12-Learning and Teaching Resources					
<u>Textbooks:</u> [1] Calculus of variation by I.Gelfand [2] Differential equations and the calculus of variations by L.Elsgolts <u>Suggested references:</u> [1] Calculus Of Variations, With Applications to Physics And Engineering by Robert Wienstock					

Corse Description Form

1-Course Name					
Optimal Control Theory					
2- Course Code					
54454123					
3- Semester/Year					
Fourth class / Second course / Applied Mathematics, 2024-2023					
4-Desacription Preparation Date					
15/10/2023					
5-Available Attendance					
Weekly attendance					
6- Number of Credit Hours (Total) / Number of Units (Total)					
4 hours per week / 60 hours per semester					
7-Course Administrators Name					
Prof. Dr. Radhi Ali Zaboon Email: Radhizaboon@gmail.com					
Asst. prof. Dr. Ghazwa Faisal Abd , Email: k.abd@uomustansiriyah.edu.iq					
8- Course Objective					
Understand Basic Concepts: Gain an understanding of the fundamental principles of optimal control theory, including the formulation of control systems and the optimization of dynamic systems. Mathematical Foundations: Develop the mathematical tools necessary to analyze and solve optimal control problems, such as calculus of variations, dynamic programming, and Pontryagin's Maximum Principle. Modeling and Analysis: Learn how to model real-world systems using control theory and analyze the stability, controllability, and observability of these systems. Design of Optimal Controllers: Apply theoretical concepts to design optimal control strategies for both linear and nonlinear systems. Explore Applications: Study the application of optimal control in various fields such as engineering, economics, robotics, and aerospace.					
9-Teaching and Learning Strategies					
• Lectures • Oral discussions • Tests • Reports					
10- Course Structure					
Week	Hours	Required learning outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Understand the concept of control systems and optimal control, and apply these concepts to real-world examples such as trajectory optimization or resource management.	Control and optimal control with example.	Theoretical lectures	Test
2	4	Develop a solid foundation in formulating and solving optimization problems by applying	Some basic concepts of optimization problems	Theoretical lectures	Homework

		concepts like objective functions and constraints.			
3	4	Learn to use Lagrange multipliers and the calculus of variations to solve constrained optimization problems, with practical examples to illustrate these techniques.	Lagrange multipliers and calculus of variations with classifications and examples.	Theoretical lectures	Oral Exam
4	4	Apply the Hamiltonian framework to optimize systems with continuous, unbounded control variables.	Optimal control with unbounded control (continuous):the Hamiltonian.	Theoretical lectures	Homework
5	4	Understand and apply both necessary and sufficient conditions for optimality in control problems, such as Pontryagin's Maximum Principle.	Necessary condition of optimality and Sufficient condition of optimality.	Theoretical lectures	Report
6	4	Learn to implement transversality conditions in optimal control problems, particularly in cases involving terminal constraints or free final time.	Transversality conditions with applications.	Theoretical lectures	Test
7	4	Analyze and solve optimal control problems that involve specific constraints at the terminal time, such as fixed endpoints.	Optimal control problem with terminal constraints	Theoretical lectures	Homework
8	4	Explore methods for solving control problems where the final time is not fixed, allowing for optimization of both control variables and time.	Optimal control problem with free time, terminal time.	Theoretical lectures	Oral Exam
9	4	Understand the mathematical conditions that must be satisfied for a system to be controllable, and apply these principles to real-world problems.	Optimal control problem with constraints on the state variables.	Theoretical lectures	Homework
10	4	Extend the principles of optimal control to situations where both	Optimal control problem with unspecified	Theoretical lectures	Report

		time and state at the endpoint can be optimized, using necessary conditions for optimality.	boundary conditions, terminal time with examples.		
11	4	Apply linear quadratic control theory to design both open-loop and closed-loop control strategies for minimizing a quadratic cost function.	Linear quadratic optimal control with open loop control and closed loop control.	Theoretical lectures	Oral Exam
12	4	Solve target problems where the objective is to drive a system to a specific state, using real-world applications like missile guidance or robotic control.	Target problem with application.	Theoretical lectures	Homework
13	4	Develop practical solutions for target problems, focusing on applications that require precise end-point control.	State controllable and complete state controllable.	Theoretical lectures	Oral Exam
14	4	Understand the concept of output controllability and apply it to design systems that can achieve desired output behavior.	Out put controllable.	Theoretical lectures	Homework
15	4	Learn the fundamental conditions required for the controllability of a dynamic system and apply these conditions to practical control problems.	Necessary condition for controllability.	Theoretical lectures	Homework

11- Course Evaluation

The final grade is 100% and is divided as follows:

- Monthly exam 20 points
- Reports 5 points
- Tests and assignments 5 points
- Final exam 70 points

12-Learning and Teaching Resources

- [1] Optimal Control Theory: An Introduction by Donald E. Kirk, 1998
 [2] Introduction to Optimal Control theory by Jack Macki, Aaron Strauss, 1982
 [3] Calculus of Variations and Optimal Control Theory, by Daniel Liberzon, 2012

Course Description Form

1-Course Name

Differential Geometry

2- Course Code					
54453294					
3- Semester/Year					
Third class / Second course / Applied Mathematics, 2024-2023					
4-Description Preparation Date					
15/10/2023					
5-Available Attendance					
Weekly attendance					
6- Number of Credit Hours (Total) / Number of Units (Total)					
4 hours per week / 60 hours per semester					
7-Course Administrators Name					
Asst. prof. Dr. Ghazwa Faisal Abd , Email: k.abd@uomustansiriyah.edu.iq Shamia mohammed Dawod Email: shamaa_84@uomustansiriyah.edu.iq					
8- Course Objective					
The course objectives of a Differential Geometry course typically focus on equipping students with an understanding of the geometric properties of curves, surfaces, and higher-dimensional manifolds using calculus and linear algebra and Understanding of Curves and Surfaces in Euclidean Space Develop a deep understanding of the geometry of curves and surfaces in three-dimensional Euclidean space, including concepts such as curvature and torsion of curves, and Gaussian curvature of surfaces.					
9-Teaching and Learning Strategies					
• Lectures • Oral discussions • Tests • Reports					
10- Course Structure					
Week	Hours	Required learning outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Students will be able to analyze and interpret the properties of Euclidean space, utilize natural coordinate functions, and apply pointwise principles to understand geometric structures and solve related mathematical problems.	Euclidean space E^n, E^3 , natural coordinate functions, pointwise principles , Exercises.	Theoretical lectures	Test
2	4	Students will be able to define and compute tangent vectors and vector fields, and apply these concepts to describe and analyze directional properties of curves and surfaces in differential geometry.	Tangent vectors, vector field, Exercises.	Theoretical lectures	Homework
3	4	Students will be able to compute directional	Directional derivatives in	Theoretical lectures	Oral Exam

		derivatives in the context of tangent vectors and evaluate the derivatives of vector fields, understanding how these derivatives describe changes in direction and magnitude across surfaces.	tangent vector, derivative of vector fields, Exercises.		
4	4		Curves in E^3 , Velocity in E^3 .	Theoretical lectures	Homework
5	4	Students will be able to apply the concept of reparametrization to curves, understanding how different parametrizations describe the same geometric curve and how to use them effectively in differential geometry.	Reparametrization of the curve, Exercises	Theoretical lectures	Report
6	4	Students will understand the role of 1-forms in differential geometry, including how to evaluate them on tangent vectors and vector fields, and how to convert a smooth function into a corresponding 1-form.	1-Forms: with tangent vector, with vector field, convert function into 1-forms Exercises.	Theoretical lectures	Test
7	4	Students will be able to work with differential forms and perform wedge products, gaining insight into antisymmetric bilinear operations that are foundational in exterior algebra.	Differential forms, wedge product	Theoretical lectures	Homework
8	4	Students will learn to compute the exterior derivative of differential forms, developing the ability to extend the concept of differentiation to higher-dimensional objects in differential geometry.	exterior derivative, Exercises.	Theoretical lectures	Oral Exam

9	4	Students will analyze the mapping of Euclidean spaces and understand how a curve is transformed under such mappings, with a focus on the image of the curve.	Mappings of Euclidean spaces, image of curve under map.	Theoretical lectures	Homework
10	4	Students will be able to compute the tangent map, regular maps, and Jacobian matrices of mappings, while understanding the role of frame fields in these computations.	Tangent map, regular map, Jacobian Matrix of mapping, Frame fields, Exercises	Theoretical lectures	Report
11	4	Students will understand how to compute dot products and Euclidean distances, and learn to construct the attitude matrix of a frame for orientation and position analysis.	Dot product, Euclidean distance, attitude matrix of the frame.	Theoretical lectures	Oral Exam
12	4	Students will be proficient in calculating norms in frame fields and performing cross products in vector spaces, applying these concepts to geometric problems.	Norms in frame field, Cross product	Theoretical lectures	Homework
13	4	Students will master the computation of covariant derivatives, understanding how to extend the concept of a derivative to curved spaces, preserving the geometric properties of a manifold.	Covariant Derivatives, Exercises	Theoretical lectures	Oral Exam
14	4	Students will gain a deep understanding of frame fields and their role in describing local bases for tangent spaces on a manifold.	Frame field, Exercises	Theoretical lectures	Homework
15	4	Students will understand the concept of connection forms and their application in	Connection Forms, Exercises	Theoretical lectures	Homework

		defining how vector fields change along curves, with an emphasis on parallel transport and curvature			
11- Course Evaluation					
The final grade is 100% and is divided as follows:					
• Monthly exam 20 points • Reports 5 points • Tests and assignments 5 points • Final exam 70 points					
12-Learning and Teaching Resources					
[1] Elementary Differential Geometry, Revised Second Edition, By Barrett O'Neill, (2006). [2] Schaum's Outline of Theory and Problems of Differential Geometry, By Martin M. Lipschutz, (1969). [3] Differential Geometry, Dover Edition, By Erwin Kreyszig.(1991) [4] Elementary Differential Geometry, Second Edition, By Andrew Pressley, (2010).					

Course Description Form

37. Course Name:	
Mathematical statistics	
38. Course Code:	
54453153	
39. Semester / Year:	
First Semester / (2023-2024)	
40. Description Preparation Date:	
15-10-2023	
41. Available Attendance Forms:	
Weekly Attendance	
42. Number of Credit Hours (Total) / Number of Units (Total)	
4 Hours per Week / 60 Hours during the Semester	
43. Course administrator's name (mention all, if more than one name)	
Name: Assistant Professor Huda Abdullah Rashid	
Email: hudamath@uomustansiriyah.edu.iq	
44. Course Objectives	
Course Objectives	• Finding the probability distribution of one or more variables. • Studying the probability distribution of ordered statistics. • The central purpose theory. • Relationship between some common probability distributions.
45. Teaching and Learning Strategies	
Strategy	Course Objectives This course covers methods for finding the probability distribution of one or more variables,

	which is a function of one or more of the identical and independent random variab in addition to. The course also includes studying the central purpose theory and relationship between some common probability distributions.				
46. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Sampling concept	Sampling concept	Theoretical lectures	Participation, assignments
2	4	The case of one variable	Distribution of function of random variable using Transformation of variables technique	Theoretical lectures	Participation, assignments
3	4	The case of two variables (with discrete type)	Distribution of function of random variable using Transformation of variables technique	Theoretical lectures	Participation, assignments
4	4	The case of two variables (with continuous type)	Distribution of function of random variable using Transformation of variables technique: i. The case of two variables	Theoretical lectures	Participation, assignments
5	4	Moment generating function technique	Moment generating function technique	Theoretical lectures	Participation, assignments
6	4	The cumulative distribution function technique	The cumulative distribution function technique	Theoretical lectures	Participation, assignments
7	4	Exam	Monthly exam	Exam	Monthly exam
8	4	Distribution of $\bar{x}$ for Normal distribution and Distribution of $n S^2 / \sigma^2$ for Normal distribution	Distribution of some statistics of Normal distribution	Theoretical lectures	Participation, assignments
9	4	Order statistics	Order statistics	Theoretical lectures	Participation, assignments
10	4	Central limit theory	Central limit theory	Theoretical lectures	Participation, assignments
11	4	Student's t distribution	Student's t distribution	Theoretical lectures	Participation, assignments
12	4	F - distribution	F - distribution	Theoretical lectures	Participation, assignments
13	4	1. Normal with some distributions	The relation between some distributions	Theoretical lectures	Participation, assignments
14	4	2. Gamma with some distributions	The relation between some distributions	Theoretical lectures	Participation, assignments
15	4	Exam	Monthly exam	Exam	Monthly exam
47. Course Evaluation					

- Monthly exam 20 marks
- Participation during the lecture and attendance
- Tests and assignments 5 marks
- Final exam 70 marks

48. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Introduction to Mathematical Statistics. Robert V. Hogg, Joseph W. McKean and Allen T. Craig (2013).
Main references (sources)	
Recommended books and references (scientific journals, reports...)	Introduction to mathematical statistics. Prof. Dr. Dhafir H. Rasheed and Ali A. Al-Wakil.
Electronic References, Websites	

Course Description Form

49. Course Name:	
Numerical Analysis I	
50. Course Code:	
54453144	
51. Semester / Year:	
1 st Course / 2024-2023	
52. Description Preparation Date:	
17-10-2023	
53. Available Attendance Forms:	
Weekly attendance	
54. Number of Credit Hours (Total) / Number of Units (Total)	
4 hours per week / 60 hours per semester	
55. Course administrator's name (mention all, if more than one name)	
Name: Prof. Dr. Nabaa Najdi Hasan, Email: alzaer1972@uomustansiriyah.edu.iq Name: Prof. Dr. Faez Hassan Ali, Email: faezhassan@uomustansiriyah.edu.iq Name: Asst. Prof. Dr. Sudad Khalil Ibraheem, Email: sudad1968@uomustansiriyah.edu.iq Name: Asst. Prof. Dr. Abdul khaleq Owaid Mazeel, Email: khaleqmazeel@uomustansiriyah.edu.iq	
56. Course Objectives	
Course Objectives	Study of numerical errors and their types, then discussing the numerical methods that contribute to solving nonlinear equations and systems of linear equations and numerical methods for solving them, and studying how to find the inclusion and numerical completion, as well as studying the methods of calculating the numerical derivative of differential equations. In each topic, more than one method is usually discussed and the most accurate methods are determined.
57. Teaching and Learning Strategies	
Strategy	- Lectures. - Oral discussions. - Tests. - Reports.

58. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Source of error, Classification of error, Number Representation, Absolute & Relative error	Numerical Error	Theoretical Lectures	Test, assignments, oral exam, report
2	4	Non-linear Equation, Locating Root, Bisection Method	Non-Linear Equations	Theoretical Lectures	Test, assignments, oral exam, report
3	4	Fixed-point Iteration Method, Fixed-point Theorem	Non-Linear Equations	Theoretical Lectures	Test, assignments, oral exam, report
4	4	Newton-Raphson Iteration Method, Secant Method, False-Position Method	Non-Linear Equations	Theoretical Lectures	Test, assignments, oral exam, report
5	4	Monthly Test	Error & Nonlinear system	Theoretical Test	Only Test
6	4	Linear System, Direct Method,	Linear system	Theoretical Lectures	Test, assignments, oral exam, report
7	4	Gauss elimination method, Indirect Method	Linear system	Theoretical Lectures	Test, assignments, oral exam, report
8	4	Gauss Jacobi Iterative Method	Linear System	Theoretical Lectures	Test, assignments, oral exam, report
9	4	Gauss-Seidel Method,	Linear System	Theoretical Lectures	Test, assignments, oral exam, report
10	4	Interpolation and Polynomials Approximate, Lagrange Interpolation Polynomials	Interpolation	Theoretical Lectures	Test, assignments, oral exam, report
11	4	Divided Difference, Newton	Interpolation	Theoretical Lectures	Test, assignments,

		interpolation formulae			oral exam, report
12	4	Newton's Forward Difference Interpolation polynomials	Interpolation	Theoretical Lectures	Test, assignments, oral exam, report
13	4	Newton's Backward Difference Interpolation polynomials	Interpolation	Theoretical Lectures	Test, assignments, oral exam, report
14	4	Numerical Differentiation.	Differentiation	Theoretical Lectures	Test, assignments, oral exam, report
15	4	Monthly Test	Linear system, Interpolation & Differentiation	Theoretical Test	Only Test

59. Course Evaluation

- Two months theoretical exam with a rate of 20 degrees.
- Reports for one course 5 degrees.
- Tests and assignments for one course 5 degrees.
- Practical tests 10 degrees, so the total is 40 degrees.
- Final exam (theoretical 48 points + practical 12) 60 degrees.

60. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Numerical Analysis 9 th Ed. By R. L. Burden and J. D. Faires, 2001.
Main references (sources)	Introduction to Numerical analysis, by T. Maraim, 2005.
Recommended books and references (scientific journals, reports...)	An Introduction to Numerical Methods and Analysis by J. F. Epperson, 2013.
Electronic References, Websites	

Course Description Form

61. Course Name:
Numerical Analysis II
62. Course Code:
54453144
63. Semester / Year:
2 nd Course / 2024-2023
64. Description Preparation Date:
4-2-2024
65. Available Attendance Forms:
Weekly attendance
66. Number of Credit Hours (Total) / Number of Units (Total)
4 hours per week / 60 hours per semester
67. Course administrator's name (mention all, if more than one name)

Name: Prof. Dr. Nabaa Najdi Hasan, Email: alzaer1972@uomustansiriyah.edu.iq
 Name: Prof. Dr. Faez Hassan Ali, Email: faezhassan@uomustansiriyah.edu.iq
 Name: Asst. Prof. Dr. Sudad Khalil Ibraheem, Email: sudad1968@uomustansiriyah.edu.iq
 Name: Asst. Prof. Dr. Abdul khaleq owaid mazeel, Email: khaleqmazeel@uomustansiriyah.edu.iq

68. Course Objectives

Course Objective	Study of numerical errors and their types, then discussing the numerical methods that contribute to solving nonlinear equations and systems of linear equations and numerical methods for solving them, and studying how to find the inclusion and numerical completeness as well as studying the methods of calculating the numerical derivative of differential equations. In each topic, more than one method is usually discussed and the most accurate methods are determined.
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69. Teaching and Learning Strategies

Strategy	• Lectures. • Oral discussions. • Tests. • Reports.
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70. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
16	4	Numerical Integrations: Trapezoidal Rule of Integration: Derivation of the Trapezoidal Rule, Error in Trapezoidal Rule.	Numerical Integrations	Theoretical Lectures	Test, assignments, oral exam, report
17	4	Simpson's 1/3 Rule, Simpson 3/8 Rule for Integration, Mid-Point Rule.	Numerical Integrations	Theoretical Lectures	Test, assignments, oral exam, report
18	4	Romberg Integration.	Numerical Integrations	Theoretical Lectures	Test, assignments, oral exam, report
19	4	Opened and closed Newton-Cotes methods.	Numerical Integrations	Theoretical Lectures	Test, assignments, oral exam, report
20	4	Composite Numerical Integration (Multiple Integrals).	Numerical Integrations	Theoretical Lectures	Test, assignments, oral exam, report
21	4	Monthly Test	Numerical Integrations	Theoretical Test	Only Test

22	4	Euler's Method for Ordinary Differential Equations and Taylor's Series Method.	Ordinary Differential Equations	Theoretical Lectures	Test, assignments, oral exam, report
23	4	Modified Euler Method.	Ordinary Differential Equations	Theoretical Lectures	Test, assignments, oral exam, report
24	4	Runge-Kutta 4th Order Method.	Ordinary Differential Equations	Theoretical Lectures	Test, assignments, oral exam, report
25	4	Systems of Differential Equations: Runge-Kutta 4th Order Method.	System of ODE's	Theoretical Lectures	Test, assignments, oral exam, report
26	4	Adam-Bashforth multi-step method Least Squares Approximation Methods.	System of ODE's	Theoretical Lectures	Test, assignments, oral exam, report
27	4	Higher Order Ordinary Differential Equations: Shooting method.	Higher Order of ODE	Theoretical Lectures	Test, assignments, oral exam, report
28	4	Numerical Solutions of BVPs for ODEs: Finite Difference Methods.	BVP's of ODE's	Theoretical Lectures	Test, assignments, oral exam, report
29	4	Numerical Solutions of PDEs: Finite Difference Methods for Parabolic Problems.	Partial Differential Equations	Theoretical Lectures	Test, assignments, oral exam, report
30	4	Monthly Test	ODE & PDE	Theoretical Test	Only Test

71. Course Evaluation

- Two months theoretical exam with a rate of 20 degrees.
- Reports for one course 5 degrees.
- Tests and assignments for one course 5 degrees.
- Practical tests 10 degrees, so the total is 40 degrees.
- Final exam (theoretical 48 points + practical 12) 60 degrees.

72. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Numerical Analysis 9 th Ed. By R. L. Bur and J. D. Faires, 2001.
Main references (sources)	Introduction to Numerical analysis, by T. Maraim, 2005.
Recommended books and references (scientific journals, reports...)	An Introduction to Numerical Methods & Analysis by J. F. Epperson, 2013.
Electronic References, Websites	

Course Description Form

73. Course Name:					
Practical Part, Numerical Analysis I					
74. Course Code:					
54453144					
75. Semester / Year:					
1 st Course / 2024-2023					
76. Description Preparation Date:					
17-10-2023					
77. Available Attendance Forms:					
Weekly attendance					
78. Number of Credit Hours (Total) / Number of Units (Total)					
4 hours per week / 60 hours per semester					
79. Course administrator's name (mention all, if more than one name)					
Name: Prof. Dr. Nabaa Najdi Hasan, Email: alzaer1972@uomustansiriyah.edu.iq Name: Prof. Dr. Faez Hassan Ali, Email: faezhassan@uomustansiriyah.edu.iq Name: Asst. Prof. Dr. Sudad Khalil Ibraheem, Email: sudad1968@uomustansiriyah.edu.iq Name: Asst. Prof. Dr. Abdul khaleq owaidee mazeel, Email: khaleqmazeel@uomustansiriyah.edu.iq Name: Asst. Prof. Dr. Sahar Ahmed Mohammed, Email: shuophd@uomustansiriyah.edu.iq Name: Asst. Prof. Dr. Zainab John Kallaf, Email: zainabjohn22@uomustansiriyah.edu.iq Name: Asst. Lecturer Safanah Faisal Yousif, Email: safanafaysal77@uomustansiriyah.edu.iq Name: Dr. Ali Abdu Rasool Abdul Husein, Email: aaabdulhussein@uomustansiriyah.edu.iq Name: Dr. Manal Ghassan Ahmed, Email: safanafaysal77@uomustansiriyah.edu.iq					
80. Course Objectives					
Course Objectives	The primary objective of the course is to develop the basic understanding of numerical algorithms and skill to implement algorithms to solve mathematical problem on computer. Introduction to numerical methods with emphasis on algorithm construction, analysis and implementation. Solutions of equations in one variable, polynomial approximation, direct solves for linear systems, indirect solves for linear systems.				
81. Teaching and Learning Strategies					
Strategy	- Practical Lectures. - Oral discussions. - Tests. - Reports.				
82. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
31	4	Absolute & Relative error	Numerical Integrations	Practical Lectures	Test, assignments, oral exam, report

32	4	Non-linear Equation, Locating Root, Bisection Method	Numerical Integrations	Practical Lectures	Test, assignments, oral exam, report
33	4	Fixed-point Iteration Method, Fixed-point Theorem	Numerical Integrations	Practical Lectures	Test, assignments, oral exam, report
34	4	Newton-Raphson Iteration Method, Secant Method	Numerical Integrations	Practical Lectures	Test, assignments, oral exam, report
35	4	False-Position Method	Numerical Integrations	Practical Lectures	Test, assignments, oral exam, report
36	4	Linear system, Direct Method, Matrices, Exam	Numerical Integrations	Practical Lectures	Only Test
37	4	Gauss elimination method, Indirect Method	Ordinary Differential Equations	Practical Lectures	Test, assignments, oral exam, report
38	4	Gauss Jacobi Iterative Method	Ordinary Differential Equations	Practical Lectures	Test, assignments, oral exam, report
39	4	Gauss-Seidel Method, Exam	Ordinary Differential Equations	Practical Lectures	Test, assignments, oral exam, report
40	4	Lagrange Interpolation Polynomials	System of ODE's	Practical Lectures	Test, assignments, oral exam, report
41	4	Divided Difference	System of ODE's	Practical Lectures	Test, assignments, oral exam, report
42	4	Newton interpolation formulae, Exam	Higher Order of ODE	Practical Lectures	Test, assignments, oral exam, report
43	4	Newton's Forward Difference Interpolation polynomials	BVP's of ODE's	Practical Lectures	Test, assignments, oral exam, report
44	4	Newton's Backward Difference Interpolation polynomials	Partial Differential Equations	Practical Lectures	Test, assignments, oral exam, report

45	4	Monthly Test	ODE & PDE	Practical Test	Only Test
83. Course Evaluation					
• Two months theoretical exam with a rate of 20 degrees. • Reports for one course 5 degrees. • Tests and assignments for one course 5 degrees. • Practical tests 10 degrees, so the total is 40 degrees. • Final exam (theoretical 48 points + practical 12) 60 degrees.					
84. Learning and Teaching Resources					
Required textbooks (curricular books, if any)			Numerical Analysis 9 th Ed. By R. L. Burden and D. Faires, 2001.		
Main references (sources)			Introduction to Numerical analysis, by T. Maraim, 2005.		
Recommended books and references (scientific journals, reports...)			An Introduction to Numerical Methods Analysis by J. F. Epperson, 2013.		
Electronic References, Websites					

Course Description Form

85. Course Name:
Numerical Analysis II (Practical) All Branches
86. Course Code:
54453144
87. Semester / Year:
2 nd Course / 2024-2023
88. Description Preparation Date:
4-2-2024
89. Available Attendance Forms:
Weekly attendance
90. Number of Credit Hours (Total) / Number of Units (Total)
2 hours per week / 30 hours per semester
91. Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Nabaa Najdi Hasan, Email: alzaer1972@uomustansiriyah.edu.iq Name: Prof. Dr. Faez Hassan Ali, Email: faezhassan@uomustansiriyah.edu.iq Name: Asst. Prof. Dr. Sudad Khalil Ibraheem, Email: sudad1968@uomustansiriyah.edu.iq Name: Asst. Prof. Dr. Abdul khaleq owaid mazeel , Email: khaleqmazeel@uomustansiriyah.edu.iq Name: Asst. Prof. Dr. Sahar Ahmed Mohammed, Email: shuophd@uomustansiriyah.edu.iq Name: Asst. Prof. Dr. Zainab John Kallaf. Email: zainabjohn22@uomustansirihay.edu.iq Name: Asst. Lecturer Safanah Faisal Yousif, Email: safanafaysal77@uomustansiriyah.edu.iq Name: Dr. Ali Abdul Rasool Abdul Husein, Email: aaabdulhussein@uomustansiriyah.edu.iq Name: Dr. Manal Ghassan Ahmed, Email: safanafaysal77@uomustansiriyah.edu.iq
92. Course Objectives

Course Objectives	Study of numerical errors and their types, then discussing the numerical methods that contribute to solving nonlinear equations and systems of linear equations and numerical methods for solving them, and studying how to find the inclusion and numerical completion, as well as studying the methods of calculating the numerical derivative of differential equations. In each topic, more than one method is usually discussed and the most accurate methods are determined.				
93. Teaching and Learning Strategies					
Strategy		• Lectures. • Oral discussions. • Tests.			
94. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
46	4	Trapezoidal Rule.	Numerical Integrations	Practical Lectures	Test, assignments
47	4	Simpson 1_3 Rule.	Numerical Integrations	Practical Lectures	Test, assignments
48	4	Simpson 3_8 Rule.	Numerical Integrations	Practical Lectures	Test, assignments
49	4	Romberg Rule.	Numerical Integrations	Practical Lectures	Test, assignments
50	4	Closed and Open Newton-Cotes Formul	Numerical Integrations	Practical Lectures	Test, assignments
51	4	Monthly Test	Numerical Integrations	Practical Test	Only Test
52	4	Euler Method.	Ordinary Differential Equations	Practical Lectures	Test, assignments
53	4	Plot_Euler's Method.	Ordinary Differential Equations	Practical Lectures	Test, assignments
54	4	Runge-Kutta (Order 4)	Ordinary Differential Equations	Practical Lectures	Test, assignments
55	4	Runge-Kutta system.	System of ODE's	Practical Lectures	Test, assignments
56	4	Taylor Method	System of ODE's	Practical Lectures	Test, assignments
57	4	Shooting method.	Higher Order of ODE	Practical Lectures	Test, assignments
58	4	Modified Euler method	BVP's of ODE's	Practical Lectures	Test, assignments
59	4	New Modified Euler method	Partial Differential Equations	Practical Lectures	Test, assignments

60	4	Monthly Test	ODE & PDE	Practical Test	Only Test
95. Course Evaluation					
• Two months theoretical exam with a rate of 20 degrees. • Reports for one course 5 degrees. • Tests and assignments for one course 5 degrees. • Practical tests 10 degrees, so the total is 40 degrees. • Final exam (theoretical 48 points + practical 12) 60 degrees.					
96. Learning and Teaching Resources					
Required textbooks (curricular books, if any)			Numerical Analysis 9 th Ed. By R. L. Burden and J. D. Faires, 2001.		
Main references (sources)			Introduction to Numerical analysis, by T. Maraim, 2005.		
Recommended books and references (scientific journals, reports...)			An Introduction to Numerical Methods and Analysis by J. F. Epperson, 2013.		
Electronic References, Websites					

Course Description Form

97. Course Name:	
Module theory 1	
98. Course Code:	
54454153	
99. Semester / Year:	
First, 2024 / 2023	
100. Description Preparation Date:	
15/ 10 / 2023	
101. Available Attendance Forms:	
Weakly Attendance	
102. Number of Credit Hours (Total) / Number of Units (Total)	
60 hours during the semester / 60 units during the semester	
103. Course administrator's name (mention all, if more than one name)	
Name: Dr.Saad Abdulkadhim Al-Saadi Email: saalsaadi@uomustansiriyah.edu.iq	
104. Course Objectives	
Course Objectives:	This subject presents the foundational material for the basic algebraic structures pervading contemporary pure mathematics, namely modules. The basic definitions and elementary results are given. Also, the concepts of submodule, quotient modules, internal direct sum, and basis are obtained.
105. Teaching and Learning Strategies	
Strategy	- Lectures - Oral discussions - Examinations

- scientific reports

106. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Definition and Examples Of modules	Basic definitions	Theoretical lectures	Test, assignments, oral exam, report
2	4	Some kind of modules.	Simple, cyclic, f.g. modules	Theoretical lectures	Test, assignments, oral exam, report
3	4	Submodules. Examples and properties of submodules.	submodules	Theoretical lectures	Test, assignments, oral exam, report
4	4	Generating set, basis, free set.	details of generating sets	Theoretical lectures	Test, assignments, oral exam, report
5	4	finitely generated module, Examples and results.	finitely generated	Theoretical lectures	Test, assignments, oral exam, report
6	4	Minimal and maximal submodules.	Max, and min, submodules	Theoretical lectures	Test, assignments, oral exam, report
7	4	Internal DirectSums of submodules.	Direct sum	Theoretical lectures	Test, assignments, oral exam, report
8	4	exam	Monthly exam		exam
9	4	Factor (quotient) Modules.	quotient Modules	Theoretical lectures	Test, assignments, oral exam, report
10	4	Homomorphisms of Modules.Definitions, properties and Examples.	Homomorphisms	Theoretical lectures	Test, assignments, oral exam, report
11	4	Factorization of Homomorphisms.	Factorizations	Theoretical lectures	Test, assignments, oral exam, report

12	4	Fundamental Isomorphism Theorems.	Isomorphism Theorems.	Theoretical lectures	Test, assignments, oral exam, report
13	4	Split epimorphisms , split monomorphisms.	Splits homo,	Theoretical lectures	Test, assignments, oral exam, report
14	4	The Theorem of JORDAN-HÖLDER-SCHREIER.	JORDAN-HÖLDER SCHREIER homo.	Theoretical lectures	Test, assignments, oral exam, report
15	4	exam	Monthly exam	Theoretical lectures	exam

107. Course Evaluation

The final mark of 100% is divided as follows:

- A monthly exam of 20 marks
- Reports 5 maks
- Tests and assignments, 5 marks
- Final exam: 70 marks

108. Learning and Teaching Resources

Required textbooks (curricular books, if any)	unavailable
Main references (sources)	Kasch, F. "Modules and rings" Academic Press London, 1982
Recommended books and references (scientific journals, reports...)	J. S. Golan and Tom Head, Modules and Structure of Rings: A Primer (Hardback, 1991).
Electronic References, Websites	https://libgen.is/

Description Form

109.	Course Name:
Module theory 2	
110.	Course Code:
54454253	
111.	Semester / Year:
Second, 2024 / 2023	
112.	Description Preparation Date:
15/ 10 / 2023	
113.	Available Attendance Forms:
Weakly Attendance	
114.	Number of Credit Hours (Total) / Number of Units (Total)
60 hours during the semester / 60 units during the semester	
115.	Course administrator's name (mention all, if more than one name)
Name: Dr.Saad Abdualkadhim Al-Saadi	
Email: saalsaadi@uomustansiriyah.edu.iq	

116. Course Objectives					
Course Objectives:		This subject presents the foundational material for direct product and external direct sum of modules and the relation between internal direct sum and external direct sum is discussed. Also, in this course the concept of free modules is studied. Moreover, the concepts of Noetherian and Artinian modules are obtained. Characterizations, results and properties of Noetherian and Artinian modules are given.			
117. Teaching and Learning Strategies					
Strategy		• Lectures • Oral discussions • Examinations • scientific reports			
118. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Construction of Products and coproducts modules	Basic definitions	Theoretical lectures	Test, assignments, oral exam, report
2	4	Connection between the internal and external direct sums of modules.	internal and external direct sums of modules	Theoretical lectures	Test, assignments, oral exam, report
3	4	Free Modules.	Examples, Remarks and result	Theoretical lectures	Test, assignments, oral exam, report
4	4	Characterizations of free modules.	Characterizations	Theoretical lectures	Test, assignments, oral exam, report
5	4	Artinian and Noetherian modules	Definitions, results and Examples.	Theoretical lectures	Test, assignments, oral exam, report
6	4	Artinian and Noetherian	Properties, results and relations	Theoretical lectures	Test, assignments, oral exam, report
7	4	Noetherian modules	Characterizations	Theoretical lectures	Test, assignments, oral exam, report
8	4	exam	Monthly exam		exam

9	4	Artinian modules	Characterizations	Theoretical lectures	Test, assignments, oral exam, report
10	4	Artinian and Noetherian rings..	Properties, results and relations	Theoretical lectures	Test, assignments, oral exam, report
11	4	Finite length of Modules	Examples, Remarks and result	Theoretical lectures	Test, assignments, oral exam, report
12	4	Finite length of Modules.	Characterizations.	Theoretical lectures	Test, assignments, oral exam, report
13	4	composition series	Properties, results and relations	Theoretical lectures	Test, assignments, oral exam, report
14	4	Endomorphisms rings of Artinian and Noetherian Modules	Examples, Remarks and result	Theoretical lectures	Test, assignments, oral exam, report
15	4	The Hilbert Basis Theorem	Properties, results and relations	Theoretical lectures	exam

Course Evaluation

The final mark of 100% is divided as follows:

- A monthly exam of 20 marks
- Reports 5 marks
- Tests and assignments, 5 marks
- Final exam: 70 marks

119. Learning and Teaching Resources

Required textbooks (curricular books, if any)	unavailable
Main references (sources)	Kasch, F. "Modules and rings" Academic Press., London, 1982
Recommended books and references (scientific journals, reports...)	J. S. Golan and Tom Head, Modules and the Structure of Rings: A Primer (Hardback, 1991).
Electronic References, Websites	https://libgen.is/

Course Description Form

120.	Course Name:
Operation Research	
121.	Course Code:

122. Semester / Year:					
First Semester/2024-2023					
123. Description Preparation Date:					
15-10-2023					
124. Available Attendance Forms:					
Weekly attendance					
125. Number of Credit Hours (Total) / Number of Units (Total)					
4 hours per week/ 60 hours per semester					
126. Course administrator's name (mention all, if more than one name)					
Name: Dr. Manal Hashim Ibrahim Email: manalhashimibrahim@gmial.com					
127. Course Objectives					
Course Objectives	After studying Linear Programming course, the student is able to study the Applications of Linear programming.				
128. Teaching and Learning Strategies					
Strategy	• Lectures • Oral Discussions • Tests • Reports				
129. Course Structure					
Wee k	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Linear Programming Problem (LPP) Formulation	Linear Programming Problem	Theortical lectures	Test,exam Oral, report
2	4	Method Of LPP/P Geometric(Graphical) Solution	Method Of LPP	-	-
3	4	Feasible and Optimal Solutions in LPP	Linear Programming Problem	-	-
4	4	Line Segment, Convex Set Extreme Point in LPP	Linear Programming Problem		
5	4	Bounded and Unbounded Feasible Recion	Feasible Recion	-	-
6	4	Standard Form of a Maximum Problem in LPP	Simplex Method	-	-
7	4	Exam	Monthly Exam		Exam
8	4	Standard Form of a Minmum Problem in LPP	Simplex Method	Theortical lectures	Test,exam Oral, report
9	4	Slack Variables and the Simplex Tabieau	Simplex Method	-	-
10	4	The Pivot Operation	Simplex Method	-	-

11	4	Examples of Simplex Method	Simplex Method	-	-
12	4	The Unbound Case of LPP	Simplex Method	-	-
13	4	Duality in LPP	Duality Problem	-	-
14	4	Some Examples and Theorems in Duality	Duality Problem	-	-
15	4	Exam	Monthly Exam		Exam
130. 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					
131. Learning and Teaching Resources					
Required textbooks (curricular books, if any)			Introduction of Operation Research. Hmdy taha		
Main references (sources)			Introduction of Operation Research . Abd Diab Jazae		
Recommended books and references (scientific journals, reports...)			Linear programming problems MR. RAVINDER PANT 2020		
Electronic References, Websites					

Course Description Form

132.	Course Name:
	Mathematical statistics
133.	Course Code:
134.	Semester / Year:
135.	Description Preparation Date:
136.	Available Attendance Forms:
	Weekly attendance
137.	Number of Credit Hours (Total) / Number of Units (Total)
	4 hours per week / 60 hours per semester
138.	Course administrator's name (mention all, if more than one name)
	Name: Shurooq Ahmed Kareem Email: shuroq80@uomustansiriyah.edu.iq
139.	Course Objectives
Course Objectives	- Studying some basic principles in statistics and - finding the distribution of variables using techniques of transforming variables into one variable and two variables, the moment generating

			function technique, the distribution function technique, • and then identifying the ordered statistic, the central limit theorem, the t distribution, the F distribution, and the relationship between some distributions.		
140. Teaching and Learning Strategies					
Strategy		• Lectures • Oral discussions • Tests • Reports			
141. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Some basic principles (definitions)	Basic Definitions	Theoretical lectures	Test, assignments , oral exam,report
2	4	Finding the distribution of a random variable using the technique of transforming variables into one discrete and continuous variable	Distribution of a Random Variable	Theoretical lectures	
3	4	Finding the distribution of two random variables using the transformation technique for two discrete variables	Distribution of Two Random Variables	Theoretical lectures	
4	4	Finding the distribution of two random variables using the transformation technique for two continuous variables	Distribution of Two Random Variables	Theoretical lectures	
5	4	Finding the distribution of two variables using the moment generating function technique	Moment Generating Function Technique	Theoretical lectures	

6	4	Finding the distribution of two variables using the cumulative distribution function technique	Cumulative Distribution Function Technique	Theoretical lectures	
7	4	Exam	Monthly Exam	Theoretical lectures	
8	4	The distribution of $\bar{x}$ for the normal distribution and the distribution of σ^2 for the normal distribution	Distribution of $\bar{x}$ and $(n-1)s^2/\sigma^2$ of the Normal Distribution	Theoretical lectures	Test, assignments, oral exam, report
9	4	Recognizing the ordered statistic	Order Statistics	Theoretical lectures	
10	4	Recognizing the central limit theorem	Central Limit Theorem	Theoretical lectures	
11	4	Finding the T distribution and the F distribution	Distribution of T and Distribution of F	Theoretical lectures	
12	4	The relationship between some distributions: the normal distribution and its relationship with some distributions	Relationship between Some Distributions	Theoretical lectures	
13	4	and Gamma and their relationship with some distributions	Relationship between Some Distributions	Theoretical lectures	
14	4	and the T distribution and their relationship with some distributions	Relationship between Some Distributions	Theoretical lectures	
15	4	Exam	Monthly Exam	Theoretical lectures	
142. Course Evaluation					
The final grade is 100% and is divided as follows: • Monthly exam 20 points • Reports 5 points					

• Tests and assignments 5 points • Final exam 70 points	
143. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	Introduction to mathematical statistics by Robert V. and et. al
Recommended books and references (scientific journals, reports...)	Introduction to mathematical statistics by Prof.Dr.Dhafir H.Rashed and et.al
Electronic References, Websites	

Course Description Form

144. Course Name:	
Mathematical Analysis 1	
145. Course Code:	
54453114(1)	
146. Semester / Year:	
First, 2024 / 2023	
147. Description Preparation Date:	
15\10\2023	
148. Available Attendance Forms:	
Weekly attendance	
149. Number of Credit Hours (Total) / Number of Units (Total)	
4 hours per week / 60 hours per semester	
150. Course administrator's name (mention all, if more than one name)	
Name: Dr. Umilkeram Qasim Obaid haider@uomustansiriyah.edu.iq , umilkeram32@gmail.com	Name: Asst. Prof. Dr. Anmar Hashim Jasim dr.anmar@uomustansiriyah.edu.iq
Name: Asst .Prof .Dr. Zainab Mohammed Alwan lionwight_2009@uomustansiriyah.edu.iq	Name: Dr. Amenah Hassan Ibrahim amena_1335723@uomustansiriyah.edu.iq
151. Course Objectives	
Course Objectives	A comprehensive study of • The relationship between the field of rational numbers and the field of real numbers • Sequences in the real field such as convergent sequences, Cauchy sequences • Infinite series with their convergence test • Metric spaces along with basic concepts such as convergence, completeness, and compactness in a more general framework including Euclidean spaces.
152. Teaching and Learning Strategies	
Strategy	• Lectures • Oral discussions • Tests

		• Reports			
153. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
	4	Relation between the Real field and Rational field	The Real field	Theoretical lectures	Test, assignment, oral exam, report
	4	Irrational numbers and Real numbers – Absolute value	The Real field	Theoretical lectures	
	4	Sequences of Real numbers - convergent sequences	Sequences	Theoretical lectures	
	4	Bounded sequences and Monotonic sequences	Sequences	Theoretical lectures	
	4	Cauchy sequences	Sequences	Theoretical lectures	
	4	Infinite Series – a converging Test	Series	Theoretical lectures	
	4	Exam	Monthly exam		Exam
	4	Absolute convergence and conditional convergence – Other Test for convergence	Series	Theoretical lectures	
	4	Basic Principles of Topology in metric spaces	Metric Spaces	Theoretical lectures	
	4	Theorems in Metric Spaces	Metric Spaces	Theoretical lectures	
	4	Convergence sequences in metric spaces	Metric Spaces	Theoretical lectures	
	4	Cauchy sequences or Fundamental sequences in metric spaces	Metric Spaces	Theoretical lectures	
	4	Complete metric spaces	Metric Spaces	Theoretical lectures	
	4	Compact spaces	Metric Spaces	Theoretical lectures	
	4	Exam	Monthly exam		Exam
154. Course Evaluation					
The final grade is 100% and is divided as follows: • Monthly exam 20 points • Reports 5 points • Tests and assignments 5 points • Final exam 70 points					
155. Learning and Teaching Resources					
Required textbooks (curricular books, if a			1- Introduction to Mathematical Analysis by Adil G. Naoum		
Main references (sources)			2- Principle of Mathematical Analysis by		

	W. Rudin
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

156. Course Name:					
Abstract algebra 2					
157. Course Code:					
158. Semester / Year:					
2024-2023					
159. Description Preparation Date:					
15/10/2023					
160. Available Attendance Forms:					
Attendance weekly					
161. Number of Credit Hours (Total) / Number of Units (Total)					
4 hours weekly/ 60 hours through the course					
162. Course administrator's name (mention all, if more than one name)					
Name :Prof. Dr. Najm Abdulzahra Makhrib Email: dr.najm@uomustansiriyah.edu.iq					
163. Course Objectives					
Course Objectives			- Study the rings - Study the subrings - Study the homomorphism - Study fundamental theorems - Study the field and domains		
164. Teaching and Learning Strategies					
Strategy		- Lectures - Discussions - Tests - Reports			
165. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Definition and Examples of rings	rings	Theoretical lecture	Test, homework, Oral exam, report
2	4	Some properties of rings	rings	Theoretical lecture	Test, homework,

					Oral exam, report
3	1 4	Theorems on rings	rings	Theoretical lecture	Test, homework, Oral exam, report
4	1 4	Characteristic of the ring	rings	Theoretical lecture	Test, homework, Oral exam, report
5	1 4	Subrings and Their Properties	subrings	Theoretical lecture	Test, homework, Oral exam, report
6	1 4	More Results of Subrings	subrings	Theoretical lecture	Test, homework, Oral exam, report
7	1 4	exam	Monthly exam		exam
8	1 4	Ideals	subrings	Theoretical lecture	Test, homework, Oral exam, report
9	1 4	Zero divisors elements and integral domains	rings	Theoretical lecture	Test, homework, Oral exam, report
10	1 4	Quotient rings	rings	Theoretical lecture	Test, homework, Oral exam, report
11	1 4	Homomorphism, Examples and Basic Concepts	Homomorphism	Theoretical lecture	Test, homework, Oral exam, report
12	1 4	Maximal ideal	ideals	Theoretical lecture	Test, homework, Oral exam, report
13	1 4	Prime ideal	ideals	Theoretical lecture	Test, homework, Oral exam, report
14	1 4	Fields	Fields	Theoretical lecture	Test, homework, Oral exam, report
15	1 4	exam	Monthly exam		exam

166. Course Evaluation

Final degree 100 divided by

- 20 degree for monthly exam.
- 5 degree for report.
- 5 degree for tests and homework .
- 70 degree for the final exam.

167. Learning and Teaching Resources

Required textbooks (curricular books, any)	Introduction to Modern Abstract Algebra, by David M. Burton
Main references (sources)	Groups and Numbers, by R. M. Luther
Recommended books and references (scientific journals, reports...)	A First Course in Abstract Algebra, by J. B. Fraleigh
Electronic References, Websites	Group Theory, by M. Suzuki