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

ACADEMIC PROGRAM DESCRIPTION GUIDE
UNDERGRADUATE STUDIES
TERM SYSTEM

2024-2025

Academic Program Description Form

University Name: Al-Nahrain University

Faculty/Institute: College of Sciences

Scientific Department: Department of Mathematics and Computer Applications

Academic or Professional Program Name: Bachelors

Final Certificate Name: Bachelor in Mathematics and Computer Applications

Academic System: Semester

Description Preparation Date: 2024

File Completion Date: 18 / 11 / 2024

Signature:

Head of Department Name:

Prof. Dr. Fadhel Subhi Fadhel

Date: 18 / 11 / 2024

Signature:

Scientific Associate Name:

Assist. Prof. Dr. Manaf Adnan Saleh

Date: 25 / 11 / 2024

جامعة النهرين / كلية العلوم
قسم الرياضيات
و
تطبيقات الحاسوب

The file is checked by: Orooba Nadhim Harbi

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Lect. Dr. Orooba Nadhim Harbi

Date: 25 / 11 / 2024

Signature:

Approval of the Dean

Prof. Dr. Asmaa Hadi Mohammed

جمهورية العراق
وزارة التعليم العالي والبحث العلمي
جامعة النهرين كلية العلوم
مكتب العميد
Dean's office
Ministry of Higher Education and Scientific Research
Al-Nahrain University / College of Science

1. **Program Mission**
Program Vision
The department should be distinguished academically, in research, and in leadership to advanced levels.

2. **Program Mission**
Preparing academic staff members who emphasize the applied aspect and possess a distinguished level of education that aligns with quality standards and accreditation, through conducting research and studies, and providing consultations that contribute to serving both the university and the community. In addition to the student acquiring basic knowledge and concepts in mathematics and computer applications, enabling him to connect the applied academic sciences according to the needs of society.

3. **Program Objectives**
The department aims to produce cadres that can keep up solving problems addressed to social life in a scientific manner based on applied mathematics for the success of work.

4. **Program Accreditation**
Does the program have program accreditation? And from which agency? -No

5. **Other external influences**
Is there a sponsor for the program? -There isn't any.

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	8	13	9%	
College Requirements	5	15	10%	
Department Requirements	32	118	81%	
Summer Training	___	Fulfilled (Zero Credit)	____	One-month summer training for third-year students (in July or August).
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
Stage One	MATH 141	Calculus I	4	
	MATH 142	Calculus II	4	
	MATH 112	Finite Mathematics	4	
	MATH 114	Foundation of Mathematics I	4	
	MATH 115	Foundation of Mathematics II	4	
	MATH 113	Analytic Geometry	4	
	UREQ 110	English Language I	2	
	UREQ 111	English Language II	2	
	UREQ 151	Programming Fundamentals	2	3
	UREQ 150	Introduction to Computer	2	3
	PHYS161	Mechanics	2	2
	PHYS162	Electricity and Magnetism	2	2
Stage two	MATH 210	Advanced Calculus I	4	
	MATH 211	Advanced Calculus II	4	
	COMP 251	Programming	2	3
	COMP 253	Computer Graphics	2	3

	MATH 212	Linear Algebra I	4	
	MATH 213	Linear Algebra II	4	
	MATH 214	Optimization I	2	3
	MATH 243	Probability and Statistics	3	
	MATH 216	Solution of ODE	4	
	CHEM 271	General Chemistry	2	
	URIQ 201	Arabic Language I	2	
	URIQ 202	Arabic Language II	2	
Third Stage	MATH 316	Applied Mathematics	4	
	MATH 319	Optimization II	2	
	MATH 312	Abstract Algebra I	4	
	MATH 313	Abstract Algebra II	4	
	MATH 317	Fuzzy Sets	3	
	MATH 314	Numerical Analysis I	2	3
	MATH 315	Numerical Analysis II	2	3
	MATH 310	Real Analysis I	4	
	MATH 311	Real Analysis II	4	
	UREQ 420	Democracy and Human Rights	1	
	MATH 318	Theory of Ordinary Differential Equations	4	
	URMETHO	Scientific Research Methodology	1	
Stage Four	MATH 411	Complex Analysis I	4	
	MATH 412	Complex Analysis II	4	
	MATH 413	Mathematical Statistics I	4	
	MATH 414	Mathematical Statistics II	4	
	MATH 415	Topology I	4	
	MATH 416	Topology II	4	
	MATH 430	Topics in Pure Mathematics	4	
	MATH 410	Partial Differential Equations	4	
	MATH421	Research Project	4	

8. Expected learning outcomes of the program

Knowledge	
Learning Outcomes 1	1- Creating a strong foundation for the student in the subject of pure and applied mathematics.

	2- Creating advanced thinking in understanding most mathematics topics. 3- The student knows how to use computer programs to find solutions to mathematical equations and enables him to read the literature of the specialized scientific subject. 4- The student will acquire as much specialized terminology as possible and be able to convert practical applications to mathematical equations.
Skills	
Learning Outcomes 2	1- Injecting a fair amount of specialized information, terminology, and equations related to the scientific subject. 2- The student gains experience in using computer programs and experience in solving many life problems. 3- Urging the student to build a self-study plan and teaching them how to progress towards achieving this plan through self-learning. 4- To be guided by the department head and its council in this regard and to benefit from the experience of professors with long experience in the field of personal development.
Ethics	
Learning Outcomes 4	1- Increasing the student's cognitive and scientific awareness. 2- Enabling the student to use mathematical concepts, both applied and pure. 3- Understanding and solving life applications of various types. 4- The student's knowledge of linking mathematical concepts to each other.

9. **Teaching and Learning Strategies**

The teaching and learning strategy is a set of tools and practices used by both the teacher and the student in order to comprehend the academic material or course in the best possible way.

This depends on two basic factors: good transmission by the teacher of the subject, which is supported by teaching strategies, and good reception by the student, which is supported by learning strategies.

Teaching strategies include a set of organized plans and methods followed by the subject teacher in order to guide students towards achieving learning goals, including cognitive goals for theoretical subjects, skill goals in proofs in a mathematical manner through sequential and ordered steps, and emotional and value goals through sensory perception of the theorems' statements and results and then their proofs and how to use their syntax theoretically, as well as introducing the student and expanding their programming skills using specialized computer programs to solve mathematical problems numerically and model mathematical and real-life problems programmatically; that is done through specific teaching and learning methods in order for the student to acquire transferable general and qualifying skills.

10. Evaluation methods

- Daily participation.
2- Daily exams.
3- Monthly exam.
4- Reports.
5- Discussion sessions (seminars).
6- Graduation projects.
7- Homework.

11. Faculty

Faculty Members

Name & Academic Position	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Professor	Mathematics	Applied Mathematics / Integral transform			1	
Professor	Mathematics	Numerical Analysis / Approximation Theory			1	
Professor	Mathematics	Fuzzy set Theory and its Applications			1	
Professor	Mathematics	Operations Research			1	
Associate Professor	Mathematics	Functional Analysis			1	
Associate Professor	Mechanical Engineering	Operations Research			1	
Associate Professor	Mathematics	Dynamical Systems			1	
Associate Professor	Mathematics	Control Systems			1	
Instructor	Mathematics	Numerical Control			1	
Instructor	Mathematics	Functional Analysis			1	
Instructor	Mathematics	Applied Mathematics			4	

Instructor	Mathematics	Algebraic Graph Theory			1	
Instructor	Mathematics	Complex Analysis			1	
Instructor	Arabic Language	Grammer			1	
Instructor	Mathematics	Stability of Fuzzy Differential Equations			1	
Instructor	Mathematics	Mathematical Statistics			2	
Instructor	Mathematics	Numerical Solutions of Fractal partial Differential Equations			1	
Instructor	Mathematics	Linear Programming			1	
Assistant Instructor	Computer Science	Computer Graphics			1	
Assistant Instructor	Mathematics	Applied Mathematics			1	
Assistant Instructor	Mathematics	Mathematical Statistics			2	
Assistant Instructor	Mathematics	Approximate Solutions of Integro–Differential Equations			1	
Assistant Instructor	Mathematics	Algebra			3	

Assistant Instructor	Mathematics	Ordinary Differential Equations			1	
Assistant Instructor	Mathematics	Numerical Solutions of Boundary Value Problems			1	
Assistant Instructor	Mathematics	Integro–Differential Equations			1	
Assistant Instructor	Mathematics	Biomathematics			1	
Assistant Instructor	Mathematics	Topology			1	

Professional Development

Mentoring new faculty members

1- Integrating new recruits into the educational process by assigning them to deliver lectures in the Mathematics Department and other departments, in addition to committees and administrative work.

2- Involving them in scientific activities (conferences, training courses, workshops, and seminars).

3- Creating joint research groups.

4- Educational, professional, and academic qualification for new faculty members, including informing them of the goals, learning outcomes, and plans drawn up to achieve them.

Professional development of faculty members

1- Continuous academic development for faculty members to keep pace with modern developments in the field of specialization.

2- Communication between faculty members, the supporting staff, and the supporting technical and administrative staff.

3- Communication between faculty members and students.

4- The existence of an integrated system for periodically evaluating faculty members and promoting them.

5- The stability of the teaching staff and the rate of continuity in their work.

6- Participation of faculty members and supporting staff in conferences, scientific activities, and community service.

7- The freedom and responsibility of faculty members in evaluating and developing the curriculum.

8- Provides the environment and time for faculty members and supporting staff for professional development and research activity.

12. Acceptance Criterion

Admission is through direct application to the Department of Mathematics and Computer Applications according to the students' Application Guide.

13. The most important sources of information about the program

-The Student's Handbook (Guide) to the central acceptance program issued by the Ministry of Higher Education and Scientific Research.

-The College of Science Handbook (Guide).

14. Program Development Plan

Based on the results and statistics of the surveys and feedback from students and employers, the following are part of the department's plan to update and develop the program:

1- Twinning between the department and the peer departments in the other Iraqi, regional and international Universities.

2- Achieving the connection between the academic and applied sciences according to the society needs and according to the development centers in Iraq.

3- Initiating new subdivisions of the department, namely: Statistics, operations Research, and Pure Mathematics.

Program 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
Stage One	MATH 141	Calculus I	Basic\ College Requirement	X	X			X				X	X		
	MATH 142	Calculus II	Basic\ College Requirement	X	X			X				X	X		
	MATH 112	Finite Mathematics	Basic\ Department Requirement	X	X		X	X				X	X	X	X
	MATH 114	Foundation of Mathematics I	Basic\ Department Requirement	X	X	X		X				X	X	X	
	MATH 115	Foundation of Mathematics II	Basic\ Department Requirement	X	X	X		X				X	X	X	
	MATH 113	Analytic Geometry	Basic\ Department Requirement	X	X			X	X	X					
	UREQ 110	English Language I	Basic\ University Requirement	X	X			X	X	X		X	X	X	
	UREQ 111	English Language II	Basic\ University Requirement	X	X			X	X	X		X			
	UREQ 151	Programming Fundamentals	Basic\ University Requirement	X	X	X		X	X	X		X			

	UREQ 150	Introduction to Computer	Basic\ University Requirement	X	X	X		X	X	X		X			
	PHYS161	Mechanics	Basic\ College Requirement				X	X				X		X	
	PHYS162	Electricity and Magnetism	Basic\ College Requirement				X	X				X		X	
Stage two	MATH 210	Advanced Calculus I	Basic\ Department Requirement	X	X	X	X	X	X	X		X	X		
	MATH 211	Advanced Calculus II	Basic\ Department Requirement	X	X	X	X	X	X	X		X	X		
	COMP 251	Programming	Basic\ College Requirement	X	X			X	X			X			
	COMP 253	Computer Graphics	Basic\ College Requirement	X	X	X	X	X	X	X	X	X	X		
	MATH 212	Linear Algebra I	Basic\ Department Requirement	X	X			X							
	MATH 213	Linear Algebra II	Basic\ Department Requirement	X	X		X	X				X	X	X	X
	MATH 214	Optimization I	Basic\ Department Requirement	X	X			X							
	MATH 243	Probability and Statistics	Basic\ College Requirement	X	X	X	X	X	X	X	X	X			
	MATH 216	Solution of ODE	Basic\ Department Requirement	X	X	X	X	X	X						
	CHEM 271	General Chemistry	Basic\ College Requirement	X	X	X	X	X	X						

	UREQ 201	Arabic Language I	Basic\ University Requirement	X	X			X				X	X	X	
	URIQ 202	Arabic Language II	Basic\ University Requirement	X	X			X				X	X	X	
Third Stage	MATH 316	Applied Mathematics	Basic\ Department Requirement	X	X	X		X							
	MATH 319	Optimization II	Basic\ Department Requirement	X	X			X				X	X		
	MATH 312	Abstract Algebra I	Basic\ Department Requirement	X	X			X				X	X		
	MATH 313	Abstract Algebra II	Basic\ Department Requirement	X	X			X	X	X		X	X	X	
	MATH 317	Fuzzy sets	Optional\Department Requirement	X	X			X	X			X	X	X	
	MATH 314	Numerical Analysis I	Basic\ Department Requirement	X	X	X		X	X			X	X		
	MATH 315	Numerical Analysis II	Basic\ Department Requirement	X	X	X		X	X			X	X	X	
	MATH 310	Real Analysis I	Basic\ Department Requirement	X	X	X	X	X	X			X			
	MATH 311	Real Analysis II	Basic\ Department Requirement	X	X	X		X	X						
	URDEMT	Democracy and Human Rights	Basic\ University Requirement	X	X		X	X				X			
	MATH 318	Theory of ODE	Basic\ Department Requirement	X	X	X		X	X						

	URMETHO	Research Methodology	Basic\ University Requirement				X		X	X	X	X	X		
Stage Four	MATH 411	Complex Analysis I	Optional\Department Requirement	X	X	X		X	X			X	X		
	MATH 412	Complex Analysis II	Optional\Department Requirement	X	X	X		X	X			X	X		
	MATH 413	Mathematical Statistics I	Basic\ Department Requirement	X	X	X		X				X	X		
	MATH 414	Mathematical Statistics II	Basic\ Department Requirement	X	X	X		X	X	X		X	X		
	MATH 415	Topology I	Optional\Department Requirement	X	X			X	X			X	X		
	MATH 416	Topology II	Optional\Department Requirement	X	X			X				X	X		
	MATH 430	Topics in Pure Mathematics	Optional\ Department Requirement	X	X	X		X	X			X	X	X	
	MATH 410	Partial Differential Equations	Basic\ Department Requirement	X	X	X		X	X			X	X	X	
	MATH421	Research Project	Basic\ Department Requirement	X						X	X	X		X	

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

Third Stage

Course Description Form

1. Course Name:	
Fuzzy sets	
2. Course Code:	
MATH317	
3. Semester / Year:	
Second 2024-2025	
4. Description Preparation Date:	
23/9/2024	
5. Available Attendance Forms:	
Attendance lectures in the classroom	
6. Number of Credit Hours (total) / Number of Units (total)	
60 hours / 4 units	
7. Course administrator's name (mention all, if more than one name)	
Name: Asst. Prof. Dr. Fadhel Subhi Fadhel Email: fadhel.subhi@nahrainuniv.edu.iq	
8. Course Objectives	
Course Objectives	• Studying fuzzy logic and in connection with classical mathematical logic in set theory. • Reviewing the basic algebraic and mathematical properties, as well as fundamental operations on fuzzy sets. • Formulating some real-life problems using fuzzy logic and indicating the appropriateness of fuzzy logic in these studies. • Studying some mathematical topics using fuzzy logic, such as evaluating fuzzy derivatives and integrals, solutions of fuzzy differential equations, studying fuzzy real analysis
9. Teaching and Learning Strategies	
Strategy	The teaching and learning strategy is considered a set of tools and practices carried out by both the teacher and the student in order to comprehend the academic material or course, which is the theory of fuzzy sets, in the best possible way. This depends on two basic factors: good transmission by the subject teacher, which is supported by teaching strategies, and good reception by the student, which is supported by learning strategies. Educational strategies include a set of organized plans and methods followed by the subject teacher in order to guide students towards achieving learning goals, including the cognitive goals of fuzzy logic, the skill goals in formulating life problems in a mathematical manner by representing them with a mathematical model, and the emotional and value goals through the sensory perception of the

	nature of the problem and how to deal with it. With it, this is done through specific teaching and learning methods in order for the student to acquire transferable general and qualifying skills.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Studying fuzzy logic	Basic definitions and examples	Attendance interactive lectures	Ask questions and give assignments
2	4	Study the basic algebraic operations with examples	Basic algebraic operations	Attendance interactive lectures	Ask questions and give assignments
3	4	Generalization of non-fuzzy concepts to fuzzy logic	Expansion principle and level sets	Attendance interactive lectures	Ask questions and give assignments
4	4	Studying the membership functions and how to find some of them analytically	The membership functions	Attendance interactive lectures	Ask questions and give assignments
5	4	Review some types of fuzzy numbers and their relationship to fuzzy sets	Fuzzy numbers	Attendance interactive lectures	Ask questions, give assignments, and make a 1st attendance mid exam
6	4	Studying different types of fuzzy functions	Fuzzy derivatives and integrals	Attendance interactive lectures	Ask questions and give assignments
7	4	Use the extension principle to find fuzzy derivatives and integrals	Fuzzy derivatives and integrals	Attendance interactive lectures	Ask questions and give assignments
8	4	Introducing the fuzzifying function and find its derivatives	Fuzzy derivatives and integrals	Attendance interactive lectures	Ask questions and give assignments
9	4	Use of left-right fuzzing functions to find derivatives and integrals	Fuzzy derivatives and integrals	Attendance interactive lectures	Ask questions and give assignments
10	4	Introducing fuzzy differential equations	Fuzzy differential equations	Attendance interactive lectures	Ask questions and give assignments
11	4	Solving fuzzy differential equations analytically using complex numbers	Fuzzy differential equations	Attendance interactive lectures	Ask questions and give assignments

12	4	Study the numerical solutions of fuzzy differential equations	Fuzzy differential equations	Attendance interactive lectures	Ask questions, give assignments, and make a 2nd attence mid exam
13	4	Using the Hausdorff distance function to define fuzzy metric space	Fuzzy real analysis	Attendance interactive lectures	Ask questions and give assignments
14	4	Give the basics definitions of real analysis in fuzzy metric space	Fuzzy real analysis	Attendance interactive lectures	Ask questions and give assignments
15	4	Study compact sets and convergent sequences in fuzzy metric space	Fuzzy real analysis	Attendance interactive lectures	Ask questions and give assignments

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.

30% monthly written exams

10% daily and oral exams, homework's, and class activities

60% written final exam

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1- Fuzzy Set Theory and Its Applications, Third Edition, By: H.-J. Zimmermann, 1996. 2- Fuzzy Mathematical Techniques with Applications, By: Kandel A., 1985.
Main references (sources)	Fuzzy Set Theory, Foundations and Applications, by Klir G. J.
Recommended books and references (scientific journals, reports...)	1- Fuzzy sets and systems: theory and applications, by: D. J. Dubois and Prade. 2- D. and M.Sc. Theses of Al-Nahrain university. 3- Journal of Fuzzy sets and Systems.
Electronic References, Websites	3-

Course Description Form

1. Course Name
Numerical Analysis I
1. Course Code:
MATH314
2. Semester / Year
First / 2024/2025
3. Description Preparation Date
1ST September 2024
4. Available Attendance Forms
Full time attendance
5. Number of Credit Hours (Total) / Number of Units (Total)
75/4
6. Course administrator's name (mention all, if more than one name)
Course leader name: **Dr. Omar Al-Tameemi** Email: omar.ismael@nahrainuniv.edu.iq Tutorial Assistant name: **Dr. Omar Al-Tameemi** Lab staff names: **1- Ass. Lec. Haneen Abdulkareem** **2- Ass. Lec. Batool Imkhelf** **3- Ass. Lec. Abbas Ibraheem** 4- **Ass. Lec. Nubras Yasir** 5- **Ass. Lec. Farah Lateef**
7. Course Objectives

Course Objectives	• Derive appropriate numerical methods to solve algebraic and transcendental equations. • Develop appropriate numerical methods to approximate a function. • Derive appropriate numerical methods to evaluate a derivative at a value. • Perform an error analysis for various numerical methods • Prove results for various numerical root finding methods. • Derive appropriate numerical methods to calculate a definite integral. • Code various numerical methods in a modern computer language.

8. Teaching and Learning Strategies

Strategy	Subject content will be presented in a combination of online materials and in the lectures. Lectures will take the form of an interactive session (3 hours per week) where the material is covered in depth. Students are expected to revise the online material before each lecture. Computer labs (2 hours per week) will focus on the practical implementation of numerical methods. Direct feedback will be provided during the computer labs. Further feedback on progress will be provided using the check-in Assignments which are spaced throughout the semester. Students will be encouraged to develop code-sharing practices in the computer labs, and to tackle problems collaboratively, as well as being able to work on solving problems individually. A central aim of this is to prepare students for real-world coding environments, which consist of a mix of collaboration with intense periods of individual work. Real world problems examples will enable the students to tackle an authentic and challenging problem in science or mathematics that can be approached using the methods given in this subject.

9. Course Structure (Theory)

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3 hrs of lecture +1 hr tutorial	Preliminaries of Computing	Numerical Solution, type of errors; relative error, absolute error, percentage	Lectures notes, In class presentations, Examples of Practical	Quizzes , Weekly homework, Team and homework problems , Open questions that have

			error, truncation error, round off error. Floating	Applications, Tutorial	a definite answer , (Oral questions)
2	3 hrs of lecture +1 hr tutorial	Numerical solution of Nonlinear Equations	Bisection method, fixed-point iteration, Newton's method.		
3	3 hrs of lecture +1 hr tutorial		Error analysis for Iterative Methods		
4	3 hrs of lecture +1 hr tutorial		Computing roots of polynomials.		
5	3 hrs of lecture +1 hr tutorial	Interpolation and Polynomial Approximation	Lagrange Polynomial		
6	3 hrs of exam +1 hr tutorial	Midterm exam			
7	3 hrs of lecture +1 hr tutorial	Interpolation and Polynomial Approximation	Divided Differences	Lectures notes, In class presentations, Examples of Practical Applications, Tutorial	Quizzes , Weekly homework, Team and homework problems , Open questions that have a definite answer , (Oral questions)
8	3 hrs of lecture +1 hr tutorial		Hermite Interpolation, Extrapolation Methods		
9	3 hrs of lecture +1 hr tutorial	Numerical Differentiation	Forward, backward and central difference approximation of the derivatives.		
10	3 hrs of exam	Midterm exam			

	+1 hr tutorial				
11	3 hrs of lecture +1 hr tutorial	Numerical Differentiation	Higher Order Derivatives.	Lectures notes, In class presentations, Examples of Practical Applications, Tutorial	Quizzes , Weekly homework, Team and homework problems , Open questions that have a definite answer , (Oral questions)
12	3 hrs of lecture +1 hr tutorial	Numerical Integration	Trapezoidal Method, Simpson's Method		
13	3 hrs of lecture +1 hr tutorial		Quadrature Integration Methods, Including Gauss-Quadrature Methods, NewtonCots Open and Closed Methods		
14	3 hrs of lecture +1 hr tutorial		Romberg integration		
15	4hrs	Review			

Course Structure (Lab)

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours of Lab.	Preliminaries of Computing	Fundamentals of MATLAB Programming, relative error, absolute error, percentage error, round off error. Floating	Lab Lectures, Practical Applications, Tutorial	Exams , Weekly homework, Lab quizzes
2	2 hours of Lab.	Numerical solution of Nonlinear Equations	Bisection method, fixed-point iteration, Newton's method.		
3	2 hours of Lab.		Error analysis for Iterative Methods		

4	2 hours of Lab.	Interpolation and Polynomial Approximation	Computing roots of polynomials.		
5	2 hours of Lab.		Lagrange Polynomial		
6	2 hours of Lab.	Midterm exam			
7	2 hours of Lab.	Interpolation and Polynomial Approximation	Divided Differences	Lab Lectures, Practical Applications, Tutorial	Exams , Weekly homework, Lab quizzes
8	2 hours of Lab.		Hermite Interpolation, Extrapolation Methods		
9	2 hours of Lab.	Numerical Differentiation	Forward, backward and central difference approximation of the derivatives.		
10	2 hours of Lab.	Midterm exam			
11	2 hours of Lab.	Numerical Differentiation	Higher Order Derivatives.	Lab Lectures, Practical Applications, Tutorial	Exams , Weekly homework, Lab quizzes
12	2 hours of Lab.	Numerical Integration	Trapezoidal Method, Simpson's Method		
13	2 hours of Lab.		Quadrature Integration Methods, Including Gauss-Quadrature Methods, Newton Cots Open and Closed Methods		
14	2 hours of Lab.		Romberg integration		
15	2hrs	Review			
10. Course Evaluation					

Formative assessment 40%: Theory (15% Midterm exams + 10% homework) + 15% lab assessment. Summative assessment 60%: Theoretical final exam 50% + Lab final exam 10%)

11. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Burden, R. L., Faires, J. D., & Burden, A. M. (2015). Numerical analysis. Cengage learning.
Main references (sources)	J. Stoer and R. Bulirsch, Introduction to Numerical Analysis, Springer-Verlag, ISBN 0-387- 90420-4
Recommended books and references (scientific journals, reports…)	C.T. Kelley, Iterative methods for linear and nonlinear equations, Society of Industrial and Applied Mathematics
Electronic References, Websites	

Course Description Form

1. Course Name
Numerical Analysis II
2. Course Code:
MATH315
3. Semester / Year
Second / 2024/2025
4. Description Preparation Date
1ST Sep. 2024
5. Available Attendance Forms
Full time attendance
2. Number of Credit Hours (Total) / Number of Units (Total)
75/4
3. Course administrator's name (mention all, if more than one name)
Course leader name: **Dr. Omar Al-Tameemi** Email: omar.ismael@nahrainuniv.edu.iq Tutorial Assistant name: Ass. Lec. **Haneen Abdulkareem** Lab staff names: **1- Ass. Lec. Haneen Abdulkareem** **2- Ass. Lec. Farah Lateef** **3- Ass. Lec. Nebras Yasser** 4- **Ass. Lec. Huda Abd Al-Razzaq**

4. Course Objectives	
Course Objectives	• Develop appropriate numerical methods to solve a differential equation. • Derive appropriate numerical methods to solve a linear system of equations. • Derive appropriate numerical methods to solve a system of nonlinear equations. • Perform an error analysis for various numerical methods • Code various numerical methods in a modern computer language.

5. Teaching and Learning Strategies	
Strategy	

	Subject content will be presented in a combination of online materials and in the lectures. Lectures will take the form of an interactive session (3 hours per week) where the material is covered in depth. Students are expected to revise the online material before each lecture. Computer labs (2 hours per week) will focus on the practical implementation of numerical methods. Direct feedback will be provided during the computer labs. Further feedback on progress will be provided using the check-in Assignments which are spaced throughout the semester. Students will be encouraged to develop code-sharing practices in the computer labs, and to tackle problems collaboratively, as well as being able to work on solving problems individually. A central aim of this is to prepare students for real-world coding environments, which consist of a mix of collaboration with intense periods of individual work. Real world problems examples will enable the students to tackle an authentic and challenging problem in science or mathematics that can be approached using the methods given in this subject.

6. Course Structure (Theory)

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3 hrs of lecture +1 hr tutorial	Introduction to Numerical Solution of Ordinary Differential Equations	Introduction to Numerical Solution of Ordinary Differential Equations	Lectures notes, In class presentations, Examples of Practical Applications, Tutorial	Quizzes , Weekly homework, Team and homework problems , Open questions that have a definite answer , (Oral questions)
2	3 hrs of lecture				

	+1 hr tutorial		Finite Difference Method		
3	3 hrs of lecture +1 hr tutorial		Euler and Modified Euler Methods		
4	3 hrs of lecture +1 hr tutorial		Explicit and Implicit Methods		
5	3 hrs of lecture +1 hr tutorial		Runge-Kutta Method, of 2 and 4 Orders		
6	3 hrs of exam +1 hr tutorial	Midterm exam			
7	3 hrs of lecture +1 hr tutorial	Direct Methods for Solving Linear Systems Iterative Techniques in Matrix Algebra	Linear Systems of Equations, Pivoting Strategies	Lectures notes, In class presentations, Examples of Practical Applications, Tutorial	Quizzes , Weekly homework, Team and homework problems , Open questions that have a definite answer , (Oral questions)
8	3 hrs of lecture +1 hr tutorial		Linear Algebra and Matrix Inversion, The Determinant of a Matrix, Matrix Factorization		
9	3 hrs of lecture +1 hr tutorial		Norms of Vectors and Matrices		
10	3 hrs of exam +1 hr tutorial	Midterm exam			
11	3 hrs of		Iterative Techniques for	Lectures notes,	Quizzes , Weekly homework, Team

	lecture +1 hr tutorial	Direct Methods for Solving Linear Systems Iterative Techniques in Matrix Algebra	Solving Linear Systems: Jacobi Iterative Gauss–Seidel Iterative	In class presentations, Examples of Practical Applications, Tutorial	and homework problems , Open questions that have a definite answer , (Oral questions)
12	3 hrs of lecture +1 hr tutorial		Error Bounds and Iterative Refinement		
13	3 hrs of lecture +1 hr tutorial	Numerical Solutions of Nonlinear Systems of Equations	Fixed Points for Functions of Several Variables		
14	3 hrs of lecture +1 hr tutorial		Newton's Method		
15	4hrs	Review			

Course Structure (Lab)

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours of Lab.	Introduction to Numerical Solution of Ordinary Differential Equations	Finite Difference Method	Lab Lectures, Practical Applications, Tutorial	Exams , Weekly homework, Lab quizzes
2	2 hours of Lab.		Euler and Modified Euler Methods		
3	2 hours of Lab.		Taylor Methods		
4	2 hours of Lab.		Explicit and Implicit Methods		
5	2 hours of Lab.		Runge-Kutta Method, of 2 and 4 Orders		

6	2 hours of Lab.	Midterm exam			
7	2 hours of Lab.	Direct Methods for Solving Linear Systems Iterative Techniques in Matrix Algebra	Forward and Backward substitution	Lab Lectures, Practical Applications, Tutorial	Exams , Weekly homework, Lab quizzes
8	2 hours of Lab.		Gauss Elimination		
9	2 hours of Lab.		LU factorization		
10	2 hours of Lab.	Midterm exam			
11	2 hours of Lab.	Direct Methods for Solving Linear Systems Iterative Techniques in Matrix Algebra	Jacobi Iterative Gauss–Seidel Iterative	Lab Lectures, Practical Applications, Tutorial	Exams , Weekly homework, Lab quizzes
12	2 hours of Lab.		Error Bounds and Iterative Refinement		
13	2 hours of Lab.	Numerical Solutions of Nonlinear Systems of Equations	Fixed Points for Functions of Several Variables		
14	2 hours of Lab.		Newton's Method		
15	2hrs	Review			

7. Course Evaluation

Formative assessment 40%: Theory (15% Midterm exams + 10% homework) + 15% lab assessment.
Summative assessment 60%: Theoretical final exam 50% + Lab final exam 10%)

8. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Burden, R. L., Faires, J. D., & Burden, A. M. (2015). Numerical analysis. Cengage learning.
Main references (sources)	J. Stoer and R. Bulirsch, Introduction to Numerical Analysis, Springer-Verlag, ISBN 0-387- 90420-4
Recommended books and references (scientific journals, reports…)	C.T. Kelley, Iterative methods for linear and nonlinear equations, Society of Industrial and Applied Mathematics
Electronic References, Websites	

Course Description Form

1. Course Name:
Optimization II
2. Course Code:
MATH 319
3. Semester / Year:
First / 2024/2025
4. Description Preparation Date:
23/9/2024
5. Available Attendance Forms:
Full time attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
60 hours/ 4 Units
7. Course administrator's name (mention all, if more than one name)
Name: Professor Dr. Ruwaida Razaq Muhsin Asst. Lec. Farah Lateef Asst. Lec. Mays Majid Lec. Adawea Email: saad.mohsen@nahrainuiv.edu.iq
8. Course Objectives

Course Objectives	• Study of non-linear programming systems and their solutions. • Study classical optimization and solve systems u many methods. • numerical optimization and its applications

9. Teaching and Learning Strategies	
Strategy	The strategy is to provide the students with as much information about linear programming as possible by attending lectures to maximize the connection between the students and the lecturer in order to solve as many real-life statistical applications as possible with practical lab. The lectures, some homework and some other additional exercises is also shared on Google Classroom.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

2-1		4	Definition and classification of nonlinear programming		
6-3		8	Solution of single variable optimization		
9-7		8	Multi variable optimization with no constraints		
11-10		10	Multi variable optimization with constraints		
13-12		14	Solve numerical optimization unrestricted search and exhaustive		
15-14		16	Solve numerical optimization dichotomous, Fibonacci and golden section		

11. Course Evaluation

Midterm exam: 40 marks
Final exam: 60 marks

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Optimization theory and applications by S.S. RAO
Main references (sources)	Operation research by HAMDY A. TAHA
Recommended books and references (scientific journals, reports…)	Any website related to our study
Electronic References, Websites	Google.com

Course Description Form

1. Course Name: Democracy and Human Rights
2. Course Code: UREQ 420
3. Semester / Year: First/ 2024–2025
4. Description Preparation Date: 25/9/2024
5. Available Attendance Forms: In Presence
6. Number of Credit Hours (Total) / Number of Units (Total)
15 /1
7. Course administrator's name (mention all, if more than one name)
Name: Ahmed Neama Jouda Email: ahmedjuda68@gmail.com
8. Coarse Objectives The aim of human rights and democracy lectures is to simplify the principles of human right and to assure democracy disciplines applying by equally and properly distribution among people in the society .
9. Teaching and Learning Strategies

Strategy	This is done through a booklet that was prepared by me using external sources such as books, newspapers, and the information network, through in-person lectures, and supporting this with illustrative means in Word or PDF format. It is carried out through weekly lectures and through observations made by the teacher and measuring the extent of . students' knowledge

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

1	One Hour	The concept of human rights	Concepts about human rights and fundamental freedoms	Theoretical lecture	
2			Categories and Features of Human Rights	Theoretical lecture	
3			Characteristics and advantages of human rights in Islam.	Theoretical lecture	
4			The difference between human rights and public freedoms.	Theoretical lecture	
5			Freedom, its concept and types.	Theoretical lecture	
6			Human rights In ancient civilizations (Mesopotamia civilization).	Theoretical lecture	
7			Human rights in ancient civilizations (Chinese,Hindu, Pharaonic and Greek Egypt).	Theoretical lecture	
8			Human rights in the heavenly religions (Christianity and Islam).	Theoretical lecture	
9			Human rights in the Middle Ages.	Theoretical lecture	
10			Human rights in the modern era and the international organizations responsible for implementing them.	Theoretical lecture	
11		Written Exam			

12			The concept of democracy and it's characteristics .	Theoretical lecture	
13			Types of democracy.	Theoretical lecture	
14			Pictures democratic syster	Theoretical lecture	
15			Democratic political rights.	Theoretical lecture	

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)	1.Universal Declaration of Human Rights (Drafting Committee of the Universal Declaration of Human Rights). 2. Human Rights (Thomas Paine). 3.Human rights in Islam (Ali Abdul Wahid).
Main references (sources)	3. Human Rights in the Divine Religions (Abdul Razzaq Rahim Salal) .
Recommended books and references (scientific journals, reports…)	Human rights in the Arab world (Hussein Jameel)
Electronic References, Websites	

Course Description Form

1. Course Name:
Theory of Ordinary Differential Equations
2. Course Code:
MATH 318
3. Semester / Year:
Second Semester / 2024-2025
4. Description Preparation Date:
10/9/2024
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total):
60 Hours/ 4Unit
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Ahmed Ayyoub Yousif Email: ahmed.ayyoub@nahrainuniv.edu.iq

8. Course Objectives

Course Objectives	• **The course aims to give the basic exercises and theories of first-order differential systems and find the solution to them through the basic solution matrix.** • **After that, the course deals with the study of the phase level and the solution behavior of these systems without addressing their solution** • **At the end of the course, the study of the stability of solutions was addressed through the theory of parallel behavior and the theories of Lyapunov.**

9. Teaching and Learning Strategies

Strategy	1- Daily Post. 2- Daily Exams. 3- The Monthly Exam. 4- Home Works.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1st & 2nd	8	Linear systems		Give Lectures	Daily Exams and H.W.
3rd & 4th	8	Fundamental matrix solution		Give Lectures	Daily Exams and H.W.

5th & 6th	8	Jordan canonical form		Give Lectures	Daily Exams and H.W.
7th & 8th	8	Phase plane		Give Lectures	Daily Exams and H.W.
9th & 10th	8	Existence and Uniqueness theorem		Give Lectures	Daily Exams and H.W.
11th & 12th	8	Periodic Systems		Give Lectures	Daily Exams and H.W.
13th & 14th	8	Stability theory		Give Lectures	Daily Exams and H.W.
15th	4	Lyapunov stability		Give Lectures	Daily Exams and H.W.

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)	The Qualitative Theory of Ordinary Differential Equations: An Introduction By Fred Brauer، John A. Nohel
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name: Real Analysis I

2. Course Code: MATH 310

3. Semester / Year: First/ 2024-2025

4. Description Preparation Date: 15/10/2024

5. Available Attendance Forms: physical attendance

6. Number of Credit Hours (Total) / Number of Units (Total): 60/4

7. Course administrator's name (mention all, if more than one name)

Name: Dr. Aamena Rasim Mohammed
Email: aamen.raimmohammed@nahrainuniv.edu.iq

8. Course Objectives

Course Objectives	- Understand the real number system. - Understand concepts of convergence and divergence for sequences, subsequences and Cauchy sequences. - Understand metric spaces, complete metric spaces and compact metric spaces.

9. Teaching and Learning Strategies

Strategy	• Giving Lectures supported by exercises and activities in the classroom • Daily and Weekly Assessments. • Giving homework

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
First	(3)+(1) Discussion	Well-ordered complete sets	Real Numbers	Lectures	General questions, discussion and assignments
Second	(3)+(1) Discussion	Absolute value	Real Numbers Sequences	Lectures Lectures	General questions, discussion and assignments

Third	(3)+(1) Discussion	Definition of sequence	Sequences	Lectures	General questions, discussion and assignments
Fourth	(3)+(1) Discussion	convergent divergent sequences	Sequences	Lectures	General questions, discussion and assignments
Fifth	(3)+(1) Discussion	Monotonic sequence	Sequences	Lectures	General questions, discussion and assignments
Sixth	(3)+(1) Discussion	Subsequences	Sequences	Lectures	General questions, discussion and assignments
Seventh	(3)+(1) Discussion	Cauchy sequences	Metric Spaces	Lectures	General questions, discussion and assignments
Eighth	(3)+(1) Discussion	Definition of me spaces with example	Metric Spaces	Lectures	General questions, discussion and assignments
Ninth	(3)+(1) Discussion	Open and closed sets	Metric Spaces	Lectures	General questions, discussion and assignments
Tenth	(3)+(1) Discussion	Limit points	Metric Spaces	Lectures	General questions, discussion and assignments
Eleventh	(3)+(1) Discussion	Convergent seque Cauchy sequences	Metric Spaces	Lectures	General questions, discussion and assignments
Twelfth	(3)+(1) Discussion	Complete metric spa	Metric Spaces	Lectures	General questions, discussion and assignments
Thirteenth	(3)+(1) Discussion	Contraction Mappin	Metric Spaces	Lectures	General questions, discussion and assignments
Fourteenth	(3)+(1) Discussion	Compact sets	Metric Spaces	Lectures	General questions, discussion and assignments
Fifteenth	(3)+(1) discussion	Hiene-Borel Theore	Metric Spaces	Lectures	General questions, discussion and assignments

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

Homework 5%
Daily preparation 5%
Monthly Assessments 30%
Final Test 60%

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introduction to Mathematical Analysis, Adil G. Naoum, Baghdad University-Iraq.
Main references (sources)	Introduction to Mathematica Analysis, William F. Trench -USA 2015

Recommended books and references (scientific journals, reports…)	Principle of Mathematical Analysis, Walter Rudin, 2000
Electronic References, Websites	https://www.britannica.com/science/analysis-mathematics

Course Description Form

1. Course Name: Real Analysis II

2. Course Code: MATH 311

3. Semester / Year: Second/ 2024-2025

4. Description Preparation Date: 15/10/2024

5. Available Attendance Forms: physical attendance

6. Number of Credit Hours (Total) / Number of Units (Total): 60/4

7. Course administrator's name (mention all, if more than one name)

Name: Dr. Aamena Rasim Mohammed
Email: aamen.raimmohammed@nahrainuniv.edu.iq

8. Course Objectives

Course Objectives	- Understand Continuity and learn test the continuity of functions in different methods. - Understand concepts of Riemann Integrations. - Understand concepts of Differentiation.

9. Teaching and Learning Strategies

Strategy	• Giving Lectures supported by exercises and activities in the classroom • Daily and Weekly Assessments. • Giving homework

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
First	(3)+(1) Discussion	Definition of Continuous Functions	Continuity	Lectures	General questi discussion assignments
Second	(3)+(1) Discussion	Continuity using open and Closed sets	Continuity	Lectures	General questi discussion assignments
Third	(3)+(1) Discussion	Continuity u sequences	Continuity	Lectures	

Fourth	(3)+(1) Discussion	Uniform Continuity	Continuity	Lectures	General discussion assignments questi
Fifth	(3)+(1) Discussion	Concept of sequence Functions convergent	Sequence of Functions	Lectures	General discussion assignments questi
Sixth	(3)+(1) Discussion	Uniform convergent	Sequence of Functions	Lectures	General discussion assignments questi
Seventh	(3)+(1) Discussion	Definition of Riemann	Riemann Integrals	Lectures	General discussion assignments questi
Eighth	(3)+(1) Discussion	Integrals Examples of Riemann	Riemann Integrals	Lectures	General discussion assignments questi
Ninth	(3)+(1) Discussion	Negligible sets¨	Riemann Integrals	Lectures	General discussion assignments questi
Tenth	(3)+(1) Discussion	continuous Functions and integration	Riemann Integrals	Lectures	General discussion assignments questi
Eleventh	(3)+(1) Discussion	The Integration as continuous Function	Riemann Integrals	Lectures	General discussion assignments questi
Twelfth	(3)+(1) Discussion	Differentiation conce	Differentiation	Lectures	General discussion assignments questi
Thirteenth	(3)+(1) Discussion	Definitions Examples	Differentiation	Lectures	General discussion assignments questi
Fourteenth	(3)+(1) Discussion	Differentiation and Integration	Differentiation	Lectures	General discussion assignments questi
Fifteenth	(3)+(1) Discussion	the Fundamental Theorem in Calculus	Differentiation	Lectures	General discussion assignments questi

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

Homework 5%
Daily preparation 5%
Monthly Assessments 30%
Final Test 60%

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introduction to Mathematical Analysis, Adil Naoum, Baghdad University-Iraq.
Main references (sources)	Introduction to Mathematica Analysis, William F. Tren USA 2015
Recommended books and references (scientific journals, reports…)	Principle of Mathematical Analysis, Wa Rudin, 2000

Electronic References, Websites	https://www.britannica.com/science/analysis-mathematics

Course Description Form

1. Course Name:	
Applied Mathematics	
2. Course Code:	
Math 316	
3. Semester / Year:	
First / 2024-2025	
4. Description Preparation Date:	
23-9-2024	
5. Available Attendance Forms:	
Attendance lectures in the classroom	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Yasmin Mueen Mohammed Email: yasameen.mueen@nahrainuniv.edu.iq	
8. Course Objectives	
Course Objectives	1. To introduce students to the new method solving Second and third Order Differential Equations Using Power Series Method. 2. Study and solutions of Special Functions/Equations. • 3. Study and solution of Fourier series method
9. Teaching and Learning Strategies	
Strategy	- Cognitive goals. 1. Students will enhance their logical thinking and problem structuring abilities, and will further develop their understanding of the concept of proof. 2. Enable students to obtain knowledge and understanding of the basic principles of applied mathematics. 3. Empower students to obtain knowledge and understanding the power series method and Fourier Series Analysis in applied mathematics. 4. Enable students to gain knowledge and understanding of how laws are linked.

	5. Support students to identify the most important applications in mathematics such as solving some complicated equations with complex roots and how to make a mathematical analysis using Fourier series.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Introduction to Linear Equations and Power Series. Studying the convergence of power series.	Linear Equations	Attendance interactive lectures	Ask questions and give assignments
2	4	Ordinary Points and Singular Points. Regular Singular Points, The Indicial Equation.	Linear Equations	Attendance interactive lectures	Ask questions and give assignments
3	4	Form and Validity of The Solution Near a Regular Singular Point. Indicial Equation with Difference of Roots NonIntegral.	Linear Equations	Attendance interactive lectures	Ask questions and give assignments
4	4	Differentiation of a Product of Equation. Indicial Equation with Equal Roots. Non-homogenous case.	Linear Equations	Attendance interactive lectures	Ask questions and give some homework's

5	4	Indicial Equation with Difference of Roots a Positive Integer (Non Logarithmic Case, Logarithmic Case). Solution of Large x (Point at Infinity).	Linear Equations	Attendance interactive lectures	Ask questions and give assignments
6	4	Special Functions: The Gamma, Beta and Error Functions	Gamma, Beta	Attendance interactive lectures	Ask questions and give assignments
7	4	Bessel's Functions: Bessel's Equation, Repeated Relation, Integral Form for Bessel's Functions, Modified Bessel's Functions	Bessel's Equation	Attendance interactive lectures	Ask questions and give assignments
8	4	Legender Equation, Legender Polynomial.	Bessel's Equation	Attendance interactive lectures	Ask questions and give assignments
9	4	Generating Function for Legender Polynomials, Orthogonalily for Legender Polynomials Associated Legender Equation.	Bessel's Equation	Attendance interactive lectures	Ask questions, give assignments, and make a 1st attendance mid exam

10	4	Hypergeometric Equation and The Confluent Hypergeometric Equation.	Fourier Series	Attendance interactive lectures	Ask questions and give assignments
11	4	Laguerre Polynomials Hermite Polynomials	Fourier Series	Attendance interactive lectures	Ask questions and give assignments
12	4	Fourier Series: Orthogonalily of a Set of Sine and Cosine.	Fourier Series	Attendance interactive lectures	Ask questions and give assignments
13	4	Fourier Series: An Expansion Theorem. Examples of Fourier series: Even and odd Functions.	Fourier Series	Attendance interactive lectures	Ask questions, give assignments, and make a 2nd attendance mid exam
14	4	Fourier Sine Series, Fourier Cosine Series. Change of Interval. Complex Form of Fourier Series. Differentiation and Integration of Fourier Series. Fourier Transform.	Fourier Series	Attendance interactive lectures	Ask questions and give assignments
15	4	Integral Transforms. Fourier Integrals. Fourier Transforms. Fourier Sine & Cosine Transform. Convolution Theory of	Fourier Series	Attendance interactive lectures	Ask questions and give assignments

		Fourier Transform.			

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.

30% monthly written exams

10% daily and oral exams, homework's, and class activities

60% written final exam

12 . Learning and Teaching Resources

1. Books Required reading:	Elementary Differential Equations, by E. D. Rainville and P. E. Bedeint Fourier series and Boundary Value Problems 1. (Brown and Churchill Series) 8th Edition.
2. Main references (sources)	lementary Differential Equations, by E. D. 1-Rainville and P. E. Bedeint
A- Recommended books and referenc (scientific journals, reports…).	طرق في الرياضيات التطبيقية, تأليف د. باسل يعقوب يوسف Any website that specializes and reliable to study applied mathematics.
Electronic References, Websites	1-https://math.libretexts.org/Bookshelves/Analysis

Course Description Form

1. Course Name:
Scientific Research Methodology
2. Course Code:
URMetho
3. Semester / Year:
Second/ Third
4. Description Preparation Date:
01/3/2025
5. Available Attendance Forms:
Internal Mode of Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
1 hours per week/ 1 units
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Zainab Riyadh Shaker Al-Yasiri Email: zaianb.riyadh22@nahrainuniv.edu.iq
8. Course Objectives

Course Objectives	By the end of this course, students will be able to: 1. Understand the fundamental concepts and significance of scientific research methodology. 2. Identify and formulate research problems, hypotheses, and objectives. 3. Conduct a comprehensive literature review and identify research gaps. 4. Differentiate between qualitative, quantitative, and mixed-methods research approaches. 5. Select appropriate research designs and data collection techniques. 6. Apply statistical and qualitative data analysis methods. 7. Interpret research findings and discuss their implications. 8. Develop ethical research practices, including data integrity and plagiarism avoidance. 9. Write structured research reports and academic papers.

9. Teaching and Learning Strategies

Strategy

A- Cognitive goals.

1. **Knowledge Acquisition:** Enable students to understand and recall fundamental concepts, theories, and methodologies in scientific research.
2. **Comprehension:** Help students interpret and explain research concepts, methodologies, and ethical considerations.
3. **Application:** Develop students' ability to apply research principles to real-world problems and academic projects.
4. **Analysis:** Strengthen students' capacity to examine research data, identify patterns, and critically assess the validity of research findings.
5. **Synthesis:** Encourage students to integrate multiple research concepts and approaches to create innovative research frameworks.
6. **Evaluation:** Train students to critically assess research quality, ethical considerations, and the impact of research findings on academic and professional fields.

B. The skills goals special to the course.

1. **Research Design Skills:** Ability to formulate research questions, develop hypotheses, and select appropriate research methodologies.
2. **Data Collection Skills:** Proficiency in designing surveys, conducting interviews, and gathering qualitative and quantitative data.
3. **Data Analysis Skills:** Competency in using statistical software, qualitative coding techniques, and data visualization tools.
4. **Critical Thinking Skills:** Ability to analyze research literature, evaluate methodologies, and synthesize information effectively.
5. **Academic Writing Skills:** Mastery in writing research papers, literature reviews, and reports using proper citation styles.
6. **Presentation and Communication Skills:** Effectiveness in presenting research findings and engaging in academic discussions.

Assessment methods

1. Monthly exams and daily quizzes.
2. Homework's.
3. Direct oral questions.

C. Affective and value goals

1. **Commitment to Ethical Research** – Encouraging academic honesty, integrity, and responsible conduct in research.
2. **Appreciation for Knowledge Creation** – Fostering curiosity and lifelong learning in scientific inquiry.
3. **Respect for Diverse Perspectives** – Promoting openness to different research paradigms and interdisciplinary approaches.
4. **Sense of Responsibility** – Developing accountability in data collection, analysis, and reporting.
5. **Confidence in Research Abilities** – Building self-efficacy in conducting and presenting research.

	Teaching and Learning Methods Assessment methods Assessment weighting used for 2-3 attempts. Weighting: Homework's and quizzes 25% Exams 75%

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	1		Why is Science Important? Advantages of Learning Science and Technology.		
2	1		What is the different between Scientific research method and Methodology		
3	1		The scientific method		
4	1		Characteristics of a Good Theory		
5	1		A Scientific Theory Vs. A Law		
6	1		Empirical evidence, Scientific Hypothesis, Scientific Law & Theory		
7	1		BASIC TYPES OF SCINECE Branches		
8	1		The Evolution of Scientific Theory and Facts.		
9	1		Scientific Theory Vs. Hypothesis		
10	1		First mid Exam.		
11	1		Writing a Scientific Report/Research		
12	1		Effective titles in academic research papers have several characteristics.		
13	1		How to Write Your Methods		
14	1		How to Write Discussions and Conclusions		
15	1		Second Mid Exam		

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)	**Creswell, J. W. (2018).** *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). Sage Publications.
Main references (sources)	**Neuman, W. L. (2014).** *Social Research Methods: Qualitative and Quantitative Approaches* (7th ed.). Pearson.
Recommended books and references (scientific journals, reports…)	**Bryman, A. (2015).** *Social Research Methods* (5th ed.). Oxford University Press.
Electronic References, Websites	**.Sage Research Methods** (https://methods.sagepub.com/) o A great online resource for research methodology, including books, articles, and case studies. **.Google Scholar** (https://scholar.google.com/) • A valuable tool for finding academic papers, books, and journals on scientific research methodology.

Course Description Form

1. Course Name:
Abstract algebra I
2. Course Code:
Math312
3. Semester / Year:
1st semester / 2024−2025
4. Description Preparation Date:
10/9/2024
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total)
3 Hours
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Ahlam J. Khaleel Email: ahlam.jamial@nahrainuniv.edu.iq
8. Course Objectives

Course Objectives	- Introducing students to basic concepts and important theorems in basic algebra topics
	- Equipping students with the basic concepts of the theory of groups.
	- At the end of this semester , the student can
	  - Create complex examples in the topic of group theory.
	  - Proof of new theories, preliminaries and results in the subject of the group

9. Teaching and Learning Strategies	
Strategy	The main strategy that will be used in this module is to encourage the students participation in the module activities. This strategy will be by giving the stude quizzes, assignments, projects and midterm exams throughout the semester

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Binary operation- algebraic structure- semi group- monoid		Theoretical lectures	Weekly quizzes

2	**3**	Group and commutative group and some examples		Theoretical lectures	Weekly quizzes
3	**3**	Properties of groups and some Theorems		Theoretical lectures	Weekly quizzes
4	**3**	Left (right) cancellation law + some examples		Theoretical lectures	Weekly quizzes
5	**3**	Order of a group and order of an element		Theoretical lectures	Weekly quizzes
6	**3**	Some theorems and problems		Theoretical lectures	Weekly quizzes
7	**3**	Exam 1 + definition of complex + multiplication of two complexes +definition of subgroup		Theoretical lectures	Weekly quizzes
8	**3**	Two step test + one step test + some theorems and examples		Theoretical lectures	Weekly quizzes
9	**3**	Definition of Coset +Some notes of cosets + Examples		Theoretical lectures	Weekly quizzes
10	**3**	Normalizer of an element +self conjugate element+center of group		Theoretical lectures	Weekly quizzes
11	**3**	Exam 2 + normal subgroup+ some results and examples		Theoretical lectures	Weekly quizzes
12	**3**	Some theorems of normal group + some problems		Theoretical lectures	Weekly quizzes
13	**3**	More theorems of Normal subgroup		Theoretical lectures	Weekly quizzes
14	**3**	Quotient group (factor group) + some examples and theorems		Theoretical lectures	Weekly quizzes
15	**3**	Review		Theoretical lectures	Weekly quizzes

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)	Introduction to Modern Abstract Algebra By Burton.
Main references (sources)	Rose, John S., A course on group theory, Dover, Newyork 1994
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Abstract algebra II
13. Course Code:
Math313
14. Semester / Year:
2nd semester / 2024-2025
15. Description Preparation Date:
10/9/2024
16. Available Attendance Forms:
17. Number of Credit Hours (Total) / Number of Units (Total)
3 Hours
18. Course administrator's name (mention all, if more than one name)
Name: Dr. Ayat Abdulaali Neamah Email: ayatneamah@nahrainuniv.edu.iq
19. Course Objectives

Course Objectives	- Introducing students to basic concepts and important theorems in basic algebra topics
	- Equipping students with the basic concepts of the theory of groups.
	- At the end of this semester , the student can
	  - Create complex examples in the topic of group theory.
	  - Proof of new theories, preliminaries and results in the subject of the group

20. Teaching and Learning Strategies	
Strategy	The main strategy that will be used in this module is to encourage the students participation in the module activities. This strategy will be by giving the stude quizzes, assignments, projects and midterm exams throughout the semester

21. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

1	**3**	Homomorphism of groups + isomorphism of group + Examples		Theoretical lectures	Weekly quizzes
2	**3**	Some theorems		Theoretical lectures	Weekly quizzes
3	**3**	Kernel and image of homomorphism+ examples		Theoretical lectures	Weekly quizzes
4	**3**	Fundamental theorem of homomorphism of groups		Theoretical lectures	Weekly quizzes
5	**3**	Automorphism + some theorems and problems		Theoretical lectures	Weekly quizzes
6	**3**	Permutation of groups + order of permutation+ some examples		Theoretical lectures	Weekly quizzes
7	**3**	Exam + Cyclic permutation + product of disjoint cycles		Theoretical lectures	Weekly quizzes
8	**3**	even permutation and odd permutation		Theoretical lectures	Weekly quizzes
9	**3**	Important properties of even and odd permutation		Theoretical lectures	Weekly quizzes
10	**3**	Definition of Alternating group+ Examples		Theoretical lectures	Weekly quizzes
11	**3**	Some Theorems		Theoretical lectures	Weekly quizzes
12	**3**	Cayley's theorem and its proof		Theoretical lectures	Weekly quizzes
13	**3**	Cyclic group + Examples		Theoretical lectures	Weekly quizzes
14	**3**	Some Theorems and problems		Theoretical lectures	Weekly quizzes
15	**3**	Review		Theoretical lectures	Weekly quizzes

22. 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

23. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introduction to Abstract Algebra
Main references (sources)	Rose, John S., A course on group theo Dover, Newyork 1994
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Fourth Stage

Course Description Form

1. Course Name:
Partial Differential Equations
2. Course Code:
MATH 410
3. Semester / Year:
First Semester / Fourth Class 2024-2025
4. Description Preparation Date:
1/10/2024
5. Available Attendance Forms:
2. Number of Credit Hours (Total) / Number of Units (Total):
60 Hours/ 3Unit
3. Course administrator's name (mention all, if more than one name)
Name: Dr. Ahmed Ayyoub Yousif Email: ahmed.ayyoub@nahrainuniv.edu.iq

4. Course Objectives

Course Objectives	• **The student knows how to solve a differential equation of the first and second order.** • **The student knows how to make a system of differential equations of the first order.** • **The student knows how to use transformations of integration in place of partial differential equations.**

5. Teaching and Learning Strategies

Strategy	1- Daily Post. 2- Daily Exams. 3- The Monthly Exam. 4- Home Works.

6. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1st & 2nd	8	Introduction to partial differential equations and the separation of variables.		Give Lectures	Daily Exams and H.W.
3rd & 4th	8	Transforming nonhomogeneous Bcs to homogeneous ones and solving more complicated problems.		Give Lectures	Daily Exams and H.W.

5th & 6th	8	Transforming hard equations into easier ones and solving nonhomogeneous PDE using eigenvector expansion method.		Give Lectures	Daily Exams and H.W.
7th & 8th	8	Integral transform (sine and cosine transform.		Give Lectures	Daily Exams and H.W.
9th & 10th	8	The Fourier series and transforms and its application to PDEs		Give Lectures	Daily Exams and H.W.
11th & 12th	8	The Laplace transform and its application to PDEs		Give Lectures	Daily Exams and H.W.
13th & 14th	8	The one dimensional wave equation (hyperbolic equation)		Give Lectures	Daily Exams and H.W.
15th	4	The D'alembert solution of the wave equation and the finite vibrating string (standing waves) and Elliptic type problems (the Laplacian)		Give Lectures	Daily Exams and H.W.

7. 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

8. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Partial differential equations for scientists a engineers By Stanley J. Farlow
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Mathematical Statistics I
2. Course Code:
MATH413
3. Semester / Year:
First/ Fourth Class 2024−2025
4. Description Preparation Date:
1/10/2024
5. Available Attendance Forms:
Lectures
6. Number of Credit Hours (Total) / Number of Units (Total)
60 ours/ 4 credits
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Akram Abbas Al-Sabbagh Email: akram.alsabbagh@nahrainuniv.edu.iq
8. Course Objectives

Course Objectives	• Learning the basic concepts of mathematical statistics • the definition of random variables and statistical distributions • introducing some of the most common statistical distributions with some properties and applications
9. Teaching and Learning Strategies	
Strategy	The strategy is to provide the students with as much information about mathematical statistics as possible by attending lectures to maximize the connection between the students and the lecturer in order to solve as many real-life statistical applications as possible. The lectures, some homework and some other additional exercises is also shared on Google Classroom.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

1	4	Basic concepts	Introduction to Statistics	lectures	
2-8	28	Statistical distributions	Distribution of Random Variables	lectures	
8-15	28	Common statistical distributions	Some Special Mathematical Distributions	lectures	

11. Course Evaluation

Midterm exam: 40 marks
Final exam: 60 marks

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introduction to the Theory Statistics, Alixander Mood,
Main references (sources)	-Modern Mathematical Statistics with Applications, Jay L. Devore, Kenneth N. Berk, Springer, 2012. - Mathematical Statistics w Applications, Dennis D. Wackerly, Willi Mendenhall III, Richard L. Scheaf Thomson Brooks, 2008.
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Mathematical Statistics II
2. Course Code:
MATH414
3. Semester / Year:
Second/ Fourth Class 2024−2025
4. Description Preparation Date:
1/10/2024
5. Available Attendance Forms:
Lectures
6. Number of Credit Hours (Total) / Number of Units (Total)
60 ours/ 4 credits
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Akram Abbas Al-Sabbagh Email: akram.alsabbagh@nahrainuniv.edu.iq
8. Course Objectives

Course Objectives	• Learning the basic concepts of multivariate mathematical statistics • the definition of variable transformation and Order Statistics • Statistical Estimations
9. Teaching and Learning Strategies	
Strategy	The strategy is to provide the students with as much information about mathematical statistics as possible by attending lectures to maximize the connection between the students and the lecturer in order to solve as many real-life statistical applications as possible. The lectures, some homework and some other additional exercises is also shared on Google Classroom.
10. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

1-5	20	Multivariate statistics	Multivariate Probability Distribution	lectures	
6-9	16	Statistical transformations	Function of Random Variable	lectures	
10-12	12	Statistical distribution for order statistics	Sampling Distribution	lectures	
12-15	12	Parameter estimation	Estimation	lecture	

11. Course Evaluation

Midterm exam: 40 marks
Final exam: 60 marks

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introduction to the Theory Statistics, Alixander Mood,
Main references (sources)	-Modern Mathematical Statistics with Applications, Jay L. Devore, Kenneth N. Berk, Springer, 2012. - Mathematical Statistics w Applications, Dennis D. Wackerly, Willi Mendenhall III, Richard L. Scheaf Thomson Brooks, 2008.
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name: Topology I

2. Course Code: MATH 415

3. Semester / Year: First/ 2024-2025

4. Description Preparation Date: 14/11/2024

5. Available Attendance Forms: Attendance lectures in the classroom

6. Number of Credit Hours (Total) / Number of Units (Total): 60/4

7. Course administrator's name (mention all, if more than one name)

Name: Dr. Aamena Rasim Mohammed
Email: aamen.raimmohammed@nahrainuniv.edu.iq

8. Course Objectives

Course Objectives	- Understand the topological spaces with different examples - Understand concepts of open, closed sets and limit, interior, exterior, boundary sets in topological spaces - Understand continuous mapping on topological Spaces and their properties.

9. Teaching and Learning Strategies

Strategy	• Giving Lectures supported by exercises and activities in the classroom • Daily and Weekly Assessments. • Giving homework

2. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
First	(3)+(1) Discussion	Definition of Topolog Spaces	Topological Spaces	Lectures	General question, Discussion, assignments
Second	(3)+(1) Discussion	Examples of Topolog Spaces	Topological Spaces	Lectures	General question, Discussion, assignments

Third	(3)+(1) Discussion	Open and closed sets In Topological spaces	Topological Spaces	Lectures	General question, Discussion, Assignments
Fourth	(3)+(1) Discussion	The limit points and Closure of sets	Topological Spaces	Lectures	General question, Discussion, Assignments
Fifth	(3)+(1) Discussion	Interior points of sets in topological spaces	Topological Spaces	Lectures	General question, Discussion, Assignments
Sixth	(3)+(1) Discussion	Exterior points of sets in topological spaces	Topological Spaces	Lectures	General question, Discussion, Assignments
Seventh	(3)+(1) Discussion	boundary points of set in topological spaces	Topological Spaces	Lectures	General question, Discussion, Assignments
Eighth	(3)+(1) Discussion	Base and Sub-base	Topological Spaces with special properties	Lectures	General question, Discussion, Assignments
Ninth	(3)+(1) Discussion	Dense and Nowhere Dens sets with Properties	Topological Spaces with special properties	Lectures	General question, Discussion, Assignments
Tenth	(3)+(1) Discussion	Connected disconnected sets with Properties	Topological Spaces with special properties	Lectures	General question, Discussion, Assignments
Eleventh	(3)+(1) Discussion	Continuous mapping Between topological Spaces	Mapping Between Topological spaces	Lectures	General question, Discussion, Assignments
Twelfth	(3)+(1) Discussion	Open and closed sets With examples	Mapping Between Topological spaces	Lectures	General question, Discussion, Assignments
Thirteenth	(3)+(1) Discussion	Homeomorphisms	Mapping Between Topological spaces	Lectures	General question, Discussion, Assignments
Fourteenth	(3)+(1) Discussion	Hereditary with examples	Mapping Between Topological spaces	Lectures	General question, Discussion, Assignments
Fifteenth	(3)+(1) Discussion	Product Topological Spaces	Mapping Between Topological spaces	Lectures	General question, Discussion, assignments

3. 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

Homework 5%
Daily preparation 5%
Monthly Assessments 30%
Final Test 60%

4. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introduction to General Topology, by: K. D. Joshi
Main references (sources)	TOPOLOGY, Edited by Dr. Sachin Kaushal

Recommended books and references (scientific journals, reports…)	Theory and problems of general topology, Seymour Lipchitz, Schuam's series,1965
Electronic References, Websites	https://en.wikipedia.org/wiki/Topology

Course Description Form

1. Course Name: Topology II

2. Course Code: MATH 416

3. Semester / Year: First/ 2024-2025

4. Description Preparation Date: 17/11/2024

5. Available Attendance Forms: Attendance lectures in the classroom

6. Number of Credit Hours (Total) / Number of Units (Total): 60/4

7. Course administrator's name (mention all, if more than one name)

Name: Dr. Aamena Rasim Mohammed
Email: aamen.raimmohammed@nahrainuniv.edu.iq

8. Course Objectives

Course Objectives	- Understand the connectedness on topological spaces with different examples - Understand concepts of Separation Axioms, T_0, T_1, T_2, T_3, T_4 spaces and relation between them, and ability To prove some of their properties. - Understand compactness on topological Spaces and learn some fundamental theorems and ability to prove some properties of compactness.

9. Teaching and Learning Strategies

Strategy	• Giving Lectures supported by exercises and activities in the classroom • Daily and Weekly Assessments. • Giving homework

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
First	(3)+(1) Discussion	Paths	Connectedness	Physical Attendance Lectures	General question, Discussion, assignments
Second	(3)+(1) Discussion	Closed Path	Connectedness	Physical Attendance Lectures	General question, Discussion, assignments

Third	(3)+(1) Discussion	Pathwise Connected Topological Spaces	Connectedness	Physical Attendance Lectures	General question, Discussion, Assignments
Fourth	(3)+(1) Discussion	Pathwise Connected Topological Spaces	Connectedness	Physical Attendance Lectures	General question, Discussion, Assignments
Fifth	(3)+(1) Discussion	Simply Connected Topologic Spaces	Connectedness	Physical Attendance Lectures	General question, Discussion, Assignments
Sixth	(3)+(1) Discussion	Locally Connected Topologic Spaces	Connectedness	Physical Attendance Lectures	General question, Discussion, Assignments
Seventh	(3)+(1) Discussion	T_0 Space	Separation Axioms	Physical Attendance Lectures	General question, Discussion, Assignments
Eighth	(3)+(1) Discussion	T_1 Space and its relat with T_0 Space.	Separation Axioms	Physical Attendance Lectures	General question, Discussion, Assignments
Ninth	(3)+(1) Discussion	T_2 Space (Hansdorff Space) and its relatio with T_1 Space.	Separation Axioms	Physical Attendance Lectures	General question, Discussion, Assignments
Tenth	(3)+(1) Discussion	Regular spaces and T_3 Space and its rela with T_2 Space.	Separation Axioms	Physical Attendance	General question, Discussion, Assignments
Eleventh	(3)+(1) Discussion	Normal spaces and T_4 Space and its rela with T_3 Space	Separation Axioms	Physical Attendance Lectures	General question, Discussion, Assignments
Twelfth	(3)+(1) Discussion	Basic Definition and Fundamental Theore	Compactness Topological Spaces	Physical Attendance Lectures	General question, Discussion, Assignments
Thirteenth	(3)+(1) Discussion	Compactness in Hansdorff Spaces	Compactness Topological Spaces	Physical Attendance Lectures	General question, Discussion, Assignments
Fourteenth	(3)+(1) Discussion	Local Compactness	Compactness Topological Spaces	Physical Attendance Lectures	General question, Discussion, Assignments
Fifteenth	(3)+(1) discussion	Compactness Separation Axioms	Compactness Topological Spaces	Physical Attendance Lectures	General question, Discussion, assignments

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

Homework 5%
Daily preparation 5%
Monthly Assessments 30%
Final Test 60%

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introduction to General Topology, by: K. D. Joshi

Main references (sources)	TOPOLOGY, Edited by Dr. Sachin Kaushal
Recommended books and references (scientific journals, reports…)	Theory and problems of general topology, Seymour Lipchitz, Schuam's series,1965
Electronic References, Websites	https://en.wikipedia.org/wiki/Topology

Course Description Form

1. Course Name: Complex Analysis I

2. Course Code: MATH411

3. Semester / Year: First/2024-2025

4. Description Preparation Date:

15/9/2024

5. Available Attendance Forms: Attendance

6. Number of Credit Hours (Total) / Number of Units (Total)60 hours

7. Course administrator's name (mention all, if more than one name)

Name: Dr. Iman A. Hussain
Email: iman a. hussain@nahrainuniv.edu.iq

8. Course Objectives

Course Objectives	**1-To study the techniques of complex variable and functions together with their derivatives, contour integration and transformations.** **2-To study complex power series, classification of singularities.** **3-To study calculus of residues and its applications the evaluation of integ and other concepts and properties**

9. Teaching and Learning Strategies

Strategy	Lectures, Homework, some activities in the class, Electronic referenc

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-3	12	Field of com numbers	Chapter 1	lectures	
4-8	20	Analytic Functions	Chapter 2	lectures	
9-11	12	Elementary Functions	Chapter 3	lectures	

12-1	16	Elementary Mapping	Chapter 4	lectures	

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)	1-Complex variables and applications Ruel v. Churchill 2-Complex analysis Theodore
Main references (sources)	1. Ablowitz, M. J., Fokas, A. S. (2003). *Complex variables: introduction and applications* (2nd ed). Cambridge University Press. 2. Brown, J. W., Churchill, R. V. (2009). *Complex Variables and Applications.* 8th Edition. New York: McGraw-Hill Higher Education. 3. Lundmark, H. (2004). *Visualizing complex analytic functions using domain coloring.* 4. Needham, T. (1997). *Visual Complex Analysis.* Oxford University Press, Oxford.
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name: Complex Analysis II

2. Course Code: MATH 412

3. Semester / Year: Second /2024-2025

2. Description Preparation Date:

15/9/2024

3. Available Attendance Forms: Attendance

4. Number of Credit Hours (Total) / Number of Units (Total)60 hours/4 Units

5. Course administrator's name (mention all, if more than one name)

Name: Dr. Iman A. Hussain
Email: iman a. hussain@nahrainuniv.edu.iq

6. Course Objectives

Course Objectives	**1-To study integral together with various technique with their derivatives, contour integration and transformations.** **2-To study complex sequence and series and conformal mappings and Rimr sphere.**

7. Teaching and Learning Strategies

Strategy	Lectures, Homework, some activities in the class, Electronic referenc

8. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-3	12	Integral	Chapter 4	lectures	
4-8	20	Complex sequence	Chapter 5	lectures	
9-11	12	Conformal mapping	Chapter6	lectures	

12-13	16	Sphere surface	Chapter 7	lectures	

9. 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

10. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1-Complex variables and applications Ruel v. Churchill 2-Complex analysis Theodore
Main references (sources)	5. Ablowitz, M. J., Fokas, A. S. (2003). *Complex variables: introduction and applications* (2nd ed). Cambridge University Press. 6. Brown, J. W., Churchill, R. V. (2009). *Complex Variables and Applications.* 8th Edition. New York: McGraw-Hill Higher Education. 7. Lundmark, H. (2004). *Visualizing complex analytic functions using domain coloring.* 8. Needham, T. (1997). *Visual Complex Analysis.* Oxford University Press, Oxford.
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

2. Course Name: Topics in Pure Mathematics
3. Course Code: MATH430
4. Semester / Year: second/fourth 2024-2025
5. Description Preparation Date:2024/9/13
6. Available Attendance Forms:
7. Number of Credit Hours (Total) / Number of Units (Total):60hours/4
8. Course administrator's name (mention all, if more than one name)
Name: Ruqayah Saadi Hashem Email: ruqayah.saadi@nahrainuniv.edu.iq
9. Course Objectives

Course Objectives	1-Enable students to obtain knowledge and understanding some of the basic principles of Fields. 2-Empowering and raising the students skills to obtain knowledge and understanding of the Algebra

10. Teaching and Learning Strategies

Strategy	• Introductory written lectures and various activities and assignments which are given in the classroom. • Answering the quick questions raised in the hall and the possibility of solving them by the student. • Adopting the principle of preparing reports by students.

11. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Definition of the Fields, some examples of Fields	Field Theory	Attendance interactive lectures	Ask questions and give assignments
2	4	Some Properties and Theorems of Fields	Field Theory	Attendance interactive lectures	Ask questions and give assignments
3	4	Some Properties and Theorems of Fields	Field Theory	Attendance interactive lectures	Ask questions and give assignments
4	4	Subfields and Prime Fields	Field Theory	Attendance interactive lectures	Ask questions and give assignments
5	4	Maximal Ideals with Some Examples	Certain Special Ideals	Attendance interactive lectures	Ask questions, give assignments, and make a 1st attence mid exam
6	4	Some Properties of Maximal Ideals	Certain Special Ideals	Attendance interactive lectures	Ask questions and give assignments
7	4	Some Theorems of Maximal Ideals	Certain Special Ideals	Attendance interactive lectures	Ask questions and give assignments
8	4	Prime Ideals	Certain Special Ideals	Attendance interactive lectures	Ask questions and give assignments
9	4	Some examples and Theorems of Prime Ideals	Certain Special Ideals	Attendance interactive lectures	Ask questions and give assignments
10	4	Some Theorems of Prime Ideals	Certain Special Ideals	Attendance interactive lectures	Ask questions and give assignments
11	4	The Radical of A ring, Semisimple Ring	Certain Special Ideals	Attendance interactive lectures	Ask questions and give assignments
12	4	Some Theorems of Radical	Certain Special Ideals	Attendance interact lectures	Ask questions, give assignments, and make a 2nd attence mid exam
13	4	Definition of Polynomial ring With some Examples	Polynomial Ring	Attendance interactive lectures	Ask questions and give assignments
14	4	Some Theorems of Polynomial Ring	Polynomial Ring	Attendance interactive lectures	Ask questions and give assignments
15	4	Some Theorems of Polynomial Ring	Polynomial Ring	Attendance interactive lectures	Ask questions and give assignments

12. 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

13. Learning and Teaching Resources

Required textbooks (curricular books, if any)	A first Course in Abstract Algebra by J. B. Fraleigh
Main references (sources)	Introduction to Modern Abstract Algebra by Burton
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	