Academic Program Description Form

University Name: Al-Nahrain University

Faculty/Institute: College of Science

Scientific Department: Department of Mathematics and Computer Applications

Academic or Professional Program Name: Bachelors

Final Certificate Name: Bachelors of Mathematics and Computer Applications

Academic System: Semester

Description Preparation Date: 2024

File Completion Date: 20 / 3 / 2024

Signature:

Head of Department Name:

Assist.Prof.Dr. Fatimah Al-Taie

Date: 20/3/2024

Signature:

Scientific Associate Name:

Assist.Prof. Dr. Manaf Adnan Saleh

Date: 14/4/2024

The file is checked by: Dr. Oroobe Nadhim Harbi

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date: 14.4.2024

Signature:

Approval of the Dean

1. Program Vision

1. That the program be pioneering and distinguished at the Arab and international levels.
2. The program must be internationally recognized and accredited in providing high quality in the field of applied mathematics, statistics, and operations research.

2. Program Mission

The mission of the program is for the student to acquire basic knowledge and concepts in mathematical sciences and computer applications that will help him accomplish work that requires knowledge of mathematical relationships, as well as the use of applied mathematical methods and programs in solving some of the life problems facing society. In this way, the connection between applied academic sciences is also achieved in accordance with the needs of society. And development in Iraq through the realization that the specialty of mathematics and computer applications is of great importance in planning and decision-making through analyzing the data collected by the mathematician in all cases, for example, banking, insurance, the Ministry of Defense, transportation, medicine, and engineering, in a way that serves and leads to the development of the aforementioned fields.

3. Program Objectives

The main goal is to equip students with the basic concepts and titles for studying mathematics for the initial stages, as the program focuses on the following:

A- Demonstrate an appropriate understanding of the basic set of mathematics and computer applications knowledge and the appropriate skill for processing of this knowledge, including its application in solving problems.

B- Apply basic mathematics concepts and computer applications through the use of analytical and computer methods tools, techniques, and judicious use of logical arguments.

C- Analyzing issues by formulating them mathematically.

D- Developing engineering modeling in system design and development, including the adoption of new technologies and adaptation to it.

E- Communicating the solution of applied mathematical and computational problems to a group of audiences in written and oral form.

F- Preparing graduates for jobs as professional mathematicians, especially in applied mathematics topics.

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	12	17	11.80%	
College Requirements	5	15	10.42%	

Department Requirements	**31**	**112**	**77.78%**	
Summer Training	**____**	**_____**	**_____**	
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	Mathematical Foundation I	4	
	MATH 115	Mathematical Foundation II	4	
	MATH 113	Analytic Geometry	4	
	UREQ 110	English Language	2	
	UREQ 151	Programming Fundamentals	2	3
	UREQ 150	Introduction to Computer Science	2	3
Stage two	MATH 210	Advanced Calculus I	4	
	MATH 211	Advanced Calculus II	4	
	COMP 251	Programming I	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 Set**	**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	**Human rights**	**1**	
	MATH 318	**Theory of ODE**	**4**	
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	**PDE**	**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 deal with it; that is done through specific teaching and learning methods in order for the student to acquire transferable general and qualifying skills, this is represented by:

1. Giving interactive lectures and display on screen.

2. Stimulating brain-storm thinking among students and use of electronic computers.
3. Support the work via blended learning.

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 Dr. Ali Hasan Fayadh	Mathematics	Applied Mathematics / Integral transform			✓	
Professor Dr. Osama Hameed Mohammed	Mathematics	Numerical Analysis / Approximation Theory			✓	
Associate Professor Dr. Fadhil Subhi Fadhil	Mathematics	Fuzzy set Theory and			✓	

		its Applications				
Associate Professor Dr. Ahlam Jameel Khaleel	Mathematics	Functional Analysis			✓	
Associate Professor Dr. Munaf Adnan Salih	Mathematics	Functional Analysis			✓	
Associate Professor Saad Muhsin Salman	Mechanical Engineering	Operations Research			✓	
Lecturer Dr. Ahmed Ayoob Yousif	Mathematics	Numerical Control			✓	
Lecturer Dr. Amina Rasim Mohammed	Mathematics	Functional Analysis			✓	
Lecturer Dr. Akram Abbas Jasim	Mathematics	Applied Mathematics			✓	
Lecturer Dr. Zainab Riyadh Shakir	Mathematics	Applied Mathematics			✓	
Lecturer Dr. Ibtisam Kamil Hannan	Mathematics	Dynamical Systems			✓	
Lecturer Dr. Fatima Sahib Kadhim	Mathematics	Control Systems			✓	
Lecturer Dr. Omar Ismaeel Khaleel	Mathematics	Applied Mathematics			✓	
Lecturer Dr. Ayat Abdul-Aaly Niemah	Mathematics	Algebraic statement theory			✓	
Lecturer Dr. Iman Abdul-Wahab Husain	Mathematics	Complex Analysis			✓	
Lecturer Dr. Rana Majid Hameed	Arabic Language	Arabic Language Grammer			✓	

Lecturer Dr. Muna Salih Abbas	Mathematics	Stability of Fuzzy Differential Equations			✓	
Lecturer Raneen Zaid Hamoud	Mathematics	Mathematical Statistics			✓	
Lecturer Dunya Muhyee Haydar	Mathematics	Semi-Analytic Methods for Solving Differential Equations			✓	
Lecturer Wurood Riyadh Abdul-Husain	Mathematics	Numerical Solutions of Fractal partial Differential Equations			✓	
Assistant Lecturer Yasemin Mueen Muhammed	Mathematics	Linear Programming			✓	
Assistant Lecturer Muhammed Qasim Ali	Computer Science	Computer Graphics			✓	
Assistant Lecturer Haneen Abdul-Kareem Ameen	Mathematics	Numerical Solutions of Partial Differential Equations			✓	
Assistant lecturer Shayma Abdul-Sattar Younis	Mathematics	Mathematical Statistics			✓	
Assistant Lecturer Batool Emkhailif Askar	Mathematics	Approximate Solutions of Integro-Differential Equations			✓	

Assistant Lecturer Ruqayeh Saady Hashim	Mathematics	Algebra			✓	
Assistant Lecturer Abbas Ibrahim Khlayf	Mathematics	Ordinary Differential Equations			✓	
Assistant lecturer Athraa Abdul-Salam Jasim	Mathematics	Numerical Solutions of Boundary Value Problems			✓	
Assistant Lecturer Farah Lateef Jewy	Mathematics	Integro-Differential Equations			✓	
Assistant Lecturer Nabaa Hussain Fakhry	Mathematics	Bio-mathematics			✓	
Assistant Lecturer Nibras Yasir Khudhair	Mathematics	Algebra			✓	
Assistant Lecturer Mays Majid Muhammed	Mathematics	Algebra			✓	
Assistant Lecturer Lamyaa Khalid Hussain	Mathematics	Mathematical Statistics			✓	
Assistant Lecturer Eman Khalid	Mathematics	Mathematical Statistics			✓	

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 student's 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

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	X	X			X				X	X		
	MATH 142	Calculus II	Basic	X	X			X				X	X		
	MATH 112	Finite Mathematics	Basic	X	X		X	X				X	X	X	X
	MATH 114	Mathematical Foundation I	Basic	X	X	X		X				X	X	X	
	MATH 115	Mathematical Foundation II	Basic	X	X	X		X				X	X	X	
	MATH 113	Analytic Geometry	Basic	X	X			X	X	X					
	UREQ 110	English	Basic	X	X			X	X	X		X	X	X	
	UREQ 151	Programming Fundamentals	Basic	X	X			X	X	X		X			

	UREQ 150	Introduction to computer	Basic	X	X	X		X	X	X		X			
Stage two	MATH 210	Advanced Calculus I	Basic	X	X	X	X	X	X	X		X	X		
	MATH 211	Advanced Calculus II	Basic	X	X	X	X	X	X	X		X	X		
	COMP 251	Programming I	Basic	X	X			X	X			X			
	COMP 253	Computer Graphics	Basic	X	X	X	X	X	X	X	X	X	X		
	MATH 212	Linear Algebra I	Basic	X	X			X							
	MATH 216	Solutions of ODE	Basic	X	X		X	X				X	X	X	X
	MATH 213	Linear Algebra II	Basic	X	X			X							
	MATH 214	Optimization I	Basic	X	X	X	X	X	X	X	X	X			
	MATH 243	Probability and Statistics	Basic	X	X	X	X	X	X						
	UREQ 201	Arabic Languages	Basic	X	X	X	X	X	X						
	CHEM 271	General Chemistry	Basic	X	X			X				X	X	X	

Third Stage	MATH 316	Applied Mathematics	Basic	X	X	X		X							
	MATH 319	Optimization II	Basic	X	X			X				X	X		
	MATH 312	Abstract Algebra I	Basic	X	X			X				X	X		
	MATH 313	Abstract Algebra II	Basic	X	X			X	X	X		X	X	X	
	MATH 317	Fuzzy Set	Basic	X	X			X	X			X	X	X	
	MATH 314	Numerical Analysis I	Basic	X	X	X		X	X			X	X		
	MATH 315	Numerical Analysis II	Basic	X	X	X		X	X			X	X	X	
	MATH 310	Real Analysis I	Basic	X	X	X	X	X	X			X			
	MATH 311	Real Analysis II	Basic	X	X	X		X	X						
	UREQ 420	Human rights	Basic	X	X		X	X				X			
	MATH 318	Theory of ODE	Basic	X	X	X		X	X						
Stage Four	MATH 411	Complex Analysis I	Basic	X	X	X		X	X			X	X		
	MATH 412	Complex Analysis II	Basic	X	X	X		X	X			X	X		

	MATH 413	Mathematical Statistics I	Basic	X	X	X		X				X	X		
	MATH 414	Mathematical Statistics II	Basic	X	X	X		X	X	X		X	X		
	MATH 415	Topology I	Basic	X	X			X	X			X	X		
	MATH 416	Topology II	Basic	X	X			X				X	X		
	MATH 430	Topics in Pure Mathematics	Basic	X	X	X		X	X			X	X	X	
	MATH 410	PDE	Basic	X	X	X		X	X			X	X	X	

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

Second Stage

Course Description Form

1. Course Name:
Computer Graphics
2. Course Code:
COMP253
3. Semester / Year:
2st semester/2nd Year
4. Description Preparation Date:
23/3/2024
5. Available Attendance Forms:
Presences
6. Number of Credit Hours (Total) / Number of Units (Total)
45 hours /3 units
7. Course administrator's name (mention all, if more than one name)
Name: Ass. Lect. Mohammed Qasim Ali Email: mohammed.q.ali@nahrainuniv.edu.iq

8. Course Objectives	
Course Objectives	• **Understand the concept of graphic and its importance and applications.** • **Learn about the graphics environment in MATLAB and how to use it.** • **Using MATLAB plotting functions to sketch geometric shapes.** • **Methods of plotting mathematical equations.** • **Sketch the three-dimensional curves, surfaces and objects.**

9. Teaching and Learning Strategies	
Strategy	1. Lectures 2. Practicality 3. Exercises (homework)

10. Course Structure(theoretical)

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1,2	4		MATLAB Graphical Environment	Lectures,	Quizzes, midterm

3,4,5	6	Understanding the course requirements	Plotting functions and its optional arguments	Practical and homework	exams, homework, attendance and participate during lecture
6,7,8	6		Plotting the mathematical equation		
9,10,11	6		Creating 2D Geometric shapes		
12…15	8		Sketch 3D (curves & surfaces) and objects and Shapes		

10. Course Structure (Practical)

Week	Hours	Required Learn Outcomes	Unit or subject name	Learnin method	Evaluation method
1,2	4	Understanding the course requirements	The (`plot`) command	Lectures, Practical and homework	Quizzes, midterm exams, homework attendance and participate during lecture
3,4,5	6		Format Plotting Figure Commands		
6,7,8	6		`fplot`, `ezplot` commands. Graphic Properties & Creating 2D shapes		
9,10,11	6		Other 2D plotting Commands and find Intersection & tangent points		
12…15	8		3D Plotting (sketch curves, surfaces and other objects)		
Lab. Teaching stuff		م.م محمد قاسم علي/ م.م. شيماء عبدالستار / م.م. رقية سعدي / م.م. ياسمين معين/ م.م. بتول امخيلف / م.م. نبأ حسين/ م.م. فرح لطيف جوي			

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)	**MATLAB: An Introduction with applications 4th edition Amos Gilat 2011**
Recommended books and references (scientific journals, reports…)	**College library**
B–Electronic references, Internet sites…	**MATLAB Documentation (mathworks.com)**

Course Description Form

13. Course Name:	
Programming I	
14. Course Code:	
COMP251	
15. Semester / Year:	
1st semester/2nd Year	
16. Description Preparation Date:	
23/3/2024	
17.Available Attendance Forms:	
Presences	
18.Number of Credit Hours (Total) / Number of Units (Total)	
45 hours/ 3 units	
19. Course administrator's name (mention all, if more than one name)	
Name: Ass. Lect. Mohammed Qasim Ali Email: mohammed.q.ali@nahrainuniv.edu.iq	
20. Course Objectives	
Course Objectives	• **the student learns to write program code for solving mathematical problem or any other problems.** • **The usage MATLAB functions to write the program code** • **Solve calculus problems**
21. Teaching and Learning Strategies	
Strategy	**1. Lectures** **2. Practicality** **3. Exercises (homework)**

22. Course Structure(theoretical)

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1,2	4	Understanding the course requirements	Flowcharts and Algorithms	Lectures, practical and homework	Quizzes, midte exams, homework, attendance and participate during lecture
3	2		Programming Using Script Files		
4	2		Input & Output Commands		
5	2		Relational And Logical Operators		
6	2		Conditional Statements		
7,8	4		Conditional Loops		

9,10	**4**		**User-Defined Functions Anonymous Functions**		
11	**2**		**Subfunctions**		
12,13	**4**		**Symbolic Math Programming**		
14,15	**4**		**Calculus Programming**		

10. Course Structure(practical)

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1,2	**4**	**Understanding the course requirements**	**Create m-file and its properties "input" & "disp" Statements**	Lectures, practical homework	Quizzes, midterm exams, homework, attendance and participate during lecture
3	**2**		**"fprintf" statement and its properties**		
4	**2**		**Relational Operators and Logical ("and", "or" ... statements) in MATLAB**		
5	**2**		**{if – elseif – else – end} and {switch} statements**		
6	**2**		**{for loop} and {while loop} statements with {break} statement usage**		
7,8	**4**		**Write User-Defined Functions and Anonymous Functions in MATLAB**		
9,10	**4**		**MATLAB Subfunctions**		
11	**2**		**1) Symbolic Variables and Expressions with "sym" and "syms" statements 2) Simplification Functions**		
12,13	**4**		**Solving Expressions and Equations with {solve} statement**		
14,15	**4**		**Calculus programming using {limit, diff, and int} statements**		

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, reports .... etc

24. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	**MATLAB® An Introduction with Applications (4th.ed Amos Gilat @ 2011**
Recommended books and references (scientific journals, reports…)	**College library**
Electronic References, Websites	**MATLAB Documentation (mathworks.com)**

Course Description Form

25. Course Name:	
Optimization I	
26. Course Code:	
MATH 214	
27. Semester / Year:	
Second/ Second	
28. Description Preparation Date:	
23/3/2024	
29.Available Attendance Forms:	
30.Number of Credit Hours (Total) / Number of Units (Total)	
60 hours / 4 units	
31. Course administrator's name (mention all, if more than one name)	
Name: Saad Mohsen Asst. Lec. Shayma Abdulsattar Asst. Lec. Nibras Yasir Asst. Lec. Abbas Ibraheem Asst. Lec. Ruqaya Saady Asst. Lec. Eman Khalid Email: saad.mohsen@nahrainuiv.edu.iq	
32. 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
33. Teaching and Learning Strategies	
Strategy	The strategy is to provide the students with as much information about nonlinear 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.

34. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
2-1		4	Definition and classificatior linear programming		
6-3		8	Model building		
9-7		8	Graphical Solution		
11-10		10	Simplex Method		
13-12		14	Duality and Theorem		
15-14		16	Transportation and Assignm		

35. Course Evaluation

Midterm exam: 40 marks
Final exam: 60 marks

36. 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

1. بنية المقرر

الأسبوع	الساعات	مخرجات التعلم المطلوبة	اسم الوحدة / أو الموضوع	طريقة التعليم	طريقة التقييم
2-1	4	حل مسائل الامثلية العامة	Definition and classification of nonlinear programming	برمجة باستخدام الماتلاب	
6-3	8	طرق حل المتغير واحد لدالة الهدف	Solution of single variable optimization	برمجة باستخدام الماتلاب	
9-7	8	حلا مسائل الامثليه لمتعددة المتغيرات برمجيا	Multi variable optimization with no constraints	برمجة باستخدام الماتلاب	

	برمجة باستخدام الماتلاب	Multi variable optimization with constraints	امثلة اضافية لايجاد النقاط العظمى والصغرى	10	11-10
	برمجة باستخدام الماتلاب	Solve numerical optimization by unrestricted search and exhaustive	حل الامثليه بالطريقه الحسابيه بالطريقه المحدده وطريقة اكسوستف برمجيا	14	13-12
	برمجة باستخدام ا لماتلاب	Solve numerical optimization by dichotomous , Fibonacci and golden section	حل الامثليه بالطريقه ا لحسابيه بالطريقه دايك توموس وفيبونشي و كولدن سكشن برمجيا	16	15-14

Course Description Form

37. Course Name: Arabic Language	
38. Course Code: **URIQ 201**	
39. Semester / Year: 1 / 2	
40. Description Preparation Date: 2024/2/20	
41.Available Attendance Forms: Integrated Education	
42.Number of Credit Hours (Total) / Number of Units (Total) : 15 hours/ 1	
43. Course administrator's name (mention all, if more than one name)	
Name: D. Rana Majed Hameed Email: Rana.Majid@nahrainuniv.edu.iq	
44. Course Objectives	
Course Objectives	**Acquiring knowledge skills about linguistic concepts.** **Keep the tongue from falling into the word's pronunciation error.** **Developing the student's expressive abilities.** **Teaching students to analyze the speech system.** **Teach students to distinguish between the origins of the word or increase and what it does in increasing meaning.** **Teaching students on methods and rules of control and drafting of vocabulary.** **Enabling the student to use the language vocabulary in the proper location.** **Provide training to strengthen the student's queen and develop his ability in language practice and influential rhetoric while benefiting from Experiences and trainings.**

45. Teaching and Learning Strategies

Strategy	1. POWERPOINT DISPLAY 2. Writing Reports- 3. Quarterly Tests- 4. Discussing and Solving Questions 5. Homework

46. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name		
First	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Concept of language errors	Lecture, class discussion and training	Daily and quarterly examinations and examinations
Second and Third	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Tie-in and Tip-Out Rules	Lecture, class discussion and training	Daily and quarterly examinations and examinations
Fourth and Fifth	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	A thousand outstretched and cabin	Lecture, class discussion and training	Daily and quarterly examinations and examinations
Sixth	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Solar and lunar letters	Lecture, class discussion and training	Daily and quarterly examinations and examinations
Seventh and Eighth	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Aldad and Lightness	Lecture, class discussion and training	Daily and quarterly examinations and examinations

Ninth and Tenth and Eleventh	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Writing whispering (connecting and cutting, intermediate whispering, extreme whispering)	Lecture, class discussion and training	Daily and quarterly examinations and examinations
The Twelfth and Thirteenth	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Punctuation marks	Lecture, class discussion and training	Daily and quarterly examinations and examinations
Fourteenth And Fifteen,	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Name, verb and differentiation	Lecture, class discussion and training	Daily and quarterly examinations and examinations

1. Course Evaluation	
Daily preparation: (10) degrees Daily exams: (10) Degree Monthly exam: (20) Degree Reports: (20) Degree Seminar: (20) Degree Homework: (20) Degree	
2. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Expression, creation, written drawing and written dictation/a. d. Abdulrahman Matlak al-Jabouri
Main references (sources)	Clarify the trajectory of the millennium of the son of Malik/Ibn Hisham. Qatar al-Nada and Bel al-Echo of Hisham's son. as adequate as Abbas Hassan, is a shrewd custom in the art of drainage, polite in drainage.
Recommended books and references (scientific journals, reports…)	Adequate Grammar / Abbas Hassan.
Electronic References, Websites	https://maktabeti.com https://www.noor-book.com

Course Description Form

1. Course Name:
Linear Algebra I
2. Course Code:
MATH 212
3. Semester / Year:
First/ Second
4. Description Preparation Date:
23/3/2024
5. Available Attendance Forms:
Presence of theories
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: Dr.Zainab Riyadh Shaker Email: zaianb.riyadh22@nahrainuniv.edu.iq

8. Course Objectives	
Course Objectives	1. Study of linear systems and their solutions. 2. Study matrices and solve systems using matrices. 3. Vectors and its applications 4. Determinants and their applications

9. Teaching and Learning Strategies	
Strategy	**A- Cognitive goals.** 1. Enable students to obtain knowledge and understanding of the basic principles of lin systems. 2. Enable students to obtain knowledge and understanding of the laws and properties matrices. 3. Enable students to gain knowledge and understanding of how laws are linked 4. Enable students to obtain knowledge of methods for deriving basic equations of lin systems. 5. Enable students to identify the most important applications of linear algebra such matrices and linear systems.. **B. The skills goals special to the course.** 1. The student will be able to use matrices to solve linear systems. 2. Using mathematical methods to understand the behavior of linear systems. **Teaching and Learning Methods** 1. Giving theoretical lectures.

	2. Giving descriptive homework. 3. Direct questions to students to test their understanding of the topic. 4. Assigning students homework **Assessment methods** 1. Monthly exams and daily quizzes. 2. Programmed mid-term exams. 3. Homework's. 4. Direct oral questions. **C. Affective and value goals** 1. Enabling students to solve second and third order DEs. 2. Enabling students to solve problems related to the derivations of laws and their equations. 3. Enabling students to solve mathematical problems using the simplest means. D. General and rehabilitative transferred skills(other skills relevant to employability a personal development) 1. The ability to self-research to solve mathematical problems. 2. Recognize vector space and its benefits and use in mathematics.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4		Linear Equations and Matrices		
2	4		Systems of Linear Equations		
3	4		Matrices		
4	4		Matrix Multiplication		
5	4		Algebraic Properties of Matrix Operations		
6	4		Special Types of matrices		
7	4		Solving Linear Systems		
8	4		Echelon Form of a Matrix		
9	4		Elementary Matrices; Finding A^(-1)		
10	4		Determinants		
11	4		Properties of Determinants		
12	4		Cofactor Expansion		
13	4		Inverse of a Matrix		

14 15	4 4		Other Applications of Determinants Vector space and its properties		

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 Linear Algebra and Application by Bernard Kolman
Main references (sources)	Introduction to Linear Algebra by Franz hohn
Recommended books and references (scientific journals, reports…)	Any website that specializes in the study of linear algebra
Electronic References, Websites	

Course Description Form

47. Course Name: Arabic Language	
48. Course Code: **URIQ 202**	
49. Semester / Year: 2/2	
50. Description Preparation Date: 2024/2/20	
51.Available Attendance Forms: Integrated Education	
52.Number of Credit Hours (Total) / Number of Units (Total) : 15 hours/1	
53. Course administrator's name (mention all, if more than one name)	
Name: D. Rana Majed Hameed Email: Rana.Majid@nahrainuniv.edu.iq	
54. Course Objectives	
Course Objectives	**Acquiring knowledge skills about linguistic concepts.** **Keep the tongue from falling into the word's pronunciation error.** **Developing the student's expressive abilities.** **Teaching students to analyze the speech system.** **Teach students to distinguish between the origins of the word or increase and what it does in increasing meaning.** **Teaching students on methods and rules of control and drafting of vocabulary.** **Enabling the student to use the language vocabulary in the proper location.** **Provide training to strengthen the student's queen and develop his ability in language practice and influential rhetoric while benefiting from Experiences and trainings.**
55. Teaching and Learning Strategies	

Strategy	1. POWERPOINT DISPLAY 2. Writing Reports- 3. Quarterly Tests- 4. Discussing and Solving Questions- 5. Homework

56. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
First	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Name, verb and differentiation	Lecture, class discussion and training	Daily and quarterly examinations and examinations
Second	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Activation (effect with it, effect for the time being, effect with it)	Lecture, class discussion and training	Daily and quarterly examinations and examinations
Third and Fourth	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Number	Lecture, class discussion and training	Daily and quarterly examinations and examinations
Fifth and Sixth and Seventh	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Language Error Applications	Lecture, class discussion and training	Daily and quarterly examinations and examinations
Eighth	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Meanings of prepositions	Lecture, class discussion and training	Daily and quarterly examinations and examinations
Ninth	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and	One Thousand Difference Base	Lecture, class discussion and training	Daily and quarterly examinations and examinations

		express it eloquently.			
Tenth	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Noon and Topical Base	Lecture, class discussion and training	Daily and quarterly examinations and examinations
Eleventh The Twelfth	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Formal aspects of administrative discourse	Lecture, class discussion and training	Daily and quarterly examinations and examinations
Thirteenth and Fourteenth and Fifteen,	1	The student acquires linguistic skills and improves the writing sketch in order to be able to write and express it eloquently.	Language of administrative discourse	Lecture, class discussion and training	Daily and quarterly examinations and examinations

3. Course Evaluation

Daily preparation: (10) degrees
Daily exams: (10) Degree
Monthly exam: (20) Degree
Reports: (20) Degree
Seminar: (20) Degree
Homework: (20) Degree

4. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Expression, creation, written drawing and written dictation/a. d. Abdulrahman Matlak al-Jabouri
Main references (sources)	Clarify the trajectory of the millennium of the son of Malik/Ibn Hisham. Qatar al-Nada and Bel al-Echo of Hisham's son. as adequate as Abbas Hassan, is a shrewd custom in the art of drainage, polite in drainage.
Recommended books and references (scientific journals, reports…)	Adequate Grammar / Abbas Hassan.
Electronic References, Websites	https://maktabeti.com https://www.noor-book.com

Course Description Form

1. Course Name:
Linear Algebra II
2. Course Code:
MATH 213
3. Semester / Year:
First/ Second
4. Description Preparation Date:
23/3/2024
5. Available Attendance Forms:
Presence of theories
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: Dr.Zainab Riyadh Shaker Email: zaianb.riyadh22@nahrainuniv.edu.iq

8. Course Objectives	
Course Objectives	1. Study of vector spaces and their solutions. 2. Solving linear systems by RREF and GJRR methods. 3. Inner product space and its applications. 4. Gram Schmidt method and their applications.

9. Teaching and Learning Strategies	
Strategy	**A- Cognitive goals.** 1. Enable students to obtain knowledge and understanding of the basic principles of linear systems. 2. Enable students to obtain knowledge and understanding of the laws and properties of matrices. 3. Enable students to gain knowledge and understanding of how laws are linked 4. Enable students to obtain knowledge of methods for deriving basic equations of linear systems. 5. Enable students to identify the most important applications of linear algebra such as matrices and linear systems. **B. The skills goals special to the course.** 1. The student will be able to use matrices to solve linear systems. 2. Using mathematical methods to understand the behavior of linear systems. **Teaching and Learning Methods** 1. Giving theoretical lectures.

	2. Giving descriptive homework. 3. Direct questions to students to test their understanding of the topic. 4. Assigning students homework. **Assessment methods** 1. Monthly and daily exams. 2. Programmed mid-term exams. 3. Homeworks. 4. direct oral questions. **C. Affective and value goals** 1. Enabling students to solve problems related to matrices. 2. Enabling students to solve problems related to the derivations of laws and their equations 3. Enabling students to solve mathematical problems using the simplest means **D. General and rehabilitative transferred skills(other skills relevant to employability and personal development)** 1. The ability to self-research to solve mathematical problems. 2. Recognize vector space and its benefits and use in mathematics.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4		Real Vector Spaces		
2	4		Subspaces		
3	4		Span		
4	4		Linear Independence		
5	4		Basis and Dimension		
6	4		Homogeneous Systems		
7	4		Relationship between Nonhomogeneous Linear Systems and Homogeneous Systems		
8	4		Coordinates and Isomorphism's		
9	4		Isomorphism's		
10	4		Rank of a Matrix		
11	4		Inner Product Spaces		
12	4		Length and Direction in $R^2$and R^3		
13	4		Gram-Schmidt Process		

14 15	4 4		Linear Transformations and Matrices Eigenvalues and Eigenvectors and Similarity		

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 Linear Algebra and Application by Bernard Kolman
Main references (sources)	Introduction to Linear Algebra by Franz hohn
Recommended books and references (scientific journals, reports…)	Any website that specializes in the study of linear algebra
Electronic References, Websites	

Course Description Form

57. Course Name:
Solutions of ODE
58. Course Code:
MATH216
59. Semester / Year:
Second / Second
60. Description Preparation Date:
2024
61. Available Attendance Forms:
Physical attendance
62. Number of Credit Hours (Total) / Number of Units (Total)
60 Hours/ 4 Units
63. Course administrator's name (mention all, if more than one name)
Name: Dr. Fatimah Al-Taie Email: fatimah.altaie@nahrainuniv.edu.iq
64. Course Objectives

Course Objectives	• Learning the basic concepts of mathematics, application in reality, solution of ordinary differential equations with first-, and higher-order and their applications. In addition, different classes of ODEs are considered.

65. Teaching and Learning Strategies

Strategy	The learning and teaching strategy is presented by: Providing the students with a sufficient amount of mathematical terms and definitions by attending lectures and presenting on the whiteboard to connect the students with the lecturer to solve as many real-life applications as possible. The pdf lectures, homework, quizzes, and exercises are shared on Google Classroom.

66. Course Structure

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

1-2	8	Introduction to DE'	Definition and classification of Differential Equations (DE's)	lectures	
3-6	16	First-order DE's	Methods for solving fi order ODE's	lectures	
7-9	12	Higher DE's	The general form of higher-order DE's	lectures	
10-11	8	Homogeneous DE'	Definition and method on solving homo. DE'	lectures	
12-13	8	Nonhomogeneous DE's	Definition, properties, and methods of solvin non-homo. DE's	lectures	
14-15	8	Laplace transform	Definition/properties c Laplace transform and then using Laplace transformation in solv DE's	lectures	

67. Course Evaluation

Pre-final exam: 40%
(Quizzes, homework: 10%, Mid-Exams 30%).
Final exam: 60%
Total: 100%

68. Learning and Teaching Resources

Required textbooks (curricu books, if any)	Earl D. Rainville and Phillip E. Bedient, Elementary Differential Equations, Collier Macmillan Publishers, fifth Edition, New York, 1974.
Main references (sources)	**[1]** C. Henry Edwards and David E. Penney, Differential Equations and Linear Algebra, ser. Pearson International Edition, third edition. Pearson Education, United States of America, 2010. **[2]** William E. Boyce, and Richard C. DiPrima, Elementary Differential Equations and Boundary Value Problems, John Wiley and Sons, Inc. Seventh edition, United State of America. 2001
Recommended books and references (scientific journals, reports…)	Applications of ODE's
Electronic Referenc Websites	**1**- Google.com **2-** https://www.khanacademy.org/math/differential-equations

Course Description Form

69. Course Name:	
Advanced calculus I	
70. Course Code:	
MATH 210	
71. Semester / Year:	
First semester / the second stage	
72. Description Preparation Date:	
2023	
73. Available Attendance Forms:	
74. Number of Credit Hours (Total) / Number of Units (Total)	
60 hours /4 Units	
75. Course administrator's name (mention all, if more than one name)	
Name: Dr. muna saleh **Email: muna.saleh@nahrainuniv.edu.iq**	
76. Course Objectives	
Course Objectives	• **Introduce the basic cocepts advance calculus**
77. Teaching and Learning Strategies	
Strategy	1- Giving concepts in lectures 2- Various example 3- Daily and monthly exam

78. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation methd
1	4		Sequences and Infinite Series	Theoretic lectures	
2	4		Type of series	Theoretic lectures	
4-3	8		Test for convergence of series	Theoretic lectures	
6-5	8		Power Series	Theoretic lectures	
8-7	8		Taylor's and Maclaurin series	Theoretic lectures	
9	4		Examples	Theoretic lectures	
10	4		Exam	Theoretic lectures	
11	4		Vector in Space.	Theoretic lectures	
12	4		(Dot) and cross products of tw vectors	Theoretic lectures	
13	4		Exam	Theoretic lectures	
14	4		Equation of lines,	Theoretic lectures	
15	4		Partial derivatives.	Theoretic lectures	

79. 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

80. Learning and Teaching Resources

Required textbooks (curricular books, if an	Thomas' Calculus 14th Edition
Main references (sources)	University Calculus with Analytic Geometry, by J Morry
Recommended books and references (scientific journals, reports…)	Calculus with application brief version
Electronic References, Websites	**Google.com**

Course Description Form

81. Course Name:	
Advanced calculus II	
82. Course Code:	
MATH 211	
83. Semester / Year:	
second semester / the second stage	
84. Description Preparation Date:	
2024	
85. Available Attendance Forms:	
86. Number of Credit Hours (Total) / Number of Units (Total)	
60 hours/4 Units	
87. Course administrator's name (mention all, if more than one name)	
Name: Dr. muna saleh **Email: muna.saleh@nahrainuniv.edu.iq**	
88. Course Objectives	
Course Objectives	• **Introduce the basic cocepts advance calculus**
89. Teaching and Learning Strategies	
Strategy	4- Giving concepts in lectures 5- Various example 6- Daily and monthly exam

90. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation methd
1	4		Introduction to Integratio	Theoretic lectures	
2	4		Double integrals over rectangle regions	Theoretic lectures	
4-3	8		Double integrals over nonrectangle regions	Theoretic lectures	
6-5	8		Area	Theoretic lectures	
8-7	8		Changing to polar coordinates	Theoretic lectures	
9	4		Triple integrals	Theoretic lectures	
10	4		Exam	Theoretic lectures	
11	4		Vector fields	Theoretic lectures	
12	4		Surface integrals	Theoretic lectures	
13	4		Exam	Theoretic lectures	
14	4		Line integrals	Theoretic lectures	
15	4		theorems	Theoretic lectures	

91. 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

92. Learning and Teaching Resources	
Required textbooks (curricular books, if an	Thomas' Calculus 14th Edition
Main references (sources)	University Calculus with Analytic Geometry, by J Morry
Recommended books and references (scientific journals, reports…)	Calculus with application brief version
Electronic References, Websites	**Google.com**

Course Description Form

93. Course Name:	
Probability and Statistics	
94. Course Code:	
MATH243	
95. Semester / Year:	
First semester/ Second year	
96. Description Preparation Date:	
14/3/2024	
97.Available Attendance Forms:	
98.Number of Credit Hours (Total) / Number of Units (Total)	
45 hours/3 Units	
99. Course administrator's name (mention all, if more than one name)	
Name: Ranen Zaid Ahmood Email: ranen.z.ahmood@nahrainuniv.edu.iq	
100. Course Objectives	
Course Objectives	• Enabling the students to understand the basics of Probability • Providing the students with the maximum amount of statistical measure of data • Understanding the basic concepts of the subject of Probability and statistics • Providing the students with the sufficient amount of statistical measure of data and Probability
101. 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.

102. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Basic concepts	Introduction to Statistic	Attendance interactive lectures	Ask questions and give assignments
2-6	20	Statistical description data	Tabular Representation	Attendance interactive lectures	Ask questions and give assignments
7-10	16	Statistical measure data	Mean, median, mode, Variance	Attendance interactive lectures	Ask questions and give assignments
11-15	20	Probability	Basic concepts theorems and Bays theorem	Attendance interactive lectures	Ask questions and give assignments

103. Course Evaluation

Pre final exam 40%(written exams)
Final exam 60%

104. Learning and Teaching Resources

Required textbooks (curricular books, if any)	• Modern Mathematical Statistics with Applications, Jay L. Devore, Kenneth N. Berk, Springer, 2012. • Mathematical Statistical with Applications, Dennis D. Wackerly, William Mendenhall III, Richard L. Scheaffer, Thomson Brooks, 2008
Main references (sources)	• Introduction to statistics, by Ronald E. Walpole. Introduction to statistics, by Ronald E. Walpole. **L**
Recommended books and references (scientific journals, reports…)	Introduction to the theory of statistic, Alxander Mood and Franclin Garyb1il
Electronic References, Websites	

Course Description Form

1. Course Name: General Chemistry
2. Course Code: CHEM 271
3. Semester / Year: 2023-2024
4. Description Preparation Date: 21/3/2024
5. Available Attendance Forms: Class Attendance
6. Number of Credit Hours (Total) / Number of Units (Total) 30 hr/2 units
7. Course administrator's name (mention all, if more than one name)
Name: Assist. Prof. Dr. Atheel Hassan Kadhim Email: atheel.alwash@nahrain.univ.edu.iq

8. Course Objectives	
Course Objectives	1. Develop and understand the uses of analytical chemistry. 2. Understanding the role of chemistry in quantitative analysis 3. The ability to understand the chemical methods used 4. Understanding of occupational safety responsibilities that must be followed • 5. Understand some basics of organic chemistry such as • Structure and properties of alcohols, alkane alkanes…. ….

9. Teaching and Learning Strategies	
Strategy	1 - Introduction to the main definitions of atom 2- Understanding the concentration expresion 3- Understanding the principles of calibration 4- A general introduction to acid and base 5. Understand the chemical equilibrium reaction

	6- The basics of the gravimetric method 7- Introduction to the basics of organic chemistry

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Introduce students to the basic concepts of pollution	Structure of atoms	White board to insure the student interaction	Oral and written exams
2	2	Introduce students to the basic concepts of pollution	Molarity, Molality expression	White board to insure the student interaction	Oral and written exams
3	2	Introduce students to the basic concepts of pollution	Normality expression	White board to insure the student interaction	Oral and written exams
4	2	Introduce students to the basic concepts of pollution	Tutorial	White board to insure the student interaction	Oral and written exams
5	2	Introduce students to the basic concepts of pollution	Acid and bases, pH	White board to insure the student interaction	Oral and written exams
6	2	Introduce students to the basic concepts of pollution	Mid exam	White board to insure the student interaction	Oral and written exams
7	2	Introduce students to the basic concepts of pollution	Titration	White board to insure the student interaction	Oral and written exams
8	2	Introduce students to the basic concepts of pollution	Chemical equilibrium	White board to insure the student interaction	Oral and written exams
9	2	Introduce students to the basic concepts of pollution	Factors effecting chemical equilibrium	White board to insure the student interaction	Oral and written exams
10	2	Introduce students to the basic concepts of pollution	Tutorial	White board to insure the student interaction	Oral and written exams
11	2	Introduce students to the basic concepts of pollution	Mid Exam	White board to insure the student interaction	Oral and written exams
12	2	Introduce students to the basic concepts of pollution	Gravimetric method	White board to insure the student interaction	Oral and written exams
13	2	Introduce students to the basic concepts of pollution	Gravimetric method	White board to insure the student interaction	Oral and written exams

14	2	Introduce students to the basic concepts of pollution	Open discussion preparing for final test	White board to insure the student interaction	Oral and written exams

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

50 Score of the mid exams
25 Score for quizzes
15 interaction within the class
10 or home works

12.Learning and Teaching Resources

Required textbooks (curricular books any)	Fundamental of analytical chemistry, D.A. Skoog, D. M.W F. J. Holler and S. R. Crouch, 8th ed., 2004, Brooks/Cole.
Main references (sources)	Chemistry A First course, Jacqueline l. Kroschwitz, Second Editic
Recommended books and references (scientific journals, reports…)	Fundamentals of chemistry: Fourth Edition, David Goldberg
Electronic References, Websites	Different sources from internet

Third Stage

Course Description Form

1. Course Name:	
Optimization II	
2. Course Code:	
MATH 319	
3. Semester / Year:	
First/ Third	
4. Description Preparation Date:	
23/3/2024	
5. Available Attendance Forms:	
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: Associate Professor Saad Mohsen Asst. Lec. Abbas Ibraheem Asst. Lec. Wurood Riyadh Asst. Lec. Eman Khalid 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 classificatior nonlinear programming		
6-3		8	Solution of single vari optimization		
9-7		8	Multi variable optimization v no constraints		
11-10		10	Multi variable optimization v constraints		
13-12		14	Solve numerical optimizatio unrestricted search exhaustive		
15-14		16	Solve numerical optimizatio dichotomous, Fibonacci 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

2. بنية المقرر

الأسبوع	الساعات	مخرجات التعلم المطلوبة	اسم الوحدة / أو الموضوع	طريقة التعليم	طريقة التقييم
2-1	4	الطريقة البيانية	Graphical solution	برمجة باستخدام الماتلاب	
6-3	8	الطريقة المبسطة	Simplex method	برمجة باستخدام الماتلاب	
9-7	8	طريقة Big M	Big M method	برمجة باستخدام الماتلاب	

11-10	10	طريقة ذات الطورين	Two phase method	برمجة باستخدام الماتلاب	
13-12	14	طريقة الثنائية	Dual simplex method	برمجة باستخدام الماتلاب	
15-14	16	طريقة النقل	Transportation method	برمجة باستخدام الماتلاب	

Course Description Form

13. Course Name: Real Analysis I	
14. Course Code: MATH 310	
15. Semester / Year: First/ 2023-2024	
16. Description Preparation Date: 15/10/2023	
17.Available Attendance Forms: physical attendance	
18.Number of Credit Hours (Total) / Number of Units (Total): 60/4	
19. Course administrator's name (mention all, if more than one name)	
Name: Dr. Aamena Rasim Mohammed Email: aamen.raimmohammed@nahrainuniv.edu.iq	
20. 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.
21. Teaching and Learning Strategies	
Strategy	• Giving Lectures supported by exercises and activities in the classroom • Daily and Weekly Assessments. • Giving homework

22. 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 discussion assignments questi
Second	(3)+(1) Discussion	Absolute value	Real Numbers	Lectures	General discussion assignments questi
Third	(3)+(1) Discussion	Definition of sequence	Sequences	Lectures	General discussion assignments questi
Fourth	(3)+(1) Discussion	convergent divergent sequences	Sequences	Lectures	General discussion assignments questi
Fifth	(3)+(1) Discussion	Monotonic sequence	Sequences	Lectures	General discussion assignments questi
Sixth	(3)+(1) Discussion	Subsequences	Sequences	Lectures	General discussion assignments questi
Seventh	(3)+(1) Discussion	Cauchy sequences	Sequences	Lectures	General discussion assignments questi
Eighth	(3)+(1) Discussion	Definition of me spaces with example	Metric Spaces	Lectures	General discussion assignments questi
Ninth	(3)+(1) Discussion	Open and closed sets	Metric Spaces	Lectures	General discussion assignments questi
Tenth	(3)+(1) Discussion	Limit points	Metric Spaces	Lectures	General discussion assignments questi
Eleventh	(3)+(1) Discussion	Convergent seque Cauchy sequences	Metric Spaces	Lectures	General discussion assignments questi
Twelfth	(3)+(1) Discussion	Complete metric spa	Metric Spaces	Lectures	General discussion assignments questi
Thirteenth	(3)+(1) Discussion	Contraction Mapping	Metric Spaces	Lectures	General discussion assignments questi
Fourteenth	(3)+(1) Discussion	Compact sets	Metric Spaces	Lectures	General discussion assignments questi
Fifteenth	(3)+(1) discussion	Hiene-Borel Theorer	Metric Spaces	Lectures	General discussion assignments questi

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, reports .... etc

Homework 5%

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

24. 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

25. Course Name: Real Analysis II	
26. Course Code: MATH 311	
27. Semester / Year: Third/ 2023-2024	
28. Description Preparation Date: 15/10/2023	
29.Available Attendance Forms: physical attendance	
30.Number of Credit Hours (Total) / Number of Units (Total): 60/4	
31. Course administrator's name (mention all, if more than one name)	
Name: Dr. Aamena Rasim Mohammed Email: aamen.raimmohammed@nahrainuniv.edu.iq	
32. 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.
33. Teaching and Learning Strategies	
Strategy	• Giving Lectures supported by exercises and activities in the classroom • Daily and Weekly Assessments. • Giving homework

34. 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 discussion assignments questi
Third	(3)+(1) Discussion	Continuity u sequences	Continuity	Lectures	General discussion assignments questi
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 Integrals	Riemann Integrals	Lectures	General discussion assignments questi
Eighth	(3)+(1) Discussion	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

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, reports .... etc

Homework 5%
Daily preparation 5%
Monthly Assessments 30%

Final Test 60%	
36. 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:
Theory of Ordinary Differential Equations
2. Course Code:
MATH 318
3. Semester / Year:
Second Semester / Third Class
4. Description Preparation Date:
1/3/2024
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 Lyabanov.**

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	Liapunov stability		Give Lectures	Daily Exams and H.W.

11. Course Evaluation

Monthly exams 70%
Daily preparation 10%
Daily exams 10%
Home works 10%

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	The Qualitative Theory of Ordinary Differential Equations. By Fred Brauer، John A. Nohel
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

37. Course Name:	
Abstract algebra I	
38. Course Code:	
MATH312	
39. Semester / Year:	
1st semester / 2023−2024	
40. Description Preparation Date:	
2023	
41.Available Attendance Forms:	
42.Number of Credit Hours (Total) / Number of Units (Total)	
60 Hours/4 units	
43. Course administrator's name (mention all, if more than one name)	
Name: Dr. Ayat Abdulaali Neamah Email: ayatneamah@nahrainuniv.edu.iq	
44. 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

45. 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
46. 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

47. 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

48. 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	

Course Description Form

49. Course Name:
Abstract algebra II
50. Course Code:
MATH 313
51. Semester / Year:
2nd semester / 2023-2024
52. Description Preparation Date:
2024
53.Available Attendance Forms:
54.Number of Credit Hours (Total) / Number of Units (Total)
60 Hours/4 Units
55. Course administrator's name (mention all, if more than one name)
Name: Dr. Ayat Abdulaali Neamah Email: ayatneamah@nahrainuniv.edu.iq

56. 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

57. 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

58. 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

59. 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

60. 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	

Course Description Form

1. Course Name: Applied Mathematics
Applied Mathematics
2. Course Code:
MATH 316
3. Semester / Year:
First/ Third
4. Description Preparation Date:
23/3/2024
5. Available Attendance Forms:
Internal Mode of 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: Dr.Zainab Riyadh Shaker Email: zaianb.riyadh22@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 unctions/Equations. 3. Study and solution of Fourier series method
9. Teaching and Learning Strategies	
Strategy	**A- Cognitive goals.** 1. Students will enhance their logical thinking and problem structuring abilities, and v further develop their understanding of the concept of proof. 2. Enable students to obtain knowledge and understanding of the basic principles applied mathematics. 3. Empower students to obtain knowledge and understanding the power series meth 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 solving some complicated equations with complex roots and how to make a mathematical analysis using Fourier series. **B. The skills goals special to the course.** 1. The student will be able to use power series method to solve 2nd or even 3rd order D 2. Studying and finding the analytical solutions for different special functions/equatio 3. Fourier series will be discussed and studying intensively. Teaching and Learning Methods

	1. Giving theoretical lectures. 2. Giving descriptive homework. 3. Direct questions to students to test their understanding of the topic. 4. Assigning students homework. 5. Solving problem sheets and past examination papers. **Assessment methods** 1. Monthly exams and daily quizzes. 2. Programmed mid-term exams. 3. Homework's. 4. Direct oral questions. **C. Affective and value goals** 1. Enabling students to solve second and third order DEs. 2. Enabling students to solve problems related to the derivations of laws and their equations. 3. Enabling students to solve mathematical problems using the simplest means. **Teaching and Learning Methods** Assessment methods Assessment weighting used for 2-3 attempts. Weighting: Homeworks and quizzes 15% Exams 85% **D. General and rehabilitative transferred skills(other skills relevant employability and personal development)** 1. The ability to self-research to solve applied mathematical problems. 2. Handling various type of differential equation using efficient methods and its benefits and use in mathematics.

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.		
2	4		Ordinary Points and Singular Points. Regular Singular Points, The Indicial Equation.		
3	4		Form and Validity of The Solution Near a Regular Singular Point. Indicial Equation with Difference of Roots NonIntegral.		
4	4				

5	4		Differentiation of a Product of Equation. Indicial Equation with Equal Roots. Non-homogenous case. Indicial Equation with Difference of Roots a Positive Integer (Non Logarithmic Case, Logarithmic Case). Solution of Large x (Point at Infinity).		
6	4				
7	4		Special Functions: The Gamma, Beta and Error Functions Bessel's Functions: Bessel's Equation, Repeated Relation, Integral Form for Bessel's Functions, Modified Bessel's Functions		
8	4				
9	4		Legender Equation, Legender Polynomial. Generating Function for Legender Polynomials, Orthogonalily for Legender Polynomials Associated Legender Equation.		
10	4		Hypergeometric Equation and The Confluent Hypergeometric Equation		
11	4		Laguerre Polynomials Hermite Polynomials		
12	4		Fourier Series: Orthogonalily of a Set of Sine and Cosine.		
13	4		Fourier Series: An Expansion Theorem. Examples of Fourier series: Even and odd Functions.		
14	4		Fourier Sine Series, Fourier Cosine Series. Change of Interval. Complex Form of Fourier Series. Differentiation and Integration of Fourier Series. Fourier Transform.		
15	4		Integral Transforms. Fourier Integrals. Fourier Transforms. Fourier Sine & Cosine Transform. Convolution Theory of 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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Elementary Differential Equations, by E. D. Rainville and P. E. Bedeint Fourier series and Boundary Value Problems

	(Brown and Churchill Series) 8th Edition.
Main references (sources)	lementary Differential Equations, by E. D. Rainville and P. E. Bedeint
Recommended books and references (scientific journals, reports…)	طرق في الرياضيات التطبيقية, تأليف د. باسل يعقوب Any website that specializes and reliable to study applied mathematics.
Electronic References, Websites	

Course Description Form

61. Course Name:	
Fuzzy sets	
62. Course Code:	
MATH 317	
63. Semester / Year:	
Second 2023-2024	
64. Description Preparation Date:	
23/3/2024	
65. Available Attendance Forms:	
Attendance lectures in the classroom	
66. Number of Credit Hours (total) / Number of Units (total)	
60 hours / 4 units	
67. Course administrator's name (mention all, if more than one name)	
Name: Asst. Prof. Dr. Fadhel Subhi Fadhel Email: fadhel.subhi@nahrainuniv.edu.iq	
68. 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
69. 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.

70. 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

71. 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

72. 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

73. Course Name	
Numerical Analysis I	
74. Course Code:	
MATH314	
75. Semester / Year	
First / 2023/2024	
76. Description Preparation Date	
1ST September 2023	
77.Available Attendance Forms	
Full time attendance	
78.Number of Credit Hours (Total) / Number of Units (Total)	
60/4	
79. 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. **Abbas Ibrahim Khleaf** Lab staff names: **1- Lec. Raneen zaid** **2- Ass. Lec. Haneen Abdulkareem** **3- Ass. Lec. Nabaa Husain** 4- **Ass. Lec. Batol Imkhelf**	
80. 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.

81. 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.

82. 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 error, truncation error, round off error. Floating	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	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	Numerical Differentiation	Forward, backward and		

	lecture +1 hr tutorial		central difference approximation of the derivatives.		
10	3 hrs of exam +1 hr tutorial	Midterm exam			
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,	Lab Lectures, Practical	Exams , Weekly homework, Lab quizzes

			relative error, absolute error, percentage error, round off error. Floating	Applications, Tutorial	
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	Exams , Weekly homework, Lab quizzes

12	2 hours of Lab.	Numerical Integration	Trapezoidal Method, Simpson's Method	Applications, Tutorial	
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			

83. 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%)

84. 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

85. Course Name	
Numerical Analysis II	
86. Course Code:	
MATH315	
87. Semester / Year	
Second / 2023/2024	
88. Description Preparation Date	
1ST Feb 2024	
89.Available Attendance Forms	
Full time attendance	
90.Number of Credit Hours (Total) / Number of Units (Total)	
60/4	
91. 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. **Abbas Ibrahim Khleaf** Lab staff names: **5- Lec. Dr. Ibtisam Kamil** **6- Lec. Raneen zaid** **7- Ass. Lec. Haneen Abdulkareem** **8- Ass. Lec. Nabaa Husain** 9- **Ass. Lec. Batol Imkhelf** **10- Ass. Lec Iman Khalid** 11- **Ass. Lec. Yasemen Moen** 12- **Ass. Lec. Farah Lateef**	
92. 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.

93. 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.

94. 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		Linear Algebra and Matrix Inversion,		

	+1 hr tutorial		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 lecture +1 hr tutorial	Direct Methods for Solving Linear Systems Iterative Techniques in Matrix Algebra	Iterative Techniques for Solving Linear Systems: Jacobi Iterative Gauss–Seidel Iterative	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		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	Finite Difference Method	Lab Lectures, Practical Applications, Tutorial	Exams , Weekly homework, Lab quizzes

2	2 hours of Lab.	Differential Equations	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

95. 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%)

96. 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: Human Rights And Democracy	
2. Course Code: **UREQ 420**	
3. Semester / Year: First/ 2023-2024	
4. Description Preparation Date: 6/12/2023	
5. Available Attendance Forms: In Presence	
6. Number of Credit Hours (Total) / Number of Units (Total)	
15 Hours /1 unit	
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	

Fourth Stage

Course Description Form

13. Course Name: Topics in Pure Mathematics	
14. Course Code: MATH 430	
15. Semester / Year: second/fourth	
16. Description Preparation Date:2024/3/13	
17.Available Attendance Forms:	
18.Number of Credit Hours (Total) / Number of Units (Total):60hours/4 Units	
19. Course administrator's name (mention all, if more than one name)	
Name: Dr. Ahlam J. Khaleel Email: ahlam.jamial@nahrainuniv.edu.iq	
20. 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
21. 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.

22. 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

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, reports .... etc

24. 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 to Modern Abstract Algebra by Burton
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

25.	Course Name: Complex Analysis I
26.	Course Code: MATH 411
27.	Semester / Year: First/2023-2024
28.	Description Preparation Date:2023-2024
29.	Available Attendance Forms: Attendance
30.	Number of Credit Hours (Total) / Number of Units (Total):60 hours/ 4Units
31.	Course administrator's name (mention all, if more than one name)
Name: Dr. Iman A. Hussain Email: iman a. hussain@nahrainuniv.edu.iq	
32.	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**
33.	Teaching and Learning Strategies
Strategy	Lectures, Homework, some activities in the class, Electronic referenc

34. Course Structure

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

1-3	12	Field of comp numbers	Chapter 1	lectures	
4-8	20	Analytic Functions	Chapter 2	lectures	
9-11	12	Elementary Functions	Chapter 3	lectures	
12-15	16	Elementary Mapping	Chapter 4	lectures	

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, reports .... etc

36. 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

37. Course Name: Complex Analysis II	
38. Course Code: MATH 412	
39. Semester / Year: First/2023-2024	
40. Description Preparation Date:2023-2024	
41.Available Attendance Forms: Attendance	
42.Number of Credit Hours (Total) / Number of Units (Total)60 hours/4 Units	
43. Course administrator's name (mention all, if more than one name)	
Name: Dr. Iman A. Hussain Email: iman a. hussain@nahrainuniv.edu.iq	
44. 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 Rimn sphere.**
45. Teaching and Learning Strategies	
Strategy	Lectures, Homework, some activities in the class, Electronic referenc
46. 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	
12-15	16	Sphere surface	Chapter 7	lectures	

47. 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

48. 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

49. Course Name:	
Mathematical Statistics I	
50. Course Code:	
MATH413	
51. Semester / Year:	
First/ Fourth	
52. Description Preparation Date:	
2024/3/20	
53.Available Attendance Forms:	
Lectures	
54.Number of Credit Hours (Total) / Number of Units (Total)	
60 hours/ 4 credits	
55. Course administrator's name (mention all, if more than one name)	
Name: Dr. Akram Abbas Al-Sabbagh Email: akram.alsabbagh@nahrainuniv.edu.iq	
56. 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
57. 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.

58. 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	

59. Course Evaluation

Midterm exam: 40 marks
Final exam: 60 marks

60. 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

61. Course Name:	
Mathematical Statistics II	
62. Course Code:	
MATH414	
63. Semester / Year:	
Second/ Fourth	
64. Description Preparation Date:	
65.Available Attendance Forms:	
Lectures	
66.Number of Credit Hours (Total) / Number of Units (Total)	
60 hours/ 4 credits	
67. Course administrator's name (mention all, if more than one name)	
Name: Dr. Akram Abbas Al-Sabbagh Email: akram.alsabbagh@nahrainuniv.edu.iq	
68. Course Objectives	
Course Objectives	• Learning the basic concepts of multivariate mathematical statistics • the definition of variable transformation and Order Statistics • Statistical Estimations
69. 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.

70. 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	

71. Course Evaluation
Midterm exam: 40 marks Final exam: 60 marks

72. 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

73. Course Name:	
Topology I	
74. Course Code:	
MATH 415	
75. Semester / Year:	
First / 2023-2024	
76. Description Preparation Date:	
23-3-2024	
77. Available Attendance Forms:	
Attendance lectures in the classroom	
78. Number of Credit Hours (Total) / Number of Units (Total)	
60 hours	
79. Course administrator's name (mention all, if more than one name)	
Name: Asst. Prof. Dr. Fadhel Subhi Fadhel Email: fadhel.subhi@nahrainuniv.edu.iq	
80. Course Objectives	
Course Objectives	• To strength the theoretical mathematical backgrounds of the undergraduate students and to prepare them for the post graduate studies. • To give clear statements of pertinent definitions, principles and theorems together with illustrative descriptive examples. • Improve student's thinking capacity to prove theoretical statements (theorems, propositions, remarks, etc.), which are given as a homework. • Studying the structures, components and properties of different questions, without smooth deformations, so that these properties remain similar under the formation processes related to the tearing process or leaving openings in the transition from one to the other and vice versa, as well. • Generalize all the concepts of real analysis topic. • To cover topics including the basic properties of topological, metric and norms spaces, the separation axioms, compactness, the product topology, and connectedness, as well as, state and prove theorems related to these concepts.
81. 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 subject or course, namely topology, 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. 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 and skill goals for proving theorems in a mathematical manner through sequential and ordered steps, and emotional and value goals through sensory perception of the operative theorems and results and then their proofs. And how to deal with it. This is done through specific teaching and learning methods in order for the student to acquire general and qualifying skills that are transferable.

82. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Introducing topological spaces and its related definitions, as well as, basic definitions and elementary examples	Topological spaces	Attendance interactive lectures	Ask questions and give assignments
2	4	Give well known examples definitions in topology (indiscrete, discrete, usual and cofinite topologies)	Examples of topological spaces	Attendance interactive lectures	Ask questions and give assignments
3	4	Studying the derived sets and closure of a set	Topological spaces	Attendance interactive lectures	Ask questions and give assignments
4	4	Studying the interior, exterior and the boundary points	Topological spaces	Attendance interactive lectures	Ask questions and give some homework's
5	4	Basis and local bases	Topological spaces	Attendance interactive lectures	Ask questions and give assignments

6	4	Introducing dense and nowhere dense spaces, separated sets	Topological spaces with special properties	Attendance interactive lectures	Ask questions and give assignments
7	4	Introducing connected, disconnected and separated sets	Topological spaces with special properties	Attendance interactive lectures	Ask questions and give assignments
8	4	Continuous, open and closed mappings	Mappings	Attendance interactive lectures	Ask questions and give assignments
9	4	More concepts related continuous, open and closed mappings	Mappings	Attendance interactive lectures	Ask questions, give assignments, and make a 1st attendance mid exam
10	4	Homeomorphisms	Mappings	Attendance interactive lectures	Ask questions and give assignments
11	4	Topological properties and hereditary	Mappings	Attendance interactive lectures	Ask questions and give assignments
12	4	Product Topological Spaces	Mappings	Attendance interactive lectures	Ask questions and give assignments
13	4	Definitions and examples of compact sets, as well as some theoretical results	Compactness	Attendance interactive lectures	Ask questions, give assignments, and make a 2nd attendance mid exam
14	4	Compact sets (further results)	Compactness	Attendance interactive lectures	Ask questions and give assignments
15	4	Stating and proving the intermediate value theorem	Intermediate value theorem	Attendance interactive lectures	Ask questions and give assignments

83. 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

84. Learning and Teaching Resources

Required textbooks (curricular books any)	1. Introduction to General Topology, by: K. Joshi 2. Theory and problems of general topology, l Seymour Lipchitz, Schuam's series,1965
Main references (sources)	1- Lecture Notes on Topology, by: John Rognes, 2018. 2- General Topology, by: Tom Leinster, 2014
Recommended books and referenc (scientific journals, reports...)	1- Lecture Notes- General Topology, by: Ziad Khalil, 2022. General Topology, by: Jesper M. Mϕller.
Electronic References, Websites	1- lecturervv3JNSPKeEU

Course Description Form

85. Course Name:	
Topology II	
86. Course Code:	
MATH 416	
87. Semester / Year:	
Second / 2023-2024	
88. Description Preparation Date:	
23-3-2024	
89. Available Attendance Forms:	
Attendance lectures in the classroom	
90. Number of Credit Hours (Total) / Number of Units (Total)	
60 hours / 4 units	
91. Course administrator's name (mention all, if more than one name)	
Name: Asst. Prof. Dr. Fadhel Subhi Fadhel Email: fadhel.subhi@nahrainuniv.edu.iq	
92. Course Objectives	
Course Objectives	• To strength the theoretical mathematical backgrounds of the undergraduate students and to prepare them for the post graduate studies. • To give clear statements of pertinent definitions, principles and theorems together with illustrative descriptive examples. • Improve student's thinking capacity to prove theoretical statements (theorems, propositions, remarks, etc.), which are given as a homework. • Studying the structures, components and properties of different questions, without smooth deformations, so that these properties remain similar under the formation processes related to the tearing process or leaving openings in the transition from one to the other and vice versa, as well. • Generalize all the concepts of real analysis topic. • To cover topics including the basic properties of topological, metric and norms spaces, the separation axioms, compactness, the product topology, and connectedness, as well as, state and prove theorems related to these concepts.
93. 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 subject or course, namely topology, 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. 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 and skill goals for proving proofs in a mathematical manner through sequential and ordered steps, and emotional and value goals through sensory perception of the operative theorems and results and then their proofs. And how to deal with it. This is done through specific teaching and learning methods in order for the student to acquire general and qualifying skills that are transferable.

94. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Homeomorphism and homeomorphic topological spaces	The relationship between homeomorphic functions and open, closed, and continuous functions	Attendance interactive lectures	Ask questions and give assignments
2	4	Homeomorphism and homeomorphic topological spaces	Homeomorphic spaces and topological properties	Attendance interactive lectures	Ask questions and give assignments
3	4	Compact topological spaces	Open cover, definition of compact set, and examples	Attendance interactive lectures	Ask questions and give assignments
4	4	Compact topological spaces	Theorems and basic properties of compact sets	Attendance interactive lectures	Ask questions and give some homework's
5	4	Hereditary properties	Definition of subspace, examples and theorems	Attendance interactive lectures	Ask questions and give assignments
6	4	Connectedness of topological spaces	Basic definitions and examples with some properties	Attendance interactive lectures	Ask questions and give assignments

7	4	Connectedness of topological spaces	Closed paths and path wise connected paths	Attendance interactive lectures	Ask questions and give assignments
8	4	Simply and locally connected topological spaces	Definitions, examples and theorems	Attendance interactive lectures	Ask questions and give assignments
9	4	The relationship between topological and metric spaces	Theorems	Attendance interactive lectures	Ask questions, give assignments, and make a 1st attendance mid exam
10	4	Separation axioms	T0 and T1 Spaces and their basic theorems	Attendance interactive lectures	Ask questions and give assignments
11	4	Separation axioms	T2 space (Hausdorff space) and its relationship with T1 spaces (basic theorems)	Attendance interactive lectures	Ask questions and give assignments
12	4	Separation axioms	Regular spaces, T3 spaces, and its relationship with T2 spaces	Attendance interactive lectures	Ask questions and give assignments
13	4	Separation axioms	Normal spaces, T4 space and their relationship with T3 spaces	Attendance interactive lectures	Ask questions, give assignments, and make a 2nd attendance mid exam
14	4	Compactness and separation axioms	The relationship between compact spaces and the spaces of the separation axioms	Attendance interactive lectures	Ask questions and give assignments
15	4	Homeomorphism and homeomorphic topological spaces	The relationship between homeomorphic functions and open, closed, and continuous functions	Attendance interactive lectures	Ask questions and give assignments

95. 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	
96. Learning and Teaching Resources	
Required textbooks (curricular books any)	3. Introduction to General Topology, by: K. Joshi 4. Theory and problems of general topology, l Seymour Lipchitz, Schuam's series,1965
Main references (sources)	3- Lecture Notes on Topology, by: John Rognes, 2018. 4- General Topology, by: Tom Leinster, 2014
Recommended books and referenc (scientific journals, reports...)	2- Lecture Notes- General Topology, by: Ziad Khalil, 2022. General Topology, by: Jesper M. Mϕller.
Electronic References, Websites	3- lecturervv3JNSPKeEU

Course Description Form

13.	Course Name:
	Partial Differential Equations
14.	Course Code:
	MATH 410
15.	Semester / Year:
	First Semester / Fourth Class
16.	Description Preparation Date:
	1/10/2023
17.	Available Attendance Forms:
18.	Number of Credit Hours (Total) / Number of Units (Total):
	60 Hours/ 3Unit
19.	Course administrator's name (mention all, if more than one name)
	Name: Dr. Ahmed Ayyoub Yousif Email: ahmed.ayyoub@nahrainuniv.edu.iq
20.	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.**
21.	Teaching and Learning Strategies
Strategy	1- Daily Post. 2- Daily Exams. 3- The Monthly Exam. 4- Home Works.
22.	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.

23. Course Evaluation

Monthly exams 70%
Daily preparation 10%
Daily exams 10%
Home works 10%

24. 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	