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

**Accreditation Department** 



Academic Program and Course Description Guide

1.11

# Introduction:

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

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

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

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

## **Concepts and terminology:**

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

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

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

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

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

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

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

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

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# Academic program description form

University name: University of ......Baghdad..... College/Institute: College of ......Sciences..... Scientific Department: Department of ......Mathematics..... Name of the academic or professional program: .......Mathematics Department Academic Program..... Name of final degree: Master of Mathematics...... Academic system: semester Description preparation date: 10/1/2023 Date of filling the file: 3/28/2024

the signature : Nare the signature : Mohammed & Howsein

the date :

Name of department head: the date :



Check the file before **Division of Quality Assurance and University Performance** Name of the Director of the Quality Assurance and University Performance **Division:** the date

the signature Isvar.

Authentication of the Dean

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#### 1. Program Vision

Raising the level of graduates of the Mathematics Department to contribute to the scientific and technical development of the country and to be among the ranks of distinguished and pioneering educational departments in academic achievement.

#### 2. Program Mission

Enhancing the educational process in the Mathematics Department to reach the highest level of quality to graduate qualified students who are able to think logically and possess scientific research skills to meet the needs of the labor market.

#### 3. Program Objectives

- Improving the quality of education to keep pace with the current technical development in international universities.
- Developing study plans at the bachelor's degree level to keep pace with scientific developments and the latest developments of the times.
- Qualifying cadres capable of dealing with advanced technologies and modern changes with all effectiveness and flexibility.
- Promoting scientific research in the field of mathematics, studying mathematical and statistical problems, and carrying out scientific research to find appropriate solutions to them, meeting the curricula needs of other departments in the college and universities.

#### 4. Program accreditation

Does the program have program accreditation? From which side? both

#### **5.** Other external influences

Is there a sponsor for the program: No

6. Program structure										
comments *	percentage	Study unit	Number of courses	Program structure						

20%	4	2	Enterprise requirements
nothing			College requirements
80%	24	10	Department requirements
		nothing	summer training
			Other

0	scription		C	
Credit h	iours	Name of the course or course	Course or course code	Year/level
practical	theoretical			
	2	Functional Analysis	MAT5101	Pure Master
	3	(1)	MAT5101	degree Course1
	3	Abnormal algebra (1)	MAT5102	
	2	Topics in nodal analysis (1)	MAT5103	
	2	Topics in linear algebra	MAT5104	
	2	Topological groups	MAT5105	
	2	Topics in episodes	MAT5106	
	2	Field theory	MAT5107	
	2	Representation theory for quasi- groups	MAT5108	
	2	English	UOB5100	
		Eurotional analysis		Duro Master
	3	Functional analysis (2)	MAT5201	Pure Master degree Course 2
	3	Abdali algebra (2)	MAT5202	
	2	Non-commutative rings	MAT5203	
	2	Topics in the arithmetic theory of group algebra	MAT5204	
	2	Theory of univalent function 1	MAT5205	
	2	Special functions	MAT5206	
	2	Fuzzy sets	MAT5207	

2	Topics in nodal analysis (2)	MAT5208	
2	Topics in differential topology 1	MAT5209	
2	Scientific research method	UOB5200	
3	Numerical analysis	MAT5109	Applied Master Course 1
3	Dynamic Systems (1)	MAT5110	
2	Inverse problems and their applications	MAT5111	
2	Finite difference methods	MAT5112	
2	Advanced numerical analysis	MAT5113	
2	Fractional differential equations	MAT5114	
2	Operations research	MAT5115	
2	Optimization and introduction to control Compatibility	MAT5116	
2	T-Regression analysis	MAT5117	
2	English	UOB5100	
			Applied Master
			course2
3	Fluid mechanics	MAT5210	
3	Mathematical modeling	MAT5211	
2	Dynamic Systems (2)	MAT5212	
2	Topics in linear algebra	MAT5213	
2	Mathematical techniques for image processing	MAT5214	

2	Stability of hysteresis differential equations	MAT5215
2	Integral coefficients	MAT5216
2	Control theory	MAT5217
2	Methods of writing research	UOB5200

8. Expected learning outcomes of the program	me
Knowledge	
The skills and experiences that a student acquires while undergoing training or a study plan. You certainly know that the skills added to the student are through the efforts of the teacher, who sets the goals for each lesson and uses methods to achieve these goals, thus honing the student's skill.	A1- Developing his analytical capabilities to reach logical solutions to various problems A2- His ability to evaluate the academic program A3- Creating and organizing statistical tables A4- Identifying the basic characteristics of the nature of scientific material
Skills	
The student chooses activities and tasks according to his inclinations and preparations for Achieving these goals Active cooperation between the student and the faculty member within the framework of Subsequent to the intended outcomes Self-evaluation and developing performance first and foremost in light of the rules a specific clear	<ul> <li>B1 - The ability to listen</li> <li>effectively and contribute</li> <li>constructively to the discussion</li> <li>B2 - The ability to make decisions</li> <li>and bear responsibility</li> <li>B3 - The ability to self-discipline</li> <li>and the spirit of motivation</li> <li>B4- The ability to collect</li> <li>information from various sources</li> </ul>
Statement of learning outcomes 3	Learning outcomes 3
Value	
aLearning outcomes help to know what the student should learn and what he can do after completing the academic	D1 - Developing the

program he is enrolled in.	student's ability to
	dialogue and discuss.
	D2 - Developing the
	student's ability to deal
	with the Internet.
	D3 - Developing the
	student's ability to deal
	with multiple media.
	D4 - Developing the
	student's ability to deal with
	technical means

### 9. Teaching and learning strategies

How to display scientific materials on projectors: Data Show, Explanation and clarification through lectures- Self-learning via The internet And mini projects within Lectures-

#### **10. Evaluation methods**

-Short exams-Homework-Semester and final exams-Within the lesson-Interaction within the lecture-Reports

### 11. The teaching staff

#### **Faculty members**

Preparing the teaching staff		Special requireme (If any)	ents/skills	Specialization	Scientific rank	
lecturer	angel			private	general	
			Inverse problems	mathematics	A.M.D.	
nothing	52					Muhammad
						Sabah Hussein
				Pure/Algebra	mathematics	Mr. Dr. Abdul
						Rahman Hamid
						Majeed
				Applied/Fluid	mathematics	Mr. Dr. Ahmed
				Mechanics		Mouloud Abdel
						Hadi
				Applied	mathematics	Mr. Dr. Raed
						Kamel Naji

mathematics	mathematics	Mr. Dr. Bahar
mathematics	mathematics	Hamad Ahmed
Pure/Algebra	mathematics	Mr. Dr. Wasan
i uio, i iigooiu	mathematics	Khaled Hassan
mathematics	mathematics	Mr. Dr.
munemunes	mathematics	Buthaina Abdel
		Hassan Ahmed
Algebra	mathematics	Mr. Dr. Alaa
		Abbas Aliwi
Nodal analysis	mathematics	Mr. Dr. Qasim
		Abdul Hamid
		Jassim
mathematics	mathematics	Mr. Dr. Zeina
		Zaki is
		beautiful
mathematics	mathematics	Mr. Dr. Hassan
		Fadel Reda
Applied	mathematics	Mr. Dr. Sadiq
		Naji Nasser
Nodal analysis	mathematics	A.M.D. Heba
		Fawzi Sabaa
mathematics	mathematics	A.M.D. Iman
		Ali is torment
mathematics	mathematics	A.M.D. Liqaa
		Zaki Hammadi
Applied	mathematics	A.M.D. Dalia
		Khaled Bahloul
mathematics	mathematics	A.M.D. Hoda
		Abdel Sattar
		Abdel Aoun
Applied	mathematics	A.M.D. Iraq
		Tariq Abbas
Zarephath	mathematics	A.M.D. Ali
		Abed Obaid
Dynamic	mathematics	A.M.D. Sherine
systems		Rasoul Jawad

#### **Professional development**

#### **Orienting new faculty members**

Briefly describes the process used to orient new, visiting, full-time, and part-time

faculty at the institution and department levels.

**Professional development for faculty members** 

Briefly describe the academic and professional development plan and arrangements

for faculty members such as teaching and learning strategies, assessment of

learning outcomes, professional development, etc..

### **12. Acceptance criterion**

It is required for the student applying for admission to the master's programMust have a bachelor's degree or its equivalent from an accredited university

### 13. The most important sources of information about the program

Direct guidance through workshops in the Department of Quality Assurance and University Performance at the university and college, and the information available in the description form with its explanations attached by the university.-Websites of Iraqi and foreign universities -Workshops held by the Ministry of Higher Education in addition to the Ministry's standards.

# 14. Program development plan

Following up on scientific development through scientific research and contacting international, Arab and local universities with the corresponding specialization via the Internet

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القي			· ·	مهارات	Įt.			عرفة	الم			اساسىي أم اختياري	name The decision	CodeThe decision	the year /
C4	C3	C2	C1	B4	<b>B3</b>	B2	<b>B</b> 1	A4	A3	A2	A1				the level
*	*	*	*	*	*	*	*	*	*	*	*	Basic	Functional Analysis (1)	MAT5101	
*	*	*	*	*	*	*	*	*	*	*	*	Basic	Abnormal algebra (1)	MAT5102	
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Topics in nodal analysis (1)	MAT5103	
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Topics in linear algebra	MAT5104	
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Topological groups	MAT5105	
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Topics in ring theory	MAT5106	
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Field theory	MAT5107	
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Representation theory for quasi- groups	MAT5108	
*	*	*	*	*	*	*	*	*	*	*	*	my choice	English	UOB5100	
*	*	*	*	*	*	*	*	*	*	*	*	Basic	Functional analysis (2)	MAT5201	

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	*	*	*	*	*	*	*	*	*	*	*	*	Basic	Abdali algebra (2)	MAT5202
	*	*	*	*	*	*	*	*	*	*	*	*	my choice	Non-commutative rings	MAT5203
	*	*	*	*	*	*	*	*	*	*	*	*	my choice	Topics in the arithmetic theory of group algebra	MAT5204
	*	*	*	*	*	*	*	*	*	*	*	*	my choice	Theory of univalent function 1	MAT5205
ſ	*	*	*	*	*	*	*	*	*	*	*	*	my choice	Special functional	MAT5206
Ī	*	*	*	*	*	*	*	*	*	*	*	*	my choice	Fuzzy sets	MAT5207
-	*	*	*	*	*	*	*	*	*	*	*	*	my choice	Topics in nodal analysis (2)	MAT5208
	*	*	*	*	*	*	*	*	*	*	*	*	my choice	Topics in differential topology 1	MAT5209
-	*	*	*	*	*	*	*	*	*	*	*	*	my choice	Scientific research method	UOB5200
_	*	*	*	*	*	*	*	*	*	*	*	*	Basic	Numerical analysis	MAT5109
	*	*	*	*	*	*	*	*	*	*	*	*	Basic	Dynamic Systems (1)	MAT5110
-	*	*	*	*	*	*	*	*	*	*	*	*	my choice	Inverse problems and their applications	MAT5111
	*	*	*	*	*	*	*	*	*	*	*	*	my choice	Finite difference methods	MAT5112
	*	*	*	*	*	*	*	*	*	*	*	*	my choice	Applied functional analysis	MAT5113

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*	*	*	*	*	*	*	*	*	*	*	*	my choice	Fractional differential equations	MAT5114
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Operations research	MAT5115
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Optimization and introduction to combinatorial control	MAT5116
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Regression analysis	MAT5117
*	*	*	*	*	*	*	*	*	*	*	*	my choice	English	UOB5100
*	*	*	*	*	*	*	*	*	*	*	*			
*	*	*	*	*	*	*	*	*	*	*	*	Basic	Fluid mechanics	MAT5210
*	*	*	*	*	*	*	*	*	*	*	*	Basic	Mathematical modeling	MAT5211
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Dynamic Systems (2)	MAT5212
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Topics in linear algebra	MAT5213
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Mathematical techniques for image processing	MAT5214
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Stability of hysteresis differential equations	MAT5215
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Integral coefficients	MAT5216

*	*	*	*	*	*	*	*	*	*	*	*	my choice	Control theory	MAT5217
*	*	*	*	*	*	*	*	*	*	*	*	my choice	Methods of writing	UOB5200
													research	

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• Please situation Signal in Squares the interview For outputs Learning Individuality from the program Submissive For evaluation

1. Course name

Functional analysis (1)

# 2. Course code

MAT5101

#### 3. Semester/year

Pure Master's degree/first course/2023-2024

#### 4. The date this description was prepared

10/1/2023

#### 5. Available attendance forms

Presence weekly

## 6. Number of study hours (total) / number of units (total)

3/45

#### 7. Name of the course administrator (if more than one name is mentioned)

zeana.zaki@sc.uobaghdad.edu.iq Email:	Name: A.D. Zeina Zaki is beautiful
8. Course objectives	
<ol> <li>Encouraging and developing scientific research in the field of mathematics in general.</li> <li>Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres.</li> <li>Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in mathematical sciences through diversification in learning and teaching methods and training students to apply the acquired knowledge and skills to solve real-world problems.</li> <li>Encouraging research programs and participating in scientific conferences and seminars.</li> <li>Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills- Building and developing partnerships with the governmental and</li> </ol>	Objectives of the study subject

private sectors and society with all its various institutions.									
9. Teaching and learning strategies									
Explanation and clarification through lectures.									
• How to display scientific materials using display devices:									
data shows, smart boards									
• Self-learn	• Self-learning through homework and mini-projects within The strategy								
lectures.									
• Graduatio	n projectsA	AndaFor scientific visit	5.						
10. Course	structure								
Evaluation method	Name of the unit/topic								
General questions and discussion	theoretical	Review of vector space	Concept of vector space	or	3	the first			
General questions and discussion	theoretical	The concept of normed spaces	Normal space		3	the second			
General questions and discussion	theoretical	Advance example of normal spaces	Some example of normal space		3	the third			
General questions and discussion	theoretical	Concept of banach space	Banach space		3	the fourth			
General questions and discussion	theoretical	Review of linear transformation	Linear transformation		3	Fifth			
General questions and discussion	theoretical	The concept of L(N,N)	N,N) The space linear transformation 3 VI						
General questions and discussion	theoretical	Review of bounded LT	Bounded linear transformation 3 Sevent			Seventh			
General questions and discussion	theoretical	The concept of dual space	The dual space		3	VIII			
First semester exam	theoretical	Review of dual space	The dual space 3		Ninth				
General questions and discussion	reneral tions and theoretical The concept of internal The linear product 3 The tenth					The tenth			
General questions and discussion	theoretical	Review of internal product of normed space	The connection between liner prod as normal space	luct	3	eleventh			

General questions and discussion	theoretical	Review of Riezer reprentation theorm	Rieze reprisnat theorem	3	twelveth
General questions and discussion	theoretical	Concept of adjoint of LT.	The adjoint of linear	3	Thirteenth
General questions and discussion	theoretical	Concept of Hilbert spaces	Hilbert space	3	fourteenth
General questions and discussion	theoretical	The orthonormal system Hilbertspace	orthonormal system Hilbert space	3	Fifteenth
11. Course	evaluation	1			

12. Learning and teaching resources	
Introduction to Hibert space" berberian,	Required textbooks (methodology, if
SK2016	any)
A Hilbert space problem book. Halmos, P.R.2017"	Main references (sources)
The most important books and special sources on the foundations of mathematics are in the central library, the science library, and the department.	Recommended supporting books and references (scientific journals, reports)
<ul> <li>Discreet websites.</li> <li>Virtual library.</li> <li>Library locations in some international universities.</li> </ul>	Electronic references, websites

1. Course name
Commutative algebra 1
2. Course code
MAT5102
3. Semester/year
Pure Master's degree/first course/2023-2024
4. The date this description was prepared
10/1/2023
5. Available attendance forms
Presence weekly
6. Number of study hours (total) / number of units (total)

45						
7. Name	of the cours	e administrator (if m	ore than one	name	is menti	ioned)
wasan.ha	san@sc.uob	aghdad.edu.iq Email:		Nam	e: Wasa	n
				Khaled Hassan		
8. Course	e objectives					
	aging and dev natics in genera	reloping scientific researcl	h in the field of			
<ul> <li>Providi mathen compat</li> </ul>	ng distinguish natics, both me ible with inter ne needs of th					
require mathen teaching	ng and qual ments of wor natical sciences g methods and lge and skills t	Objectives of the				
confere	aging research nces and semir					
-		ing environment for facu vledge and educational	•			
develop skillsBu governi instituti	their know ilding and nental and pri ions	vledge and educational developing partnershi vate sectors and society wi	and research ips with the			
develop skillsBu govern instituti 9. Teachi	their know ilding and nental and pri ions ing and lear	vledge and educational developing partnershi vate sectors and society wi ming strategies	and research ips with the ith all its various			
develop skillsBu govern instituti 9. Teachi Explan	their know nilding and nental and pri- tions ang and lear ation and cla	vledge and educational developing partnershi vate sectors and society wi ming strategies rification through lectur	and research ips with the ith all its various es.			
develop skillsBu governn instituti 9. Teachi Explan How to	their know nilding and nental and pri- tons ang and lear ation and cla	vledge and educational developing partnershi vate sectors and society wi ming strategies rification through lectur ntific materials using dis	and research ips with the ith all its various es.			
develop skillsBu governn instituti <b>9. Teach</b> i Explan How to	their know nilding and nental and pri- tions ang and lear ation and cla	vledge and educational developing partnershi vate sectors and society wi ming strategies rification through lectur ntific materials using dis	and research ips with the ith all its various es.			
develop skillsBu govern instituti 9. Teachi Explan How to data sh	their know ilding and nental and pri- ions ing and lear ation and cla o display scie- ows, smart b	vledge and educational developing partnershi vate sectors and society wi ming strategies rification through lectur ntific materials using dis	and research ips with the ith all its various es. splay devices:	The	strategy	
develop skillsBu govern instituti 9. Teachi Explan How to data sh	their know ilding and nental and pri- ions ing and lear ation and cla o display scie ows, smart be arning throug	vledge and educational developing partnershi vate sectors and society wi rning strategies rification through lectur ntific materials using dis oards.	and research ips with the ith all its various es. splay devices:	The	strategy	
develop skillsBu govern instituti 9. Teachi • Explan • How to data sh • Self-lea lecture	their know ilding and nental and pri- ions ing and lear ation and cla o display scie- ows, smart b- arning throug s.	vledge and educational developing partnershi vate sectors and society wi rning strategies rification through lectur ntific materials using dis oards.	and research ips with the ith all its various es. splay devices:	The	strategy	
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develop skillsBu govern instituti 9. Teachi • Explan • How to data sh • Self-lea lecture • Gradua	their know ilding and nental and pri- ions ing and lear ation and cla o display scie ows, smart be arning throug s. ation projects	vate sectors and educational developing partnershi vate sectors and society wi ming strategies rification through lectur ntific materials using dis oards. th homework and mini-p aFor scientific visits.	and research ips with the ith all its various es. splay devices:	ning	strategy	the week
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<ul> <li>develop skillsBu governn instituti</li> <li><b>9. Teachi</b></li> <li>Explan</li> <li>How to data sh</li> <li>Self-lea lecture</li> <li>Gradua</li> <li><b>10. Cours</b></li> <li>Evaluation method</li> <li>Questions</li> </ul>	their know ilding and nental and pri- ions ing and lear ation and cla o display scie: ows, smart be arning throug s. ation projects se structure Teaching method	vate sectors and educational developing partnershi vate sectors and society wi ming strategies rification through lectur ntific materials using dis oards. th homework and mini-p aFor scientific visits.	and research ips with the ith all its various es. splay devices: projects within Required learn outcomes	ning nodel asic	hours	week

discussion			direct addition		
Questions and discussion	theoretical	Simple modules and Schours lemma	Getting to know a simple model	3	4
Questions and discussion	theoretical	Noethrian and Artinian modules	Some important definitions	3	5
Questions and discussion	theoretical	Theorems on Noetherian modules	Some important theories	3	6
Questions and discussion	theoretical	Free modules	Identify the Hurra model	3	7
Questions and discussion	theoretical	Properties of free modules	Learn about the features of the Hurra model	3	8
Questions and discussion	theoretical	Short exact sequences	Identify short perfect sequences	3	9
Questions and discussion	theoretical	Split sequences	Identify the types of sequences	3	10
Questions and discussion	theoretical	Torsion and divisible modules	Recognition	3	11
Questions and discussion	theoretical	Projective modules	Identify some types of models	3	12
Questions and discussion	theoretical	Properties of Projective modules	Learn about some properties	3	13
Questions and discussion	theoretical	Injective modules and Bear criterion	Get to know another model	3	14
Exam					15
11 Cours	o oveluetio	n			

#### **11. Course evaluation**

12. Learning and teaching resources	
DM Burton, Abstract Algebra, WNC Brown	Required textbooks
publisher, 2019	(methodology, if any)
C. Faith, Algebra, ring, modules and	
categories, Springer-verlage, Berlin, New	
York, 2017	Main references (sources)
I. Kaplinsky, Commutative, University of	
Chicago, 1974	
F.Kasch, Modules and rings, academic press,	Recommended supporting books
NewYork, 1982	and references (scientific
	journals, reports)

Discreet websites.	
<ul> <li>Virtual library.</li> <li>Library locations in some international</li> </ul>	Electronic references, websites
universities.	

1. Course name	
Topics in nodal analysis 1	
2. Course code	
MAT5103	
3. Semester/year	
Pure Master's degree/first course/2023-2024	
4. The date this description was prepared	
10/1/2023	
5. Available attendance forms	
Presence weekly	
6. Number of study hours (total) / number of u	units (total)
2/30	
7. Name of the course administrator (if more t	han one name is mentioned)
abdulrahman.majeed@sc.uobaghdad.edu.iqWhi	Name: Abdul Rahman Hamid
ch :kassim.jassim@sc.uobaghdad.edu.iq	Name H.D. Qasim Abdel Hamid
8. Course objectives	
• Encouraging and developing scientific research in the field of mathematics in general.	
• Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres.	Objectives of the study subject
• Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in mathematical sciences through diversification in learning and teaching methods and training students to	

	he acquired kr problems.	nowledge and skills to sol	lve real-						
Encouraging research programs and participating in scientific conferences and seminars									
9. Teaching and learning strategies									
How the device of the dev	to display sc es: data shov	larification through le ientific materials usin vs, smart boards.	ig display	The stra	teav				
within <ul> <li>Gradu</li> </ul>	n lectures. ation projec	ugh homework and m	1						
<b>10. Cou</b>	rse structu	re							
Evaluati on method	Teaching method	Name of the unit/topic	Required lea outcome	-	hours	the week			
General question s and discussi on	theoretical	Why study functions of a complex variable	Learn abou importance of o function	complex	2	the first			
General question s and discussi on	theoretical	Complex number in exponential form	Know how to complex nun exponential	nber in	2	the second			
General question s and discussi on	theoretical	Functions of complex variable	Identify con function		2	the third			
General question s and discussi on	theoretical	retical Limits, continuous Knowledge of purpose, 2 the fourth							
General question s and discussi on	eneral lestion s and iscussi theoretical Equivalent condition for (Cauchy-Riemann equations) Identify equivalent conditions 2 Fifth								
General question s and discussi on	theoretical	Exponential and logarithmic function trigonometric and hyperbolic functions	Learn about exp functions, logar		2	VI			
General question	theoretical	Definite integrals of complex valued	Learn about content integration of content of content of the second seco		2	Sevent h			

	Γ				
s and		functions	functions		
discussi					
On Comment					
General					
question		The Cauchy integral	Learn about Cauchy's	2	<b>3</b> 7 <b>1 1 1</b>
s and	theoretical	formula	integral formula	2	VIII
discussi					
on					
General					
question					
s and	theoretical	Power series	Identify power series	2	Ninth
discussi					
on					
General					
question					
s and	theoretical	The residual theorem	Learn about the remainder	2	The
discussi	licoreticui		theorem	-	tenth
on					
General					
			Learn about zeros and		
question	41	Zeros and poles of		2	.1
s and	theoretical	analytic functions	poles of analytical	2	eleven
discussi		5	functions		
on					
General					
question			Knowing the remaining		
s and	theoretical	Calculus of residues	account	2	twelve
discussi			account		
on					
General					
question			Knowledge of Mobias		
s and	theoretical	Mobius transform and	transformation and other	2	thirteen
discussi		others	transformations		
on					
General					
question					
-	theoretical	Conformal manning	Identifying animals that	2	Fourtee
s and	meoretical	Conformal mapping	keep angles	Z	n
discussi					
On 1					
General					
question		More on Harmonic	Learn more about		
s and	theoretical	functions	harmonic functions	2	fifteen
discussi			narmonie runeuons		
on					
11. Cou	11. Course evaluation				
12. Lean	rning and t	eaching resources			
Complex analysis by Alfors, LV2017 Required textbooks (methodology,					
	_	-	if any)		

	II ully)
Complex analysis by Bak, J. 2019	Main references (sources)

	Recommended supporting books and references (scientific journals, reports)
The most important books and special sources on the foundations of mathematics are in the central library, the science library, and the department.	Electronic references, websites
<ul><li>Discreet websites.</li><li>Virtual library.</li></ul>	
Library locations in some international universities.	

#### 1. Course name

#### **English**

#### 2. Course code

UOB5100

#### 3. Semester/year

Pure Master's degree/first course/2023-2024

#### 4. The date this description was prepared

10/1/2023

#### 5. Available attendance forms

Presenceweekly

#### 6. Number of study hours (total) / number of units (total)

2/30

#### 7. Name of the course administrator (if more than one name is mentioned)

Email:

#### 8. Course objectives

- Encouraging and developing scientific research in the field of mathematics in general.
  Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic
- quality to meet the needs of the education sector with highly qualified cadres.
- Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in mathematical sciences through diversification in learning and teaching methods and training students to apply the acquired knowledge and skills to solve real-world problems.
   Objectives of the study subject
- Encouraging research programs and participating in scientific conferences and seminars
- Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skillsBuilding and developing partnerships with the governmental and private sectors and society with all its various institutions

9. Teaching and learning strategies					
<ul> <li>Explanation and clarification through lectures.</li> <li>How to display scientific materials using display devices: data shows, smart boards, plasma screens.</li> <li>Self-learning through homework and mini-projects within lectures.</li> <li>Graduation projects and scientific visits</li> </ul>					
10. Course st	tructure				
roadEvaluation	Teaching method	Unit name (topic)	Required educational outcomes	hours	the week
Questions and discussion	theoretical	International student	Getting to know students from different parts of the world and talking to them		the second
Questions and discussion	theoretical	Vocabulary development	Knowledge of the development of speech vocabulary	2	the third
Questions and discussion	theoretical	Where in the world	Identify a location in the world		the fourth
Questions and discussion	theoretical	Newspaper articles	Identify articles and how to read magazines	2	Fifth
Questions and discussion	theoretical	Modern technology	Learn about the technology of his speech	5 2	VI
Questions and discussion	theoretical	Conferences and visits	Identify the style of writing in conferences	2	Seventh
Questions and discussion	theoretical	Science and our world	Science and our world	2	VIII
Questions and discussion	theoretical	Writing trends	Identify the characteristics of writing	2	Ninth
Questions and discussion	theoretical	Reading air pollution	Identify the characteristics of pollution using the reading method	·)	The tenth
Questions and discussion	theoretical	Past and present	Learn about the rules of the presen and past tense	nt 2	eleventh
Questions and discussion	theoretical	The world of IT	Identify the basic characteristics of the nature of scientific material	2	twelveth
Questions and discussion	theoretical	Inventions, discoveries	Identify the characteristics of breakthroughs and discoveries	·)	Thirteenth

discoveries

Questions and discussion	theoretical	Processes	Identify the basic processes of the nature of matter	2	fourteenth
Questions and discussion	theoretical	Travel and tourism	Learn about tourism and travel	2	Fifteenth
11. Course e	valuation				
12. Learning	g and teachi	ing resources			
New hand way:- Academic skills reading writing 2019			Required textbooks (methodology, if any)		
Academic skills reading writing 2018			Main references (sources)		
The most important books and special sources on the foundations of mathematics are in the central library, the science library, and the department.			Recommended su references (scient reports)		
<ul> <li>Discreet websites.</li> <li>Virtual library.</li> <li>Library locations in some international universities.</li> </ul>			Electronic referen	nces, webs	ites

1. Course name		
Topics in linear algebra		
2. Course code		
MAT5104		
3. Semester/year		
Pure Master's degree/first course/2023-2024		
4. The date this description was prepared		
10/1/2023		
5. Available attendance forms		
Presence weekly		
6. Number of study hours (total) / numbe	r of units (total)	
2/30		
7. Name of the course administrator (if m	ore than one name is mentioned)	
iman.athab@sc.uobaghdad.edu.iq	Name: Dr. Iman Ali	
<u>ali.abd@sc.uobaghdad.edu.iq</u>	Dr Ali Abed Obaid	

Course objectives				
Encouraging and developing scientific research in the field of mathematics in general. Providing distinguished academic programs in the field of				
mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres.				
Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in mathematical sciences through diversification in learning and teaching methods and training students to apply the acquired knowledge and skills to solve real-world problems.	Objectives of the study subject			
Encouraging research programs and participating in scientific conferences and seminars				
Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills Building and developing partnerships with the governmental and private sectors and society with all its various institutions				
. Teaching and learning strategies				
Explanation and clarification through lectures.				
How to display scientific materials using display devices:				
data shows, smart boards, plasma screens. The strategy				
Self-learning through homework and mini-projects v	within	The strategy		
lectures.				
Graduation projectsWaFor scientific visits.		1		

Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Questions and discussion	theoretical	Basic Concepts	Basic principles	2	1
Questions and discussion	theoretical	Vector space over an arbitrary field	Matrix algebra	2	2
Questions and discussion	theoretical	Subspaces of vector space	Vector space	2	3
Questions and discussion	theoretical	Span and independence	Basic properties of space	2	4
Questions and discussion	theoretical	Bases and finite dimensional vector space	Subspace	2	5
Questions and discussion	theoretical	Bases and infinite dimensional vector space	Complementary subspace	2	6
Questions and discussion	theoretical	Dragonalization	quotient space	2	7
Questions and discussion	theoretical	Liner mappings	Basis and dimension	2	8
Questions and discussion	theoretical	Eigen values and eigen vectors	Examples and exercises	2	9
Questions and discussion	theoretical	Isometry andQuotnent space	Foundation theories	2	10
Questions and discussion	theoretical	Orthonormal sat	The basis of the space of division and completion	2	11

### **11. Course evaluation**

12. Learning and teaching resources	
1)Strang G Linear Algebra and applied Academic press 1976 2) Advanced Linear Algebra, second edition, Brue N Cooperstein	Required textbooks (methodology, if any)
Bernard Coleman Introduction to Linear Algebra with its ApplicationsaTranslated by Adel Ghassan and Basil Atta Al-Hashemi - University of Baghdad2000	Main references (sources)
The most important books and special sources on the foundations of mathematics are in the central library, the science library, and the department.	Recommended supporting books and references (scientific journals, reports)
The most important books and special sources on the foundations of mathematics are in the central library, the science library, and the department.	Electronic references, websites

1. Course name	
Topics in episodes	
2. Course code	
MAT5106	
3. Semester/year	
Master's degree/first semester/2023-2024	
4. The date this description was prepared	
10/1/2023	
5. Available attendance forms	
My presence	
6. Number of study hours (total) / number of units (total	l)
2/30	
7. Name of the course administrator (if more than one n mentioned)	ame is
alaa.elewi@sc.uobaghdad.edu.iq Email:	Name: Alaa Abbas Aliwi
8. Course objectives	
<ul> <li>Preparing graduates specialized in mathematics to contribute to the development of the country</li> <li>Meeting the needs of the education sector with highly qualified cadres</li> <li>Encouraging distinguished people to work in the department</li> <li>Encouraging research programs and participating in scientific conferences and seminars</li> <li>Achieving quality and academic accreditation</li> </ul>	Objectives of the study subject
9. Teaching and learning strategies	
<ul><li>Paper lectures</li><li>Presentations</li><li>Electronic screen</li></ul>	The strategy

• Telegram, electronic classes, and websites						
10. Course structure						
Evaluation method	Teaching method	Name of the	unit/topic	Required learning outcomes	hours	the week
General questions and discussion	In-person lectures	CERTAIN SPECIAL IDEALS			2	the first
General questions and discussion	In-person lectures	The relationsh some kinds	-		2	the second
General questions, discussion, and exams	In-person lectures				2	the third
Duties are general	In-person lectures	Jacobson	radical		2	the fourth
Annie's test	In-person lectures	Local r	ings		2	Fifth
General questions and discussion	In-person lectures	Regular rings			2	VI
Duties are general	In-person lectures	Boolean	rings		2	Sevent h
Monthly exam	In-person lectures	Monthly exam			2	VIII
General questions and discussion	In-person lectures	Polynomial rings			2	Ninth
Monthly exam	In-person lectures	Extension	of field		2	The tenth
General questions and discussion	In-person lectures	Prime ra	ndical		2	elevent h
Duties are general	In-person lectures	Discussing a assignn			2	twelvet h
Monthly exam	In-person lectures	Monthly	exam		2	Thirtee nth
General questions and discussion	In-person lectures	Rings of Fraction			2	fourtee nth
General questions and discussion	In-person lectures	Rings with chain condition 2		2	Fifteen th	
11. Course	evaluation					
12. Learnin	g and teaching	resources				
			Required te	extbooks (m	ethodolog	y, if

	Main references (sources)
The most important books and special sources on the foundations of mathematics are in the central library, the science library, and the department.	Recommended supporting books and references (scientific journals, reports)
<ul> <li>Discreet websites.</li> <li>Virtual library.</li> <li>Library locations in some international universities.</li> </ul>	Electronic references, websites

1. Course name						
Commutative algebra(2)						
2. Course code						
MAT5202						
3. Semester/year						
Pure Master's degree/second course/2023-2024						
4. The date this description was prepared						
10/1/2023						
5. Available attendance forms						
My presence						
6. Number of study hours (total) / number of units (total)						
3/45						
7. Name of the course administrator (if more than one name is mentioned)						
bahar.ahmed@sc.uobaghdad.edu.iq Email	Name: Bahar Hamad Ahmed					

o. Course o	bjectives						
-	g and develop s in general.	ping scientific research ir	n the field of				
Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres.							
• Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in mathematical sciences through diversification in learning and teaching methods and training students to apply the acquired knowledge and skills to solve real-world problems.					Objectives of the study subject		
Ũ	• Encouraging research programs and participating in scientific conferences and seminars						
<ul> <li>Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills Building and developing partnerships with the governmental and private sectors and society with all its various institutions</li> </ul>							
9. Teaching	g and learn	ing strategies					
<ul> <li>Explanation and clarification through lectures.</li> <li>How to display scientific materials using display devices: data shows, smart boards, plasma screens.</li> <li>Self-learning through homework and mini-projects within lectures.</li> </ul>							
<ul><li>How to display boards, plasm</li><li>Self-learning</li></ul>	ay scientific mate na screens. through homewo	erials using display devices: d	ectures.	The s	strategy		
<ul> <li>How to displate to the boards, plasm</li> <li>Self-learning</li> <li>Graduation</li> </ul>	ay scientific materia screens. through homewoon projectsW	erials using display devices: d	ectures.	The s	strategy		
<ul> <li>How to displate to the boards, plasm</li> <li>Self-learning</li> <li>Graduation</li> </ul>	ay scientific materia screens. through homewoon projectsW	erials using display devices: d	ectures.	ning	strategy	the week	
<ul> <li>How to displate to the boards, plasman self-learning</li> <li>Graduation</li> <li>Evaluation</li> </ul>	ay scientific materia screens. through homewoon projects W structure Teaching	erials using display devices: d ork and mini-projects within I VaFor scientific visits Name of the	ectures. Required lear	ning		the week the first	
<ul> <li>How to displate to the boards, plasm</li> <li>Self-learning</li> <li>Graduation</li> <li><b>10. Course</b></li> <li>Evaluation method</li> <li>General questions and</li> </ul>	ay scientific materia screens. through homeworn projects W structure Teaching method	erials using display devices: d ork and mini-projects within I VaFor scientific visits Name of the unit/topic	ectures. Required lear outcomes Learn about s	ning ome	hours		
<ul> <li>How to displate to the boards, plasman self-learning</li> <li>Graduation</li> <li><b>10. Course</b></li> <li><b>Evaluation</b></li> <li>General</li> <li>questions and</li> <li>discussion</li> <li>General</li> <li>questions and</li> </ul>	ay scientific materia screens. through homeworn projects W structure Teaching method theoretical	erials using display devices: d ork and mini-projects within I VaFor scientific visits Name of the unit/topic Essential submodule	ectures. Required lear outcomes Learn about s concepts Learn about s	ning ome ome f the	hours (3)	the first the	
<ul> <li>How to displate boards, plasments</li> <li>Self-learning</li> <li>Graduation</li> <li><b>10. Course</b></li> <li><b>Evaluation</b></li> <li>General</li> <li>questions and discussion</li> <li>General</li> <li>questions and discussion</li> <li>General</li> <li>questions and discussion</li> </ul>	ay scientific materia screens. through homeword on projects W structure Teaching method theoretical	erials using display devices: d ork and mini-projects within I VaFor scientific visits Name of the unit/topic Essential submodule Uniform module	ectures. Required lear outcomes Learn about s concepts Learn about s theories	ning ome ome f the ed	hours (3) (3)	the first the second	
<ul> <li>How to displate boards, plasments</li> <li>Self-learning</li> <li>Graduation</li> <li><b>10. Course</b></li> <li><b>Evaluation</b> method</li> <li>General questions and discussion</li> <li>General questions and discussion</li> <li>General questions and discussion</li> <li>General questions and discussion</li> </ul>	ay scientific materia screens. through homewor on projects W structure Teaching method theoretical theoretical	erials using display devices: d ork and mini-projects within I VaFor scientific visits Name of the unit/topic Essential submodule Uniform module Relative complement	ectures. Required lear outcomes Learn about s concepts Learn about s theories Knowledge or theories use Some theories	ning ome ome f the ed s and their	hours (3) (3) (3)	the first the second the third	

				-			
General questions and discussion	theoretical	Local module	Learn about some concepts	(3)	Seventh		
General questions and discussion	theoretical	Internal and external direct sum	Learn about some concepts	(3)	VIII		
First semester exam	theoretical	Injective module	Learn about some concepts	(3)	Ninth		
General questions and discussion	theoretical	Injective hull	Learn about some concepts	(3)	The tenth		
General questions and discussion	theoretical	Projective cover	Learn about some concepts	(3)	eleventh		
General questions and discussion	theoretical	The socle of a module	Learn about some concepts	(3)	twelveth		
General questions and discussion	theoretical	Semi simple module	Learn about some concepts	(3)	Thirteenth		
General questions and discussion	theoretical	Singular submodule	Learn about some concepts	(3)	fourteenth		
		Exam			fifteen		
11. Course	evaluation						
12. Learnin	g and teac	hing resources					
DM Burton, Abstract Algebra, WNC Brown publisher, 2017			-	Required textbooks (methodology, if any)			
C. Faith, Algebra, ring, modules and categories, Springer-verlage, Berlin, New York,2015 I. Kaplnsky, Commutative, University of			w 5 Main references (	Main references (sources)			
Chicago, 2016 F.Kasch, Modules and rings, academic press, NewYork, 1982			s, Recommended su	Recommended supporting books and references (scientific journals, reports)			
<ul> <li>Discreet v</li> <li>Virtual lik</li> <li>Library locat</li> <li>universities.</li> </ul>	orary.	ne international		Electronic references, websites			

### 1. Course name

For function analysis (2)

### 2. Course code

MAT5201

### 3. Semester/year

Pure Master's degree/second course/2023-2024

### 4. The date this description was prepared

10/1/2023

### 5. Available attendance forms

My presence

### 6. Number of study hours (total) / number of units (total)

3/45

# 7. Name of the course administrator (if more than one name is mentioned)

buthaina.a@sc.uobaghdad.edu.iq Email:

Name: Buthaina Abdel Hassan Ahmed

#### 8. Course objectives • Encouraging and developing scientific research in the field of mathematics in general. • Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres. • Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in Objectives of the study mathematical sciences through diversification in learning and subject teaching methods and training students to apply the acquired knowledge and skills to solve real-world problems. • Encouraging research programs and participating in scientific conferences and seminars • Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skillsBuilding and developing partnerships with the governmental and private sectors and society with all its various institutions

9. Teachii	ng and lea	rning strategies							
	0	6 6							
•		arification through lectur							
	How to display scientific materials using display								
devices	: data show	s, smart boards, plasma s	screens.	The stra	ategy				
• Self-lea	rning throu		ucgy						
within l	ectures.								
Graduat	tion project	sWaFor scientific visits							
10. Cours	e structur	e							
Evaluation method	Teaching method	Name of the unit/topic	Required le	-	hours	the week			
General questions and discussion	theoretical	Bounded linear operator	Learn about some concepts		(3)	the first			
General questions and discussion	theoretical	Basic spectral theory	Learn abou theorie		(3)	the second			
General questions and discussion	theoretical	Basic spectral theory	0	Knowledge of the theories used		the third			
General questions and discussion	theoretical	The spectrum and resolved sets		Some theories and examples		the fourth			
General questions and discussion	theoretical	The spectral mapping theorem	Theories and their applications		(3)	Fifth			
General questions and discussion	theoretical	Classification of points in the	Some classif used		(3)	VI			
General questions and discussion	theoretical	. spectral radius	Learn abou concep		(3)	Seventh			
General questions and discussion	theoretical	Duality	Learn about some concepts		(3)	VIII			

Learn about some

concepts

Types of primers

used

(3)

(3)

Ninth

The tenth

Adjoints of Hilbert space

operator

Elementary types of

operator

First

semester

exam General

questions

and discussion

theoretical

theoretical

General questions and discussion	theoretical	The big three classical theorems		assifications of the ree main theories	(3)	eleventh	
General questions and discussion	theoretical	The big three classical theorems	al Classifications of the three main theories		(3)	twelveth	
General questions and discussion	theoretical	The big three classical theorems			(3)	Thirteenth	
General questions and discussion	theoretical	The big three classical theorems		assifications of the ree main theories	(3)	fourteenth	
Exam						fifteen	
11. Cours	e evaluati	on					
12. Learn	12. Learning and teaching resources						
Barbara	D. Mac Clu	er, "Elementary functio	nal	Required textbo	ooks		
analysis", springer, 2013			(methodology,				
Bryan P. Rynee and Martine A. Youngson, linear functional analysis, 2016"			Nigin references (sources)				
Balmoha	n V. Limaye	e, Functional analysis, r	new	v Recommended supporting books			
	age international, 2006			and references (scientific			
				journals, report	(s)		
Discree	et websites						
• Virtual library.				Electronic refe	rences s	vehsites	
Library locations in some international					cinces, v		
universitie	es.						

1. Course name
Non-commutative rings
2. Course code
MAT5203
3. Semester/year
Pure Master's degree/second course/2023-2024

4. The date this desc	cription was prepare	ed					
10/1/2023							
5. Available attenda	nce forms						
My presence							
6. Number of study	hours (total) / numb	per of units (tot	al)				
2/30							
7. Name of the cour	se administrator (if	more than one	name	is men	tioned)		
abdulrahman.majeed Email:	@sc.uobaghdad.edu.	iq		e: Abdu nan Hai			
8. Course objectives	8. Course objectives						
<ul> <li>mathematics in general</li> <li>Providing distinguishe mathematics, both more compatible with interner meet the needs of the end of th</li></ul>	d academic programs in the phological and applied, so ational standards of acade education sector with highlen ing specialist students to me in the private and public set through diversification in training students to apply to o solve real-world problem programs and participating	ne field of o that they are mic quality to ly qualified cadres. eet the ectors in learning and the acquired ns. g in scientific members to search skills	U U	ctives o subjec			
9. Teaching and least	0 0						
<ul> <li>How to display scie data shows, smart b</li> <li>Self-learning throug within lectures.</li> </ul>	arification through lect entific materials using boards, and screensnoZ gh homework and min WaFor scientific visit	display devices: Zama. i-projects	The s	strategy			
10. Course structure							
Evaluation Teaching method method	Name of the unit/topic	Required learn outcomes	ing	hours	the week		
General questions theoretical	Ring-theorem preliminaries	Learn about ring t	heory	2	the first		

General questions and discussion	theoretical	n-Jordan mapping	N-Jordan app	2	fifteen	
11. Course	e evaluatio	n				
12. Learni	ing and tea	aching resources				
Algebraic division ring extensions by C.Fouth 2017			<b>v</b> 1	Required textbooks (methodology, if any)		
Rings with involutions by IN Herstein 2016			Main references (	Main references (sources)		
The most important books and special sources on the foundations of mathematics are in the central library, the science library, and the department.			and references (so	· · · ·		
• Virtual Library loc				nces, web	sites	

1. Course name	
Special functions	
2. Course code	
MAT5206	
3. Semester/year	
Pure Master's degree/second course/2023-2024	1
4. The date this description was prepared	
10/1/2023	
5. Available attendance forms	
My presence	
6. Number of study hours (total) / number of	units (total)
2/30	
7. Name of the course administrator (if more	than one name is mentioned)
hiba.f@sc.uobaghdad.edu.iq Email	Name: Heba Fawzi
:	Sabaa

8. Course ob	jectives					
• Encouraging mathematics	-	ing scientific	research in the field of			
mathematics compatible v	mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified					
requirements mathematica teaching met	• Preparing and qualifying specialist students to meet the				ves of t	he study
00	Encouraging research programs and participating in scientific conferences and seminars					
<ul> <li>Preparing a s develop their Building and</li> </ul>	stimulating er knowledge a developing j	and education partnerships	or faculty members to nal and research skills with the governmental l its various institutions			
9. Teaching	and learni	ing strate	gies	I		
• Explanatio	n and clarif	ication thro	ough lectures.			
• How to display scientific materials using display						
devices: data shows, smart boards, plasma screens.				The strategy		
• Self-learning through homework and mini-projects within lectures.						
	n projectsW	aFor scient	tific visits			
10. Course s	1 0					
Evaluation method	Teaching method	Name of the unit/topic	Required learning out	comes	hours	the week
Through tests andnThrough general	theoretical		Gamma Function and Re Functions.	lated -1	(2)	the first
questions and discussion			Asymptotic expansion The Gamma function.			
General questions and discussion	theoretical		Euler's product for gamma -4 (2) the second function and some important identities. Asymptotic expansion of the -5			
			gamma function for larg	e  z .		

	41		$\langle 0 \rangle$	41. 41. 1
General questions, discussion, and exams	theoretical	Beta function and some of the -6 properties of the Beta function. Some important alternative -7 proofs.	(2)	the third
General questions and discussion	theoretical	Factorial function and its main -8 properties. The probability integral9 Asymptotic expansion of -10 probability integral.	(2)	the fourth
Annie's test	theoretical	The exponential integral11 Asymptotic expansion of -12 exponential integral.	(2)	Fifth
General questions and discussion	theoretical	Hypergeometric function13 Riemann P-function and -14 transformation of solution. Identification of -15 Hypergeometric integrals with fundamental solutions.	(2)	VI
General questions and discussion	theoretical	Elementary properties of the -16 Hypergeometric function. The Confluent Hypergeometric -17 function.	(2)	Seventh
Annie's test	theoretical		(2)	VIII
General questions and discussion	theoretical	Elementary properties of the -18 Confluent Hypergeometric function. Integral representation of the -19 Confluent Hypergeometric function.	(2)	Ninth
Monthly exam	theoretical	Asymptotic representation of -20 the Confluent Hypergeometric function for large  z .	(2)	The tenth
General questions and discussion	theoretical	Bessel Functions21 Recurrence relations of Bessel -22 Function and its of integral order.	(2)	eleventh
onThrough testing or through	theoretical	Generating function of Bessel -23 Function of first kind.	(2)	twelveth

discussion		Schlafli	s contour integral24		
General questions and discussion	theoretical	Bessel F	epresentation of the -25 unction of integral order. ctions of third kind26	(2)	Thirteenth
General questions and discussion	theoretical		integral solution of the essel equation.	(2)	fourteenth
General questions and discussion	theoretical	Propertie	Properties of Hankel function.		Fifteenth
11. Course e	evaluation				
12. Learning	g and teaching r	esources			
Fuzzy	Sets and Fuzzy	<b>1</b>	Required textbooks	metho	dology, if
	Joakim	Lindblad2016	any)		
	Henri Prade (201	· •			
and Sys	stems: Theory and	l Applications,	Main references (sou	irces)	

Recommended supporting books and

references (scientific journals,

Electronic references, websites

reports....)

Reading, MA: Addison-Wesley.

The most important books and special

sources on chaos theory located in the

department.

• Discreet websites.

• Virtual library.

universities.

central library, the science library, and the

• Library locations in some international

1. Course name	
Nodal analysis 2	
2. Course code	
MAT5208	

emester/year Master's degree/second course/2023-2024 he date this description was prepared /2023 vailable attendance forms presence umber of study hours (total) / number of units (total)	 
he date this description was prepared /2023 vailable attendance forms presence umber of study hours (total) / number of units (total)	otal)
/2023 vailable attendance forms presence umber of study hours (total) / number of units (total)	otal)
presence umber of study hours (total) / number of units (to	otal)
umber of study hours (total) / number of units (to	otal)
umber of study hours (total) / number of units (to	otal)
ame of the course administrator (if more than on	e name is mentioned)
im.jassim@sc.uobaghdad.edu.iq il:	Name: Qasim Abdel Hamid
ourse objectives	
ncouraging and developing scientific research in the field of athematics in general. roviding distinguished academic programs in the field of athematics, both morphological and applied, so that they are ompatible with international standards of academic quality to eet the needs of the education sector with highly qualified adres. reparing and qualifying specialist students to meet the quirements of work in the private and public sectors in athematical sciences through diversification in learning and aching methods and training students to apply the acquired nowledge and skills to solve real-world problems. ncouraging research programs and participating in scientific onferences and seminars reparing a stimulating environment for faculty members to evelop their knowledge and educational and research skills uilding and developing partnerships with the governmental and rivate sectors and society with all its various institutions	Objectives of the study subject
eaching and learning strategies xplanation and clarification through lectures.	The strategy
eac	hing and learning strategies

Evaluation method	Teaching method	Name of the unit/topic	Required learning	hours	the week
General questions and discussion	theoretical	Review complex analysis	outcomesLearn about the importance of complex functions	2	the first
General questions and discussion	theoretical	Basic concept	Know the basic concepts	2	the second
General questions and discussion	theoretical	Basic lemmas	Identify the basic issues	2	the third
General questions and discussion	theoretical	Transforms theorems	Knowledge of conversion theories	2	the fourth
General questions and discussion	theoretical	Review of area theorem 1	Getting to know the theory 1	2	Fifth
General questions and discussion	theoretical	Review of area theorem 2	Learn about theory 2	2	VI
General questions and discussion	theoretical	Applications of area theorems	Applications: space theories	2	Seventh
General questions and discussion	theoretical	Bieberbunch principle	Learn about the principle of Birbankh	2	VIII
General questions and discussion	theoretical	Koebe principle	Learn about the Quibi principle	2	Ninth
General questions and discussion	theoretical	Growth principle	Learn about the principle of growth	2	The tenth
General questions and discussion	theoretical	Distortion principle	Learn about the theories and principles of distortion	2	eleven
General questions and discussion	theoretical	Main corollaries	Find out the main results	2	twelve
General questions	theoretical	Application distortion	Misrepresentation applications	2	thirteen

and discussion					
General questions and discussion	theoretical	Application on growth theorem	Applications of growth theory	2	Fourteer
Monthly					fifteen
exam					Inteen
11. Course	e evaluation				
12. Learni	ng and teac	hing resources			
	_	s by Alfors, L.V. 2020	Required textbook if any)	s (meth	odology,
Con	nplex analysi	s by Alfors, L.V. 2020	Main references (s	ources)	
sources on are in the c and the dep	the foundati entral librar partment.	oks and special ions of mathematics y, the science library,	Recommended sup and references (sci reports)		
• Virtual l	ations in son	ne international	Electronic reference	ces, web	osites

universities.

### 1. Course name

Scientific research method

### 2. Course code

UOB5200

### 3. Semester/year

Pure Master's degree/second course/2023-2024

### 4. The date this description was prepared

10/1/2023

### 5. Available attendance forms

My presence

### 6. Number of study hours (total) / number of units (total)

2/30

7. Name of the course administrator (if more than one name is mentioned)				
asawer.d@sc.uobaghdad.edu.iq	Name: Duraid Hamdi			
Email:	bracelets			
8. Course objectives				
Encouraging and developing scientific research in the field of				
mathematics in general.				
Providing distinguished academic programs in the field of				
mathematics, both morphological and applied, so that they are				
compatible with international standards of academic quality to meet				
the needs of the education sector with highly qualified cadres.				
Preparing and qualifying specialist students to meet the				
requirements of work in the private and public sectors in	Objectives of the			
mathematical sciences through diversification in learning and	study subject			
teaching methods and training students to apply the acquired	study subject			
knowledge and skills to solve real-world problems.				
Encouraging research programs and participating in scientific				
conferences and seminars				
Preparing a stimulating environment for faculty members to develop				
their knowledge and educational and research skills Building and				
developing partnerships with the governmental and private sectors				
and society with all its various institutions				
9. Teaching and learning strategies				

• Explanation and clarification through lectures.	
• How to display scientific materials using display	
devices: data shows, smart boards, plasma screens.	
• Self-learning through homework and mini-projects	The strategy
within lectures.	
• Graduation projectsWaFor scientific visits	

### **10.** Course structure

	, sti uctui (	2			
Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Questions	theoretical	Type of writing	Scientific Articles Research	1	1
and		Type of writing	papers	-	-
discussion			P ap cro		
Questions	theoretical	Proposals	purpose of Proposals	1	2
and		roposuis	components of Proposals	-	-
discussion					
Questions	theoretical	Titles	Point to check in your own	1	3
and			writing	_	
discussion					
Questions	theoretical	Planning your	Putting your ideas in order	1	4
and		writing		-	•
discussion					
Questions	theoretical	Paragraph writing	Placing the main idea in the	1	5
and		- angraph and	paragraph	-	C
discussion			P.m. op. op.		
Questions	theoretical	Abstract and	Problems, Literature review and	1	6
and		introduction	Referring	-	Ū.
discussion			8		
Questions	theoretical	Problem statement	Main objective of paper	1	7
and		purpose	5 1 1		
discussion					
Questions	theoretical	Writing the main	Use of illustrations General	1	8
and		body	information		
discussion					
Questions	theoretical	Results	Summarizing what was done	1	9
and					
discussion					
Questions	theoretical	Discussion	Did the research support the	1	10
and			hypothesis		
discussion					
Questions	theoretical	Tables and Graphs	Describing graphsDescribing	1	11
and			Tables		
discussion					
Questions	theoretical	Referencing	Types of references style sheets	1	12
and					
	1	1	1		

discussion						
Questions	theoretical	Format of	]	Ref. to book, article and	1	13
and		reference		unpublished work		
discussion						
Questions	theoretical	Useful phrases	Ph	rases that used in research	1	14
and				paper		
discussion						
Exam	-	Examined		-	1	15
11. Course evaluation						
	6	ching resources				
Z. subodova, writing in English apractical handbook for			12	Required textbooks (me	ethodolo	ogy, if
scientific technical writers, Technical University Bron, 2013.			any)		0,	
bodova, writing in English apractical handbook for scientific technical writers, Technical University Bron, 2013. A. wallwork, English for research: usage style and grammar, springer .Newyork .Headelborg Dordrecht London.2000 T.panston, Aconcise grammar for English language teachers, Ireland 2003 Guidance on writing university theses and scientific research (Issam Fadel Al-Jumaili - Zahra Mahmoud Al-Khafaji)2009			Main references (source	es)		
The most important books and special sources on the			Recommended support	ing boo	ks and	
foundations of mathematics are in the central library, the			references (scientific jo	ournals,		
coionoo libror	and the demont					

science library, and the department.reports....)Discreet websites.Virtual Library Library locations in some international<br/>universities.Electronic references, websites

1. Course name
Topics in the arithmetic theory of group algebra
2. Course code
MAT5204
3. Semester/year
Pure Master's degree/second course/2023-2024
4. The date this description was prepared
10/1/2023
5. Available attendance forms
My presence

#### 6. Number of study hours (total) / number of units (total) 2/307. Name of the course administrator (if more than one name is mentioned) ali.abd@sc.uobaghdad.edu.iq Name: Ali Abd Obaid Email: 8. Course objectives Encouraging and developing scientific research in the field of mathematics in general. Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres. Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in Objectives of the study mathematical sciences through diversification in learning and subject teaching methods and training students to apply the acquired knowledge and skills to solve real-world problems. Encouraging research programs and participating in scientific conferences and seminars

Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills. -Building and developing partnerships with the governmental and private sectors and society with all its various institutions

# 9. Teaching and learning strategies

- Explanation and clarification through lectures.
- How to display scientific materials using display devices: data shows, smart boards, plasma screens.
- Self-learning through homework and mini-projects The strategy within lectures.

Graduation projects For scientific visits

10. Course	e structure	;			
Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
General questions and discussion	In-person lectures	Introduction to CGT.	What is CGT?	2	the first
General questions and discussion	In-person lectures	Crash course to finite group theory	General result on group theory	2	the second
General questions,	In-person lectures	Crash course to finite group theory	Symmetric group with application	2	the third

		r	I		1
discussion, and exams					
Duties are	In-person	Crash course to finite	Group Action and	2	the fourth
general	lectures	group theory	Orbits	2	
Annie's test	In-person	Crash course to graph	General result on graph	2	Fifth
i mine s test	lectures	theory	theory	-	1 IIII
General	In-person	Crash course to graph	Properties of graphs	2	VI
questions	lectures	theory	1 01		
and					
discussion					
Duties are	In-person	The GAP	What is GAP?	2	Seventh
general	lectures	System			
Annie's test	In-person	The GAP	GAP Manual	2	VIII
	lectures	System			
General	In-person	Algorithm in CGT	Example of CGT	2	Ninth
questions and	lectures		Algorithm with		
discussion			application in GAP		
Monthly	In-person	Application in CGT	Using the Online Atlas	2	The tenth
exam	lectures		Using the Online Atlas	-	
General	In-person	YAGS Graph System	A Gentle Tutorial	2	eleventh
questions	lectures				
and					
discussion					
Duties are	In-person	Application in CGT	Basic results on	2	twelveth
general	lectures		communication graphs		
Annie's test	In-person	Application in CGT	Application on	2	Thirteenth
<u> </u>	lectures		communication graphs		
General	In-person	Application in CGT	Basic results on A4-	2	fourteenth
questions	lectures		graphs		
and discussion					
General	In-person	Application in CGT	Application on A4-	2	Fifteenth
questions	lectures		graphs	-	1 inteentii
and			0 1		
discussion					
11. Course	e evaluatio	n			
12. Learni	ing and tea	ching resources			
D. F. Holt	, B. Eick, and	E. A. Brien, "Handbook	of		
computatio	onal group the	ory." Discrete Mathemati	cs Required textbooks	s (meth	odology,
and its	Applications	(Boca Raton). Chapman			
		Hall/CRC, 200			

The GAP Group., "GAP Groups, Algorithms, and [1] Programming", Version 4.11.1, http://www.gap-	
system.org, 2021.	Main references (sources)

C. Cedillo, R. MacKinney-Romero, MA Pizaa, [2]	
IA Robles and R. Villarroel-Flores, "Yet Another	
Graph System, YAGS", Version 0.0.5. 2021.	
The most important books and special sources on the foundations of mathematics are in the central library, the science library, and the department.	Recommended supporting books and references (scientific journals, reports)
Discreet websites.	
Virtual library.	
• Library locations in some international universities	Electronic references, websites

1. Cour	se name
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Dynamic Systems (1)

### 2. Course code

MAT5110

### 3. Semester/year

Applied Master/first course/2023-2024

### 4. The date this description was prepared

10/1/2023

### 5. Available attendance forms

My presence

### 6. Number of study hours (total) / number of units (total)

3/45

### 7. Name of the course administrator (if more than one name is mentioned)

shireen.jawad@sc.uobaghdad.edu.iq Email:	Name: Sherine Rasoul
8. Course objectives	

Encouraging and developing scientific research in the field of	
mathematics in general.	
Providing distinguished academic programs in the field of	
mathematics, both morphological and applied, so that they are	
compatible with international standards of academic quality to	
meet the needs of the education sector with highly qualified	
cadres.	
Preparing and qualifying specialist students to meet the	
requirements of work in the private and public sectors in	Objectives of the study
mathematical sciences through diversification in learning and	subject
teaching methods and training students to apply the acquired	5
knowledge and skills to solve real-world problems.	
Encouraging research programs and participating in scientific	
conferences and seminars	
Preparing a stimulating environment for faculty members to	
develop their knowledge and educational and research skills	
Building and developing partnerships with the governmental and	
private sectors and society with all its various institutions	
9. Teaching and learning strategies	
• Explanation and clarification through lectures.	The strategy

devi • Self with	ices: data sh -learning th iin lectures.	scientific materials using dis nows, smart boards, plasma sc nough homework and mini-pr jectsWaFor scientific visits	creens.		
10. Cours	se structui	·e			
Evaluation method	Teaching method	Unit name (topic)	Required educational outcomes	hours	the week
General questions	theoretical	Iterates of functions, Graphical representation of an orbit,	Identify the basic characteristics of the	(3)	1
and discussions	meorenear	attracting and repelling fixed points, nonhyperbolic fixed points	nature of scientific material		
General questions and discussions	theoretical	Families of function, bifurcation of family of function, period doubling bifurcation, fold bifurcation, period – 3 points	Identify the basic characteristics of the nature of scientific material	(3)	2
General questions and discussions	theoretical	Chaos in one dimension, lyapunov exponents, transitivity and strong chaos	Identify the basic characteristics of the nature of scientific material	(3)	3
General questions and discussions	theoretical	Chaotic function,strongly chaotic,conjugacy,	Identify the basic characteristics of the nature of scientific material	(3)	4
General questions and discussions	theoretical	Two dimensional maps, dynamics of linear maps	Identify the basic characteristics of the nature of scientific material	(3)	5
General questions and discussions	theoretical	Similar matrices, invariant set, linear conjugate, attracting, repelling, and saddle point of linear function	Identify the basic characteristics of the nature of scientific material	(3)	6
General questions and discussions	theoretical	Solution of linear system, the general solution of linear systems	Identify the basic characteristics of the nature of scientific material	(3)	7
General questions and discussions	theoretical	Stability of two-dimensional maps	Identify the basic characteristics of the nature of scientific material	(3)	8
General questions and discussions	theoretical	Nonlinear maps	Identify the basic characteristics of the nature of scientific material	(3)	9
General questions and discussions	theoretical	Attracting, repelling, saddle point of nonlinear maps	Identify the basic characteristics of the nature of scientific material	(3)	10

Conoral		Hortman Cramon theorem area	Identify the heate	(2)	11
General	theoretical	Hartman-Groman theorem, area contracting, area expanding	Identify the basic characteristics of the	(3)	11
questions and	theoretical	0 1 0	nature of scientific		
discussions		maps.	material		
		The behavior of F near a saddle		(2)	12
General	theoretical		Identify the basic characteristics of the	(3)	12
questions and	theoretical	points, stable and unstable	nature of scientific		
discussions		manifold theorem, stability via linearization	material		
General	 			(2)	13
	the exection 1	Lyapunove function for	Identify the basic	(3)	15
questions	theoretical	nonlinear map, Lyapunove	characteristics of the		
and		stability theorem	nature of scientific		
discussions			material	(2)	1.4
General		LaSalle's invariance principle,	Identify the basic	(3)	14
questions	theoretical	Lyapunov's invariance theorem	characteristics of the		
and			nature of scientific		
discussions			material		1.7
Exam					15
11. Cours	se evaluati	on			
12. Learn	ning and to	eaching resources			
Denny Gi	uliclc. Enco	unters with chaos, MCGrow	Required textbook	(S	
		Hill 2015	-		
Dohon	+ I Dowona			iiiy)	
	-	y, An introduction to chaotic		```	
dynan	•	n, second edition, Addison -		sources)	
	wesely pul	blishing company, Inc. 2016			
Saber N. I	Elaydi, Dise	crete Chaos, Second Edition.	Recommended sur	pporting	g
		iversity Chapman and Hall\			-
-	conney on		journals, reports	•	
D'	<b>1</b> 14			•/	
• Discree	et websites				
• Virtual	library.		Electronic referer	000	anitas
		Electronic referen	ces, wei	osnes	
Library locations in some international					
universiti	es.				

1. Course name	
Advanced numerical analysis(1)	
2. Course code	
MAT5109	
3. Semester/year	
Applied Master/first course/2023-2024	
4. The date this description was prepared	
10/1/2023	
5. Available attendance forms	
My presence	
6. Number of study hours (total) / number of units (t	total)
3/45	
7. Name of the course administrator (if more than or	ne name is mentioned)
ahmed.abdulhadi@sc.uobaghdad.edu.iq : sadiq.n@sc.uobaghdad.edu.iq	Name: Ahmed Mouloud Abdel Hadi Name: Sadiq Naji Nasser
8. Course objectives	
Encouraging and developing scientific research in the field of mathematics in general.	Objectives of the study subject

Providing dia	stinguished a	cademic programs in the field of				
mathematics, both morphological and applied, so that they are						
compatible with international standards of academic quality to meet						
the needs of	the education	sector with highly qualified cad	lres.			
Preparing an	d qualifying s	specialist students to meet the				
requirements	of work in th	he private and public sectors in				
mathematica	l sciences thr	ough diversification in learning	and			
teaching met	hods and trai	ning students to apply the acquir	red			
knowledge a	nd skills to so	olve real-world problems.				
Encouraging	research prog	grams and participating in scien	tific			
conferences	and seminars					
Preparing a s	timulating en	vironment for faculty members	to			
develop their	knowledge a	and educational and research ski	lls			
Building and	developing p	partnerships with the governmer	tal and			
private secto	rs and society	with all its various institutions				
9. Teachi	ng and lea	rning strategies				
• Expl	anation and	l clarification through lectu	res.			
-		scientific materials using d				
		ows, smart boards, plasma				
		-		The strate	a	
	-	rough homework and mini-	projects		egy	
with	in lectures.					
Grad	luation proj	ectsWaFor scientific visits				
10. Cours	e structur	e				
Evaluation	Teaching	Name of the unit/topic	Require	d learning	hours	the
method	method			comes		week
Questions	theoretical	Introduction 1	Concept	and basic	3	1

Evaluation	Teaching	Name of the unit/topic	Required learning	hours	the
method	method		outcomes		week
Questions	theoretical	Introduction 1	Concept and basic	3	1
and					
discussion					
Questions	theoretical	Errors	Concept and basic	3	2
and					
discussion					
Questions	theoretical	Finding roots (theory)	Def. and theorems	3	3
and					
discussion					
Questions	theoretical	Finding roots (theory)	Concept and examples	3	4
and					
discussion					
Questions	theoretical	Interpolation (theory)	Def. and theorems	3	5
and					
discussion					
Questions	theoretical	Interpolation (theory)	Concept and basic	3	6
and					
discussion					
Questions	theoretical	spline	Def. and remarks	3	7
and					
discussion					
Questions	theoretical	spline	Concept and examples	3	8

and discussion					
Questions	theoretical	Similarity	Concept and basic	3	9
and					
discussion					
Questions	theoretical	Differentiation and	Concept and examples	3	10
and		integration			
discussion					
Questions	theoretical	Differentiation and	Def. and theorems	3	11
and		integration			
discussion					
Questions	theoretical	Numerical solution of linear	Concept and examples	3	12
and		system (theory)			
discussion					
Questions	theoretical	Numerical solution of linear	Def. and theorems	3	13
and		system (theory)			
discussion					
Questions	theoretical	Numerical solution of linear	Concept and examples	3	14
and		system (theory)			
discussion					
Exam	-		-		15

# 11. Course evaluation

12. Learning and teaching resources	
Introduction to applied numerical analysis by	Required textbooks
Richard Hamming 2014	(methodology, if any)
Numerical methods for scientists and engineers by Richard Hamming 2016	Main references (sources)
The most important books and special sources on the foundations of mathematics are in the central library, the science library, and the department.	Recommended supporting books and references (scientific journals, reports)
<ul><li>Discreet websites.</li><li>Virtual library.</li></ul>	Electronic references, websites
Library locations in some international universities	

### 1. Course name

Inverse problems and their applications

### 2. Course code

MAT5111

### 3. Semester/year

Applied Master/first course/2023-2024

### 4. The date this description was prepared

10/1/2023

### **5.** Available attendance forms

My presence

### 6. Number of study hours (total) / number of units (total)

2/30

7. Name of the course administrator (if more than one name is mentioned)				
mmmsh@sc.uobaghdad.edu.iqEmail:	Name: Muhammad Sabah Hussein			
8. Course objectives				
Encouraging and developing scientific research in the field of mathematics in general. Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres. Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in mathematical sciences through diversification in learning and teaching methods and training students to apply the acquired knowledge and skills to solve real-world problems. Encouraging research programs and participating in scientific conferences and seminars Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills Building and developing partnerships with the governmental and private sectors and society with all its various institutions	Objectives of the study subject			
9. Teaching and learning strategies				
• Explanation and clarification through lectures.	The strategy			

devic • Self- withi	es: data sho learning thr n lectures.	scientific materials using dispows, smart boards, plasma scough homework and mini-pr	creens.		
		ectsWaFor scientific visits			
10. Course			D 11		.1
Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Questions and discussion	theoretical	Introduction to inverse problems	Def. ,remarks and examples	2	1
Questions and discussion	theoretical	Preliminaries and examples	Concept and some remarks	2	2
Questions and discussion	theoretical	Definitions	Theorems and application	2	3
Questions and discussion	theoretical	Examples of ill-posed problems	Def. and theorems	2	4
Questions and discussion	theoretical	Least-squares method	Def. andremark	2	5
Questions and discussion	theoretical	Tikhonov's regularization method	Concept and examples	2	6
Questions and discussion	theoretical	Singular value decomposition	Def. and remarks	2	7
Questions and discussion	theoretical	Conjugate gradient method	Def. and remarks	2	8
Questions and discussion	theoretical	Applications and further methods	Def. and remarks	2	9
Questions and discussion	theoretical	Cauchy problem for Laplace's equation	Def. and properties	2	10
Questions and discussion	theoretical	Backward heat conduction problem	Def. and properties	2	11
Questions and discussion	theoretical	Inverse heat conduction problem	Def. and properties	2	12
Questions and discussion	theoretical	Inverse source problems	Def. and properties	2	13
Questions and discussion	theoretical	Inverse coefficient problems	Concept and examples	2	14

	Exam			15
				1.7
11. Course eval	wation			
11. Course eval				
12. Learning an	nd teaching resources			
	oblem theory, Albert Tarntola,	Required textbooks		
	2019	(methodology, if any	y)	
An introductio	on to the mathematical theory			
	olems by Andreas Kirsch 2016	Main references (so	urces)	
_	tant books and special	Recommended supp	orting hoo	ke
	oundations of mathematics	and references (scient	-	кð
	ll library, the science library,	journals, reports)		
and the departm		,		
Discreet webs				
• Virtual library	у.			
Library locati	ions in some international	Electronic reference	s, websites	
universities.				

1. Course name	
English	
2. Course code	
UOB5100	
3. Semester/year	
Applied Master/first course/2023-2024	
4. The date this description was prepared	
10/1/2023	
5. Available attendance forms	
Presenceweekly	
6. Number of study hours (total) / number of units (tota	al)
2/30	
7. Name of the course administrator (if more than one	name is mentioned)
<u>ali.abd@sc.uobaghdad.edu.iq</u> Email: <u>asawer.d@sc.uobaghdad.edu.iq</u> Email:	Name: Ali Abd Obaid Name: Duraid bracelets
8. Course objectives	
<ul> <li>Encouraging and developing scientific research in the field of mathematics in general.</li> <li>Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres.</li> <li>Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in mathematical sciences through diversification in learning and teaching methods and training students to apply the acquired knowledge and skills to solve real-world problems.</li> <li>Encouraging research programs and participating in scientific conferences and seminars</li> </ul>	Objectives of the study subject

• Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skillsBuilding and developing partnerships with the governmental and private sectors and society with all its various institutions					
9. Teachin	g and learr	ning strategies			
<ul> <li>9. Teaching and learning strategies</li> <li>Explanation and clarification through lectures.</li> <li>How to display scientific materials using display devices: data shows, smart boards, plasma screens.</li> <li>Self-learning through homework and mini-projects within lectures.</li> <li>Graduation projects and scientific visits</li> </ul>					
10. Course	e structure				
Evaluation method	Teaching method	Unit name (topic)	Required educational outcomes	hours	the week
Questions and discussion	theoretical	International student	Getting to know students from different parts of the world and talking to them	2	the second
Questions and discussion	theoretical	Vocabulary development	Knowledge of the development of speech vocabulary	2	the third
Questions and discussion	on theoretical Where in the world in the world			2	the fourth
Questions and discussion	theoretical	IIdentify articles and how to read magazinesI1Newspaper articles magazines2		Fifth	
Questions and discussion	theoretical	Modern technology	Learn about the technology of his speech	2	VI
Questions and discussion	theoretical	Conferences and visits	Identify the style of writing in conferences	2	Seventh
Questions and discussion	theoretical	Science and our world	Science and our world	2	VIII
Questions and discussion	theoretical	Writing trends	Identify the characteristics of writing	2	Ninth
Questions and discussion	theoretical	Reading air pollution	Identify the characteristics of pollution using the reading method	2	The tenth
Questions and discussion	theoretical	Past and present	Learn about the rules of the present and past tense	2	eleventh

Questions and discussion	theoretical	The world of IT	Identify the basic characteristics of the nature of scientific material	2	twelveth
Questions and discussion	theoretical	Inventions, discoveries	Identify the characteristics of breakthroughs and discoveries	2	Thirteenth
Questions and discussion	theoretical	Processes	Identify the basic processes of the nature of matter	2	fourteenth
Questions and discussion	theoretical	Travel and tourism	Learn about tourism and travel	2	Fifteenth

# 11. Course evaluation

12. Learning and teaching resources	
New hand way:- Academic skills reading writing 2019	Required textbooks (methodology, if any)
Academic skills reading writing 2018	Main references (sources)
The most important books and special sources on the foundations of mathematics are in the central library, the science library, and the department.	Recommended supporting books and references (scientific journals, reports)
<ul> <li>Discreet websites.</li> <li>Virtual library.</li> <li>Library locations in some international</li> </ul>	Electronic references, websites
universities.	

1. Course name
Operations Research
2. Course code
MAT5115
3. Semester/year
Applied Master/first course/2023-2024
4. The date this description was prepared
10/1/2023
5. Available attendance forms

### My presence

## 6. Number of study hours (total) / number of units (total)

### 2/30

# 7. Name of the course administrator (if more than one name is mentioned)

iraq.t@sc.uobaghdad.edu.iq Email:

Name: Dr. Iraq Tariq

8. Course	objective	s				
Encouraging and developing scientific research in the field of mathematics in general. Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres. Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in mathematical sciences through diversification in learning and teaching methods and training students to apply the acquired knowledge and skills to solve real-world problems. Encouraging research programs and participating in scientific conferences and seminars Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills Building and developing partnerships with the governmental and private sectors and society with all its various institutions			Objective subject	s of the	study	
	0	rning strategies				
<ul> <li>How devi</li> <li>Self with</li> </ul>	v to display ces: data sh -learning th iin lectures.	d clarification through lectures scientific materials using disp lows, smart boards, plasma sc rough homework and mini-pr jectsWaFor scientific visits	play reens.	The strate	gy	
10. Cours	se structur	е				
Evaluation method					the week	
General questions and discussions	theoretical	Effective Organization and Time Management,	Identi charao the scienti	Identify the basic (2) characteristics of the nature of scientific material		1
General questions	theoretical	Informal Retrieval		fy the basic cteristics of	(2)	2

Exam			serentific material		15
and discussions			the nature of scientific material		
questions	theoretical		characteristics of		-
General		The oral examination	Identify the basic	(2)	14
discussions			scientific material		
and	meoreneal		the nature of		
questions	theoretical	writing style	Identify the basic characteristics of	(2)	13
discussions General		Writing style	scientific material	(2)	13
and			the nature of		
questions	theoretical		characteristics of		
General	(h	Writing your thesis	Identify the basic	(2)	12
discussions			scientific material		
and			the nature of		
questions	theoretical		characteristics of		
General		The structure of your thesis	Identify the basic	(2)	11
discussions			scientific material		
and			the nature of		
questions	theoretical	-	characteristics of		
General		Have a plan	Identify the basic	(2)	10
discussions			scientific material		
and			the nature of		
questions	theoretical	The purpose of a mesis	characteristics of	(2)	,
General		The purpose of a thesis	Identify the basic	(2)	9
discussions			scientific material		
questions and	uicoretical		the nature of		
General	theoretical	Standard format of a paper	Identify the basic characteristics of	(2)	ð
discussions Conoral		Standard format of a more	scientific material	( <b>2</b> )	8
and			the nature of		
questions			characteristics of		
General	theoretical	Getting started	Identify the basic	(2)	7
discussions		~	scientific material		
and			the nature of		
questions	theoretical		characteristics of		
General		What is a scientific paper?	Identify the basic	(2)	6
discussions			scientific material		
and			the nature of		
questions	theoretical	thesis	characteristics of		
General		Writing and defending your	Identify the basic	(2)	5
discussions			scientific material		
and			the nature of		
questions	theoretical		characteristics of		
General		Writing a paper	Identify the basic	(2)	4
discussions			scientific material		
and			the nature of		
General questions	theoretical	Critical Reading	Identify the basic characteristics of	(2)	3
discussions	theoretical	Critical Deading		( <b>2</b> )	3
and			the nature of scientific material		

Monthly and daily exam and quest from 40, final from 60

12. Learning and teaching resources				
Research methodology methods & techniques, CRKothari	Required textbooks (methodology, if any)			
Research Methodology: Methods And Techniques (Multi Color Edition) Paperback – December 11, 2008	Main references (sources)			
The reality of libraries in some international universities.	Recommended supporting books and references (scientific journals, reports)			
<ul> <li>Discreet websites.</li> <li>Virtual library.</li> <li>Library locations in some international universities.</li> </ul>	Electronic references, websites			

1. Course	name
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Finite difference methods

#### 2. Course code

MAT5112

### 3. Semester/year

Applied Master/first course/2023-2024

### 4. The date this description was prepared

10/1/2023

### 5. Available attendance forms

My presence

### 6. Number of study hours (total) / number of units (total)

2/30

### **7.** Name of the course administrator (if more than one name is mentioned)

# dahlia.khaled@sc.uobaghdad.edu.iq Email: Name: Dalia Khaled

### 8. Course objectives

Encouraging and developing scientific research in the field of	
mathematics in general.	
Providing distinguished academic programs in the field of	
mathematics, both morphological and applied, so that they are	
compatible with international standards of academic quality to meet	
the needs of the education sector with highly qualified cadres.	
Preparing and qualifying specialist students to meet the requirements	
of work in the private and public sectors in mathematical sciences	Objectives of the
through diversification in learning and teaching methods and	5
training students to apply the acquired knowledge and skills to solve	study subject
real-world problems.	
Encouraging research programs and participating in scientific	
conferences and seminars	
Preparing a stimulating environment for faculty members to develop	
their knowledge and educational and research skills Building and	
developing partnerships with the governmental and private sectors	
and society with all its various institutions	
9. Teaching and learning strategies	

• Explanation and clarification through lectures.	
• How to display scientific materials using display	
devices: data shows, smart boards, plasma screens.	
• Self-learning through homework and mini-projects	The strategy
within lectures.	
Graduation projectsWaFor scientific visits	

## **10.** Course structure

100 00015		C			
Evaluation	Teaching	Name of the unit/topic	Required learning	hours	the
method	method		outcomes		week
Questions	theoretical	Overview of PDE's	introduction	2	1
and					
discussion					
Questions	theoretical	Classification of PDE's	Some important	2	2
and			classifications		
discussion					
Questions	theoretical	Explicit methods for 1-D heat	Explicit methods	2	3
and			for the heat		
discussion			equation		
Questions	theoretical	Explicit methods diffusion	Explicit methods	2	4
and		equation	for the diffusion		
discussion			equation		
Questions	theoretical	Implicit backward Euler method	Implicit methods	2	5
and			of Euler's methods		
discussion					
Questions	theoretical	Numerical implementation of	Numerical	2	6
and		the implicit backward	applications of		
discussion			explicit posterior		
			methods		
Questions	theoretical	Finite difference	Final differences	2	7
and					
discussion					
Questions	theoretical	Discretization	Some important	2	8
and			definitions		
discussion					
Questions	theoretical	Consistency	Some important	2	9
and			definitions		
discussion					
Questions	theoretical	Stability and fundamentals of	Stability and fluid	2	10
and		fluid flow	flow fundamentals		
discussion					
Questions	theoretical	Conservative property	See some features	2	11
and					
discussion					
Questions	theoretical	The upwind scheme	See some features	2	12
and					
discussion					
Questions	theoretical	Transportive property	See some features	2	13
and					
discussion					

Questions and discussion	theoretical	Upwind difference and artificial viscosity	Some important classifications	2	14
		Test			15
11. Course evaluation					
12. Learn	ing and tea	aching resources			
Calculus of infinite difference, George Boole.2016			Required textbook (methodology, if a		
Finite difference methods for partial differential equations, George E. Forsythe & Wolfgang R. Wasow2015			Main references (s	ources)	
<ol> <li>Finite difference equations, H.Levy &amp; F.Lessman.2013</li> <li>Finite difference methods for ordinary and</li> </ol>			Recommended sup and references (sci journals, reports	entific	books
partial differential equations2012				/	
	t websites.				
<ul> <li>Virtual library.</li> <li>Library locations in some international universities.</li> </ul>			Electronic references, websites		

#### 1. Course name

Mathematical modeling

#### 2. Course code

MAT5211

#### 3. Semester/year

Applied Master/Second Course/2023-2024

#### 4. The date this description was prepared

10/1/2023

### 5. Available attendance forms

My presence

6. Number of study hours (total) / number of units (total)

3/45

7. Name of the course administrator (if more than one name is mentioned) raid.naji@sc.uobaghdad.edu.iq

Email:

Name: Raed Kamel Naji

8. Course objectives	
Encouraging and developing scientific research in the field of mathematics in general. Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres. Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in mathematical sciences through diversification in learning and teaching methods and training students to apply the acquired knowledge and skills to solve real-world problems. Encouraging research programs and participating in scientific conferences and seminars Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills Building and developing partnerships with the governmental and private sectors and society with all its various institutions	Objectives of the study subject

9. Teaching and learning strategies				
<ul> <li>Explanation and clarification through lectures.</li> <li>How to display scientific materials using display devices: data shows, smart boards, plasma</li> </ul>				
<ul> <li>Self-learning through homework and mini- projects within lectures.</li> <li>Graduation projectsWaFor scientific visits</li> </ul>	The strategy			

# **10. Course structure**

Evaluation	Teaching	Unit name (topic)	Required educational	hours	the
method	method		outcomes		week
General		Introduction to	Identify the basic	(3) 1	
questions	theoretical	mathematical modeling	characteristics of the		
and		with basic modeling	nature of scientific		
discussions		concepts	material		
General		Introduction to	Identify the basic	(3)	2
questions	theoretical	mathematical modeling	characteristics of the		
and		with basic modeling	nature of scientific		
discussions		concepts	material		
General	theoretical	Modeling growth and decay	Identify the basic	(3)	3
questions		with various applications	characteristics of the		
and			nature of scientific		
discussions			material		
General		Modeling growth and decay	Identify the basic	(3)	4
questions	theoretical	with various applications	characteristics of the		
and			nature of scientific		
discussions			material		
General		Mathematical modeling	Identify the basic	(3)	5
questions	theoretical	using first-order differential	characteristics of the		
and		equations	nature of scientific		
discussions			material		
General		Mathematical	Identify the basic	(3)	6
questions	theoretical	modeling using first-order	characteristics of the		
and		differential equations	nature of scientific		
discussions			material		
General	theoretical	Mathematical modeling	Identify the basic	(3)	7
questions		using first-order differential	characteristics of the		
and		equations	nature of scientific		
discussions			material		
General		Mathematical modeling	Identify the basic	(3)	8
questions	theoretical	using second-order	characteristics of the		
and		differential equations	nature of scientific		
discussions		_	material		
General		Mathematical modeling	Identify the basic	(3)	9
questions	theoretical	using a system of	characteristics of the		
and		differential equations	nature of scientific		
discussions		-	material		
General		Mathematical modeling	Identify the basic	(3)	10
questions	theoretical	using a system of	characteristics of the		

and		differential equations with	nature of scientific		
discussions		applications in biology	material		
General		Mathematical modeling	Identify the basic	basic (3) 1	
questions	theoretical	using a system of	characteristics of the		
and		differential equations with	nature of scientific	ic	
discussions		applications in biology	material		
General		Mathematical modeling	Identify the basic	(3)	12
questions	theoretical	using a system of	characteristics of the		
and		differential equations with	nature of scientific		
discussions		applications in biology	material		
General		Mathematical modeling	Identify the basic	(3)	13
questions	theoretical	using a system of	characteristics of the		
and		differential equations with	nature of scientific		
discussions		applications in	material		
		epidemiology			
General		Mathematical modeling	Identify the basic	(3)	14
questions	theoretical	using a system of	characteristics of the		
and		differential equations with	nature of scientific		
discussions		applications in	material		
		epidemiology			
Exam		Mathematical modeling			15
		using a system of			
		differential equations with			
		applications in			
		epidemiology			
11. Cours	se evaluati	on			
12. Learn	ing and te	eaching resources			
Modeling	with diffe	rential equations. By DN		.1 1	1
		orrie. Ellis Horwood Ltd.	Required textbooks (	methodo	ology,
Durgnes		2020	111 any $1$		
Μ	lathematic	al Models in Biology and			
Medicine	e. By IN Kai	pur, Affiliated East-West			
press private limited 2016.		Main references (sou	rces)		
Mathan	-	leling. By IN Kapur, New		1005)	
mathem	iatical MOC	iening. By in Kapur, New			

press private minted 2010.	Main references (sources)
Mathematical Modeling. By JN Kapur, New	
Age International (P) Ltd. 2000.	
A First Course in Mathematical Modeling,	
Fifth edition Frank R.	Recommended supporting books
Giordano, William P. Fox and Steven B.	and references (scientific journals,
Horton. Brooks/Cole, Cengage Learning,	reports)
2014	
Discreet websites.	
Virtual library.	Electronic references, websites
Library locations in some international	Licensine references, websites
universities.	

1. Course name
Fluid mechanics
2. Course code
MAT5210
3. Semester/year
Applied Master/Second Course/2023-2024
4. The date this description was prepared
10/1/2023
5. Available attendance forms
My presence
6. Number of study hours (total) / number of units (total)
3/45

ahmed.abdulhadi@sc.uobaghdad.edu.iq	Name: Ahmed	
Email:	Mouloud Abdel Had	
8. Course objectives		
Encouraging and developing scientific research in the field of mathematics in general. Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres. Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in mathematical sciences through diversification in learning and teaching methods and training students to apply the acquired knowledge and skills to solve real- world problems. Encouraging research programs and participating in scientific conferences and seminars Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills Building and developing partnerships with the governmental and private sectors and society with all its various institutions	Objectives of the study subject	
9. Teaching and learning strategies		
<ul> <li>Explanation and clarification through lectures.</li> <li>How to display scientific materials using display devices: data shows, smart boards, plasma screens.</li> <li>Self-learning through homework and mini-projects within lectures.</li> <li>Graduation projectsWaFor scientific visits</li> </ul>	The strategy	

# **10. Course structure**

Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Questions and discussion	theoretical	Basic definitions(Ch1)	Concept and basic	3	1
Questions and discussion	theoretical	Basic definitions(Ch1)	Concept and basic	3	2
Questions and discussion	theoretical	Kinematic fluid mechanics(Ch2)	Def. and theorems	3	3
Questions and discussion	theoretical	Kinematic fluid mechanics(Ch2)	Concept and examples	3	4
Questions	theoretical	Dynamic fluid mechanics(Ch3)	Def. and theorems	3	5

theoretical	Dynamic fluid mechanics(Ch3)	Concept and basic	3	6
theoretical	The fluid mechanics problem	Def. and remarks	3	7
theoretical	Applications on the fluid	Concept and	3	8
	mechanics problem	examples		
theoretical	Dimensionless analysis and	Concept and basic	3	9
	Similarity(Ch4)			
theoretical	Dimensionless analysis and	Concept and	3	10
	Similarity(Ch4)	examples		
theoretical	Formulation of boundary layer	Def. and theorems	3	11
	and BLM(Ch5)			
theoretical	Formulation of boundary layer	Concept and	3	12
	and BLM(Ch5)	examples		
theoretical	Turbulent flow(Ch6)	Def. and theorems	3	13
theoretical	Turbulent flow(Ch6)	Concept and	3	14
		examples		
-		-	3	15
	theoretical theoretical theoretical theoretical theoretical	theoreticalThe fluid mechanics problemtheoreticalApplications on the fluid mechanics problemtheoreticalDimensionless analysis and Similarity(Ch4)theoreticalDimensionless analysis and Similarity(Ch4)theoreticalFormulation of boundary layer and BLM(Ch5)theoreticalFormulation of boundary layer and BLM(Ch5)theoreticalTurbulent flow(Ch6)	theoreticalThe fluid mechanics problemDef. and remarkstheoreticalApplications on the fluid mechanics problemConcept and examplestheoreticalDimensionless analysis and Similarity(Ch4)Concept and basictheoreticalDimensionless analysis and Similarity(Ch4)Concept and examplestheoreticalDimensionless analysis and Similarity(Ch4)Concept and examplestheoreticalFormulation of boundary layer and BLM(Ch5)Def. and theorems examplestheoreticalFormulation of boundary layer and BLM(Ch5)Concept and examplestheoreticalTurbulent flow(Ch6)Def. and theorems	theoreticalThe fluid mechanics problemDef. and remarks3theoreticalApplications on the fluid mechanics problemConcept and examples3theoreticalDimensionless analysis and Similarity(Ch4)Concept and basic examples3theoreticalDimensionless analysis and Similarity(Ch4)Concept and basic examples3theoreticalDimensionless analysis and Similarity(Ch4)Concept and examples3theoreticalFormulation of boundary layer and BLM(Ch5)Def. and theorems examples3theoreticalFormulation of boundary layer and BLM(Ch5)Concept and examples3theoreticalTurbulent flow(Ch6)Def. and theorems3theoreticalTurbulent flow(Ch6)Soncept and examples3

# **11. Course evaluation**

# 12. Learning and teaching resources

Fluid mechanics, Frank M. White2019	Required textbooks (methodology, if any)
Fluid mechanics, MK Jain 2017	Main references (sources)
Fluid mechanics: Fundmentals and application 4th edition 2010	Recommended supporting books and references (scientific journals, reports)
Discreet websites.	
Virtual library.	Electronic references, websites
Library locations in some international universities.	

1. Course name

Control theory

#### 2. Course code

MAT5217

3. Semester/year

Applied Master/Second Course/2023-2024

## 4. The date this description was prepared

10/1/2023

### 5. Available attendance forms

My presence

### 6. Number of study hours (total) / number of units (total)

2/30

### 7. Name of the course administrator (if more than one name is mentioned)

sadiq.n@sc.uobaghdad.edu.iq Email:

Name: Sadiq Naji Nasser

8. Course objectives				
Encouraging and developing scientific research in the field of mathematics in general. Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres. Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in mathematical sciences through diversification in learning and teaching methods and training students to apply the acquired knowledge and skills to solve real-world problems. Encouraging research programs and participating in scientific conferences and seminars	Objectives of the study subject			

develop thei Building and	r knowledge I developing	nvironment for faculty members and educational and research ski partnerships with the governmen y with all its various institutions	lls			
9. Teachi	ng and lea	rning strategies				
<ul> <li>How deviation</li> <li>Screet</li> <li>Self proj</li> </ul>	v to display ces: data sh ens. -learning th ects within	d clarification through lecture scientific materials using de nows, smart boards, plasma rough homework and mini- lectures. jectsWaFor scientific visits	isplay	The strateg	у	
10. Cours	se structur	·e				
Evaluation method	Teaching method	Unit name (topic)	-	ed educational utcomes	hours	the week
General		The basic optimal control			(2)	1

	e sil uctul	C			
Evaluation	Teaching	Unit name (topic)	Required educational	hours	the
method	method		outcomes		week
General questions and discussions	theoretical	The basic optimal control problem	Identify the basic concepts of the nature of scientific material	(2)	1
General questions and discussions	theoretical	Parameter optimization problems - Constrained and unconstrained optimization	Learn about finding the optimal solution in the presence of restrictions and without restrictions	2	2
General questions and discussions	theoretical	The first and second -order conditions	Necessary conditions	(2)	3
General questions and discussions	theoretical	one variable optimal control problem for (continuous case)	Continuous control problems with one variable	(2)	4
General questions and discussions	theoretical	Optimal control problems - special forms	Control issues in particular	(2)	5
General questions and discussions	theoretical	The Mayer Problems of Optimal Control	IssuesMayer	(2)	6
General questions and discussions	theoretical	Simplest Problem— Necessary Conditions with Sufficiency and Interpretations	Identify the basic characteristics of the nature of scientific material	(2)	7
General questions	theoretical	Problems for several variables	Issues of controlling more than one	(2)	8

and			variable		
discussions					
General		Bounded Controls with	Control issues with	(2)	9
questions	theoretical	further Control Constraint	multiple constraints		
and					
discussions					
General		Discontinuous and Bang-	Some types of optimal	(2)	10
questions	theoretical	Bang Control	solutions		
and					
discussions					
General		The Pontryagin Maximum	principlePontryagin	(2)	11
questions	theoretical	Principle, with further	the Great and theories		
and		Sufficiency Theorems	related to him		
discussions					
General		Alternative Formulations and	Some other formulas	(2)	12
questions	theoretical	state Variable Inequality			
and		Constraints			
discussions					
General		The basic discrete optimal	Fundamentals of	(2)	13
questions	theoretical	control problems for one and	intermittent control		
and		several variables.	theory		
discussions					
General		Other notes and properties	General notes and	(2)	14
questions	theoretical		features		
and					
discussions					
General		Some applications to optimal	Some applications and	(2)	15
questions		control theory.	examples		
and					
discussions					
11. Cours	se evaluati	on			
12. Learn	ing and te	eaching resources			
-CP S	Simon Mathe	matics for Economists, (2020)			
-Sethi SP ar	id Thompson	GL, Optimal Control Theory:	Required textbooks (r	nethodo	ology,
Applicatio	ons to Manage	ement Science and Economics	if any)		
		2nd edition, Springer (2016).	J /		
Alpha Cha	ing Element	of dynamic optimization Hill(			
		1992)			
-A.E. Bryson, Jr. Yu-Chi Ho "Applied Optimal					
Controloptimization, estimation and control" Taylor &			Main references (sources)		
Controlopti	inization, esti	-			
-		Francis Newyork,(1975)			
-	· Lamberto C	Francis Newyork,(1975) esari "optimization theory and	(		
-	· Lamberto C	Francis Newyork,(1975)	``````````````````````````````````````		
-	Lamberto C applica	Francis Newyork,(1975) esari "optimization theory and	Recommended suppo	rting bo	oks
Clark C.,	Lamberto C applica Mathematica	Francis Newyork,(1975) esari "optimization theory and tions" Springer-Verlag (1983)	``````````````````````````````````````	-	
Clark C.,	Lamberto C applica Mathematica	Francis Newyork,(1975) esari "optimization theory and tions" Springer-Verlag (1983) al Bioeconomics: The Optimal	Recommended suppo and references (scient	-	
Clark C., Manager	Lamberto C applica Mathematica	Francis Newyork,(1975) esari "optimization theory and tions" Springer-Verlag (1983) al Bioeconomics: The Optimal ewable Resources, 2nd edition,	Recommended suppo	ific jou	rnals,

The virtual library and library sites in some	
international universities.	

1. Course name
Topics in linear algebra
2. Course code
MAT5213
3. Semester/year
Applied Master/Second Course/2023-2024
4. The date this description was prepared
10/1/2023
5. Available attendance forms
My presence

6. Number of study hours (total) / number of units (total)						
2/30						
7. Name of the course administrator (if more than one name is mentioned)						
huda.oun@sc.uobaghdad.edu.iq	Name: Hoda Abdel					
Amyto: 8. Course objectives	Sattar					
<ul> <li>b. Course objectives</li> <li>Encouraging and developing scientific research in the field of mathematics in general.</li> <li>Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres.</li> <li>Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in mathematical sciences through diversification in learning and teaching methods and training students to apply the acquired knowledge and skills to solve real-world problems.</li> <li>Encouraging research programs and participating in scientific conferences and seminars</li> <li>Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills Building and developing partnerships with the governmental and private sectors and society with all its various institutions</li> </ul>	Objectives of the study subject					
9. Teaching and learning strategies						
<ul> <li>Explanation and clarification through lectures.</li> <li>How to display scientific materials using display devices: data shows, smart boards, plasma screens.</li> <li>Self-learning through homework and mini-projects within lectures.</li> <li>Graduation projectsWaFor scientific visits</li> </ul>	The strategy					

# **10. Course structure**

Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Questions and discussion	theoretical	Basic Concepts	Basic Concepts ;Vector space - subspace- Linear combination-linear dependent and linear independent- basis- span	2	1
Questions and discussion	theoretical	Basic of sub space	Basic concepts of matrix ; Properties of arithmetic matrix – inverse matrix	2	2
Questions and	theoretical	Some Concepts	Linear algebra solution;Solution- Gaussian	2	3

Orrestians			—		
Questions and discussion	theoretical	Isomorphism basic	General Linear system;homogenous system- Determine	2	4
Questions and discussion	theoretical	Matrices of linear maps	Eigenvalue and Eigenvectors	2	5
Questions and discussion	theoretical	Examples and transformation matrices	Matrices of linear maps;Algebra of linear maps	2	6
Questions and discussion	theoretical	Some proposition	Exam	2	7
Questions and discussion	theoretical	Some proposition	Application of linear algebra	2	8
Questions and discussion	theoretical	Some thm about this	Minimization and least square	2	9
Questions and discussion	theoretical	Orthogonal matrices	Applications to curve fitting and circuits	2	10
Questions and discussion	theoretical	Some thm +definite symmetric	Applications to curve fitting and circuits	2	11
Questions and discussion	theoretical	Self adjoint	Some theorem about applied linear algebra	2	12
Questions and discussion	theoretical	Give some prop. And thm.	Application of linear Algebra	2	13
Questions and discussion	theoretical	Give some prop. And thm.	Inner products and norms	2	14
Questions and discussion	theoretical	Give some prop. And thm.	Exam	2	15

12. Learning and teaching resources					
BERNARD KOLMAN and DAVID R. HILL,	Required textbooks (methodology,				
linear algebra with application	if any)				
Peter J. Olver and Chehrzad Shakiban, -1					
Applied Linear Algebra,	Main mafanan aga (agamaga)				
2010.Bernard Coleman Introduction	Main references (sources)				
to Linear Algebra with its					

Applications Translated by Adel Ghassan and Basil Atta Al-Hashimi - University of Baghdad2000	
The most important books and special sources on the foundations of mathematics are in the central library, the science library, and the department.	Recommended supporting books and references (scientific journals, reports)
Discreet websites.	
Virtual library.	Electronic references, websites
Library locations in some international universities	

1. Course name	
Methods of writing research	
2. Course code	
UOB5200	
3. Semester/year	
Applied Master/Second Course/2023-2024	
4. The date this description was prepared	
10/1/2023	
5. Available attendance forms	
My presence	
6. Number of study hours (total) / number of	of units (total)
2/30	
7. Name of the course administrator (if mor	re than one name is mentioned)
asawer.d@sc.uobaghdad.edu.iq Email	Name: Duraid
:	bracelets
8. Course objectives	

Encouraging a mathematics i	-	ng scientific research	in the field of			
Providing dist mathematics, compatible with the needs of the Preparing and requirements mathematical teaching meth knowledge and Encouraging to conferences a Preparing a st develop their Building and	tinguished action both morpho ith internation he education qualifying sp of work in the sciences thro ods and train d skills to sol research prog nd seminars imulating envi knowledge and developing pa	ademic programs in the logical and applied, so hal standards of acade sector with highly qua- pecialist students to me or private and public so ugh diversification in ing students to apply live real-world problem rams and participating vironment for faculty and educational and rest artnerships with the growith all its various in	o that they are emic quality to meet alified cadres. neet the ectors in learning and the acquired ms. g in scientific members to search skills overnmental and	Objective: subject	s of the	study
9. Teachin	g and lear	ning strategies				
<ul> <li>How devic</li> <li>Self-l withi</li> </ul>	to display s es: data sho earning thr n lectures.	clarification throu scientific materials ows, smart boards, ough homework an ectsWaFor scientifi	using display plasma screens. nd mini-projects	The strate	gy	
10. Course	estructure	<b>;</b>				
Evaluation method	Teaching method	Name of the unit/topic	Required learning	g outcomes	hours	the week
Questions and discussion	theoretical	Type of writing				1
Questions and discussion	theoretical	Proposals	purpose of Proposals 1 components of Proposals		2	
Questions and discussion	theoretical	Titles	Point to check in your own 1 writing		3	
Questions and discussion	theoretical	Planning your writing	Putting your idea	as in order	1	4
Questions	theoretical	Paragraph writing	Placing the main	idea in the	1	5

theoretical	Problem statement	Main objective of paper	1	7
	purpose			
theoretical	Writing the main	Use of illustrations General	1	8
	body	information		
theoretical	Results	Summarizing what was done	1	9
theoretical	Discussion	Did the research support the	1	10
		hypothesis		
theoretical	Tables and Graphs	Describing graphsDescribing	1	11
		Tables		
theoretical	Referencing	Types of references style sheets	1	12
theoretical	Format of	Ref. to book, article and	1	13
	reference	unpublished work		
theoretical	Useful phrases	Phrases that used in research	1	14
		paper		
-	Examined	-	1	15
	theoretical theoretical theoretical theoretical theoretical theoretical	Independent of theoreticalPurposetheoreticalWriting the main bodytheoreticalResultstheoreticalDiscussiontheoreticalTables and GraphstheoreticalReferencingtheoreticalFormat of referencetheoreticalUseful phrases	purposeJurposetheoreticalWriting the main bodyUse of illustrations General informationtheoreticalResultsSummarizing what was donetheoreticalDiscussionDid the research support the hypothesistheoreticalTables and GraphsDescribing graphsDescribing TablestheoreticalReferencingTypes of references style sheetstheoreticalFormat of referenceRef. to book, article and unpublished worktheoreticalUseful phrasesPhrases that used in research paper	purposeJene 1theoreticalWriting the main bodyUse of illustrations General information1theoreticalResultsSummarizing what was done1theoreticalDiscussionDid the research support the hypothesis1theoreticalTables and GraphsDescribing graphsDescribing Tables1theoreticalReferencingTypes of references style sheets1theoreticalFormat of referenceRef. to book, article and unpublished work1theoreticalUseful phrasesPhrases that used in research paper1

## **11. Course evaluation**

12. Learning and teaching resources						
Z. subodova, writing in English apractical handbook for scientific technical writers, Technical University Bron, 2013.	Required textbooks (methodology, if any)					
bodova, writing in English apractical handbook for scientific technical writers, Technical University Bron, 2013. A. wallwork, English for research: usage style and grammar, springer .Newyork .Headelborg Dordrecht London.2000 T.panston, Aconcise grammar for English language teachers, Ireland 2003 Guidelines for writing university theses and scientific research (Issam Fadel Al-Jumaili - Zahra Mahmoud Al-Khafaji) 2009	Main references (sources)					
The most important books and special sources on the foundations of mathematics are in the central library, the science library, and the department.	Recommended supporting books and references (scientific journals, reports)					

Discreet websites. Virtual Library Library locations in some international universities.	Electronic references, websites
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1. Course name
Stability of hysteresis differential equations
2. Course code
MAT5215
3. Semester/year
Applied Master/Second Course/2023-2024
4. The date this description was prepared
10/1/2023

5. Available attendance forms							
My present	ce						
6. Number	6. Number of study hours (total) / number of units (total)						
2/30							
7. Name of	f the cours	e administrator (if n	nore than one	nam	e is me	ntioned)	
hassan.fadl	nil.r@sc.uc	baghdad.edu.iqEmail	:		ne: Has el Reda		
8. Course	•	g scientific research in the					
Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres. Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in mathematical sciences through diversification in learning and teaching methods and training students to apply the acquired knowledge and skills to solve real-world problems. Encouraging research programs and participating in scientific conferences and seminars Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills Building and developing partnerships with the governmental and private sectors and				•	ectives y subje		
9. Teachin	g and lear	ning strategies		I			
<ul> <li>9. Teaching and learning strategies</li> <li>Explanation and clarification through lectures.</li> <li>How to display scientific materials using display devices: data shows, smart boards, plasma screens.</li> <li>Self-learning through homework and mini-projects within lectures.</li> <li>Graduation projects For scientific visits</li> </ul>				The	strateg	у	
10. Course	structure			I			
Evaluation method	Teaching method	Name of the unit/topic			hours	the week	
General questions and discussion	In-person lectures	History of Delay Differential Equation	outcomes     2       Identify the basic concepts of the nature of scientific material     1		the first		
General	In-person	Classification of Delay			2	the	

questions and discussion	lectures	Differential Equations	Identify the basic concepts of the nature of scientific material		second
General questions, discussion, and exams	In-person lectures	Types of Delay Differential Equation	Identify the basic concepts of the nature of scientific material	2	the third
Duties are general	In-person lectures	Applications of Delay Differential Equation	Identify the basic concepts of the nature of scientific material	2	the fourth
Annie's test	In-person lectures	Solution of Delay Differential Equation	Identify the basic concepts of the nature of scientific material	2	Fifth
General questions and discussion	In-person lectures	Linear Delay Differential Equations	Identify the basic concepts of the nature of scientific material	2	VI
Duties are general	In-person lectures	Uniqueness and Existence of Delay Differential Equation	Identify the basic concepts of the nature of scientific material	2	Seventh
Annie's test	In-person lectures	Methods for solving of Delay Differential Equation	Identify the basic concepts of the nature of scientific material	2	VIII
General questions and discussion	In-person lectures	Solution of the first Order Delay Differential Equations	Identify the basic concepts of the nature of scientific material	2	Ninth
Monthly exam	In-person lectures	Exam	Identify the basic concepts of the nature of scientific material	2	The tenth
General questions and discussion	In-person lectures	Discussing reports	Identify the basic concepts of the nature of scientific material	2	eleventh
Duties are general	In-person lectures	The Method of Successive Integrations	Identify the basic concepts of the nature of scientific material	2	twelveth

· · · · · · · · · · · · · · · · · · ·					
Annie's test	In-person lectures	Example	Identify the basic concepts of the nature of scientific material	2	Thirteenth
General questions and discussion	In-person lectures	Laplace Transformation Method	Identify the basic concepts of the nature of scientific material	2	fourteenth
General questions and discussion	In-person lectures	STEPS Examples		2	Fifteenth
11. Course	e evaluatio	n			
12. Learni	ng and tea	aching resources			
	Differential	Equations and	1		
Applications	edited byO.	ArinoUniversity of Pau France 2019	)		
		ML Hbid University Cadi Ayyad Marrakech, Morocco 2018	, Required textbook	s (metl	nodology,
		and E. Ait Dad University Cadi Ayyad Marrakech, Morocco2019	5		
An Introduc	•	Differential Equations with nees Applications to the Life ByHal Smith 2003	Main references (s	ources	)
The most important books and special sources on the foundations of mathematics are in the central library, the science library, and the department.			Recommended sup and references (sci reports)	-	-
• Virtual l	locations in	n some international	Electronic reference	ces, we	bsites

1. Course name	
Mathematical techniques for image processing	
2. Course code	
MAT5214	
3. Semester/year	
Applied Master/Second Course/2023-2024	
4. The date this description was prepared	
10/1/2023	
5. Available attendance forms	
My presence	
6. Number of study hours (total) / number of units (	(total)
2/30	
7. Name of the course administrator (if more than o	one name is mentioned)
Saad.m@sc.uobaghdad.edu.iq Email:	Name: Saad Muhammad Ali Al- Mumen
8. Course objectives	
Encouraging and developing scientific research in the field of mathematics in general. Providing distinguished academic programs in the field of mathematics, both morphological and applied, so that they are compatible with international standards of academic quality to meet the needs of the education sector with highly qualified cadres. Preparing and qualifying specialist students to meet the requirements of work in the private and public sectors in	Objectives of the study subject

		hrough diversification in learning and a students to apply the acc	-			
teaching methods and training students to apply the acquired knowledge and skills to solve real-world problems.						
-		rograms and participating in sci	entific			
conferences	_					
Preparing a	stimulating	environment for faculty member	ers to			
	-	e and educational and research				
Building and	l developing	g partnerships with the governn	nental and			
private secto	ors and socie	ety with all its various institutio	ns			
9. Teachi	ng and le	earning strategies				
• Exp	lanation a	nd clarification through lec	tures.			
• Hov	v to displa	y scientific materials using	display			
	-	shows, smart boards, plasm				
		through homework and min				
	in lecture	•	in-projects			
				Th	astrataou	
	-	ojectsWaFor scientific visi	ts	1 110	e strategy	
• Pape	er lectures					
• Pres	entations					
• Elec	ctronic scr	een				
• Tele	egram, ele	ctronic classes, and website	es			
10. Cours	se structu	ıre		[		
Evaluation	Teaching	Name of the unit/topic	Required	1	hours	the week
method	method	- ······	learning			
			outcome	S		
General	In-	Grayscale Digital Images •			2 The spatial	the first
questions and	person lectures	Working with Images in •			Theoretical	
discussion	leetares	MATLAB	Basics of			
		Images and Statistical •	Digital Ima	ges		
		Description of Quantitative Data				
		Image histograms •				
General	In-	Measurements of Center •			2	the
questions	person	and Spread	Basics o	f	Theoretical	second

questions and discussion	person lectures	and Spread Color Images and Color • Spaces	Basics of Digital Images	Theoretical	second
General questions, discussion, and exams	In- person lectures	Power Functions and • Gamma-Correction Exponential Functions and • Image Transformations Logarithmic Functions and • Image Transformations	Lightening & Darkening of Grayscale Image	2 Theoretical	the third

Duties are general	In- person lectures	Linear Functions and • Contrast Stretching Automation of Image • Enhancement	Lightening & Darkening of Grayscale Image	2 Theoretical	the fourth
Annie's test	In- person lectures	Discrete and Continuous • Random Variables Transformation of Random • Variables Image Equalization and • Histogram Matching	Probability, Random Variables, & Histogram Processing	2 Theoretical	Fifth
General questions and discussion	In- person lectures	Basic Operations on • Matrices Linear Transformations • and Their Matrices Homogeneous Coordinates • and Projective Transformations	Matrices &Linear Transformations	2 Theoretical	VI
Duties are general	In- person lectures	Image Blurring and Noise • Reduction Discrete Linear • Convolution Circular Convolution • Algebraic Properties of • Convolution	Convolution & Image Filtering	2 Theoretical	Seventh
Annie's test	In- person lectures	Convolution as a Linear • Transformation Convolution in Two • Dimensions	Convolution & Image Filtering	2 Theoretical	VIII
General questions and discussion	In- person lectures	Partial Derivatives and the • Gradient Edge Detector Directional Derivatives • and the Roberts Cross Operator The Prewitt and Sobel • Edge Detectors	Edge Detection	2 Theoretical	Ninth
Monthly exam	In- person lectures	Laplacian Edge Detection • Edge Detection in Noisy • Images	Edge Detection	2 Theoretical	The tenth

			1	1	r1
General questions and discussion	In- person lectures	Fourier Series Expansion • 1D Discrete Fourier • Transform DFT 2D Discrete Fourier • Transform DFT	Analysis and processing of images in the Frequency Domain	2 Theoretical	eleventh
Duties are general	In- person lectures	Frequency Domain • Processing of Digital Images	Analysis and processing of images in the Frequency Domain	2 Theoretical	twelveth
Annie's test	In- person lectures	Fundamentals • Lowpass (Smoothing) • Frequency Domain Filters Highpass (Sharpening) • Frequency Domain Filters Bandreject and Bandpass • Filters	Application of Filtering in the Frequency Domain	2 Theoretical	Thirteenth
General questions and discussion	In- person lectures	Erosion and dilation • Opening and closing • The Hit-or-Miss • transformation Various morphological • algorithms for binary images	Mathematical morphology	2 Theoretical	fourteenth
General questions and discussion	In- person lectures	Image pyramids • Subband coding • Multiresolution expansions • The Haartransform • Wavelet transform in one • and two dimensions Discrete wavelet transform •	Wavelets and multiresolution processing	2 Theoretical	Fifteenth
11. Cours	se evalua	tion			
	U	teaching resources			
<ul> <li>Galperin, Yevgeniy V. An Image Processing Tour of          <ul> <li>College Mathematics. CRC Press, 2021.</li> </ul> </li> <li>Bovik, Alan C., ed. The essential guide to image processing. academic press,2019</li> </ul>			Required textbo any)	ooks (metho	dology, if
E	Gonzalez, Rafael C., Richard E. Woods, and Steven L. • Eddins. 2009. Digital Image processing using MATLAB®, Gatesmark Publishing, 2009. Solomon, Chris, and Toby Breckon. Fundamentals of			s (sources)	

Digital Image Processing: A practical approach with examples in Matlab. John Wiley & Sons, 2011.	
The most important books and special sources on the foundations of mathematics are in the central library, the science library, and the department.	Recommended supporting books and references (scientific journals, reports)
Discreet websites.	
Virtual library.	
Library locations in some international	Electronic references, websites
universities	

1. Cour	se name
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Dynamic Systems (2)

## 2. Course code

MAT5212

#### 3. Semester/year

Applied Master/Second Course/2023-2024

### 4. The date this description was prepared

10/1/2023

### 5. Available attendance forms

My presence

## 6. Number of study hours (total) / number of units (total)

2/30

### 7. Name of the course administrator (if more than one name is mentioned)

shireen.jawad@sc.uobaghdad.edu.iq Email:	Name: Sherine Rasoul		
8. Course objectives			

	· · · · · · · · · · · · · · · · · · ·
Encouraging and developing scientific research in the field of	
mathematics in general.	
Providing distinguished academic programs in the field of	
mathematics, both morphological and applied, so that they are	
compatible with international standards of academic quality to	
meet the needs of the education sector with highly qualified	
cadres.	
Preparing and qualifying specialist students to meet the	
requirements of work in the private and public sectors in	Objectives of the study
mathematical sciences through diversification in learning and	subject
teaching methods and training students to apply the acquired	
knowledge and skills to solve real-world problems.	
Encouraging research programs and participating in scientific	
conferences and seminars	
Preparing a stimulating environment for faculty members to	
develop their knowledge and educational and research skills	
Building and developing partnerships with the governmental and	
private sectors and society with all its various institutions	
9. Teaching and learning strategies	
• Explanation and clarification through lectures.	The strategy

<ul> <li>How to display scientific materials using display devices: data shows, smart boards, plasma screens.</li> <li>Self-learning through homework and mini-projects within lectures.</li> <li>Graduation projectsWaFor scientific visits</li> </ul> <b>10. Course structure</b>					
Evaluation method	Teaching method	Unit name (topic)	Required educational outcomes	hours	the week
General questions and discussions	theoretical	A review of the basic concepts in the course of dynamical systems	Identify the basic characteristics of the nature of scientific material	2	1
General questions and discussions	theoretical	Families of function and bifurcation	Identify the basic characteristics of the nature of scientific material	2	2
General questions and discussions	theoretical	Period- 3 point and relative lemma and theorems	Identify the basic characteristics of the nature of scientific material	2	3
General questions and discussions	theoretical	Singers theorem, Basin of attraction of periodic points	Identify the basic characteristics of the nature of scientific material	2	4
General questions and discussions	theoretical	Chaos in one dimension, transitivity, Lyapunove exponents, transitivity and strong chaos	Identify the basic characteristics of the nature of scientific material	2	5
General questions and discussions	theoretical	Conjugacy and its properties	Identify the basic characteristics of the nature of scientific material	2	6
General questions and discussions	theoretical	two dimensional maps,the dynamics of linear maps	Identify the basic characteristics of the nature of scientific material	2	7
General questions and discussions	theoretical	Similar matrices, invariant set, linear conjugate, attracting, repelling and saddle point of linear function	Identify the basic characteristics of the nature of scientific material	2	8
General questions and discussions	theoretical	The difference equations and their solutions	Identify the basic characteristics of the nature of scientific material	2	9
General questions	theoretical	Solution of linear system, the general solution of	Identify the basic characteristics of	2	10

and		lineer systems	the nature of		
discussions		linear systems	scientific material		
General questions and discussions	theoretical	Stability of two- dimentional maps (nonlinear)	Identify the basic characteristics of the nature of scientific material	2	11
General questions and discussions	theoretical	Attracting, repelling, saddle point of nonlinear maps	Identify the basic characteristics of the nature of scientific material	2	12
General questions and discussions	theoretical	Hartman-Grobman theorem, area contracting and area expanding maps, the behavior of F near a saddle point, stable and unstable manifold theorem, stability via linearization	Identify the basic characteristics of the nature of scientific material	2	13
General questions and discussions	theoretical	Lyapunove function for nonlinear map, Lyapunove stability theorem,LaSalles invariance principle, Lyapunove stability theorem	Identify the basic characteristics of the nature of scientific material	2	14
Exam					15
	e evaluati	on eaching resources			
	I	Encounters with chaos • Denny Gulick 1992-McGraw-Hill	-1 (methodology 11)		
Robert L.Devany, An introduction to chaotic dynamical system, second edition, Addition – wesely publishing company, Inc. 1989 Saber N.Elaydi, Discrete Chaos, Second edition. Terinity University chapman and hall.		Main references (sources)			
	•	crete Chaos, Second Edition hiversity Chapman and Hall <i>CRC</i> , 2008	books and referen	ces (sci	-
• Discree	et websites			,	
Virtual library.		Electronic referen	ces, we	bsites	
Library lo	Library locations in some international				

universities.	