



Course Specification

— (Postgraduate)

Course Title: Nonlinear Functional Analysis
Course Code: 202652-3
Program: Master of Pure Mathematics
Department: Mathematics and Statistics
College: Science
Institution: Taif University
Version: 1
Last Revision Date: 20/5/2023



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A. General information about the course:

1. Course Identification:

1. Credit hours: (3)h			
2. Course type			
A.	<input type="checkbox"/> University	<input type="checkbox"/> College	<input checked="" type="checkbox"/> Department <input type="checkbox"/> Track
B.	<input type="checkbox"/> Required		<input checked="" type="checkbox"/> Elective
3. Level/year at which this course is offered: (L 3)			
4. Course general Description:			
<p>Some topics in non-linear functional analysis must be discussed such as: Fixed point methods- Nonexpansive mappings- Differential and integral calculus in Banach spaces- Implicit and inverse function theorems – Potential operators and Variation methods for linear and non-linear operator equations – Extreme of functionals. Monotone operators and monotonicity methods for nonlinear operator equation- Applications to differential and integral equations.</p>			
5. Pre-requirements for this course (if any):			
Measure Theory and Functional analysis.			
6. Pre-requirements for this course (if any):			
7. Course Main Objective(s):			
<ol style="list-style-type: none"> 1. Study Fixed point methods. 2. Study Differential and integral calculus in Banach spaces. 3. Study Implicit and inverse function theorems. 4. Study Potential operators and Variation methods for linear and non-linear operator equations. 5. Study Monotone operators and monotonicity methods for nonlinear operator equation. 6. Study Applications to differential and integral equations. 			

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3	100%
2	E-learning	0	0
	Hybrid	0	0
	• Traditional classroom		



No	Mode of Instruction	Contact Hours	Percentage
	• E-learning		
4	Distance learning	0	0

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	0
5.	Others (specify).....	0
	Total	45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Recognize fundamentals concepts of certain operators related to fixed points.	K1	lecture	• Exams <input type="checkbox"/> Assignments
1.2	Describe generalizations some theorems by fixed point methods.	K3	Lecture	• Exams <input type="checkbox"/> Assignments
...				
2.0	Skills			
2.1	Give some applications for to differential and integral equations.	S1	Lecture	• Exams <input type="checkbox"/> Assignments





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.2	Demonstrate properties of Monotone operators and monotonicity methods for nonlinear operator equation .	S5	Lecture	<ul style="list-style-type: none"> • Exams □ Assignments
...				
3.0	Values, autonomy, and responsibility			
3.1	Participate basic properties Potential operators and Variation methods for linear and non-linear operator equations.	V1	Lecture	<ul style="list-style-type: none"> • Exams □ Assignments
3.2	Give responsibility for learning some Implicit and inverse function theorems.	V2	Discussion	Group Discussion
...				

C. Course Content:

No	List of Topics	Contact Hours
1.	Fixed point methods.	9
2.	Differential and integral calculus in Banach spaces.	9
3.	Implicit and inverse function theorems.	9
4.	Potential operators and Variation methods for linear and non-linear operator equations.	9
5.	Monotone operators and monotonicity methods for nonlinear operator equation.	3
6.	Applications to differential and integral equations.	6
Total		45



D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes and HomeWorks	Continues	10 %
2.	Midterm exam	10 th - 11 th	20 %
3.	Final exam	17 th	70%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	Klaus Deimling, Nonlinear Functional Analysis, Springer Berlin (1985)
Supportive References	Erwin Kreyzig, Introductory Functional Analysis with Applications, Willy, 1978
Electronic Materials	https://doi.org/10.2307/2371787
Other Learning Materials	Non

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture halls, containing white boards, and electronic monitors - The seats fit the number of students - Laboratories equipped with suitable numbers of computers
Technology equipment (Projector, smart board, software)	Laptop and projector
Other equipment (Depending on the nature of the specialty)	Wi-Fi internet connections

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Faculty, Program Leader	Direct
Effectiveness of students assessment	Students, Faculty	Indirect
Quality of learning resources	Faculty	Direct& Indirect



Assessment Areas/Issues	Assessor	Assessment Methods
The extent to which CLOs have been achieved	Faculty	Direct& Indirect
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	Department Council
REFERENCE NO.	
DATE	OCTOBER 2023

قسم الرياضيات والإحصاء
Mathematics and Statistics
Department

