2023
TPG-153

Course Specification
(Postgraduate)

Course Title:	**Spectral Theory**
Course Code:	**202655-3**
Program:	**Master of Pure Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Taif University**
Version:	**1**
Last Revision Date:	**20/5/2023**

Table of Contents

A. General information about the course:

1. Course Identification:

1. Credit hours: (3) h				
2. Course type				
A.	☐University	☐College	☒ Department	☐Track
B.	☐Required		☒ Elective	
3. Level/year at which this course is offered: (L 3)				
4. Course general Description:				
Spectral operators– continuous spectrum– self adjoint operators– functional operators– spectral measures– spectral integrals– spectral analysis for natural operators– ordinary and singular differential operators– Schrödinger spectral operator– perturbed spectrum				
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):				

1. **Study spectral operators.**
2. **Study continuous spectrum.**
3. **Study self adjoint operators.**
4. **Study functional operators.**
5. **Study spectral measures.**
6. **Study spectral integrals.**
7. **Study spectral analysis for natural operators.**
8. **Study ordinary and singular differential operators.**

Study Schrödinger spectral operator and perturbed spectrum.

2. Teaching Mode: (mark all that apply)

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

No	Mode of Instruction	Contact Hours	Percentage
	Hybrid • Traditional classroom • E-learning	0	0
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** spectral operators, continuous spectrum, self adjoint operators and functional operators.	K1	lecture	• Exams □ Assignments
1.2	**Describe** spectral measures, continuous spectrum– self adjoint operators and functional operator's spectral integrals.	K3	Lecture	• Exams □ Assignments
…				

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.0	**Skills**			
2.1	**Apply** spectral analysis for natural operators, ordinary and singular differential operators.	S1	Lecture	• Exams □ Assignments
2.2	**Demonstrate** Schrödinger spectral operator– perturbed spectrum.	S5	Lecture	• Exams □ Assignments
...				
3.0	**Values, autonomy, and responsibility**			
3.1	**Participate** effectively within groups and independently.	V1	Lecture	• Exams □ Assignments
3.2	**Give** responsibility for learning importance and continuing personal and professional development.	V2	Discussion	Group Discussion
...				

C. Course Content:

No	List of Topics	Contact Hours
1.	Spectral operators.	3
2.	Continuous spectrum.	3
3.	Self adjoint operators.	3
4.	Functional operators.	6
5.	Spectral measures.	6
6.	Spectral integrals.	6
7.	Spectral analysis for natural operators.	6
8.	Ordinary and singular differential operators.	6
9.	Schrödinger spectral operator and perturbed spectrum.	6
Total		**45**

D. Students Assessment Activities:

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

E. Learning Resources and Facilities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes + home works+ oral presentation +written test+ group project	Continues	30%
2.	Final exam	16 th	70%

1. References and Learning Resources:

Essential References	**Konstantin Pankrashkin, Introduction to the spectral theory** **Webpage of the course: http://www.math.u-psud.fr/~pankrash/2012spec/**
Supportive References	**V. S. Sunder, Functional Analysis, Spectral Theory, 1997.** https://www.imo.universite-paris-saclay.fr/~pankrashkin/2012spec/notes29.pdf
Electronic Materials	**Non**
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
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

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