Course Specification

(Postgraduate)

Course Title: **Approximation Theory**
Course Code:**MATH666**
Program: **Master Program in Mathematics**
Department: **Mathematics**
College: **Science**
Institution: **University of Tabuk, KSA**
Version: **2**
Last Revision Date:**1/12/1443 H**

Table of Contents

A. General information about the course:

Course Identification					
1. Credit hours:	3 H				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☐	Elective ☒			
3. Level/year at which this course is offered: Level-2 or higher					
4. Course general Description					
Polynomial Interpolation: Lagrange interpolation formula, error in polynomial interpolation, Newton's interpolation method, Hermite interpolation. The approximation problem, existence of best approximation and uniqueness: approximation in a metric space, approximation innormed space, conditions for uniqueness of the best approximation, the uniform convergence of polynomial approximations, Least Squares approximation, Chebyshev approximation, Spline approximation					
5. Pre-requirements for this course (if any): None					
6. Co- requirements for this course (if any): None					
7. Course Main Objective(s)					
1. Study the different approximation methods and theories. 2. Study the application of these methods and theories in real life. 3. Computational study and numerical evaluation of the approximations and the involved error.					

1. Teaching mode(mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	45	100 %
2.	E-learning		
3.	Hybrid ● Traditional classroom ● E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	3 H /week

2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	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 The students will be able to:			
1.1	Demonstrate advanced concepts of approximation theory.	K1	Lectures, Group works, Presentations, Classroom discussion, Seminar, Case study, problem solving session	Exams, Quizzes, Research project, presentation, interactive discussion and participation, Surveys.
1.2	Describe the theories of convergence and best approximations for continuous functions as well as error estimates for smooth functions	K2		
1.3	Enhance deep understanding of current topics in approximation theory	K3		
2.0	Skills The students will be able to:			
2.1	Apply the best methods and the analytical procedures to find the right result.	S1	Lectures, Group works, Presentations, Classroom discussion, Seminar, Case study, problem solving session	Exams, Quizzes, Home works, Assignments, Research project, presentation, interactive discussion and participation, Surveys.
2.2	Solve and compare between different methods of solving interpolation polynomial.	S2		
3.0	Values, autonomy, and responsibility The students will be able to:			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.1	Demonstrate the responsibility of the working individually or as group research.	V2	Lectures, Group works, Presentations, Classroom discussion, Seminar, Case study, problem solving session	Research project, Home works, Assignments, presentation, interactive discussion and participation, Surveys.

C. Course Content

No	List of Topics	Contact Hours
1	Introduction of polynomial interpolation.	3
2	Lagrange interpolation formula.	3
3	Error in polynomial interpolation	3
4	Newton's interpolation method	3
5	The approximation problem.	3
6	Hermite interpolation,	3
7	**Mid-Exam #**	---
7	Existence of best approximation and uniqueness,	3
8	Approximation in a metric space	3
9	Conditions for uniqueness of the best approximation,	3
10	Applications on the best approximation.	3
11	The uniform convergence of polynomial approximations	3
12	Least Squares approximation	3
13	Chebyshev approximation,	3
14	Spline approximation.	3
15	Hermit approximation	3
16+17	**Revision & Final Exam**	
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Home works and Assignments	Weekly basis	20%
2.	Mid-term exam	7th week	25%
3.	Presentation and discussion	During the Semester	15%
4.	Final Exam	At End of Semester	40 %

*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	1. Trefethen, L. N., Approximation Theory and Approximation Practice, SIAM, Society for Industrial and Applied Mathematics (2020) 2. Numerical Analysis, Richard Burden and J. Douglas Faires, 8th Ed. (Thomson Brooks-Cole, 2005) 3. Course on Approximation Theory, Ward Cheney and Will Light, graduate studies in mathematics volume 2001
Supportive References	A Short Course on Approximation Theory, N. L. Carothers, Bowling Green State University (2008), Lecture notes.
Electronic Materials	Matlab software, Saudi digital library.
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture Room with capacity of 30 students and equipped with White Board, Library
Technology equipment (projector, smart board, software)	Overhead projector and internet connection.
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct and Indirect
Effectiveness of students assessment	Teacher	Direct
Quality of learning resources	Students	Indirect
The extent to which CLOs have been achieved	Teacher, Quality Committee	Direct and Indirect
Other		

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

Assessment Methods(Direct, Indirect)

G. Specification Approval Data

Council / Committee	**Approval by the Department Council**
Reference No.	DEPARTMENT COUNCIL NO (26)
Date	**11/9/1444 H**