

**KING FAHD UNIVERSITY OF PETROLEUM & MINERALS**

Department of Mathematics & Statistics

**Math575 Course Syllabus**

Introduction to Approximation Theory

Term – 212

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**Course Title:** Math575 (Introduction to Approximation Theory)

**Credits:** 3-0-3

**Textbooks:**

- ***Approximation Theory and Methods, 1st Edition, M. J. D. Powell, Cambridge University Press; 1st edition (March 31, 1981)***
- ***Interpolation and Approximation by Polynomials by George M. Phillips Springer 2003***
- ***Introduction to approximation theory* by Elliott Ward Cheney Jr. [American Mathematical Society 1966](#)**

**Objectives:** Best approximation in normed linear spaces: basic concepts. Lagrange and Hermite interpolation. Approximate solution of over-determined system of linear equations. Linear approximation of continuous functions in Chebyshev and least squares norms. Rational approximation. Piecewise polynomial approximation. Cubic and B-splines.

**Learning Outcomes:**

**Upon successful completion of this course, the student should be able to**

1. Understand the approximation problems particularly in Chebyshev and least squares norms.
2. Interpolate data using Lagrange and Hermite interpolation.
3. Understand and apply Chebyshev and least squares polynomial approximation.
4. Comprehend the properties of orthogonal polynomials with selective applications.
5. Find Chebyshev and least squares solution of overdetermined systems of linear equations.

6. Construct cubic and basic B-splines and conduct underlying error analysis.
7. Have the basic knowledge of Padé and rational approximation with simple applications.

**The Course Grading Policy:**

	<b>Date</b>	<b>Time</b>	<b>Place</b>	<b>Materials</b>	<b>Percentage</b>
<b>Exam I</b>	TBA	TBA	TBA	TBA	25% (75 pts)
<b>Exam II</b>	TBA	TBA	TBA	TBA	25% (75pts)
<b>Final Exam</b>	TBA	TBA	TBA	comprehensive	35% (105 pts)
<b>Homeworks</b>	Homeworks, projects, presentations				15% (30pts)

**Missing The Midterm Exam:**

In case a student misses an exam (Exam I, Exam II, or the Final Exam) for a legitimate reason (such as medical emergencies), he must bring an official excuse from Students Affairs. Otherwise, he will get zero in the missed exam.

**Attendance:**

Attendance is a University Requirement (see p. 38 of the Undergraduate Bulletin 2006-2009). A DN grade will be awarded to any student who accumulates 09 unexcused absences.

**Academic Integrity:**

All KFUPM policies regarding ethics apply to this course.

### Pacing Schedule

Week	Topic
1	Univariate Interpolation
2	Best approximation in normed linear spaces
3	Best approximation in normed linear spaces
4	Approximate solution of over-determined system of linear equations
5	<b>Chebyshev Interpolation</b>
6	Piecewise polynomial approximation
7	Multivariate Interpolation
8	Multivariate Interpolation
9	Splines
10	Bernstein Polynomials
11	Rational approximation by the exchange algorithm
12	Least squares approximation
13	Properties of orthogonal polynomials
14	<b>Approximation to periodic functions</b>
<a href="#">Eid Al-Fitr Holidays: April 24-May 05</a>	
15	The theory of best L 1 approximation