KINGDOOM OF SAUDI ARABIA
Ministry of Education
Al-Imam Mohammad Ibn Saud Islamic University
College of Sciences
Department of Mathematics & Statistics

المملكة العربية السعودية
وزارة التعليم
جامعة الإمام محمد بن سعود الإسلامية
كلية العلوم
قسم الرياضيات والإحصاء

SYLLABUS

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Teaching Language
MAT	**433**	**Numerical Analysis (2)**	**4**	**2**	**2**	**1**	**7**	**MAT 333**	**8[1]**	**English**

A. Course Description

This course is the continuation of Numerical Analysis I (MAT 333). It introduces numerical methods for approximating functions and data, approximating eigenvalues, and solving boundary value problems for ordinary and partial differential equations. It provides practical technics for best approximation as well as theoretical analysis of the problems along with algorithms for their solutions.

B. Course Outcomes

At the end of this course the student will be able to:

- Approximate functions and data.
- Approximate eigenvalues and eigenfunctions numerically.
- Use basic finite difference methods for ordinary and partial differential equations.
- Be familiar with the concepts of consistency, stability, and convergence.
- Use of Matlab or C++ in Lab.

C. References:

Required Textbook

Numerical Analysis, R. Burden and J. Faires, 8th Edition, Brooks/Cole, 2001.

Other references:

- *Numerical Solution of Partial Differential Equations: An Introduction,* 2nd Edition, K. W. Morton & D. F. Mayers, Cambridge University Press, 2005.

- *An Introduction to Numerical methods and Analysis,* James F. Epperson, Wiley; 2002.

- *Elementary Numerical Analysis, 3rd Edition,* Kendall Atkinson; Weimin Han; 2004.

Course Website: Google Classroom Webpage: http://www.imamm.org/

D. Topics Outline

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[1] *B.Sc. in Applied Mathematics.*

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1. **Advanced Numerical Linear Algebra:** Least Squares Method, Matrix Eigenvalue Problems: Power Method, QR Factorization.

2. **Finite Difference Techniques:** Difference Equation Replacement, Implicit and Explicit Finite Difference Method.

3. **Boundary Value Problems for ODEs:** Multistep Methods, Finite Difference Methods for Systems of Differential Equations.

4. **Finite Difference Method for PDEs:** Finite Difference Method for Boundary Value Problems, Numerical Solution of Elliptic PDEs, Numerical Solution of Parabolic PDEs, Numerical Solution of Hyperbolic PDEs.

E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

F. Exams & Grading System

The semi-official dates of the exams for this course are:

– **Midterm 1:** 6th or 7th week.
– **Midterm 2:** 11th or 12th week.
– **Quizzes & Homework:** During the semester.
– **Final Exam:** 16th week.

Your course grade will be based on your semester work as follows:

Midterm 1: 20 %	Midterm 2 (Lab Exam): 20 %	Final Exam: 40 %
2 Quizzes, 4 Homeworks, Attendance & Participation: 20 %		

The grading distribution:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

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G. Student Workload:

#	Teaching/learning activities	Contact Hours	Frequency	Total Contact hours	Self-study hours	Total self-study hours	Student Learning Time
1	Lecture	2	15	30	1	15	45
2	Tutorial	1	15	15	1	15	30
3	Lab\Practical	2	15	30	2	30	60
4	Homework	0	4	0	1	15	15
5	Quiz	0.25	2	0.5	1	2	2.5
6	Test (Midterm)	1.5	2	3	6	12	15
7	Final Exam	2	1	2	12	12	14
Total				**80.5**		**103**	**183.5**

Independent self-study = 103/15 $\cong$ 7 hrs per week

H. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams
goo.gl/ykm7t3