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	**333**	**Numerical Analysis (1)**	**4**	**2**	**2**	**2**	**6**	**MAT 223 Mat 231 Mat 251**	**5[1]**	**English**

A. Course Description

This course is an introduction to the numerical analysis. It presents the fundamental concepts and methods, and basic numerical analysis tools in the field. This course emphasizes not only numerical methods, but also the analysis of their convergence and convergence rates. It develops as well the basic understanding of numerical algorithms and skills to implement algorithms to solve mathematical problems on the computer.

B. Course Outcomes

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

- Be familiar with the basics of numerical analysis.
- Use computational techniques for finding approximate solutions to difficult mathematical problems.
- Estimate the error sources and the convergence of the algorithms with respect to the various techniques used.
- Use computers to solve mathematical problems using Matlab or C++ in Lab.

C. References:

Required Textbook

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

Other references:

- *An Introduction to Numerical methods and Analysis***,** James F. Epperson, Wiley, 2002.
- *Elementary Numerical Analysis***,** Kendall Atkinson; Weimin Han, 3rdEdition, 2004.

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

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

D. Topics Outline

1. **Introduction to data representation:** Numerical Errors, Floating Point Representation, Round-off; Significant Digit, Error Propagation.
2. **Root Finding:** Bisection Method, Newton's Method, Secant Method, Fixed Point Iterations.
3. **Interpolation and Approximation:** Taylor polynomials, Approximation of order n, Polynomial Error, Linear and Quadratic Interpolation, Lagrange Interpolation, Newton Divided Difference Method, Error Evaluation.
4. **Numerical Integration and Differentiation:** The Trapezoidal and Simpson Rules, Gaussian Quadrature, Numerical Differentiation.
5. **Numerical Solution of Linear Systems:** Gauss Elimination, LU and Cholesky Decompositions, Iterative Methods: Jacobi and Gauss-Siedel Methods, Error Analysis.
6. **Numerical Solution of Differential Equations:** Euler Method, Runge-Kutta Methods. Error and Convergence Analysis.

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:** 6^{th} or 7^{th} week.
- **Midterm 2:** 11^{th} or 12^{th} week.
- **Quizzes & Homework:** During the semester.
- **Final Exam:** 16^{th} week.

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

Midterm 1: 20 %	**Midterm 2 (Lab Exam):** 20 %	**Final Exam:** 40 %
Quizzes, Homework, 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)

G. 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