

The University of Jordan
King Abdullah II School for Information Technology
Computer Science Department

1901351

Numerical Analysis

Spring 2016

1901351 Numerical Analysis: (Prerequisite: Computer Skills-2 1901102)

The course is a basic course in numerical methods, introduces students to: Error analysis; Finding roots of a function: bracketing and iterative methods; Roots: direct and indirect solution of systems of linear equations; Solution of nonlinear systems; Approximation and interpolation; Numerical integration and differentiation; Programming language program in parallel with material or using MATLAB. Weekly practice in the lab.

Instructor: Dr. Jamal Alsakran

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Email: j.alsakran@ju.edu.jo
Course homepage: jamalalsakran.me/NumAnalysis/NumAnalysis.html

Office Hrs: Sunday, Tuesday, and Thursday 12:00 – 1:00

Text Book: Mathews. J.H, Fink. K.D, Numerical Methods Using MATLAB, 4th edition, Prentice Hall

Assessment: 25 Midterm Exam
25 Quizzes and Homework
50 Final Exam

Grading Scale:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
100-90	89-85	84-80	79-75	74-70	69-65	64-61	60-57	56-53	52-50	49-45	44-0

Intended learning Outcomes:

Successful completion of this course should lead to the following learning outcomes:

A. Knowledge and Understanding: Students Should

- A2. Understand the basic error analysis techniques
- A3. Understand the basic methods for root approximation
- A3. Understand the basic methods for solving nonlinear systems
- A4. Understand the basic numerical techniques for approximating differentiation and integration

B. Intellectual Skills: Students should have the ability to

- B1. Analyze and compare the significance of the different techniques for root approximation
- B2. Analyze and compare the different techniques for solving nonlinear systems
- B3. Analyze and compare the different techniques for numerical differentiation and integration

C. Subject Specific Skills: Students should have the ability to

C1. Implement numerical methods illustrated using MATLAB

C2. Solve real world problems numerically using MATLAB

D. Transferable Skills: Students should have the ability to

D1. Discuss and work in a group in order to solve numerical approximation problems

D2. Discuss and work in a group in order to program numerical solutions using MATLAB

D3. Demonstrate developed solutions and programs

Teaching Methods:

Method	Learning Outcome	Assessment Methods
Lectures	A1 + A2 + A3 + A4 + B1 + B2 + B3	Exams + Quizzes
Laboratory	C1 + C2 + D1 + D2 + D3	Programming Homework

Tentative Course Contents:

Chapter	Topics	Period
Ch 1	Introduction to MATLAB Introduction to numerical analysis and number systems Error analysis <ul style="list-style-type: none">• Absolute errors• Relative errors• Precision in Measurements	3 weeks
Ch 2	Solving nonlinear equations $f(x) = 0$ <ul style="list-style-type: none">• Iteration for solving $x = g(x)$• Bracketing methods for locating roots• Newton-Raphson and secant methods	3 weeks
Ch 3	Solution of linear systems $AX = B$ <ul style="list-style-type: none">• Introduction• Properties of vectors and matrices• Upper-triangular linear systems• Gaussian elimination and pivoting• Triangular factorization• Iterative methods for linear systems	4 weeks
Ch 5	Curve Fitting <ul style="list-style-type: none">• Least-squares lines• Curve fitting• Interpolation by Spline functions	3 weeks
Ch 6	Numerical differentiation <ul style="list-style-type: none">• Approximating the derivative• Numerical differentiation formulas	1 week
Ch 7	Numerical integration <ul style="list-style-type: none">• Introduction• Composite trapezoidal and Simpson's rule	1 week