



Faculty of Science

MATHEMATICS DEPARTMENT

Course Syllabus

Semester: Second Semester 2018/2019

Course information

Course Code and Number: **Math330**

Course Title: **Numerical Methods.**

Pre requisite: **Math234 & (Comp132 or Comp133 or Comp 142 or Comp 230)**

Instructors Information

Instructor	Muna Abu Alhalawa	Alaeddin Elayyan	Mahmoud Ghannam
Office	SCI306	SCI210	SCI306

Course Description

Floating point representation and computer arithmetic, numerical solution of nonlinear equation, numerical solutions of systems of linear and nonlinear equations, interpolation and curve fitting and splines, numerical integration and differentiation, numerical solution of initial value problems.

Course goals

This Course is an introductory to Numerical Analysis. It aims to introduce the basic numerical techniques used in several mathematical branches accompanied with MATLAB algorithms.

Course outcomes

Upon completion of Math 330, students will be able to perform the following tasks.

1. Students will be able to comprehend the floating-point system of numbers.
 2. Students will be able to analyze different types and sources of errors.
 3. Students will be able to use iterative techniques to solve nonlinear equations.
 4. Students will be able to solve systems of linear and nonlinear equations numerically.
 5. Students will be able to calculate the cost of computer algorithms.
 6. Students will be able to learn the concept of interpolation and polynomial approximation using Lagrange's and Newton's approaches.
 7. Students will be able to comprehend piecewise interpolation, mainly the cubic spline functions.
 8. Students will be able to apply different methods of curve fitting.
 9. Students will be able to estimate derivatives of all orders at any point.
 10. Students will be able to estimate integrals with high accuracy
 11. Students will be able to use numerical methods to estimate solutions of ODEs.
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Course Topics and Contents

Lecture	Section	Topic
1	1.1	Review of Calculus
2	1.3	Error Analysis
3,4	2.1	Iteration for Solving $x = g(x)$
5	2.2	Bracketing Methods for Locating a Root
6	2.3	Initial Approximation and Convergence Criteria
7,8	2.4	Newton-Raphson and Secant Methods
9	3.3	Upper-Triangular Linear Systems
10,11	3.4	Gaussian Elimination and Pivoting
12,13	3.5	Triangular Factorization
14	3.6	Iterative Methods for Linear Systems
14	3.7	Iteration for Nonlinear Systems: Seidel and Newton's Methods
15	4.1	Taylor Series and Calculation of Functions
15	4.2	Introduction to Interpolation
16	4.3	Lagrange Approximation
17	4.4	Newton Polynomials
18	5.1	Least-Squares Line
19	5.2	Methods of Curve Fitting
20	5.3	Interpolation by Spline Functions
21,22	6.1	Approximating the Derivative
23,24	6.2	Numerical Differentiation Formulas
25,26	7.1	Introduction to Quadrature
27	7.2	Composite Trapezoidal and Simpson's Rule
28	7.5	Gauss-Legendre Integration
29	9.2	Euler's Method
29	9.3	Heun's Method
30	9.4	Taylor Series Method
30	9.5	Runge-Kutta Methods

Course assessment detail

Methods of assessment	Relative weight
First Hour Exam	25%
Second Hour Exam	25%
Final Exam	35%
Quizzes & Lab Test	15%

Course Textbookk

Author	Title	ISBN	Edition	Publisher
John H. Mathews and Kurtis D. Fink	Numerical Methods Using MATLAB	9780130652485	Fourth	PEARSON

General Guidelines

- 1) **Attendance:** Mandatory. (If you miss more than 4 classes, you get dropped)
- 2) **Cheating:** Immediate course fail with final expulsion possibility.
- 3) **Make Up:**
 - *There is a makeup exam for the final exam **only**; conditioned with an acceptable excuse via Ritaj portal within 48 hours. Otherwise, the absentee gets **Fail Absent -FA-** (Grade = 50).
 - * In case of missing **one** of the other exams with acceptable excuses, the formula in the student guide for grades will be used. Otherwise, the absentee gets **zero**.
- 4) **Internet:** Check your personal Ritaj account daily.
- 5) **Calculators:** Bring your own scientific calculator each class.
- 6) **Exams Instructions:**
 - * Bring your own scientific calculator.
 - * Mobiles must be set off.
 - * Personal BZU ID is mandatory.
 - * Commitment to announced exam's halls at time is a must.
 - * No cheating whatsoever.
- 7) **Teaching Assistants:** Available daily at SCI309.
- 8) **Grade formula:** In case of missing one of the two hour exams, the missing grade will be evaluated as follows:

Missing grade = (section's grade of the missing exam × Average student's grade of the other exams) / Average section's grade of the other exams.

Assigned problems

Section	Problems
1.1	3, 4, 6, 12(a,c)
1.3	1, 2, 5(a,b), 6(a), 7(a), 9
2.1	1(a,b), 2, 3(a,b), 4, 9
2.2	3(a,b), 5, 6, 8,11
2.4	3, 4, 5, 7,8,9, 10
3.3	2, 6
3.4	3, 6, 12, 14(a)
3.5	2(a), 4(b)
3.6	2, 6
3.7	2(a), 6, 7(a)
4.1	1, 2
4.2	1
4.3	2, 3, 5(b,c), 7, 10,11,12
4.4	5, 7, 8
5.1	1(a), 3(a), 8(a), 9(a), 10
5.2	1(a), 3(b), 4(b), 5(b), 8-15
5.3	3, 4, 5, 15(a)
6.1	2, 3, 11
6.2	1(a), 7, 10, 11
7.1	1(a), 2(a), 3, 6
7.2	1(a), 2(c), 8(b), 9(b)
7.5	1, 4
9.2	1, 3
9.3	1, 3
9.4	1, 3
9.5	1, 3