



Forman Christian College, Lahore
(A Chartered University)
Department of Mathematics

Instructor Information

Asim Nadeem

Assistant Professor

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Office Hours: Monday to Friday: 11:00 AM – 01:00 PM

Tuesday, Thursday: 9:00 AM – 9:30 AM, 12:15 PM – 01: 00 PM

Online Office Hours: All days: 7 PM to 9 PM (Text / WhatsApp / E-mail)

Course Information:

Spring 2023

Numerical Computing

CSCS 320 A

3 credits

Prerequisite: MATH 111

Room # S - 316

Timing: M,W,F: 10:00 ---- 10:50

Recommended Books

- Numerical Methods Using MATLAB by John H. Mathews, Kurtis D. Fink
- Numerical Methods by Dr. V. N. Veda Murthy and Dr. N. Ch. S. N. Iyengar.
- Numerical Analysis by Richard L. Burden and J. Douglas Fairies
- Applied Numerical Methods using MATLAB by Won Young Yang

Course Contents

This is a Computer Science (CSCS) lab course. Course contents include introduction to computer representation of numbers, error analysis, finite differences, interpolation, splines, numerical differentiation and integration, numerical solution of linear and nonlinear systems of equations.

Learning Outcomes

Students will be able to

- understand the concepts and working of numerical techniques used to solve different mathematical problems.
- solve linear and nonlinear equations, interpolation, differentiation, and integration problems.
- reduce errors to its minimum while finding numerical solutions of mathematical problems.
- apply methods and techniques of numerical analysis to other areas of mathematics like ordinary differential equations and linear algebra, etc.
- apply numerical methods in MATLAB.

Course Requirements:

- Students are expected to attend every class. Students must arrive at class on time, should remain in class for the entire class period and mobile phone should be switched off or on silence. If a student arrives more than 10 minutes late or leave class during lecture or use mobile in class, he/she will be marked absent.
- Course assessment will be through **quizzes, attendance, behavior, class participation, assignments, midterm, and final exam.**
- Quizzes, Mid-term exam and final exam will be conducted on campus. Students will submit homework on Moodle. There is **no make up** for the **missed quizzes** and **homework**. Make up for midterm and final exam is possible only under extremes cases if a student provides strong documentary evidence. In case of make-up exam there will be a 0-20% deduction in marks depending upon case-to-case basis.
- Academic dishonesty or cheating will result in zero points (grade F) and will be referred to AIC (Academic Integrity Committee) at FCC for necessary action.

<u>Grades</u>	<u>Quality Points</u>	<u>Numerical Value</u>	<u>Meaning</u>
A	4.00	93-100	Superior
A-	3.70	90-92	
B+	3.30	87-89	
B	3.00	83-86	Good
B-	2.70	80-82	Fair
C+	2.30	77-79	
C	2.00	73-76	Satisfactory
C-	1.70	70-72	
D+	1.30	67-69	
D	1.00	60-66	Passing
F	0.00	59 or below	Failing

Course Evaluation:

Grading will be based on following criteria:

Homework	10%
Attendance, behavior and class participation	05%
Quizzes	15 %
Midterm	30%
Final	40%

Lesson Plans

Week	Topics	ASSESSMENTS
1	Course Introduction, Policies, Requirements and Grading Criteria. Discussion on Necessity of Numerical Computing along with Examples; Introduction to MATLAB; Introduction to Computer Representation of Numbers.	
2	Solution of Non-Linear Equations: Bisection Method, Method of False Position, Algorithm and Program.	
3	Newton Raphson Method, Secant Method, Algorithm and Program.	
4	Solution of a System of Linear Equations Gauss-Jacobi Iteration. Algorithm and Program	Quiz-1
5	Gauss-Seidel Iteration. Algorithm and Program.	
6	Errors: Error Analysis, Truncation Error, Rounding-Off Error, Propagated Error, Chopping-Off Error.	
7	Difference Operators and Interpolation: Forward Differences, Backward Differences. Gregory Newton Forward Interpolation	HW-1
8	Gregory Newton Backward Interpolation. Divided Differences.	Midterm
9	Newton's Divided Difference Formula.	
10	Lagrange's Interpolation. Interpolation using MATLAB	Quiz - 2
11	Equidistant Terms with One or More Missing Values. Inverse Interpolation, Lagrange's Method.	
12	Spline Interpolation	
13	Numerical Differentiation: Derivatives by Newton's Forward Difference Formula; Derivatives by Newton's Backward Difference Formula;	
14	Numerical Integration: General Quadrature Formula. Trapezoidal Rule. Simpson Rule, Algorithm and Program	Quiz - 3
15	Solution of System of Non-Linear Equations Newton's Method, Problem Solving and Algorithm discussion.	HW-2