Forman Christian College
(A Chartered University)
Department of Mathematics
Numerical Computing (CSCS 320)
Spring 2023
Dr. Nazish Shahid, Associate Prof.
Room No. S-352
Office Hours: Mon, Wed 1:20 PM-2:00 PM
Fri 1:00 PM-2:10 PM
Tues, Thur 1:50 PM-2:50 PM
Note: For other than office hours get an appointment.
nazishshahid@fccollege.edu.pk

Course Details

Course Timings: **Mon, Wed, Fri 11:00 AM -11:50 AM**
Class Room: **S-316**
Credits: **3 hrs.**
Prerequisite: **MATH 111**
Section: **B**

Recommended Books & Lecture Notes

- Numerical Methods Using MATLAB by John H. Mathews, Kurtis D. Fink
- **Numerical Methods by Dr. V. N. Vedamurthy and Dr. N. Ch. S. N. Iyengar (will be followed for this course)**
- Numerical Analysis by Richard L. Burden and J. Douglas Fairies
- Applied Numerical Methods using MATLAB by Won Young Yang
- Lecture Notes (available on Moodle)
- Links of youtube video lectures posted on Moodle

Goals

- To be able to solve higher order equations using numerical methods.
- To be able to find solution of systems of linear equations by exact and iterative methods.
- To be able to understand the concepts and working of numerical differentiation and numerical integration.
- To be able to reduce errors to its minimum while finding numerical solutions of higher order equations.
- To be able to apply methods and techniques of numerical analysis to other areas of mathematics like ordinary differential equations and linear algebra, etc.

Course Requirements

- **Every student must bring his\her calculator in the class.**
- **There will be absolute grading for evaluation of the course.**
- Students are expected to attend all classes. **University's attendance policy** will be followed and the student whose attendance is less than 70% won't be allowed to take the final exam.
- Students must arrive in the class at time and should remain there for the entire period.
- All electronic devices including **Mobile phones should be switched off** during classes, quizzes and midterm.
- **All quizzes and exams shall be held on-campus.**
- There is no make up for missed quizzes and assignments. Make up for midterm and final exam is possible only under extremes cases if the student provides strong documentary evidence. In case of makeup exam there will be a 0-20% deduction in marks depending upon case-to-case basis. Medical Certificate will be acceptable if the medical officer of FCC verifies it.
- For other "Expectations" and "Breaches of Academic Integrity" please visit
    https://www.fccollege.edu.pk/policy-on-academic-integrity/

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.

Course Evaluation
Course assessment will be done through the following steps:

Attendance, Behavior, Class Participation	5%
Assignments (2)	5%
Quizzes (3)	20%
Midterm	30%
Final Exam	40%

Contents Distribution

Week	Topics	Assessment
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, Newton Raphson Method;	
3	**Solution of Non-linear Equations (continued)** Secant Method, Method of False Position;	
4	**Solution of a System of Linear Equations** Gauss-Jacobi Iteration; Algorithm and Program	**Assignment 1**
5	**Solution of a System of Linear Equations (continued)** Gauss-Seidel Iteration; **Errors** Error Analysis, Truncation Error, Rounding-Off Error, Propagated Error, Chopping-Off Error	**Quiz-1**
6	**Difference Operators and Interpolation** Forward Differences, Backward Differences; Gregory Newton Forward Interpolation	
7	**Interpolation (continued)** Gregory Newton Backward Interpolation; Divided Differences; Newton's Divided Difference Formula	

8	**Interpolation (continued)** Lagrange's Interpolation; Interpolation using MATLAB	**Midterm**
9	Equidistant Terms with One or More Missing Values; **Inverse Interpolation** Lagrange's Method; Spline Interpolation	
10	**Numerical Differentiation** Derivatives by Newton's Forward Difference Formula; Derivatives by Newton's Backward Difference Formula;	**Quiz-2**
11	**Numerical Integration** General Quadrature Formula; Trapezoidal Rule	
12	**Numerical Integration (continued)** Simpson Rule; Numerical Differentiation (Algorithm and Program)	**Assignment 2**
13	**Numerical Integration** Algorithm and Program	
14	**Numerical Integration (continued)** Algorithm and Program	
15	**Solution of System of Non-Linear Equations** Newton's Method	**Quiz-3**
16	**Solution of System of Non-Linear Equations** Algorithm and Program	