Tafila Technical University
Faculty *of*
Information & Communications Technology
Department of Information Technology

Numerical Analysis
0602361 + 0208212
(3 Credit Hours**)**
2nd Semester, **2021/2022**

Instructor:	**Dr. Abdullah O. AL-Zaghameem**
E-mail:	aoz@ttu.edu.jo
Class Time:	**11:00 – 12:30 Mon, Wed**
Location:	**202 م**
Office Hours:	**(Sun, Tue) 11:00 AM** **(Mon) 01:00 PM**
Evaluation:	**20 Points** (1st Exam) **20 Points** (2nd Exam) **10 Points** (Quizzes + Assignments) **50 Points** (Final Exam)

Syllabus

Course Description	The course is an introduction to numerical methods. Students will study topics like Error analysis; 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. Students will write programs in a specific programming language to solve a wide set of numerical problems.
Course Objectives	At the end of the course, students should be able to: ▪ Practice the fundamentals of numerical analysis. ▪ Learn how to represent problems numerically in computing world. ▪ Design and implement precise algorithms to solve mathematical problems numerically. ▪ Write correct and comprehensive programs to solve problems.
Rules and Notes	Students enrolled in this course should pay attention to the following notes: 1. Attending course lectures on time is obligatory. 2. Respecting your colleagues, instructor, and appointments reflects your diligence. 3. Always submit your homework, projects, assignments before deadlines. 4. Absence is unforgivable without official excuse. 5. Ask, Ask, and Ask.

Chapter	Topic	Hours
1 Introduction	▪ Revision: 1D & 2D arrays + Random Numbers in C++.	1
	▪ Reading from and writing to files in C++.	1
	▪ Represent math equations and functions in C++	1
	▪ Analysis & Numerical Analysis	1
	▪ Types of Errors	1
	▪ Computing Series – Example: Taylor's Theorem	1
	▪ Applied Problems – 1	1
2 Solving Nonlinear Equations	▪ Introduction	
	▪ Bisection Method	1
	▪ Linear Interpolation – The Secant Method	1
	▪ Linear Interpolation – False Position	1
	▪ Newton's Method	1
	▪ Muller's Method	1
	▪ Applied Problems – 2	1
3 Solving Sets of Equations	▪ Matrices and Vectors – Fundamentals	1
	▪ Operations on Matrices	1
	▪ Elimination Methods – Gaussian Method	1
	▪ Elimination Methods – Gauss-Jordan Method	1
	▪ Iterative Methods – Jacobi Iteration	1

	▪ Applied Problems – 3	1
4 Interpolation	▪ Introduction	1
	▪ Interpolating Polynomials – Fitting to Data	1
	▪ Interpolating Polynomials – Lagrangian Polynomials	1
	▪ Interpolating Polynomials – Neville's Method	1
	▪ Interpolating Polynomials – Divided Differences Tables	2
	▪ Applied Problems – 4	2
5 Numerical Differentiation and Integration	▪ Introduction	1
	▪ Differentiation with a Computer	6
	▪ Numerical Integration – The Trapezoidal Rule	6

Textbooks and References:

Textbook:

- **Applied Numerical Analysis**, **Gerald & Wheatley,** 7th Ed, **Pearson,** 2004

Useful books:

- **An Introduction to Numerical Methods and Analysis, James Epperson,** 2nd Ed, **Wiley,** 2013

Requirements:

Students will need to write programs in one of the programming languages they taught in previous courses; though, C++ and Java are highly recommended. For C++ programmers, Visual Studio 2019 Community Edition (or such) will be good IDE. I recommend Eclipse IDE for Java programmers.