The Hashemite University
Faculty of Engineering
Course Syllabus
Department of Allied Engineering Sciences (DAES)

Course Title:	Numerical Analysis	**Course Number:**	110402303
Designation:	Compulsory	**Prerequisite(s):**	101203
Instructor:		**Instructor's e-mail:**	
Office Hours: Required Course:			

Course Description (catalog): Basic principles of numerical analysis and methods for solving different engineering problems: error analysis, solution of linear and nonlinear algebraic equations, regression and interpolating polynomials, numerical differentiation and integration, numerical solution of ordinary and partial differential equations.

Textbook(s) and/or Other Supplementary Materials:
Numerical Methods for Engineers by Chapra, S.C. and Canale, R.P., McGraw-Hill, 7th edition.

References:
Applied Numerical Analysis by Curtis F. Gerald and Patrick O. Wheatley, Addison-Wesley. 6th edition.
An Introduction to Numerical Methods and Analysis by James F. Epperson, Wiley, 2001.

Major Topics Covered:

Topic	# Weeks	# of contact hours
MATLAB Basics	2	6
Error Analysis: Approximations and Round-Off Errors	1	3
Error Analysis: Truncation Errors and the Taylor Series	1	3
Roots of Equations: Bracketing and Open Methods	2	6
Linear Algebraic Equations: Gauss Elimination, LU Decomposition and Special Matrices	2	6
Curve Fitting: Least Squares Regressions and Interpolation	2	6
Numerical Differentiation and Integration Formulas	2	6
Ordinary Differential Equations: Runge-Kutta Methods, boundary value and eigenvalue problems.	3	9
Total	**15**	**45**

*Contact hours include lectures, quizzes and exams

Specific Outcomes of Instruction (Course Learning Outcomes):
After completing the course, the student will be able to:

- **CLO 1**: Explain and define the meaning of numerical techniques. (1)
- **CLO 2:** Evaluate and compare the accuracy of different numerical solution methods. (1, 5)
- **CLO 3**: Demonstrate the fundamentals of numerical methods for: Root of equations, solving systems of linear equations, Data interpretation by curve fitting and interpolation, numerical differentiation, and integration. (1, 5)

CLO 4: Manipulate numerical solutions for 1^{st} and 2^{nd} order differential equations. (1, 5)

Student Outcomes (SO) Addressed by the Course:

#	Outcome Description	Contribution
	General Engineering Student Outcomes	
(1)	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	H
(2)	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	
(3)	an ability to communicate effectively with a range of audiences	
(4)	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
(5)	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	M
(6)	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
(7)	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	
	H=High, **M**= Medium, **L**=Low	

Grading Plan:

	Mid Exam	30 Points
	MATLAB based course work	20 Points
	Participation, attendance, and absence	10 points
	Final exam	40 Points