



The Hashemite University
Faculty of Engineering
Department of Mechanical Engineering
Course Syllabus
Fall 2020/2021



COURSE TITLE: Numerical Analysis (3,0, 0)
DESIGNATION: Compulsory
INSTRUCTOR: Yousef almashakbeh
OFFICE HOURS: See posted Hours

COURSE NUMBER: 110402303
PREREQUISITE(S): 110101203, 110108112
INSTRUCTOR'S E-MAIL: yousefalmashakbeh@hu.edu.jo

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, 5th 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	# Lectures	Contact hours
Error Analysis: Approximations and Round-Off Errors	2	2
Error Analysis: Truncation Errors and the Taylor Series	4	4
Roots of Equations: Bracketing and Open Methods	5	5
Linear Algebraic Equations: Gauss Elimination, LU Decomposition and Special Matrices	4	4
Curve Fitting: Least Squares Regressions and Interpolation	5	5
Numerical Differentiation and Integration Formulas	4	4
Ordinary Differential Equations: Runge-Kutta Methods, boundary value and eigenvalue problems.	5	5
Exams	2	2
Total	31	31

*Contact hours include lectures, quizzes and exams

After completing the course, the student will be able to:

- Explain and define the meaning of numerical techniques. (a)
- Evaluate and compare the accuracy of different numerical solution methods. (a, e)
- 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. (a, e)
- Manipulate numerical solutions for 1st and 2nd order differential equations. (a, e)

Student Outcomes (SO) Addressed by the Course:

#	Outcome Description	Contribution
General Engineering Student Outcomes		
(a)	an ability to apply knowledge of mathematics, science, and engineering	H
(b)	an ability to design and conduct experiments, as well as to analyze and interpret data	
(c)	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	
(d)	an ability to function on multidisciplinary teams	L
(e)	an ability to identify, formulate, and solve engineering problems	H
(f)	an understanding of professional and ethical responsibility	
(g)	an ability to communicate effectively	
(h)	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	
(i)	a recognition of the need for, and an ability to engage in life-long learning	
(j)	a knowledge of contemporary issues	
(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	L
H=High, M= Medium, L=Low		

Grading Plan:

	Date	Day	Time
Mid exam	40 points		
Attendance	10 points		
Final Exam	50 points		

Prepared by: Yousef almashakbeh

Date: October 10th, 2020