Zarqa University

Faculty of Engineering Technology
Department: Electrical Department
Course title: Numerical Analysis 0904304

Prerequisite: Advanced Engineering Mathematics 0904300
Instructor: T.B.D
Lecture's time: T.B.D
Office Hours: T.B.D

Course description:

Error analysis. Solution of equations in one variable. Numerical solution of a set of linear and nonlinear equations. Curve fitting and interpolation. Numerical integration and differentiation. Numerical solution of ordinary differential equations.

Aims of the course:
Course Learning Outcomes: By the completion of the course the student should be able to:

1- **Solve** equations in one variable.
2- **Solve** set of linear and nonlinear equations in multi variables.
3- **Use** curve fitting to interpolate experimental data.
4- **Use** interpolating polynomial to interpolate experimental data.
5- **Compute** differentiation and integration numerically.
6- **Solve** the initial value problem.
7- **Analyze** the error performance of the different numerical methods.

Intended Learning Outcomes (ILOs):

1- Understand the basic methods for root approximation.
2- Understand the basic methods for solving linear systems.
3- Understand the basic numerical techniques for curve fitting.
4- Understand the basic numerical techniques for interpolation.
5- Understand the basic numerical techniques for approximating differentiation and integration.
6- Understand the basic numerical techniques for solving ODEs.

Course Structure:

Week	C. Hrs	ILOs	Topics	Teaching Procedure	Assessment methods
1-2		1	Introduction to numerical analysis. Error analysis. Roots of equations. Bisection method. Newton Raphson method. Secant method. Fixed point method. Matlab examples.	Lecturing using power point + Home assignment+ MatLab activities	Mid exam, quizzes and final exam
3		2	Gauss Elemination.	Lecturing using power point + Home assignment+ MatLab activities	Mid exam, quizzes and final exam
4-5		2	LU decomposition. Matrix inverse. Gauss seidel method. Matlab examples.	Lecturing using power point + Home assignment+ MatLab activities	Mid exam, quizzes and final exam
6-7		3	Least square regression: linear, polynomial and exponential. Error analysis. Matlab examples.	Lecturing using power point + Home assignment+ MatLab activities	Mid exam, quizzes and final exam
8-9		4	Direct, spline, Lagrange and Newton's interpolation. Matlab examples.	Lecturing using power point + Home assignment+ MatLab activities	Mid exam, quizzes and final exam
10-11		5	Taylor series. Numerical differentiation. Matlab examples.	Lecturing using power point + Home assignment+ MatLab activities	Quizzes and final exam
12-13		5	Numerical integration. Matlab examples.	Lecturing using power point + Home assignment+ MatLab activities	Quizzes and final exam
14		6	Ordinary differential equations. Matlab examples.	Lecturing using power point + Home assignment+ MatLab activities	Quizzes and final exam

15			Review		
16			Final Exam		

References:

1- S.C. Chapra and R.P. Canale, ***Numerical Methods for Engineers***, 7th Ed., McGraw – Hill, 2015
2- R.L. Burden & J.D. Faires, "**Numerical Analysis**", 9th ed, Brooks/Cole, 2010.
3-W. Cheney & D. Kincaid, "**Numerical Mathematics and Computing**", 6th ed, Brooks/Cole, 2008

Assessment Methods:

Methods	Grade	Date
Quizzes 1,2 & 3	15%	At the end of the 4th, 8th and 12th weeks
Mid Exam	35%	In accordance with faculty time table
Final Exam	50%	In accordance with faculty time table