CC 413 – NUMERICAL ANALYSIS

CREDIT HOURS

3 Hours

CONTACT HOURS (Hours/week)

Lecture: 2; Tutorial: 2

TEXT BOOK

Steven C. Chapra and Raymond P. Canale, "Numerical Methods for Engineers with Software and Programming Applications", McGraw Hill, latest edition.

COURSE DESCRIPTION

Introduction to numerical methods and their applications - solve science and engineering problems - convergence - error analysis of numerical methods.

PREREQUISITE:

CC 112 – BA 224

RELATION OF COURSE TO PROGRAM

Required

COURSE INSTRUCTION OUTCOMES

The student will be able to:

- Know an introduction of numerical methods and errors of computers, errors analysis, error propagation, roots of equations of one variable linear equations, Eigen values and Eigen vectors.
- Do numerical differentiation, integration, interpolation, least square error, and regression.

TOPICS COVERED

- Solution of equations of one variable: Bisection method, False Position method, and secant method.
- Solution of equations of one variable: Successive Approximation method, and modified Successive Approximation method.
- Solution of equations of one variable: Newton Raphson method and nearly equal roots.
- Solution of equations of one variable: Berge Vieta method (of roots of polynomials).
- Error Analysis and Propagation: Types and sources of errors and ill-conditioning and instability.
- Error Analysis and Propagation: Process graphs, error propagation with examples.
- Solutions of linear equations: (Direct Methods) Gauss elimination and Gauss Jordan methods.
- Solutions of linear equations: (Direct Methods) Gauss Jordan method for Integral matrices.

- Solutions of linear equations: (Indirect Methods) Jacobi, Gauss Siedel, and conditions of convergence.
- Matrix Inversion using direct methods for solution of linear equations. Eigen values.
- Numerical Interpolation (Linear, Quadratic, and Lagrange polynomials).
- Numerical Differentiation and Integration (Mid-point integration).
- Numerical Integration (Trapezoidal, Simpson, and Gaussian integration).
- Linear and Quadratic regression.
- Lagrange regression and revision.

CONTRIBUTION OF COURSE TO MEET THE REQUIREMENTS OF CRITERION 5:

Professional component Content			
Math and Basic Sciences	**Engineering Topics**	**General Education**	**Other**
✓			

RELATIONSHIP OF COURSE TO STUDENT OUTCOMES:

Student Outcomes		Course aspects
A	An ability to apply knowledge of mathematics, science, and engineering	a_1 a_2
B	An ability to design and conduct experiments, analyze and interpret data.	
C	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economics, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability	
D	An ability to function on multi-disciplinary teams.	
E	An ability to identify, formulate, and solve engineering problems	e_1 e_2 e_3
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 social content	
I	A recognition of the need for, and an ability to engage in life-long learning.	
J	A knowledge of contemporary issues within and outside the electrical engineering profession.	
k	An ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.	k