TKU212101

Numerical Methods

Metode Numeris

BASIC INFORMATION

Course Credit	3 / 150 minutes per Week
Course Type	Required
Course Classification	Engineering Topics
Prerequisites	Single-Variable & Multi-Variable Calculus; Vector and Matrix Theory; Linear Algebra; Differential Equations; Data Structures & Algorithms

STUDENT AND LEARNING OUTCOMES

Covered Student Outcomes

Development of Engineering Solution (KP.2) Engineering Design (KP.3)

Learning Outcomes

LO1 Students are able to solve mathematical problems using numerical methods.

LO2 Students are able to analyze the advantages and disadvantages of different approaches to solve a mathematical problem.

COURSE DESCRIPTION

This course introduces various numerical techniques related to mathematical modelling, including solving linear equations, root solver, eigenproblems, polynomial approximation and interpolation, integration, and differentiation, and differential equations.

TOPICS

1. Basic Tools of Numerical Analysis

1.1 Systems of Linear Algebraic Equations

1.2 Eigenproblems

1.3 Nonlinear Equations

1.4 Polynomial Approximation and Interpolation

1.5 Numerical Differentiation and Difference Formulas

1.6 Numerical Integration

2. Systems of Linear Algebraic Equations

2.1 Introduction

2.2 Properties of Matrices and Determinants

2.3 Direct Elimination Methods

2.4 LU Factorization

2.5 Tridiagonal Systems of Equations

2.6 Pitfalls of Elimination Methods

REFERENCES

[1] Joe D. Hoffman, Joe D. Hoffman, Steven Frankel., 2001., Numerical Methods for Engineers and Scientists