BNQF Code: 06112109, Department Code: MATH-2109

Course Title: Numerical Analysis

Credit Hr.: 3.00, **Contact Hr.:** 3.00, **Course Type:** GED
Pre-requisites (if any**):** None

Rationale

The aim of the course is to present a creation, analyzing, and implementation algorithms for obtaining numerical solutions to problems of calculus; selection of a best element (with regard to some criteria) from some set of available alternatives.

Course Objectives

1. To find acceptable approximate solutions when exact solutions are either impossible or so arduous and time-consuming as to be impractical.
2. To devise alternate methods of solution better suited to the capabilities of computers.
3. To formulate problems in their fields of research as optimization by defining the underlying independent variables, the proper cost function, and the governing constraint functions.

Course Learning Outcomes (CLO)

After completing the course, students will know how to:

CLO1 Use different numerical methods for solving any computational problem.

CLO2 Locate and use good mathematical calculations while developing software.

CLO3 Get the accuracy that is desired from any computational task.

CLO4 Assess the reliability of the numerical results.

CLO5 Determine the effect of round off error or loss of significance.

Mapping Course Learning Outcomes (CLOs) with the PLOs

CLOs	PLOs											
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2			√									
CLO3				√								
CLO4				√								
CLO5				√								

Course Content and Mapping CLOs with the Teaching-Learning& Assessment Strategy

Week	Contents	Teaching-Learning Strategy	Assessment Strategy	CLO
1.	Accuracy and precision, Error definitions, Round-off errors, Truncation errors.	Lecture, Discussion	Class Test	CLO3, CLO5
2.	The bisection method, the false-position method	Lecture, Discussion, Problem Solving	Class Test	CLO1, CLO2
3.	The Newton-Raphson method, Secant method.	Lecture, Discussion, Problem Solving	Class Test	CLO1, CLO2
4.	Gauss elimination, Gauss Jordan method	Lecture, Discussion, Problem Solving	Class Test	CLO1, CLO2
5.	Jacobi iteration, Gauss Seidel method	Lecture, Discussion,	Assignment	CLO1, CLO2

		Problem Solving		
6.	Linear interpolation, Lagrange interpolating polynomials, Newton's divided difference interpolating polynomials	Lecture, Discussion	Class Test, Quiz	CLO4
7.	**Review and makeup class form week 1 to 6 and Mid-semester exam.**			CLO1, CLO2, CLO3, CLO4, CLO5
8.	Linear regression, Linear curve fitting methods, Least square method	Lecture, Discussion	Class Test, Quiz	CLO4
9.	Non-linear curve fitting methods, Polynomial of *n*th degree	Lecture, Discussion	Class Test	CLO4
10.	Power function, Exponential function, Polynomial regression	Lecture, Discussion	Exam	CLO1, CLO2
11.	Numerical differentiation, The trapezoidal rule	Lecture, Discussion Problem Solving	Assessment	CLO1, CLO2
12.	Integration with unequal segments, Simpson's 3/8 Rule.	Lecture, Discussion Problem Solving	Assessment	CLO1, CLO2
13.	Solution by Taylor's series, Euler's method, Heun's method, Runge-Kutta method	Lecture, Discussion Problem Solving	Class Test	CLO1, CLO2, CLO3
14.	**Review and makeup class form week 8 to 13 and Mid-semester exam.**			CLO1, CLO2, CLO3, CLO4

Assessment Strategy	**Course Evaluation Process and Mark Distributions**		
Continuous Assessment: Class Test, Assignment, Presentation **Summative:** Mid-Semester and Semester Final Exam	1.	Attendance:	5%
	2.	Mid Semester Exam	20%
	3.	Class Test/ Assignment/ Presentation/ Case study/ Sudden Test/ Tutorial	15%
	4.	Semester Final Examination	60%
Make-up Procedures			
Repeat Course, Mid-Semester Incomplete Exam, Semester Final Incomplete Exam			
	Total:		100%

Learning Materials

1. *Numerical Methods by E. Balagurusamy*.
2. *Introductory Methods of Numerical Analysis by S.S. Sastry.*