

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: TEXTILE ENGINEERING

SUBJECT NAME: COMPUTATIONAL METHODS FOR TEXTILE

SUBJECT CODE: 3712513

M.E. 1st SEMESTER

Type of course : Program Elective (II)

Prerequisite : Basic engineering mathematics at BE level

Rationale : At the PG level students are required to develop various computational abilities. They also have to undergo research thesis. Knowledge of various computational tools and mathematics will help them in validating hypothesis firmly.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE(E)	PA (M)	PA (V)	PA (I)		
3	1	0	4	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction to Numerical Analysis: Analytic & Numerical solution, Sources of error (Inherent error, Truncation error, Round off error, Absolute error/ Relative error), Significant digits, Loss of significant digit. Solution to transcendental equations: Initial Approximation (Bisection method), Methods based on first degree approximation (Secant Method, Regula - Falsi Method, Newton - Raphson Method and its modifications), Rate of Convergence.	8	20
2	System of linear algebraic equations and Eigenvalue problems: Direct Methods (Cramer's rule, Gauss – Elimination method [Pivoting], Gauss – Jordan Elimination method, LU Decomposition, Cholesky factorisation), Iteration Methods (Jacobi Iteration method, Gauss – Seidel method), Eigenvalues and Eigenvectors (Jacobi & Given's method for symmetric matrices, Power method, Inverse power method, Shift of Origin)	14	30
3	Interpolation: Arbitrary points (Lagrange Interpolation, Newton's Divided Difference), Equispaced points (Finite Differences, Newton Forward Difference, Newton Backward Difference).	8	20
4	Ordinary differential equations: Euler Method, Taylor Series Method, Explicit Runge-Kutta Method (second, fourth, higher order).	6	15
5	Fundamentals of computer programming: Introduction, Flow charts, Pseudo Code Concepts: Structured Programming, Object Oriented Programming Programming in C++: Classes and Objects, Constructors and Destructors, Operator Overloading, Inheritance, Pointers, Virtual Functions, Polymorphism.	6	15

Reference Books:

1. Fundamentals of Engineering Numerical Analysis, Parvin Moin, Cambridge University Press.
2. Object Oriented Programming in C++, Robert Lafore, 4th Edition, SAMS Publication.

Course Outcome:

1. To familiarize students with various computation methods used in textiles.
2. Apply the knowledge for understanding problems pertaining to textile processes.

List of Open Source Software/learning website: <http://nptel.iitm.ac.in>, World Wide Web, Google Search Engine etc.