

Subject Code: 1ET2060101	Subject Title: NUMERICAL METHODS FOR CIVIL ENGINEERING
Pre-requisite Subject	Engineering Mathematics

Course Objective:

To find solution of structural engineering problems, a mathematical model of the problem is formed and then its closed form or numerical solution is obtained using mathematics. Thus, the knowledge of application of various mathematical tools is essential for the solution of structural problems. The course on Numerical Methods equips the students with the applications of numerical and statistical methods to solve problems related to structural engineering.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	1	-	4	60	40	-	20	120

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
01	Error analysis, types of errors, accuracy & precision, stability in numerical analysis	02	05
02	Empirical laws and curve fitting.	04	10
03	Interpolation & extrapolation, general, interpolation formulae, numerical differentiation & integration / solution of large systems of linear equations, use of software, solution of banded equations.	08	15
04	Solution of non-linear algebraic and transcendental equations, Newton-Raphson iterative method, numerical solutions of ordinary differential equations and partial differential equations using finite difference technique, its applications to structural engineering problems.	08	20
05	Solution of Eigen value problems, iterative methods & transformation methods. Applications to Structural Dynamic problems, stress problems, buckling of columns.	06	15
06	Laplace transform methods, Laplace equation - Properties of harmonic functions - Fourier transform methods for Laplace equation.	06	15
07	Euler's equation - Functional dependent on first and higher order derivatives.	04	10
08	Correlation and regression, Principles of least squares.	04	10

List of Tutorials:

Minimum 15 problems from above topics.

List of References:

1. Numerical methods in Engineering - Salvadori & Baron
2. Numerical Methods in Finite Element Analysis - Bathe & Wilson
3. Advanced Mathematics – Kresysig
4. Numerical Analysis - Scarborough

Course Outcome:

After learning the course, the students should be able to:

1. Solve algebraic equations,
2. Obtain numerical solution of ordinary and partial differential equations,



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3. Apply integration method/s for structural analysis,
4. Carry out interpolations and curve fitting,
5. Obtain solution of eigen value problems and Fourier series for structural analysis,
6. Apply iterative and transformation methods in structural engineering

Open Ended Problems:

Apart from above tutorials/experiments a group of students has to undertake one open ended problem/design problem. Few examples of the same are given below:

1. Real life application of Numerical Methods for solving engineering problems.
2. Developing computer codes for various Numerical Methods using open source/commercial programme.
3. Application open source/commercial software tools for solving numerical problems.

List of Open Source Software/learning website:

www.scilab.org/
<http://nptel.ac.in/>
<http://ocw.mit.edu/>