**College of Engineering, Pune-5**

**Department of Mathematics**

**( MA 152003 ) Computational Methods in Engineering**

F.Y. M. Tech.

Teaching Scheme Examination Scheme

Lectures : 3 hrs / week Internal Test 1: 20 marks

Internal Test 2: 20 marks

End Sem. Exam: 60 marks

**Objectives :** The basic necessity for the foundation of Engineering & Technology being mathematics, the main aim is, to teach mathematical methodologies & models, develop mathematical skills & enhance thinking power of students. To give a very strong base of Mathematics to do quality research in Engineering is the main objective.

**Unit I : Roots of Equations [6 Hrs]**

Bracketing methods, open methods and case studies.

**Unit II : Linear Algebraic Equations [8 Hrs]**

Gauss Elimination, LU decomposition and matrix inversion, special matrices and Gauss-Seidel method, case studies.

**Unit III : Numerical Differentiation and Integration [8 Hrs]**

Newton-Cotes integration formulas, integration of equations, numerical differentiation, case studies.

**Unit IV : Ordinary Differential Equations [9 Hrs]**

Runge-Kutta methods, stiffness and multistep methods, boundary value and eigen value problems, case studies.

**Unit V : Partial Differential Equations [9 Hrs]**

Finite difference methods for elliptic and parabolic equations, case studies.

**Text Book :**

* Numerical Methods for Engineers by Steven C. Chapra, Raymond P. Canale, McGraw-Hill (special Indian edition), 5th edition 2010.

**Reference Books :**

* Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, Inc., 8th edition 2010.
* Higher Engineering Mathematics by H K Dass, S Chand & Co. Ltd.,15th edition 2006.
* Higher Engineering Mathematics by Dr B S Grewal, Khanna Publication, 40th edition 2007.
* Introductory methods in Numerical Analysis by S S Sastry,PHI,Latest Edition.
* Applied Numerical Methods using MATLAB for Engineers and Scientists by Steven C. Chapra McGraw-Hill ( Indian edition), 3rd edition 2012.

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**Outcomes :** Students will be able to

1. know and recall the core knowledge of the syllabus. ( To measure this outcome, questions may be of the type- define, identify, state, match, list, name etc.)
2. understand the concept. ( To measure this outcome, questions may be of the type- explain, describe, illustrate, evaluate, give examples, compute etc.)
3. analyze the problem and apply the appropriate concept. ( To measure this outcome, questions will be based on applications of core concepts)
4. give reasoning. ( To measure this outcome, questions may be of the type- true/false with justification, theoretical fill in the blanks, theoretical problems, prove implications or corollaries of theorems, etc.)
5. apply core concepts to new situations. ( To measure this outcome, some questions will be based on self-study topics and also comprehension of unseen passages.)
6. organize and present thoughts. (To measure this outcome, questions may asked to write summaries and short notes on a given topic.)