

C-5

NATIONAL INSTITUTE OF TECHNOLOGY PATNA

(Ashok Rajpath, Patna, Bihar – 800 005)

Mathematics Syllabus

Department of Computer Science and Engineering

Course Name: Engineering Mathematics – I (MA14**) L-T-P-C: 3-1-0-4

Total Lectures: 42

Pre-requisite: None

Objectives/Overview:

- To learn fundamentals of matrices and linear algebra.
- To learn fundamentals of differential calculus in R^n .
- To learn formulation and solutions of ordinary differential equations.

Course Outcomes: After successful completion of this course the students should:

Sl. No.	Outcome	Mapping to POs
1.	Be acquainted with basic linear algebra and its different tools which are fundamentally used in almost all mathematical and engineering problems.	
2.	Understand the convergence of infinite series which are often used in analysis of current flow and sound waves. Also, the students will understand how to analyze problems with several variables. Especially they will be able to solve optimization problems related to one or two variables.	
3.	Be able to solve higher order linear differential equations which is frequently used in Engineering problems.	

Basic Linear Algebra: Reduction to canonical form, solution of simultaneous linear equations, rank of the matrix, characteristic equation, eigen values and eigen vectors, Caley-Hamilton theorem, Diagonalization of matrix, similarity transformation, vector spaces, basis, dimension, linear transformations and their representation by matrices, rank and nullity, Inner product space. **14 Lectures**

Differential Calculus: Convergence of sequence and infinite series, Basic ideas of limit, continuity and differentiability of a function of real variable. Limit, continuity and differentiability of functions of several variables, partial derivatives and directional derivatives with their geometrical interpretation, total derivative, derivatives of composite and implicit functions, derivatives of higher order and their commutativity, Chain rule, Euler's theorem on homogeneous functions, harmonic functions, Taylor's expansion of functions of two variables, maxima and minima of functions of two variables, Lagrange's method of multipliers. **14 Lectures**

Ordinary Differential Equations: First order exact differential equations, Integrating factors, Second and higher order linear differential equations with constant coefficients, operator method, method of variation of parameters, Euler Cauchy method, Simultaneous linear differential equations, Series solution, Legendre and Bessel equations. **14 Lectures**

Suggested Readings:

1. Advance Engineering Mathematics – R. K. Jain and S.R.K. Iyenger, Narosa Publishing House
2. Advance Engineering Mathematics - E. Kreyszig, 8th Edition, John Wiley and Sons, New York
3. Linear Algebra – K. Hoffmann and R. Kunze – Prentice Hall
4. Linear Algebra and its Applications – Gilbert Strang, Cengage learning.
5. Algebra I: A Basic Course in Abstract Algebra - R.K. Sharma, S.K. Shah, A.G. Shankar, Pearson
6. Multivariable Calculus 9th edition - Daniel K. Clegg, James Stewart, and Saleem Watson
7. Thomas Calculus - G. B. Thomas Jr., M.D. Weir and J.R. Hass, Pearson Education, 2009
8. Mathematical Analysis - Apostol, T.M., John Wiley & Sons (Asia) 2005.
9. Elementary Differential Equations - W. E. Boyce and R.C. DiPrima, 7th Ed., John Wiley & Sons, 2002.
10. Differential Equations – S L Ross, Willey 3rd edition 2004.