



In addition to Part I (General Handout for all courses appended to the time table) portion here give specific details regarding the course.

Course Number : MATH F241
Course Title : Mathematical Methods
Instructor-In-charge : BHUPENDRA K SHARMA

1. Scope and objective of the course:

Course introduces the concept of different mathematical methods and their applications to engineering or real life problems. Students will be able to apply basic mathematical methods to modeling and solving real-world problems.

2. Text Books:

T1: Francis B. Hildebrand, Methods of Applied Mathematics, Dover Publications; 2nd edition, 1992.

T2: Sudhakar Nair, Advanced Topics in Applied Mathematics: For Engineering and the Physical Sciences, Cambridge University Press; 2011.

3. Reference Books:

R1. G. B. Arfken and H. J. Weber, Mathematical Methods for Physicist, Academic Press; 2002.

R2. Anadi S. Gupta, Calculus of Variations with Applications, Prentice-Hall of India Pvt. Limited; 2004.

R3. Lokenath Debnath and D. Bhatta, Integral Transforms and their Applications, Taylor & Francis Group; 2002.

R4. Ivar Stakgold, Michael Holst, Green's Functions and Boundary Value Problems, Wiley; 3rd Edition, 2011.

R5. Ram P. Kanwal, Linear Integral Equations, Birkhauser Boston; 1996.

R6. A. Jerri, Introduction to Integral Equations with Applications, Wiley-Interscience; 2nd Edition, 1999.

4. Lecture Plan:

Lec. No.	Learning Objectives	Topics to be covered	Text Book/Sec.
1-2	How the differential equations converted to integral equations and vice versa	Introduction and relation between integral and differential equations	T1 (3.1-3.2)
3-5	Solution of boundary value problems with the help of Green's function	Dirac delta function, Green's operator and Green's function, Adjoint operator, Sturm-Liouville	T2 (1.1-1.10), T1 (3.3)





		operator	
6-7	Solutions of the integral equations with separable kernels	Fredholm integral equations	T1 (3.6-3.7)
8-9	Properties of characteristic numbers and characteristic functions	Hilbert-Schmidt theory	T1 (3.8)
10- 12	Solution techniques for integral equations	Iterative methods for solving equations of the second kind, The Neumann series and Fredholm theory	T1 (3.9-3.11)
13-16		Approximation of Fredholm equations by sets of algebraic equations, Approximate methods of undetermined coefficients, The method of collocation, The method of weighting functions, The method of least squares	T1 (3.15-3.19)
17-18	Solution of differential equations with the help of integral transform	Fourier series, Riemann-Lebesgue lemma, Localization lemma, Fourier integral theorem, Fourier cosine and sine transforms	T2 (3.1-3.4)
19-21		Properties of Fourier transforms, Properties of trigonometric transforms, Transforms of elementary functions	T2 (3.5-3.7)
22-26		Convolution integral, Mixed trigonometric transform, Applications of Fourier transform, Discrete Fourier transforms,	T2 (3.8-3.9, 3.11, 3.19)
27-28	What is calculus of variation? How it is used to	Maxima and minima, the simplest case, illustrative examples	T1 (2.1-2.3)
29-30	maximizing or minimizing definite integrals involving functions and their derivatives of one and two	Natural boundary conditions, transition conditions, the variational notation	T1 (2.4-2.5)
31	independent variables?	General case of two independent variables	T1 (2.6)



32-33		Constraints and Lagrange multipliers	T1 (2.7)
34-35		Variable end points, Sturm-Liouville problems	T1 (2.8-2.9)
36-38		Hamilton's principle and Lagrange's equations	T1 (2.10-2.11)
39-40	Approximate solutions of the differential equations with the help of Rayleigh-Ritz method	The Rayleigh-Ritz method	T1 (2.19)

5. Evaluation Scheme:

Component	Duration	Weightage	Date & Time	Venue	Remarks
Mid Term Exam	90 Min	35%	15/3 9:00 - 10:30 AM	***	CB
Comprehensive Examination	3 Hours	45%	5/5 FN	***	CB/OB (details will be announced in class)
Surprise Quizzes /Assignments	***	20%	***	***	CB

*** To be announced later.

6. Notices: All notices regarding the course MATH F241 will be put on Mathematics department notice board/NALANDA.

7. Make up Policy: Make up will be given only for genuine cases and for that prior permission has to be obtained

8. Chamber consultation hours: To be announced in the class.

**Instructor-In-Charge
MATH F241**

