

MATHEMATICAL METHODS (2021)

Instructor: Ravi Venkatramani

Email: ravi.venkatramani@tifr.res.in

Phone: 2278 2064 (off), 9503233302 (cell)

TA: Mitradip Das

Email: mitradip.tifr@gmail.com or mitradip.das@tifr.res.in

Course start date: September 14 (Tuesday)

Hours: 4:00 pm – 5:30 pm (Tues/Thurs)

Off Hrs: 3:00-5:00 pm Mon & 2-4 pm Wed

Syllabus

1. Linear Algebra: Vectors and Matrices (13 Lectures)

- a. Vectors
 - i. Vector algebra, differentiation and integration, Vector operators
 - ii. Line, surface, and volume integrals Integral theorems and applications
 - iii. Vector spaces, basis sets, linear operators, generalized vector spaces
- b. Matrix representations and operators
 - i. Notation, algebra and matrix operations, special square matrices
 - ii. Change of basis, eigenvalues and eigenvectors and applications

2. Ordinary Differential Equations (12 Lectures)

- a. Introduction and elementary methods
 - i. Classifications of equations, Solution methods for first order ODE
- b. Higher order ODE and solutions
 - i. Linear equations with const and variable coefficients,
 - ii. Fourier series and transforms, convolutions/deconvolutions
 - iii. Solutions using Laplace transforms and Green`s functions
- c. Series solutions of ODE
 - i. Solutions about ordinary and singular points, Fuch`s theorem, Frobenius Method

Course Textbooks:

1. M. L. Boas, *Mathematical methods in physical sciences*, 3rd editions, Wiley-India (2006)
2. K. F. Riley, M. P. Hobson, S.J. Bence, *Mathematical methods for physics and engineering*, 3rd edition, Cambridge University Press (2002)

Grading:

Final Exam in December

Assignments every two weeks (first assignment Sept 21) + in-class discussion

Grade distribution:

Assignments (20%) + in-class discussion (12 presentation + 8 participation=20%) + written exam (60%)