

Indian Institute of Technology Rajasthan

First semester of AY 2011-12

FS1: MATHEMATICS-I

Instructor: Dr.VVMS Chandramouli
chsarma@iitj.ac.in

Course contents

Sequences of real numbers, review of limit, Continuity and differentiability of functions, Rolle's theorem, Mean value theorems and Taylor's theorem, Maxima, minima and curve sketching, Riemann integral, **Linear Algebra:(Part-1)** System of Linear equations. Vector spaces (over the field of real and complex numbers), subspaces, linear dependence/ independence, basis, dimensions, coordinate with respect to a basis, complementary subspaces. Linear transformations, Range space and rank, Null space and nullity, matrix representation of linear transformation, change of basis and similarity, rank-nullity theorem. Inner product, Norm, Gram-Schmidt orthogonalization process, orthonormal bases. Eigenvalues and eigenvectors, characteristic polynomials, Cayley-Hamilton theorem, properties of eigenvalues and eigenvectors, diagonalization of matrices.

Multivariable Calculus:(Part-2)

Functions of Several Variables: Limit, continuity of functions of several variables. Differentiation and Integration of vector valued function of real variable and its applications. Real valued functions of vector variables (Scalar Field): Partial derivatives, directional derivatives. Taylor's formula for functions from R^2 to R . Tangent plane and normal line, Scalar field: Maxima, minima, saddle points, Lagrange multipliers. Total derivative of Functions from R^n to R^m , Jacobian matrix, sufficient condition for differentiability.

Multiple Integration: Double integrals. Triple integrals. Evaluating multiple integrals using iterated integrals. Transforming multiple integrals into other coordinate systems for evaluation. Multiple integrals application to volume, surface area, moments of inertia. Scalar fields, scalar line integrals, scalar surface integrals. Vector fields, vector line integrals, vector surface integrals. Greens, Gauss and Stokes theorems.

Text

- K. Hoffman & R. Kunze, Linear Algebra, 2nd Edition, PHI.
- Tom Apostol, Calculus, Vol-1 and Vol-2.
- Thomas & Finney, Calculus and Analytic Geometry, 9th ed, Addison-Wesley/Narosa.

References

- Gilbert Strang, Linear Algebra and its Applications, 4th Edition, Thomson India Edition.
- Thomas, Calculus, 11 Edition, Pearson publications.
- S. Kumaresan, Linear Algebra A Geometric Approach, PHI.

- Anton, Calculus and Analytic Geometry.
- James Stewart, Calculus: Early transcendentals, 5th Ed., Thompson Press, (2nd Indian Print 2007).
- Marsden, Multivariable Calculus

Lecture and Tutorials

Every week we have three lectures of about one hour duration. In addition, there will be a tutorial of one hour duration. The mode of lectures will be new to you and puts more responsibility on you. It may not be possible for you to take down notes of each lecture completely but it is advisable to note it down the important points. At the same time, the course will be fast paced. Thus it is extremely important that you remain attentive in the class and do not miss a lecture.

Lec Hours: MON 9:00-10:00; WED 11:00-12:00PM; THU 10:00- 11:00.

Tutorial Class: TUE 12:00 - 1:00PM

Policy for Attendance

Attendance in lectures as well as tutorials is compulsory. Students not having 80 % attendance in the above may be awarded F grade. Attendance will be recorded through an attendance sheet that will be circulated in the class. Each student is expected to sign against his/her name only. Cases of Proxy will be severely dealt with. Random check will be performed from time to time.

Evaluation Plan

- There will be Two (or Three) Quizzes of total 15%. Each Quiz will be of 30 minutes duration and will carry 7.5 % weightage. Day, time and syllabus for Quiz-1 and Quiz-2 will be announced later in the class.
- First Mid-semester examination, schedule to be held during 29 Aug - 01 Sep, will be of 20 % weightage. Second Mid-semester examination, schedule to be held during 28 Sep - 30 Sep, will be of 20 % weightage. The End-semester examination, scheduled to be held during 24 Nov - 30 Nov 2011 will be of 45 % weightage and will cover entire syllabus of the course.
- There is no make-up exams for quizzes and Mid exams. However the end exam will be considered only after submitting proper documentation.