MTH 102N, 2008-2009 II Semester

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Text : Advanced Engineering Mathematics, E. Kreysig

Course web site : http://home.iitk.ac.in/∼ psraj/mth102

Tentative Course Plan
Complex Analysis

Lecture 1: Complex numbers, Polar form, De Moiver's formula, convergent sequence, Continuity, Complex Differentiation.

Lecture 2: Complex Differentiation and Cauchy-Riemann equations, Applications of C-R equations.

Lecture 3: Analytic functions and Power series.

Lecture 4: Derivative of a power series, Exponential function.

Lecture 5: Logarithmic function and trigonometric functions.

Lecture 6: Contour and Contour integral, Antiderivative.

Lecture 7: ML inequality, Cauchy's Theorem,

Lecture 8: Cauchy integrral formula, Examples : evaluation of contour integrals, Derivatives of analytic functions.

Lecture 9 Cauchy's estimate, Liouville's theorem, Fundamental Theorem of Algebra, Morera's theorem (without proof), Taylor's Theorem

Lecture 10: Examples : Computation of Taylor's series, Zeros of Analytic functions, Identity theorem, Uniqueness theorem, Applications.

Lecture 11: Identity theorem, Uniqueness theorem, Applications, Maximum modulus principle, Laurent series.

Lecture 12: Computation of Laurent expansion, Cauchy residue theorem.

Lecture 13: Poles, Residue at a pole, Examples.

Lecture 14: Residue at a pole and Examples (cond.), Evaluation of real improper integrals.

Lecture 15 - 16: Evaluation of real improper integrals of different forms.

Lecture 17: Linear fractional transformations.

Linear Algebra

Lecture 1: Matrices, System of linear equation, Gauss elimination method, Elementary matrices.

Lecture 2: Elementary matrices, Invertible matrices, Gauss-Jordon method for finding inverse of a matrix.

Lecture 3-4: Determinants, Basic properties of determinants, Cramer's Rule.

Lecture 5: Cofactor expansion, Determinant method for finding inverse of a matrix,

Lecture 6: Vector space, Subspace.

Lecture 7: Linear span, Linear independence and dependence, Examples

Lecture 8-9: Basis, Dimension, Bases for subspace, Intersection and sum of two subspaces.

Lecture 10: Linear transformation, Representation of linear maps by matrices.

Lecture 11: Kernal and Range of a linear map, Rank-Nullity Theorem, Rank of a matrix, Row and column spaces.

Lecture 12: Solution space of a system of homogeneous and non-homogeneous equations,

Lecture 13: Inner product on $\mathbb{R}^n$, Cauchy-Schwartz inequality, Orthogonal basis, Gram-Schmidt orthogonalization process.

Lecture 14: Orthogonal projection, Orthogonal subspaces, Orthogonal complement, Projection theorem.

Lecture 15-16: Relations between four fundamental subspaces, An application.

Lecture 17: Orthogonal matrix, QR decomposition,

Lecture 18-21: Eigen-values, Eigen-Vectors, Diagonalization, An application.