M.Sc (Semester3) ---- 1

MA 5450 Functional Analysis

Unit I: Normed linear space; Banach spaces and basic properties: Heine-Borel theorem, Riesz lemma and best approximation property: Inner product space and projection theorem; Orthonormal bases; Bessel inequality and Parseval's formula; Riesz-Fischer theorem.
Unit II: Bounded operators and basic properties; Space of bounded operators and dual space; Riesz representation theorem; Adjoint of operators on a Hilbert space; Examples of unbounded operators; Convergence of sequence of operators.
Unit III: Hahn-Banach Extension theorem;Uniform boundedness principle; Closed graph theorem and open mapping theorem. Some applications.
Unit IV: Invertibility of operators; Spectrum of an operator

References :

Text Books:
1. M.T.Nair: Functional Analysis: A First Course, Prentice Hall of India, 2002(Third Printing, PH1 Learning Pvt. Ltd., 2010)
2. B.V. Limaye: Functional Analysis, Second Edition New Age International, 1996
References:
1. B.Bollabas: Linear Analysis, Cambridge University Press (Indian edition),1999.
2. E.Kreyszig: Introdiction to Functional Analysis with Applications,wiley,1989.
3. S.Ponnusamy: Foundations of Functional Analysis,Narosa, 2003.
4. G.F.Simmons:Introduction toTolpology and Modern Analysis,McGraw-hill, 1963.
5. A.E. Taylor and D.C. Lay: Introduction to Function Analysis, 2nd ed., Wiley, New York, 1980.

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MA 5470 Numerical Analysis

Norms of vectors and matrices, liner systems: direct and iterative schemes, ill conditioning and convergence analysis; Numerical Schemes for non-linear systems, Regression, Numerical solution of differential equations: Single step and multi-step methods, order, consistency, stability and convergence analysis, stiff equtations, two point boundary value problems: Shooting and finite difference methods.

References :

Text Books:
1. David Kinciad & Ward Cheney, Numerical Analysis and mathematics of scientific Computing, Brooks/Cole,1999.
2. J D Lambert, Computational methods in ordinary differential equations, Wiley and Sons, 1973
. 3. J C Butcher, The numerical analysis of ordinary differential equations, John wiley, 1987.
References:
1. K.Atkinson, Elementary Numerical Analysis, Jhon Wiley,1978
2. Curtis E Gerald & Partrock O Whealtley, Applied Numerical Analysis, Addison Wesley, 1988.
3. M.K.Jain S.R.K.Iyengar, R.K.Jain, Numeric Methods for Scientific and Engineering,

Computation, Wiley Eastern, 2003.
4. John H Mathews, Numerical Methods for Mathematics, Science and Engineering, Prentice Hall of India,1994.
5. K.Shankara Rao, Numerical Methods for Sceintists and Engineers, Prentice Hall of India, 2001.
6. L.N.Trefethen, Finite Difference and Spectral Methods for Ordinary and Partial Differential Equations, http://www.comlab.ox.ac.uk/nick.trefethen/pdetext.html, (unpublished text), 1996
7. A.Iserles, A First Course in the Numerical Analysis of Differential Equations, Cambridge University Press, 1996.

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MA 5400 PROBABILITY THEORY

Unit I: Probability spaces; properties of probability; Random variables and their properties; expectation; Kolmogorov's theorem about consistent distributions; Laws of large numbers; de Finetti theorems; 0-1 laws; convergence of random series; Stopping times; Wald's identity; Markov property, another proof of SLLN.
Unit II: Convergence of laws: selection theorem; Characteristic functions; central limit theorem; Multivariate normal distributions and central limit theorem; Lindeberg's central limit theorem; Levy's equivalence theorem; three series theorem; Levy's continuity theorem; Levy's equivalence theorem.
Unit III: Conditional expectation; Martingales, Doob's decomposition; Uniform integrability; Optional stopping; inequalities for Martingales; Convergence of Martingales; Portmanteau theorem; Metrics for convergence of laws; empirical measures Convergence and uniform tightness.
Unit IV: Introduction to Stochastic processes.

References :

Text Books:
1. Dudley, R. M. Real Analysis and Probability. Cambridge, UK: Cambridge University Press, 2002.
References:
1. Feller, William. An Introduction to Probability Theory and its Applications. Vol. I and II. New York, NY: Wiley, 1968-1971.
2. Ledoux, Michel. The Concentration of Measure Phenomenon. Vol. 89, Mathematical Surveys and Monographs. Providence, RI: American Mathematical Society, 2001

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ELECTIVE I

Elective-I is to be chosen as one of the following courses:
1. MA5430: Algebra-II: Ring Theory and Field Theory
2. MA5490: Fluid Dynamics
3. MA6080: Fourier Analysis
4. For 2015 Batch: MA6190 Mathematical Logic.
For 2016 Batch onwards: MA5440 Combinatorics and Number Theory

References :

ELECTIVE II

References :

MA5260 SEMINAR

A seminar of 2 credits, under the supervision of a teacher at the end of 3rd semester
The procedure of evaluation has two components:
A write-up on the topic of the seminar to be evaluated by the supervisor for 30% marks and presentation to be evaluated for the remaining 70% marks, by a committee of examiners comprising the supervisor and at least one additional faculty member of the department.

References :