dimensional wave equation - Vibrating Membranes: 8
Applications of the calculus of variations - Three
dimensional problems.
The Diffusion Equations: Elementary solutions of the
Diffusion Equation - Separation of variables- The use
of Integral transforms.

References

1. I.N. Sneddon, Elements of Partial Differential
Equations, Dover, 2006.

2. Robert C. McOwen, Partial Differential Equations,
Pearson Education, 2 edition, 2003.
3. T.Amaranath: An Elementary Course on Partial
Differential Equations. Narosa, 2nd Edition, 2003.
4. G.F.Simmons: Differential Equations with
Applications and Historical notes. Tata McGraw Hill,
2nd edition, 2003.

Code:MSM531 Functional Analysis

Normed linear space; Banach spaces and basic properties; Heine - Borel theorem, Riesz
of operators; Spectrum of an operator. Spectral theory
of self adjoint compact operators.

Lectures : 3 Tutorials : 2 Practical : 0 Credits : 4
lemma and best approximation property; Inner product
space and projection theorem; Orthonormal bases;
Bessel inequality and Parseval's formula; Riesz -
Fischer theorem. Bounded operators and basic
properties; Space of bounded operators and dual
space; Riesz representation theorem; Adjoint of
operators on a Hilbert space; Self adjoint, Nor mal and
Unitary Operators; Examples of unbounded operators;
Convergence of sequence of operators.
Hahn-Banach Extension theorem; Uniform
boundedness principle; Closed graph theorem and
open mapping theorem. Some applications. Invertibility

References

1. B.V. Limaye, Functional Analysis, Second Edition,
New Age International, 1996. 2. B.Bollabas, Linear
Analysis, Cambridge University Press,Indian edition,
1999. 3. G.F.Simmons, Introduction to Topology and
Modern Analysis, McGraw - Hill, 1963.
4. E. Kreyzig, Introduction to Functional Analysis with
Applications, Wiley India Private Limited.
5. A.E. Taylor and D.C. Lay, Introduction to Functional
Analysis, 2nd edition, Wiley, New york, 1980.

Code:MSM532 Measure and Integration

Review of Riemann Integral Lebesgue Measure; Lebesgue Outer Measure; Lebesgue Mea

Lectures : 3 Tutorials : 2 Practical : 0 Credits : 4
surable Sets . Measure on an Arbitrary σ - Algebra;
Measurable Functions; Integral of a Simple
Measurable Function; Integral of Positive Measurable
Functions. Lebesgue's

Monotone Convergence Theorem; Integrability;
Dominated Convergence Theorem; L^p - Spaces.
Differentiation and Fundamental theorem for Lebesgue
integration Product measure; Statement of Fubini's
thoerem.

References

1. G. de Barra, Measure and Integration, Wiley
Eastern, 1981.
2. W. Rudin, Real and Complex Analysis, Third
edition, McGraw-Hill, International Editions, 1987.
3. H.L. Royden, Real Analysis, Third edition, Prentice-
Hall of India, 1995. 4. D.L. Cohn, Measure Theory,
Birkhauser, 1997.
5. P.K. Jain and V.P. Gupta, Lebesque Mesure and
Integration, New Age Interna tional, 2006.

Code:MSM533 Numerical Analysis

Solution of Equations, Linear Systems and Algebraic Eigenvalue Problems Solution of al
Analysis and Condition numbers; Linear system (Iter
ative methods): Gauss - Jacobi and Gauss - Seidel -
Convergence considerations; Eigen value problem:
Power method - Jacobi for a real symmetric matrix.

Lectures : 3 Tutorials : 2 Practical : 0 Credits : 4
gebraic and transcendental equations: Fixed - point
iteration method, Newton's method; Linear system
(Direct methods): Gaussian elimination - Pivoting - LU
Decomposition; Vector and Matrix norms - Error

9

Interpolation, Differentiation and Integration Interpolation: Lagrange's interpolation - Errors in Lagrange's interpolation - Newton's divided differences - Newton's finite dif ference interpolation - Optimal points for interpolation - Piecewise Interpolation: Piece wise linear and piecewise Cubic Spline interpolation Numerical differentiation: Numerical differentiation based on interpolation, finite differences, method of undetermined coeffi cients; Numerical integration: Newton Cotes formulae - Gaussian quadrature - Errors in Simpson's rule and Gaussian quadrature - method of undetermined coefficients - quadra ture rules for Multiple integrals.

Ordinary Differential Equations Single - Step methods: Euler's method and Modified Euler's method - Taylor series method - Runge -Kutta method of fourth order - Multi step methods: Adams-Bashforth - Adams - Moulton methods - Stability considerations - Two point BVPs: Finite Difference method - Linear problems with Dirichlet and derivative boundary conditions - Stiff equations - Eigenvalue problems.

References

1. Atkinson. K.E., "An Introduction to Numerical Analysis", Wiley, 1989 .
2. Phillips, G.M and Taylor, P.J., "Theory and Applications of Numerical Analysis", Second Edition, Elsevier, New Delhi, 2006.
3. Isaacson.E., and Keller, H.B., "Analysis of Numerical Methods" Dover, 1994.
4. Conte. S.D., and Carl de Boor, "Elementary Numerical Analysis", Third Edition, McGraw-Hill Book Company, 1983.
5. Kincaid D. and Chenney W., "Numerical Analysis: Mathematics of Scientific Com puting", Brooks/Cole Pub. 2nd Edition, 2002.
6. A. Quarteroni, F.Saleri and P. Gervasio, Scientific Computing with MATLAB and Octave,Springer Science & Business Media, 2010.

Code:MSM534 Computational Lab

Introduction to basic operators, Functions and Predefined Variables, Defining Vari

Lectures : 0 Tutorials : 0 Practical : 4 Credits : 2
ables/Matrices, Matrix Operations, Plotting Graphs -
Two-Dimensional Plots - Three Dimensional Plots,
General Commands, Polynomials, Curve Fitting and
Interpolation - programming exercise (Numerical
Methods) including development of algorithms to solve
ordinary differential equations and partial differential
equations.