5. J. Brown and R. Churchill, Complex Variables and Applications, McGraw-Hill Education, 2013.

Code:MSM523 Topology

Topological Spaces, Basis for a topology, Subspace topology, Closed sets and Limit points,

Lectures : 3 Tutorials : 2 Practical : 0 Credits : 4
Continuous Functions, Product Topology, Quotient Topology. Connected spaces, Con

nected subspaces of the Real line, Components and Local Connectedness, Path connect edness, Compact spaces, Limit-point compactness, Local compactness.

Countability and Separation axioms, Urysohn Lemma, Urysohn Metrization Theorem, Tietze Extension Theorem, Tychonoff Theorem

References

1. J.R. Munkres, Topology, 2nd Ed., Pearson Education India, 2001. 2. K.D. Joshi, Introduction to General Topology, New Age International, New Delhi, 2000.
3. J. Dugundji, Topology, Allyn and Bacon, Inc. 1966.
4. J.L. Kelley, General Topology, Van Nostrand, 1955.
5. M.G. Murdeswar, General Topology, New Age International, 1990. 6. G.F. Simmons, Introduction to Topology and modern Analysis, International Stu dent edition, 1963.

Code:MSM524 Multivariable Calculus

Functions of several - variables, Directional derivative, Partial derivative, Total deriva

Lectures : 3 Tutorials : 2 Practical : 0 Credits : 4
tive, Jacobian, Chain rule and Mean - value theorems, Interchange of the order of differ entiation, Higher derivatives, Taylor's theorem, Inverse mapping theorem, Implicit func tion theorem, Extremum problems, Extremum problems with constraints, Lagrange's multiplier method.

Multiple integrals, Properties of integrals, Existence of integrals, iterated integrals, change of variables.

Curl, Gradient, div, Laplacian cylindrical and spherical coordinate, line integrals, surface integrals, Theorem of Green, Gauss and Stokes.

References

1. Apostol T.M., Mathematical Analysis, Original Edition .
2. C.H.Edwards Jr.: Advanced Calculus of Several Variables. Academic Press, 1973. 3. Apostol T.M., Calculus-II - Part-2,Non-Linear Analysis

Code:MSM525 Partial Differential Equations Partial Differential Equations- First Order Partial Differential

Equations - Linear equa

Lectures : 3 Tutorials : 2 Practical : 0 Credits : 4
tions of first order. Nonlinear Partial Differential Equations of the first order - Cauchys method of characteristics - Compatible systems of first order equations - Charpits method- Special types of First order equations - Jacobis method.
Partial Differential Equations of Second order - The origin of Second-order Equations - Linear Partial Differential Equations with constant coefficients - Equations with vari able coefficients - Characteristics curves of second - order equations- Characteristics of equations in three variables.
The Solution of Linear Hyperbolic Equations - Separation of variables - The Method of Integral Transforms - Nonlinear Equations of the second order.
Laplaces Equation - The occurrence of Laplaces Equation in Physics- Elementary solution of Laplaces Equation - Families of Equipotential surfaces Boundary value problems - Separation of variables- Problems with axial symmetry.
The wave equation - The occurrence of wave equation in Physics - Elementary solutions of the one-

dimensional wave equation - Vibrating Membranes: 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.

8

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

Lectures : 3 Tutorials : 2 Practical : 0 Credits : 4

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. 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 of operators; Spectrum of an operator. Spectral theory of self adjoint compact operators.

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

Lectures : 3 Tutorials : 2 Practical : 0 Credits : 4

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

Lectures : 3 Tutorials : 2 Practical : 0 Credits : 4

Solution of Equations, Linear Systems and Algebraic Eigenvalue Problems Solution of algebraic and transcendental equations: Fixed - point iteration method, Newton's method; Linear system (Direct methods): Gaussian elimination - Pivoting - LU Decomposition; Vector and Matrix norms - Error 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.