

SDM COLLEGE OF ENGINEERING & TECHNOLOGY, DHARWAD

Department of Mathematics

20PMECC100 **Applied Mathematics** **(4-0-0) 4**

Contact Hours: 52

Course Learning Objectives (CLOs): This course will enable students to: Acquaint with principles of Probability theory, Random process, Linear Algebra, Wavelet transforms Laplace transform and Linear programming problems and apply the knowledge in the applications of Electronics and Communication Engineering Sciences.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1 to 4)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Learn the idea of random variables (discrete/continuous) and probability distributions in analyzing the probability models arising in random processes.		1,2	
CO-2	Learn the concept of Wavelets and its Applications to Denoising.		1,2	
CO-3	Apply Linear Algebra, QR and singular value decomposition techniques for data compression, least square approximation in solving inconsistent linear systems.		1,2	
CO-4	Apply transform method to solve one-dimensional wave equation, one-dimensional heat equation, Laplace equation, Poisson equation.		1,2	
CO-5	Solve system of linear and non-linear equation arising in engineering fields.		1,2	

POs	PO1	PO2	PO3	PO4	PO5	PO6
Mapping Level	2.0	2.0				

Prerequisites: Basics of 1. Probability 2. Differentiation and Integration
3. Vectors.

Contents:

- 1. Probability Theory:** Review of basic probability theory. Definitions of random variables and probability distributions, probability mass and density functions, expectation, moments, central moments, characteristic functions, probability generating and moment generating functions-illustrations. Binomial, Poisson, Exponential, Gaussian and Rayleigh distributions example. **10 Hrs.**
- 2. Introduction to Linear Algebra:** Groups, Fields, Binary Field Arithmetic, Construction of Galois Field and its basic properties. Vectors, matrices, Vector spaces.
Introduction to Wavelets: Introduction, The origin of wavelets, wavelets and other reality transforms. Wavelets in the future. Continuous Wavelets: First level of introduction of wavelet transforms. Continuous time frequency representation of signals. Discrete Wavelet Transform signal decomposition (Analysis) frequency response, signal reconstruction. Applications of Wavelets in science and Engineering,
Denoising: Introduction, Denoising using wavelet shrinkage – statistical modelling and estimation, Noise estimation, Denoising Images with MATLAB. **12 Hrs.**
- 3. Linear Algebra:** Computation of Eigen values and Eigen vectors of real symmetric matrices-Given's method. Orthogonal vectors and orthogonal bases. Gram-Schmidt orthogonalization process. QR decomposition, singular value decomposition, least square approximations. **10 Hrs.**
- 4. Transform Methods:** Laplace transform methods for one dimensional wave equation– Displacement sine string–Longitudinal vibration of a elastic bar. Fourier transform methods for one dimensional heat conduction problems. Fourier transform methods for Laplace equation and Poisson equation. **10 Hrs.**
- 5. Linear and Nonlinear Programming:** Simplex Algorithm-Two Phase and Big-M techniques-Duality theory-Dual Simplex method, Nonlinear Programming–Constrained extremal problems-Lagrange's multiplier method Kuhn-Tucker conditions and solutions. **10 Hrs.**

Reference Books:

- 1) Richard Bronson, "Schaum's Outlines of Theory and Problems of Matrix Operations", McGraw-Hill, 1988.
- 2) Venkataraman M K, "Higher Engineering Mathematics", National Pub.Co, 1992.
- 3) Sneddon, I.N., "Elements of partial differential equations", Dover Publications, 2006.
- 4) Taha H A, "Operations research- An Introduction", Mc Milan Publishing Co, 1982.
- 5) K.P. Soman, K.I. Ramachandran, Dr. G. Resmi; Insight into Wavelets (From theory to Practice), PHI Publications, 3rd edition. 2010.



HoD Mathematics

SDM COLLEGE OF ENGINEERING & TECHNOLOGY, DHARWAD

Department of Mathematics

20PMEEEC100

Applied Mathematics

(4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs):

Learn the idea of random variable and probability distribution. To prepare the students to formulate and solve linear programming problem. Study Numerical methods to solve algebraic, transcendental equations. Learn to solve system of linear equations. Introducing students to the fundamental concepts of Graph theory and linear *algebra*.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1 to 4)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Learn the idea of random Variables (discrete/continuous) and probability distributions in analyzing the probability models arising in power system engineering.		1,2	
CO-2	Apply the concept of optimization to solve system of linear and non-linear programming problems.		1,2	
CO-3	Learn the Concept of graph theory in engineering problems.		1,2	
CO-4	Employ numerical techniques in order to achieve more accurate values in the computation of roots of algebraic and non-linear equations		1,2	
CO-5	Apply standard iterative methods to compute Eigen values		1,2	

Pos	PO1	PO2	PO3	PO4	PO5	PO6
Mapping Level	2.0	2.0				

Prerequisites: Differentiation, Matrices, vectors, Basic probability theory

Contents:

1) Probability Theory:

Review of basic probability theory. Definitions of random variables and probability distributions, probability mass and density functions, expectation, moments, central moments, characteristic functions, probability generating and moment generating functions-illustrations. Binomial, Poisson, Exponential, Gaussian and Rayleigh distributions example. **10 Hrs.**

2) Linear and Nonlinear Programming:

Formulation of LPP problem. Simplex Algorithm-Two Phase and Big-M techniques – Duality theory- Dual Simplex method. Nonlinear Programming –Constrained extremal problems-LaGrange’s multiplier method- Kuhn-Tucker conditions and solutions. **12 Hrs.**

3) Graph Theory:

Basic terminologies, types of graphs, sub graphs, graphs isomorphism connected graphs-walks, paths, circuits, connected and disconnected graphs, operations on graphs, Eulerian paths and circuits, Hamiltonian paths and circuits, shortest path algorithms, applications of graphs. **10 Hrs.**

4) Numerical Methods:

Solution of algebraic and transcendental equations- iterative methods based on second degree equation – Muller method (no derivation), Chebyshev method. Fixed point iteration method (first order), acceleration of convergence, Δ - Aitken’s method. Bairstow’s method, Graeffe’s root squaring method. **10 Hrs.**

5) Linear Algebra:

Computation of Eigen values and Eigen vectors of real symmetric matrices- Given’s method. Orthogonal vectors and orthogonal bases. Gram-Schmidt orthogonalization process. QR decomposition, singular value decomposition, least square approximations. **10 Hrs.**

Reference Books:

- 1) M K Jain, S R K Iyengar and R K Jain, “Numerical Methods for Scientific and Engineering Computations”, New Age International, 2004.
- 2) Dr. B.S. Grewal, “Higher Engineering Mathematics”, 41st Edition, Khanna Publishers, 2011.
- 3) Narsingh Deo, “Graph Theory with Applications to Engineering and Computer Science”, PHI, 2012.
- 4) Kenneth Hoffman and Ray Kunze, “Linear Algebra”, 2nd Edition, PHI, 2011.
- 5) Richard Bronson, “Schaum’s Outlines of Theory and Problems of Matrix Operations”, McGraw-Hill, 1988.



HoD Mathematics

SDM COLLEGE OF ENGINEERING & TECHNOLOGY, DHARWAD

Department of Mathematics

20PMSC100 Mathematical Foundations of Computer Science (4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs):

Acquaint with principles of Probability theory, Random process, Linear Algebra, and apply the knowledge in the **applications of Computer science and engineering applications.**

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1 to 4)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Apply the idea of random variables (discrete/continuous) and probability distributions in analyzing the probability models arising in random processes.		3,6	
CO-2	Use different techniques for estimating the parameters of a given distribution.		3,6	
CO-3	Understand each technique and use appropriate method to analyze multivariate data.		3,6	
CO-4	Apply Linear Algebra for decomposition and dimension-reduction of large data.	3,6		
CO-5	Apply the mathematical concepts in fields of computer science and engineering		3,6	

Pos	1	2	3	4	5	6
Mapping Level			2.2			2.2

Pre-requisites:

1. Basic probability theory.
2. Random variables.
3. To obtain Statistical Averages.

Content:

1. Probability

Probability mass, density, and cumulative distribution functions, Parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains. **12 Hrs.**

2. Sampling

Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood. **10 Hrs.**

3. Statistics

Statistical inference, Introduction to multivariate statistical models: regression and classification problems, principal components analysis, The problem of overfitting model assessment. **10 Hrs.**

4. Linear Algebra

Computation of Eigen values and Eigen vectors of real symmetric matrices- Given's method. Orthogonal vectors and orthogonal bases. Gram-Schmidt orthogonalization process. QR decomposition, singular value decomposition, least square approximations. **10 Hrs.**

5. Computer science and engineering applications

Applications to varying fields of CSE like bioinformatics, soft computing, machine learning, data mining, computer vision, Network protocols, analysis of Web traffic, computer security, operating systems, distributed systems. **10 Hrs.**

REFERENCE BOOKS

1. Verma, Foundation Mathematics for Computer Science, 1986.
2. K. Trivedi. Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley.
3. Kenneth Hoffman and Ray Kunze, "Linear Algebra", 2nd Edition, PHI, 2011.
4. *Richard Bronson*, "Schaum's Outlines of Theory and Problems of Matrix Operations", McGraw-Hill, 1988.



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