Evaluation Scheme & Syllabus

for
All branches of B. Tech.

AS PER AICTE MODEL CURRICULUM

Department of Mathematics

Faculty of Engineering &Technology

V.B.S. Purvanchal University, Jaunpur

B. Tech First Year (All branches), B. Tech Second Year (CSE and IT Branch) and B. Tech fourth year open electives (VII-Semester) structure in accordance with AICTE Model Curriculum and effective for admitted in July, 2023 batch of Engineering.

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External Expert

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SEMESTER – I

Code	Subject	Periods			Evaluation Scheme				End Sem.		Total	Credits
		L	T	P	CT	TA	TOTAL	PS	TE	PE		
KAS103	Mathematics-I	3	1	0	30	20	50	-	100	-	150	4

SEMESTER – II

Code	SUBJECT	Periods			Evaluation Scheme				End Sem		Total	Credits
		L	T	P	CT	TA	TOTAL	PS	TE	PE		
KAS203	Mathematics-II	3	1	0	30	20	50	-	100	-	150	4

SEMESTER – III (For CSE and IT)

Code	Subject	Periods			Evaluation Scheme				End Sem		Total	Credits
		L	T	P	CT	TA	TOTAL	PS	TE	PE		
KCS303	**Discrete Structures & Theory of Logic (KCS303)**	3	1	0	30	20	50	-	100	-	150	4

SEMESTER – IV

Mathematics- IV runs in all branches CSE, IT, ME; EE, ECE and EIE of Engineering

Code	Subject	Periods			Evaluation Scheme				End Sem		Total	Credits
		L	T	P	CT	TA	TOTAL	PS	TE	PE		
KAS401	Mathematics-IV (Partial Differential Equations: Analytical and Numerical Approaches)	3	1	0	30	20	50	-	100	-	150	4

SEMESTER – VII (For CSE and IT)

Code	Subject	Periods			Evaluation Scheme				End Sem		Total	Credits
		L	T	P	CT	TA	TOTAL	PS	TE	PE		
KOE075	Operations Research	3	1	0	30	20	50	-	100	-	150	4

SEMESTER – VII (for all branches of Engineering CSE, IT, ME; EE, ECE and EIE)

Code	Subject	Periods			Evaluation Scheme				End Sem		Total	Credits
		L	T	P	CT	TA	TOTAL	PS	TE	PE		
KOE079	Fuzzy Logic	3	1	0	30	20	50	-	100	-	150	4

SEMESTER – VIII (for all branches of Engineering CSE, IT, ME; EE, ECE and EIE)

Code	Subject	Periods			Evaluation Scheme				End Sem		Total	Credits
		L	T	P	CT	TA	TOTAL	PS	TE	PE		
KOE101	Probability and Statistics	3	1	0	30	20	50	-	100	-	150	4

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AICTE Guidelines in Model Curriculum:

The model curriculum provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The Model Curriculum provides an opportunity for the students to choose courses from the prescribed courses, which comprise core, elective, and open elective courses. The model curriculum provides a cafeteria type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. The courses shall be evaluated on the grading system, which is better than the conventional mark system. It is necessary to introduce the grading system to ensure uniformity among all technical institutions in India. This will benefit the students by allowing them to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers to assess the performance of the candidates. In order to bring uniformity in the evaluation system and computation of the cumulative grade point average (CGPA) based on students' performance in examinations, the AICTE has formulated guidelines as per the guidelines described in the Model Curriculum Ordinance Governing the Degree of Bachelor of Technology (B.Tech.).

https://www.vbspu.ac.in/en/page/ordinances-department-of-computer-science-and-engineering

Evaluation methodology to be followed:

The evaluation and assessment plan consists of the following components:

a. Class attendance and participation in class discussions etc.
b. Quiz.
c. Tutorials and assignments.
d. Sessional examination.
e. Semester examination.

Assessment procedure: Assessment procedure will be as follows:

1. These will be comprehensive examinations held on-campus (Sessional).
2. Quiz.
   a. Quiz will be of type multiple choice, fill-in-the-blanks or match the columns.
   b. Quiz will be held periodically.
3. Tutorials and assignments
   a. The assignments may be of multiple choice type or comprehensive type at least one assignment from each Module.
   b. The grades and detailed solutions of assignments (of both types) will be accessible on google class meet after the submission deadline.
4. Semester examination copies will be evaluated by the university using the central evaluation system.

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KAS-103 MATHEMATICS-I

(Common to all branches of B. Tech. Courses)

L 3 T 1 **MAX. MARKS 100**

Course Objectives: The objective of this course is to familiarize the graduate engineers with techniques in calculus, sequences and series, multivariate calculus, and vector calculus. It aims to equip the students with standard concepts and tools from intermediate to advanced levels that will enable them to tackle more advanced levels of mathematics and applications that they would find useful in their disciplines. The students will learn:

- To apply the knowledge of differential calculus in the field of engineering.
- The resource for learning advanced engineering mathematics that utilizes Sequence and series as a method for achieving convergence in a series.
- To deal with the functions of several variables that are essential in optimizing the results of real life problems.
- To apply integral calculus in various fields of engineering and have a basic understanding of Beta and Gamma functions and applications of Dirichlet's integral.
- To deal with vector calculus that is required in different branches of Engineering to graduate engineers.

Module 1: Differential Calculus- I **[08]**

Introduction to limits, continuity, and differentiability up to two independent variables, applications of Rolle's, Lagrange's, and Cauchy Mean value theorems, Successive differentiation (nth order derivatives), the Leibnitz theorem and its applications, Envelope, Curve tracing for Cartesian, parametric and polar co-ordinates.

Module 2: Sequences and Series of Real Numbers **[8]**

Sequences: definition, boundedness, limit of a sequence, convergence (limit, monotone, and Cauchy) criterion, convergence of series and some tests (auxiliary series or p-Series, comparison, Cauchy's Root, d' Alembert's Ratio, Gauss's, Cauchy condensation, Raabe's, De Morgan's and Bertrand's, and Logarithmic tests) for convergence of positive term series and convergence of alternating series.

Module 3: Differential Calculus-II **[08]**

Partial derivatives, total derivative, Approximation of errors, Euler's Theorem for homogeneous functions and their applications, Taylor's and Maclaurin's theorems for functions of one and two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians and their applications.

19/8/2023 19/08/2023 19/08/2023

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Module 4: Multivariable Calculus-I **[08]**

Multiple integrals, change of order of double integration, Change of variables, Improper integrals: Definition and their types, Beta, and Gama functions, and their properties, Dirichlet's integrals and applications of integrals to evaluate surface areas, volume of revolutions, Centre of mass and Centre of gravity (Constant and variable densities) etc.

Module 5: Vector Calculus **[08]**

Vector differentiation: Gradient, Curl, Divergence and their physical interpretations, Directional derivatives, Tangent and Normal planes, Line, surface, and volume integrals, Green's, Gauss's Divergence, and Stokes theorems with their applications (without proof).

COURSE OUTCOMES At the end of this course, the students will be able to:		Bloom's Knowledge Level (KL)
CO 1	Remember the concept of differentiation to find successive differentiation, Leibnitz Theorem, and create curve tracing, and find partial and total derivatives	K_1 & K_6
CO 2	Understand the concept of convergence to test the convergence of an infinite series.	K_2& K_4
CO 3	Remember the concept of Beta and Gamma function; analyse area and volume and Dirichlet's theorem in multiple integral	K_3 & K_5
CO 4	Remember the concept of Beta and Gamma function; analyse area and volume and Dirichlet's theorem in multiple integral	K_4
CO 5	Applying the concept of Vector Calculus and evaluate directional derivative, line, surface and volume integrals along with their applications in mathematical physics.	K_3, K_4 &K_5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Text Books:

1. **G. B. Thomas, R. L. Finney**, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
2. **B. S. Grewal**, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. **R. K. Jain and S. R. K. Iyenger**, Advance Engineering Mathematics, Narosa Publishing House, 2002.

Reference Books

1. **E. Kreyszig,** Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. **B. V. Ramana**, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.

19/8/2023 19/08/2023 19/08/2023

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3. **Ray Wylie C. and Louis C. Barret,** Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition, 1995.
4. **Murray Spiegel,** Schaum's Outline of Advanced Mathematics for Engineers and Scientists, 2009.

KAS 203 MATHEMATICS-II

(Common to all B. Tech. Courses)

L 3 T 1 **MAX MARKS 100**

Course Objectives: Students who are pursuing a career in engineering will benefit from this course because it will introduce them to fundamental engineering concepts such as ordinary differential equations, the Laplace transform, Fourier series, and complex variables. The students will be prepared to deal with advanced levels of mathematics and applications, which will be necessary for their respective fields of study, thanks to this course. The following are some of the things that the students will learn:

- The efficient mathematical tools for the solutions of differential equations that model physical processes.
- The fundamental knowledge of the Laplace transform and its applications in solving differential equations. The resource for learning advanced engineering mathematics that utilizes Fourier series as a method for achieving convergence in a series and expanding a function.
- The essential tools of matrices, Eigen values, and their application in a comprehensive manner.
- The instruments for differentiable functions of complex variables, which are utilized in a variety of strategies for addressing issues that arise in engineering.
- The tools for the integration of functions of complex variables that are utilized in a variety of methodologies for the purpose of addressing engineering issues.

Module 1: Matrices **[08]**

Matrices: Inverse and Rank of matrices using elementary transformations, system of linear equations, Symmetric, Skew-symmetric and Orthogonal Matrices; Hermitian and Skew Hermitian Matrices, Characteristic equation, Cayley-Hamilton theorem and its applications, Eigen values and Eigenvectors; Diagonalisation of a Matrix.

Module 2: Ordinary Differential Equation of higher Order **[9]**

Solutions of linear differential equation of nth order with constant coefficients, Simultaneous linear differential equations, second order linear differential equations with variable coefficients, changing independent variable, Normal form, Reduction of order, method of variation of parameters, Cauchy-Euler equations. Existence and Uniqueness theorem, Picard's theorem for initial value problem.

Module 3: Fourier Series and Laplace Transforms **[10]**

Dirichlet's conditions, Fourier series including half range and its applications to find the sum of infinite series; Laplace Transform: Definition, Necessary and sufficient conditions for the existence of Laplace transform, Laplace transform of derivatives and integrals, initial and final value

19/8/2023 19/08/2023 19/08/2023

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theorems, Unit step function, Dirac-delta function, Laplace transform of Periodic function, Inverse Laplace Transform, Convolution theorem (without proof) and application to solve linear and non-linear ODE.

Module 4: Complex variables – Differentiation and Integration [11]

Complex valued function, Limit, continuity and differentiability of complex valued functions, harmonic and analytic functions, Cauchy- Riemann equations (Cartesian form), Contour integrals and definition of the integral limit as a sum, Cauchy-Goursat's theorem (with proof), applications of

Cauchy's integral formula, Taylor's series and Laurent's series (without proof), singularities and their classifications, zeros of analytic functions, residues, and Cauchy residue theorem.

Module 5: Linear Algebra [8]

Vector space over real numbers/complex numbers, Subspaces, Linear span, Linearly independence, Dimensions and Basis, Linear transformations, Matrix of Linear transformation, Rank-Nullity theorem (Statement and their applications).

COURSE OUTCOMES At the end of this course, the students will be able to:		Bloom's Knowledge Level (KL)
CO 1	Understand the concept of complex matrices, Eigen values, Eigen vectors and apply the concept of rank to evaluate linear simultaneous equations	K_2 & K_5
CO 2	Remember the concept of differentiation to evaluate Linear Differential Equations (LDEs) of nth order with constant coefficient and LDEs with variable coefficient of 2nd order.	K_1& K_5
CO 3	Understand and apply the concept of Laplace transform to solve the differential equations and expansion of a suitable function as a Fourier series.	K_2, K_3& K_5
CO 4	Learn about the analyticity of a complex valued function. Understand the complex integration, singularities by using the Laurent expansion, importance of residue theorem to calculate some integrals .	K_2, K_5& K_6
CO 5	Learn about vector spaces, linear transformation, Matrix of Linear transformation.	K_2

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Text Books:

1. **George F. Simmons**, Differential Equation with Application and Historical Notes, Tata McGraw-Hill Publishing Company Ltd., 2017.
2. **B. S. Grewal,** Higher Engineering Mathematics, Khanna Publisher, 2005.
3. **R. K. Jain and S. R. K. Iyenger**, Advanced Engineering Mathematics, Narosa Publishing - House, 2002.
4. **J. W. Brown and Ruel V. Churchill,** Fourier Series and Boundary Value Problems, 8th Edition- Tata McGraw-Hill , 2011

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Reference Books:

1. **E. Kreyszig**, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. **Peter V. O'Neil**, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
4. **Charles E. Roberts Jr.**, Ordinary Differential Equations, Application, Model and Computing, CRC Press T&F Group, 2010.
5. **J. W. Brown and Ruel V. Churchill**, Complex Variables and Applications, 8th Edition, Tata McGraw-Hill, 2013.
6. **B. V. Ramana**, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
7. **Murray R. Spiegal,** *Schaum's outlines* Complex variables 2nd edition, 2009.

KCS 303 Discrete Structures & Theory of Logic

(Common to CSE and IT Branch)

L 3 T 1 **MAX MARKS 100**

Course Objectives: The main objectives of the course are to:

- Introduce concepts of mathematical logic for analysing propositions and proving theorems.
- Use relations, functions, and their properties for solving applied problems.
- Investigate algebraic structures and their applications in cryptography and differential geometry.
- Introduce the basic concepts of lattices, propositional logic, and predicate logic and their properties.
- Learn about recurrence relations, combinatorics, and number theory while solving some physical problems.

Module I: **[08]**

Relations: Definition, Operations on relations, Properties of relations, Equality of relations, Recursive definition of relation, Order of relations.

Functions: Definition, Types of functions, Operations on functions, recursively defined functions.

Natural Numbers: Introduction, Mathematical Induction; Proof Methods: Proof by counter – example, Proof by contradiction.

Module II: **[11]**

Binary operations with examples, Algebraic Structures:, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields.

Module III: **[07]**

Lattices: Definition, Properties of lattices-Bounded, Completeness, Modular and Complete lattice. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps.

19/8/2023 19/08/2023 19/08/2023

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Module IV: **[08]**

Propositional Logic: Proposition, well-formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference.

Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic.

Module V: **[10]**

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

Number Theory: Introduction, Basic Properties, Divisibility Theory, Congruences and their applications.

	Course Outcomes (COs)	Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO 1	Writing an argument using logical notation and determine if the argument is valid or not	K_3, K_4
CO 2	Remember and understanding of the basic principles of Boolean Algebra.	K_1, K_2
CO 3	Demonstrate an understanding of relations and functions and be able to determine their properties.	K_3
CO 4	Demonstrate different methods for Algebraic Structures, Lattices and Logic.	K_1, K_4
CO 5	Model problems in Computer Science using Number Theory.	K_2, K_6

Text books:

1. **K. H. Rosen**, Discrete Mathematics and Its Applications, 6/e, McGraw-Hill, 2006.
2. **B. Kolman, R.C. Busby, and S.C. Ross**, Discrete Mathematical Structures, 5/e, Prentice Hall, 2004.
3. **J. P. Trembley and R. Manohar**, Discrete Mathematical Structure with Application to Computer Science, McGraw Hill, 2010.

Reference Books:-

1. **E.R. Scheinerman**, Mathematics: A Discrete Introduction, Brooks/Cole, 2000.
2. **R. P. Grimaldi**, Discrete and Combinatorial Mathematics, 5/e, Addison Wesley, 2004
3. **V. Krishnamurthy**, Combinatorics Theory and Application, East-West Press Pvt. Ltd., New Delhi

19/8/2023

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19/08/2023

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KAS 401 Mathematics-IV
Partial Differential Equations: Analytical and Numerical Approaches
(Common to all B. Tech. Courses)

L 3 T 1 **MAX MARKS 100**

Course Objectives: The main objectives of the course are to:

- Introduce the concepts of partial differential equations and how to solve partial differential equations analytically and numerically.
- Introduce the concept of the application of partial differential equations to evaluate the problems concerned with partial differential equations.
- Investigate the basic concepts of Laplace, and Fourier transforms
- Introduce concepts of applications of Laplace and Fourier transforms over PDEs.
- Introduce the concept of Numerical approach for PDEs.

Module I: Partial Differential Equations **[10]**

Origin of Partial Differential Equations (PDEs), Linear and Nonlinear PDEs of First Order, Lagrange's Equations, Charpit's Method, Cauchy's Method of Characteristics, Solution of linear

PDEs of higher order with constant coefficients, equations reducible to linear PDEs with constant coefficients.

Module II: Applications of Partial Differential Equations **[9]**

Classification of linear partial differential equations of second order, Method of separation of variables, Solution of the wave and heat conduction equations up to two dimensions, Laplace equation in two dimensions, Equations of transmission lines.

Module III: Laplace and Fourier transforms **[8]**

Review on Laplace and Inverse Laplace Transforms, Review of Fourier series, Fourier transforms, Fourier sine and Fourier cosine transforms and their properties.

Module IV: Applications of Laplace and Fourier transforms over PDEs **[8]**

Applications of Laplace transforms to solve Heat, Wave and Laplace equations, applications of Fourier transforms, Fourier sine and Fourier cosine transforms to solve Heat, wave and Laplace equations.

19/8/2023	19/08/2023	19/08/2023
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Module V: Numerical approach for PDEs **[10]**

Forward, Backward and central difference operators, Interpolation, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals, and their applications to finite difference schemes to solve heat, wave and Laplace equations.

COURSE OUTCOMES At the end of this course, the students will be able to:		Bloom's Knowledge Level (KL)
CO 1	Remember the concept of partial differential equations to solve analytically and numerically.	K_1& K_3
CO 2	Analyze the concept of partial differential equations to evaluate the problems concerned with PDEs	K_4 & K_5
CO 3	Understand the concept of Laplace, and Fourier transforms	K_2
CO 4	Learn the concept of applications of Laplace and Fourier transforms over PDEs	K_1& K_5
CO 5	Apply the concept of Numerical approaches to PDEs.	K_3&K_6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Text Books

1. **E. Kreyszig,** Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. **Lokenath Debnath, and Dambaru Bhatta**, Integral Transforms and Their Applications, 2nd Edition, Kindle Edition.
3. **William F. Ames**, Numerical Methods for Partial Differential Equations, 3rd Edition, 1992,

Reference Books:

4. **R.K. Jain and S.R.K. Iyenger:** Advance Engineering Mathematics; Narosa Publishing House, New Delhi, 2002.
5. **L.C. Evans, Partial Differential Equations,** American Mathematical Society, Providence, 1998. 4. G. B. Folland, Introduction to Partial Differential Equations, 2nd Ed., Prentice-Hall of India, 1995.

19/8/2023 19/08/2023 19/08/2023

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KOE-075 Operations Research
(Common to CSE and IT Branch)

L 3 T 1 **MAX MARKS 100**

Course Objectives: The main objectives of the course are to

1. To understand the methodology of OR problem solving and formulate linear programming problem.
2. To develop formulation skills in transportation models and finding solutions
3. To understand the basics in the field of game theory and assignment problems
4. To know how project management techniques, help in planning and scheduling a project
5. To know the basics of replacement and inventory problems and Non-linear programming.

Module I **[10]**

Introduction: Definition and scope of operations research (OR), OR model, Linear Programming: Two variable Linear Programming model, Convex Sets, Graphical Method, Simplex Method, Big – M Method, Two Phase Method, Revised Simplex Method, Duality Theory, Dual Simplex Method.

Module II **[6]**

Transportation Problems: Types of transportation problems, mathematical models, Assignment: Allocation and assignment problems and models, processing of job through machines.

Module III **[10]**

Network Techniques: Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem. Project Management: Phases of project management, guidelines for network construction, CPM and PERT

Module IV **[9]**

Theory of Games: Rectangular games, Minimax theorem, saddle points, graphical solution of 2xn or mx2 games, game with mixed strategies, dominance criterion, reduction to linear programming model.

Module V **[10]**

Replacement Problem and Inventory Problem Inventory Control: Models of inventory, operation of inventory system, quantity discount. Replacement: Replacement models: Equipment's that deteriorate with time, equipment's that fail with time.

Nonlinear programming, KT condition, Solution by graphical method, Kuhn-Tucker condition.

COURSE OUTCOMES At the end of this course, the students will be able to:		Bloom's Knowledge Level (KL)
CO 1	Identify and develop operational research models from the verbal description of the real system.	K_2, K_3 & K_4
CO 2	Be able to build and solve Transportation Models and Assignment Models.	K_4 & K_5
CO 3	Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry.	K_3

19/8/2023 19/08/2023 19/08/2023

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CO 4	Aware with the basic concepts and tools of game theory and can apply these tools to real-life situations.	K_2& K_5
CO 5	Remember the concept of Replacement Problem , Inventory Control and Nonlinear programming and apply to real-life situations	K_1&K_3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Text Books:

1. **H. A. Taha,** Operations Research: An Introduction, MacMillan Pub Co., NY, 9th Edition (Reprint). 2013
2. **M. Bazaraa, H. D. Sherali and C. M. Shetty,** Nonlinear Programming: Theory and Algorithms, Wiley-Interscience, 3rd Ed. 2006

Reference Books:

1. **J.C. Pant**, Introduction to optimization Operations Research, Jain Brothers, New Delhi, 2nd Ed. 2012
2. **W. L. Winston**, Operations Research, Thomson Learning, 2003.
3. **S. D. Sharma**, Operations Research (Theory Methods and Applications), Kedar Nath Ram Nath, New Delhi, 2014.

KOE-079 Fuzzy Logic

(Common to all B. Tech. Courses in Sem VII)

L 3 T 1 **MAX MARKS 100**

Course Objectives: The objectives of the course are to:

1. To develop the fundamental concepts such as fuzzy sets, operations, and fuzzy relations.
2. To lean about the fuzzification of scalar variables and the defuzzification of membership functions.
3. To learn three different inference methods to design fuzzy rule based system.
4. To develop fuzzy decision making by introducing some concepts and also Bayesian decision methods
5. To learn different fuzzy classification methods.

UNIT I **(10)**

Classical sets: Operations and properties of classical sets, Mapping of classical sets to the functions. Fuzzy sets - Membership functions, Fuzzy set operations, Properties of fuzzy sets. Classical and Fuzzy relations**:** Cartesian product, crisp relations-cardinality, operations and properties of crisp relations. Fuzzy relations-cardinality, operations, properties of fuzzy relations, fuzzy Cartesian product and composition, Fuzzy tolerance and equivalence relations

UNIT II **(9)**

Fuzzification and Defuzzification : Features of the membership functions, various forms, fuzzification, defuzzification to crisp sets, □- cuts for fuzzy relations, Defuzzification to scalars.

19/8/2023 19/08/2023 19/08/2023

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Fuzzy logic and approximate reasoning, Other forms of the implication operation.

UNIT III **(9)**

Fuzzy Systems: Natural language, Linguistic hedges, Fuzzy (Rule based) system, Aggregation of fuzzy rules, Graphical techniques of inference, Membership value assignments: Intuition, Inference, rank ordering.

UNIT IV **(9)**

Fuzzy decision making: Fuzzy synthetic evaluation, Fuzzy ordering, Preference, and consensus, Multi objective decision making, Fuzzy Bayesian, Decision method, Decision making under Fuzzy states and fuzzy actions.

UNIT V **(8)**

Fuzzy Classification: Classification by equivalence relations-crisp relations, Fuzzy relations, Cluster analysis, Cluster validity, C-Means clustering, Hard C-Means clustering, Fuzzy C-Means algorithm.

COURSE OUTCOMES After successful completion of the course, the students are able to:		Bloom's Knowledge Level (KL)
CO 1	Familiarity about the basic ideas of fuzzy sets, operations and properties of fuzzy sets and about fuzzy relations.	K_2, & K_4
CO 2	Understanding the basic features of membership functions, fuzzification process and defuzzification.	K_2
CO 3	Designing fuzzy rule based system.	K_3
CO 4	To know about combining fuzzy set theory with probability to handle random and non-randomuncertainty, and the decision making process.	K_2, K_5 &K_6
CO 5	To remember and gain the knowledge about fuzzy C-Means clustering.	K_1

1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Text Books

1. **Timothy J. Ross**, Fuzzy logic with engineering applications, 3rd edition, Wiley,2010.
2. **George J. Klir, Bo Yuan**, Fuzzy sets and Fuzzy logic theory and Applications, PHI, New Delhi, 1995.

Reference Book (s):

1. **S. Rajasekaran, G. A. Vijayalakshmi**, Neural Networks and Fuzzy logic and Genetic Algorithms,Synthesis and Applications, PHI, New Delhi, 2003.

19/8/2023 19/08/2023 19/08/2023

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KOE101 Probability and Statistics

(Common to all B. Tech. Courses in Sem VIII)

L 3 T 1 **MAX MARKS 100**

Course Objectives: The objectives of the course are to:

1. To develop the fundamental concepts such as probability and applications of Bayes theorem.
2. To lean about the basic features of random variables
3. To learn about Moments to decide symmetry of a distribution and Correlation analysis
4. To calculate about discrete and continuous distributions
5. To learn analyse whether Hypothesis to be rejected or accepted

UNIT I: Probability theory **(8)**

Probability Classical, Relative Frequency and Axiomatic Definition of Probability, Properties of Probability Function, Conditional Probability, Independence of Events, Theorem of Total Probability, and Bayes' Theorem

UNIT II Random variables and Variances [9]

Random Variable, Distribution Functions and their Its Properties, Types of Probability Distributions (Discrete, Continuous), Probability Mass Function, Probability Density Function, Mathematical Expectation, Moments, Variance, and their properties.

UNIT III Moments, and Correlation analysis [10]

Measures of Skewness and Kurtosis, Probability and Moment Generating Functions and Their Properties, Mode, Median, Quartiles, Method of least squares (Fitting of straight lines, second degree polynomials, exponential curves), Correlation and Rank correlation, Regression analysis: Regression lines, regression coefficients, properties of regressions coefficients.

UNIT IV Special Probability Distributions [8]

Discrete Distributions: Uniform, Bernoulli, Binomial, Geometric, Negative Binomial, Poisson, and Hyper-Geometric Distributions and their Moments

Continuous Distributions: Uniform, Exponential, Gamma, Beta, and Cauchy Distributions and their Moments, Normal Distribution and Its Properties.

Module V: Sampling and Testing of Hypothesis: [10]

Sampling Theory (Small and large samples), Estimation, Hypothesis, Null hypothesis, Alternative hypothesis, Testing a Hypothesis, Level of significance, Confidence limits, Test of significance of difference of means, Z-test, t-test and Chi-square test.

19/8/2023	19/08/2023	19/08/2023
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External Expert	**External Expert**	**BOS Convener**

COURSE OUTCOMES After successful completion of the course, the students are able to:		Bloom's Knowledge Level (KL)
CO 1	Familiarity about the basic ideas of probability and applications of Bayes theorem.	K_2, & K_4
CO 2	Understanding the basic features of random variables	K_2
CO 3	Finding the Moments to decide symmetry of a distribution and Correlation analysis	K_3
CO 4	To know about discrete and continuous distributions	K_2, K_5 &K_6
CO 5	To analyse whether Hypothes to be rejected or accepted	K4

1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Text Books

1. **Spiegel, M. R., Schiller, J. J. and Srinivasan, R. A.,** Probability and Statistics. 3rd ed., McGraw-Hill, New York, 2009.

2. **Chung, K. L. and AitSahlia, F.,** Elementary Probability Theory, 4th ed., Undergraduate Texts in Mathematics, Springer-Verlag, New York, 2003.

3. **Gupta, S. C. and Kapoor, V. K.,** Fundamentals of Mathematical Statistic, 10th ed., Sultan Chand & Sons, New Delhi, .

4. Kreyszig E., Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.

Reference Book (s):

1. **Ross, S. M.,** Introduction to Probability Models, 6th ed., Academic Press, San Diego, CA, USA, 1997.

2. **Kolmogorov, A. N.,** Foundation of the Theory of Probability, Chelsea, New York, 1950.

3. **Feller, W.,** An Introduction to Probability Theory and its Applications, Vol. I and II, New York, NY: Wiley, 1968-1971.

4. **Casella, G. and Berger, R. L.,** Statistical Inference, 2nd ed. Belmont CA: Duxbury, 2002.

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