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 (CS and IT Branch) and B. Tech Fourth Year Open Electives (VII-Semester) structure in accordance with AICTE Model Curriculum Effective W.E.F. Academic Session 2022-23

(Dr. Mukesh Kumar)
External Expert

(Dr. Raj Kumar)
BOS Convener

(Dr. Uday Raj Prajapati)
BOS member

SEMESTER – I

Code	SUBJECT	PERIODS			Evaluation Scheme				End Sem		Total	credit
		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	credit
		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	credit
		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

Code	SUBJECT	PERIODS			Evaluation Scheme				End Sem		Total	credit
		L	T	P	CT	TA	TOTAL	PS	TE	PE		
KAS401	Engineering Science Course ESC] Mathematics-IV (PDE, Prob. & Stats.)	3	1	0	30	20	50	-	100	-	150	4

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

SEMESTER – VII (For CSE and IT)

Code	SUBJECT	PERIODS			Evaluation Scheme				End Sem		Total	Credit
		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	Credit
		L	T	P	CT	TA	TOTAL	PS	TE	PE		
KOE07	Fuzzy Logic	3	1	0	30	20	50	-	100	-	150	4

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* **AICTE Guidelines in Model Curriculum:**

After successful completion of 160 credits, a student shall be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours only, if he/she completes additional university recommended courses only (Equivalent to 20 credits; NPTEL Courses of 4 Weeks, 8 Weeks and 12 Weeks shall be of 2, 3 and 4 Credits respectively) through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MOOCS courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only. The student shall be awarded Hons. Degree (on successful completion of MOOCS based 20 credit) only if he/she secures 7.50 or above CGPA and passed each subject of that Degree Programme in single attempt without any grace marks.

KAS-103 MATHEMATICS-I L 3 T 1 MAX. MARKS 100

(Common to all B. Tech. Courses and effective for admitted in July, 2022 batch of Engg.)

Module 1: Matrices [08]

Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Hermitian and Skew Hermitian Matrices, Inverse and Rank of matrices using elementary transformations, Rank-Nullity theorem; Using Rank approach to decide nature/solutions of system of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its applications, Eigen values and Eigenvectors; Diagonalisation of a Matrix.

Module 2: 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 (n^{th} order derivatives), the Leibnitz theorem and its applications, Envelope, Involutes and Evolutes, Curve tracing for cartesian, parametric and polar co-ordinates.

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.

Module 4: Multivariable Calculus-I [08]

Double and triple integrals, change of order of integration, Change of variables, and their applications to find areas and volumes, Centre of mass and Centre of gravity (Constant and variable densities).

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

1. Solving linear simultaneous equations.
2. Applying the concept of limit, continuity, and differentiability in the study of Rolle's, Lagrange, and Cauchy mean value theorems and Leibnitz theorems.
3. Partial derivative applications include maxima, minima, series expansions of functions, and Jacobians.
4. Evaluation of multiple integrals and their applications for finding area, volume, centre of mass, and centre of gravity.
5. Familiar with vector concepts and how to apply them to directional derivatives, tangent and normal planes Also evaluate line, surface, and volume integrals.

Text Books:

1. **B. V. Ramana**, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. **B. S. Grewal**, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. **R K. Jain & S R K. Iyenger**, Advance Engineering Mathematics, Narosa Publishing House 2002.

Reference Books

1. **E. Kreyszig,** Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. **D. Poole, Linear Algebra**: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
3. **Ray Wylie C and Louis C Barret,** Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.
4. **Chandrika Prasad**. Advanced Engineering Mathematics,
5. **Murray Spiegel:** Schaum's Outline of Advanced Mathematics for Engineers and Scientists.

KAS 203 MATHEMATICS-II L 3 T 1 MAX MARKS 100

(Common to all B. Tech. Courses and effective for admitted in July, 2022 batch of Engg.)

Module 1: Ordinary Differential Equation of higher Order [9]

Solutions of linear differential equation of n^{th} 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, Series solutions by Frobenius Method.

Module 2: Multivariable Calculus-II and Fourier Series [8]

Improper integrals, Beta, and Gama functions, and their properties, Dirichlet's integrals with applications, definite integrals to evaluate surface areas and volume of revolutions making use of Beta, and Gama functions, Fourier series, Half range Fourier series.

Module 3: Sequences and Series [8]

Sequences: Definition, boundedness, limit of a sequence, convergence criterion (limit, monotone, and Cauchy) with examples, Convergence of series, Tests (Auxiliary series or p-Series or Generalized Harmonic series, Comparison, Cauchy's Root, d' Alembert's Ratio, Gauss's, Raabe's, De Morgan's and Bertrand's, and Logarithmic tests) for convergence of series.

Module 4: Complex variables – Differentiation [8]

Limit, continuity and differentiability of complex valued functions, Harmonic and analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Conformal mapping, Mobius transformations and their properties.

Module 5: Complex variables Integration **[10]**

Contour integrals, Cauchy-Goursat's theorem, Cauchy integral formula, Taylor's series, Laurent's series, Liouvilles's theorem, Singularities and their classifications, zeros of analytic functions, Residues, Cauchy Residue theorem, Evaluation of real integrals of the type $\int_{-\infty}^{\infty} f(x)\,dx$ and $\int_0^{\pi} f(cos\theta, sin\theta)\,d\theta$.

COURSE OUTCOMES

1. Familiarity about the concept of differentiation and apply for solving higher order differential equations.
2. Applications of Dirichlet's integrals to find surface area and volume of revolutions.
3. Understanding the concept of convergence of sequence and series.
4. Applications of Fourier series in Engineering and science.
5. Applications of conformal mapping, Mobius transformations and their properties.
6. Illustration about the working methods of finding singularities, Taylor's series, Laurent's series and evaluation of definite integrals.

Text Books:-

1. **B. V. Ramana**, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. **B. S. Grewal,** Higher Engineering Mathematics, Khanna Publisher, 2005.
3. **R. K. Jain & S. R. K. Iyenger**, Advance Engineering Mathematics, Narosa Publishing -House, 2002.

Reference Books:-

1. **E. Kreyszig**, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. **Peter V. O'Neil**, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. **Maurice D. Weir, Joel Hass, Frank R.Giordano, Thomas,** Calculus, Eleventh Edition, Pearson.
4. **G.B Thomas, R L Finney**, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
5. **James Ward Brown and Ruel V Churchill,** Fourier Series and Boundary Value Problems, 8th Edition-Tata McGraw-Hill
6. **Veerarajan T**., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
7. **Charles E Roberts Jr**, Ordinary Diffrential Equations, Application, Model and Computing, CRC Press T&F Group.
8. **James Ward Brown and Ruel V Churchill**, Complex Variables and Applications, 8th Edition, Tata McGraw-Hill.

KCS 303 Discrete Structures & Theory of Logic L 3 T 1 MAX MARKS 100
(Common to CSE and IT admitted in July, 2022 batch of Engg.)

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO 1	Write an argument using logical notation and determine if the argument is or is not valid.	K_3, K_4
CO 2	Understand the basic principles of sets and operations in sets.	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

DETAILED SYLLABUS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Relations:** Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. **Functions:** Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions. **Natural Numbers:** Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction.	**08**
II	**Algebraic Structures:** Definition, 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.	**08**
III	**Lattices**: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.	**08**
IV	**Propositional Logic:** Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. (8) **Predicate Logic:** First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.	**08**
V	**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, Applications of Congruences.	**08**

Text books:

1. Koshy, Discrete Structures, Elsevier Pub. 2008 Kenneth 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. E.R. Scheinerman, Mathematics: A Discrete Introduction, Brooks/Cole, 2000.
4. R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5/e, Addison Wesley, 2004
5. Liptschutz, Seymour, "Discrete Mathematics", McGraw Hill.
6. Trembley, J.P & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", McGraw Hill.
7. Narsingh, "Graph Theory With application to Engineering and Computer.Science.", PHI.
8. Krishnamurthy, V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi

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KAS401 Mathematics-IV **L 3 T 1** **MAX MARKS 100**

Partial Differential Equations, Probability and Statistics

(Common to all B. Tech. Courses and effective for admitted in July, 2022 batch of Engg.)

Module I: Partial Differential Equations **[09]**

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 [08]

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

Module III: Statistical Techniques **[08]**

Measures of central tendency, Moments, Moment generating function (MGF), Skewness, Kurtosis, Curve Fitting, Method of least squares (Fitting of straight lines, second degree polynomials, exponential curves) Correlation and Rank correlation, Regression analysis: Regression lines of y on x and x on y, regression coefficients, properties of regressions coefficients.

Module IV: Probability and Distributions **[08]**

Introduction of probability, Addition and multiplication laws, conditional probability, Bayes theorem, Random variables (Discrete and Continuous Random variables), Probability mass, and Probability density functions, Expectation and variance, Binomial, Poisson and Normal distributions.

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.

COURSE OUTCOMES

	Course outcomes	Bloom's Knowledge Level (KL)
	At the end of this course, the students will be able to:	
CO 1	Remember the concept of partial differential equation and to solve partial differential equations	K_1& K_3
CO 2	Analyze the concept of partial differential equations to evaluate the problems concerned with partial differential equations	K_4 & K_5
CO 3	Understand the concept of correlation, moments, skewness and kurtosis and curve fitting	K_2
CO 4	Remember the concept of probability to evaluate probability distributions	K_1 & K_5
CO 5	Apply the concept of hypothesis testing and statistical quality control to create control charts	K_3 & K_6

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K_1 –Remember, K_2 – Understand, K_3 – Apply, K_4 – Analyze, K_5 – Evaluate, K_6 – Create

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. Final examination.

Award of Internal/External Marks: Assessment procedure will be as follows:

1. These will be comprehensive examinations held on-campus (Sessionals).
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/home-work may be of multiple choice type or comprehensive type at least one assignment from each Module/Unit.
b. The grades and detailed solutions of assignments (of both types) will be accessible online after the submission deadline.
4. Final examinations.

Text Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003.
3. S. Ross: A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
5. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Delhi

Reference Books:

1. R.K. Jain and S.R.K. Iyenger: Advance Engineering Mathematics; Narosa Publishing House, New Delhi.
2. J.N. Kapur: Mathematical Statistics; S. Chand & Sons Company Limited, New Delhi.

KOE-075 Operations Research L 3 T 1 MAX MARKS 100

(Common to CSE and IT admitted in July, 2022 batch of Engg.)

Unit	Topics	Lectures
I	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.	10
II	Transportation Problems: Types of transportation problems, mathematical models, Assignment: Allocation and assignment problems and models, processing of job through machines.	8

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III	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	10
IV	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.	9
V	Cutting Plane and Branch and Bound Techniques for all Integer and Mixed Integer Programming Problems	8

Text Books

1. Pant, J.C., " Pant, J.C., "Introduction to optimization Operations Research", Jain Brothers, New Delhi, 2nd Ed. 2012
2. Wayne L. Winston,"Operations Research" Thomson Learning, 2003.
3. Taha H. A., "Operations Research: An Introduction", MacMillan Pub Co., NY, 9th Edition (Reprint). 2013
4. Bazaraa, M., Sherali, H. D. and Shetty, C. M., "Nonlinear Programming: Theory and Algorithms", Wiley-Interscience; 3rd Ed. 2006

EC-312C Fuzzy Logic L 3 T 1 MAX MARKS 100

(Common to all B. Tech. Courses and effective for admitted in July, 2022 batch of Engg.)

Course Objectives

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.

Course Outcomes:

After successful completion of the course, the students are able to

1. Familiarity about the basic ideas of fuzzy sets, operations and properties of fuzzy sets and aboutfuzzy relations.
2. Understanding the basic features of membership functions, fuzzification process and defuzzification.
3. Designing fuzzy rule based system.
4. To know about combining fuzzy set theory with probability to handle random and non-randomuncertainty, and the decision making process.
5. To gain the knowledge about fuzzy C-Means clustering.

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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 **(8)**

Fuzzification and Defuzzification : Features of the membership functions, various forms, fuzzification, defuzzification to crisp sets, λ- cuts for fuzzy relations, Defuzzification to scalars. 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 **(10)**

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,

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):

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

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