MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA

Deemed to be University

(Declared under Distinct Category by Ministry of Education, Government of India)

NAAC ACCREDITED WITH A++ GRADE

B. Tech. (Admitted batch 2023) Annexure-X

Scheme of Examination (Department of Engineering Mathematics & Computing)

III Semester

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot									
				End Sem.		Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work & Sessional	Skill Based Mini Project		L	T	P			
				End Term Evaluation	$Proficiency in subject /course												
1.	3250321	DC	Stochastic Process and Financial Mathematics	50	10	20	20	-	-	-	100	2	1	-	3	Offline	PP
2.	3250322	BSC	Discrete MathematicalStructures	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP
3.	3250323	DC	Operating System Concepts	50	10	20	20	-	-	-	100	2	1	-	3	Offline	MCQ
4.	3250324	DC	Data Structures and Algorithms	50	10	20	20	40	30	30	200	3	-	2	4	Offline	A+O
5.	3250325	DC	Numerical Techniques	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP
6.	3250326	DLC	Computing Lab	-	-	-	-	40	30	30	100	-	-	2	1	Offline	A+O
7.	3250327	DLC	Self-learning/Presentation#	-	-	-	-	-	40	-	40	-	-	2	1	Blended +Mentoring	SO
8.	2000xxx	CLC	Novel Engaging Course	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	3250328	DLC	Skill Internship Project–I (Institute Level Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
Total				**250**	**50**	**100**	**100**	**230**	**80**	**40**	**850**	**13**	**4**	**12**	**23**		
10.	3000001	Natural Sciences & Skills	Engineering Physics	50	10	20	20	-	40	10	150	2	-	-	Grade	Blended	MCQ
11	1000001	MAC	Indian Constitution and Traditional Knowledge	50	10	20	20	-	-	-	100	2	-	-	Grade	Blended	MCQ

$Proficiency in course/subject – includes the weight age towards ability/ skill/ competence /knowledge level /expertise attained /attendance etc. in that particular course/subject

#compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation

Mode of Teaching						Mode of Examination					Total Credits
Theory				Lab	NEC	Theory			Lab	SIP/ SLP/ NEC	
Offline	Online	Blended		Offline	Interactive	PP	A+O	MCQ	SO	-	
		Offline	Online								
7	-	-	1	1	-	3	2	1	3	-	23
77 %	-	-	11 %	11%	-	33%	22%	11%	33%	-	Credits %

MCQ: Multiple Choice Question,**AO:** Assignment + Oral, **OB:** Open Book, **PP:** Pen Paper, **SO:** Submission and Oral

B. Tech. (Third Semester) Annexure-XI

Stochastic Process and Financial Mathematics
(MAC-3250321)

L	T	P	C
3	0	0	3

Objective of Course

- To perceive the mathematical techniques in financial sector
- To explore the concept of free and risky assets
- To understand mathematical models and risk management
- To know stochastic differential and integral equations

Unit: 1

Basic Notions and Assumptions, No-Arbitrage Principle, One-Step Binomial Model, Risk and Return, Forward Contracts, Call and Put Options, Growth and decay curves, Managing Risk with Options, Credit and loan, Cost of credit and amortization.

Unit: 2

Time Value of Money, Simple Interest, Periodic Compounding, Streams of Payments, Discrete and Continuous Compounding, how to Compare Compounding Methods, Money Market, Discrete Time Model: Stock and Money Market Models, Investment Strategies, The Principle of No Arbitrage, Fundamental Theorem of Asset Pricing.

Unit: 3

Dynamics of Stock Prices, Expected Return, Binomial Tree Model, Risk-Neutral Probability, Martingale Property, Numerical Techniques in Finance: Continuous-Time Limit, Monte-Carlo methods, Lattice Method.

Unit: 4

Portfolio Management: Risk and Expected Return on a Portfolio, Numerical and Combinatorial Optimization: Dynamic programming and allocating investments MarKov chains and sequential decision making, Linear programming and the simple method, The theory of games.

UNIT: 5

Random Walks and Brownian Motion, Concept of Stochastic Differential Equations (SDEs) - drift, diffusion, Ito calculus: Ito's Lemma, Ito Integral and Ito Isometry.

Course Outcomes

CO's	Description of CO's
CO1	Define and describe market models, growth and decay curve
CO2	Analyze free risk assets in financial sector
CO3	Deal with the market risk measurement and management
CO4	Employ discrete market models and able to manage portfolio.
CO5	Explore stochastic differential equations

After successfully completing this course, the students will have skill and knowledge to:

Recommended Books:

1. Marek Capinski and Tomasz Zastawniak, "Mathematics for Finance", Springer (2011).
2. KannooRavindran, The Mathematics of Financial Models: Solving Real-World Problems with Quantitative Methods, Wiley Finance, (2014)
3. AmbadNazriWahidudin, "Financial Mathematics and its Applications", Ventus Publishing ApS (2011).
4. Ales Cerny: "Mathematical techniques in Finance: Tools for incomplete markets", Princeton University Press (2011).

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	1	1	1	1	1	3	3	3
CO2	3	3	3	3	3	3	1	1	1	1	1	3	3	3
CO3	3	3	3	3	3	3	1	1	1	1	1	3	3	3
CO4	3	3	3	3	3	3	1	1	1	1	1	3	3	3
CO5	3	3	3	3	3	3	1	1	1	1	1	3	3	3

1 - Slightly; 2 - Moderately; 3 – Substantially

B. Tech. (Third Semester)

Discrete Mathematical Structures
(MAC – 3250322)

L	T	P	C
3	0	0	3

Objective of Course

- To have knowledge of basic algebra and discrete numeric function.
- To describe function and its relation
- To familiarize propositional logic
- To know about the graph theory and its application in computer
- To familiarize the discrete numeric function and generating function

UNIT: 1

Sets, Subsets, Power sets, Complement, Union and Intersection, Demorgan's law Cartesian products, Relations, relational matrices, properties of relations, equivalence relation, functions, Injection, Surjection and Bijective mapping, Composition of functions, Permutations, the characteristic functions and Mathematical induction.

UNIT: 2

Partial order set, Hasse diagrams, upper bounds, lower bounds, Maximal and minimal element, first and last element, Lattices, sub lattices, Isotonicity, distributive inequality, Lattice homomorphism, lattice isomorphism, complete lattice, complemented lattice, and distribution lattice.

UNIT: 3

Group axioms, permutation group, sub group, co-sets, normal subgroup, semi group, Lagrange theorem, fields, minimal polynomials, reducible polynomials, primitive polynomial, polynomial roots, applications.

UNIT: 4

Finite graphs, incidence and degree, isomorphism, sub graphs and union of graphs, connectedness, walk, paths and circuits, Eulerian and Hamiltonian graphs. Trees: properties of trees, pendant vertices in tree, Center of tree, spanning trees and cut vertices, binary tree,matrix representation of graph, incidence and adjacency matrix and their properties, applications of graphs in computer science.

UNIT: 5

Introduction to discrete numeric functions and generating functions, introduction to recurrence relations and recursive algorithms, linear recurrence relations with constant coefficients, homogeneous solutions, particular solutions and total solutions

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Acquire Knowledge of set theory
CO2	Analyse the concept of Lattices
CO3	Identify the concept of Group Theory
CO4	Derive the Inferences from Graph theory
CO5	Illustrate the Discrete numeric function and recursive relation

Recommended Books:

1. J.P Tremblay and Manohar: Discrete Mathematical Structures with Application to Computer science, McGraw-Hill, 1st Edition 2017.
2. NersinghDeo: Graph Theory, PHI Learning, 2014.
3. C.L Liu: Discrete Mathematics.4th Edition 2012.
4. Rosen: Discrete Mathematics and its Applications, McGraw Higher Ed, 7th Edition 2008.
5. N. Herstein: Topics in Algebra, Wiley, 2nd Edition 2006.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2	1	1	1	1	1	1	3	3	3
CO2	3	3	2	3	2	1	1	1	1	1	1	3	3	3
CO3	3	3	2	3	2	1	1	1	1	1	1	3	3	3
CO4	3	3	3	3	3	1	1	1	1	1	1	3	3	3
CO5	3	3	2	3	3	1	1	1	1	1	1	3	3	3

1 - Slightly; 2 - Moderately; 3 – Substantially

B. Tech. (Third Semester)

L	T	P	C
3	0	0	3

Operating System Concepts
(MAC - 3250323)

Course Objectives

- Recognize the concepts and principles of operating systems.
- Provide comprehensive introduction to understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in operating systems.
- To teach understanding how the various elements that underlie operating system interact and provides services for execution of application software.

Unit: 1

Introduction: Evolution of operating systems, Types of operating systems, Different views of operating system, operating system concepts and structure.

Processes: The process concept, systems programmer's view of processes, operating system services for processes management, scheduling algorithms, Performance evaluation.

Unit: 2

Memory Management: Memory management without swapping or paging, swapping, virtual memory, page replacement algorithms, modelling paging algorithms, design issues for paging system, segmentation, Thrashing.

Unit: 3

Interprocess communication and synchronization: The need for interprocess synchronization, mutual exclusion, semaphores, hardware support for mutual exclusion, queuing implementation of semaphores, classical problems in concurrent programming, critical region and conditional critical region, monitors messages. Deadlocks: Deadlock prevention, deadlock avoidance.

Unit: 4

Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface – File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; File System Implementation- File System Structure, Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery.

Unit:5

Performance measurement: Monitoring and evaluation introduction, important trends affecting performance issues, why performance monitoring and evaluation are needed, performance measures, evaluation techniques, bottlenecks and saturation, feedback loops, raid model.

Case study: Unix Operating System.

Course Outcomes

After completion of this course, the students would be able to:

CO's	Description of CO's
CO1	Outline the basic concept of operating systems
CO2	Analyze the working of operating system
CO3	Examine the working of various scheduling/allocation approaches
CO4	Measure the performance of various scheduling/allocation approaches
CO5	Compare the various operating system problems/issues

Recommended Books:

1. Silberschatz, Galvin: Operating System Concepts, Wiley, 9/E, 2013.
2. Stalling William: Operating Systems, Pearson Education, 5/E, 2006.
3. Andrew S. Tanenbaum: Modern Operating Systems, 3/E, PHI, 2006.
4. J. Bach Maurice: The Design of Unix Operating System, Pearson, First Edition, 2015.
5. Bovet & Cesati: Understanding the Linux Kernel, O'Reily, 3/E, 2005.
6. Peter Norton: Complete Guide to Windows XP, SAMS, 2002.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	1	1	1	1	1	1	3	3	3
CO2	3	2	2	2	2	1	1	1	1	1	1	3	3	3
CO3	3	3	2	2	2	1	1	1	1	1	1	3	3	3
CO4	3	3	2	2	2	1	1	1	1	1	1	3	3	3
CO5	3	3	2	2	3	1	1	1	1	1	1	3	3	3

1 - Slightly; 2 - Moderately; 3 – Substantially

B. Tech. (Third Semester)

Data Structures and Algorithms
(MAC - 3250324)

L	T	P	C
2	0	2	3

Course Objectives

- To be familiar with the use of data structures as the foundational base for computer solutions to problems.
- To understand various techniques of searching and sorting.
- To understand basic concepts about stacks, queues, lists, trees and graphs.

Unit: 1

Prerequisites: Array, Structure, pointers, pointer to structure, functions, parameter passing, recursion.
Stack and Queue: Contiguous implementations of stack, various operations on stack, various polish notations-infix, prefix, postfix, conversion from one to another-using stack; evaluation of post and prefix expressions. Contiguous implementation of queue: Linear queue, its drawback; circular queue; various operations on queue.

Unit: 2

General List: list and it's contiguous implementation, it's drawback; singly linked list-operations on it; doubly linked list-operations on it; circular linked list; linked list using arrays. Linked implementation of stack and queue,various applications of Linked List, like polynomial representation, Josephus Problem.

Unit: 3

Trees: Definitions-height, depth, order, degree, parent and children relationship etc;Binary Trees- various theorems, complete binary tree, almost complete binary tree;Tree traversals-preorder, pre order and post order traversals, their recursive and non-recursive implementations; expression tree- evaluation; Linked representation of binary tree-operations. Threaded binary trees; forests, conversion of forest into tree. Heap-definition.AVL tree- definition, insertion & deletion operations; Basic idea of B tree and B+ Tree: definition, order, degree, operations and comparison.

Unit: 4

Searching, Hashing and Sorting: Requirements of a search algorithm; sequential search, binary search, indexed sequential search, interpolation search; hashing-basics, methods, collision, resolution of collision, chaining; Internal sorting- Bubble sort, selection sort, insertion sort, quick sort, merge sort on linked and contiguous list, shell sort, heap sort, tree sort.

Unit: 5

Graphs: Related definitions: Graph representations- adjacency matrix, adjacency lists, adjacency multi-list; traversal schemes- Depth first search, Breadth first search; Minimum spanning tree; Shortest path algorithm; Prim's,Kruskal&Dijkstra algorithm. Sparse Matrix.

Course Outcomes

After completion of this course, the students would be able to:

CO's	Description of CO's
CO1	Outline the basics of Algorithms and their performance criteria's.
CO2	Explain the working of linear/Non Linear data structures.
CO3	Identify the appropriate data structure to solve specific problems
CO4	Analyze the performance of various data structures & their applications
CO5	Evaluate the time/space complexities of various data structures & their applications.

Recommended Books:

1. AM Tanenbaum, Y Langsam& MJ Augustein: Data structure using C, PHI, 2007.
2. Robert Kruse, Bruse Leung: Data structures & Program Design in C, Pearson Education, 2007.
3. Richard, Gilberg Behrouz, Forouzan: Data structure – A Pseudocode Approach with C, Thomson press, 2005.
4. Jean – Paul Trembly, Paul Sorenson: An Introduction to Structure with application, TMH, 2007.
5. N. Wirth: Algorithms + Data Structure = Programs, Prentice Hall, 1978.
6. SartajSahni : Data Structures,Algorithms and Applications in C++, Universities Press, 2014.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	1	1	1	1	1	3	3	3
CO2	3	2	3	3	3	1	1	1	1	1	1	3	3	3
CO3	3	3	3	3	3	1	1	1	1	1	1	3	3	3
CO4	3	3	3	3	3	1	1	1	1	1	1	3	3	3
CO5	3	3	3	3	3	1	1	1	1	1	1	3	3	3

1 - Slightly; 2 - Moderately; 3 – Substantially

B. Tech. (Third Semester)

Numerical Techniques
(MAC – 3250325)

L	T	P	C
2	1	0	3

Course Objective

- To perceive the Errors, Algebraic & Transcendental
- To expose the concept of Interpolation, Extrapolation, Numerical differential and Integration
- To understand Numerical solution of Ordinary Differential Equation
- To explore the Finite Difference Methods

Unit 1:

Problem solving on computer, Algorithms and flow charts, Introduction to numerical computing, approximations and errors in numerical computations. Useful rules for estimating Errors, Truncation and round off errors, propagation of errors, Error in the Approximation of function, Error in Approximation

Bisection method, RegulaFalsi method, Iteration method, Newton Raphson method, Secant method, convergence of iterative methods.

Unit 2:

Matrix algebra, Solution of simultaneous linear algebraic equations: Gauss elimination, Gauss Jordan method, LU decomposition, Jacobi method, Gauss Seidel method, SOR method, Ill and well condition of equations, Condition of a system and stability issues., Finite Differences, forward, backward and central operators, Shifting operators, Averaging Operators, Differences of a polynomial, Factorial Notation, Relation between operators.

Unit 3:

Newton's forward and backward interpolation formula, Lagrange interpolation formula, Divided differences and Newton's divided difference formula, Inverse Interpolation, Numerical differentiation, Numerical integration: Newton-Cotes integration formulas, Trapezoidal, Simpson's rules (1/3 & 3/8)and Weddle rules.

Unit 4:

Taylor series method, Picard's method, Euler's method, Modified Euler's method, RungeKutta methods fourth order. Multistep methods: Milne's Predictor corrector method, Numerical solution of the simultaneous linear differential equation, Second order differential equation.

Unit 5:

Classification of partial differential equation, Finite difference method, Numerical solution of Partial Differential equations, five-point formula, Laplace and Poisson equation.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Identify the concepts Algebraic & Transcendental Equations
CO2	Acquire the knowledge of finite difference
CO3	Describe numerical integration and differentiation
CO4	Illustrate the problems of ordinary differential equation
CO5	Analyze the Partial differential equations

Recommended Books:

1. B. S. Grewal: Higher Engineering Mathematics, Khanna Publisher, 43rd Edition, 2015.
2. B.V. Ramanna: Higher Engineering Mathematics, McGraw Hill,1st Edition, 2017.
3. S.S. Sastry: Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 4th edition, 2007.
4. J. H. Mathews and K. D. Fink: Numerical Methods using MATLAB, PHI, 4th edition, 2007.
5. C.F. Gerald and P.O. Wheatley: Applied Numerical Analysis, Pearson Education, 6th edition, 2006.
6. H. K. Dass: Advance Engineering Mathematics, S. Chand& Company, Publisher, 2018.

Course Articulation Matrix

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CO1	3	3	3	3	3	2	1	1	1	1	1	3	3	3
CO2	3	2	3	3	3	2	1	1	1	1	1	3	3	3
CO3	3	3	3	3	3	2	1	1	1	1	1	3	3	3
CO4	3	3	3	3	3	2	2	1	1	1	1	3	3	3
CO5	3	3	3	3	3	2	2	1	1	1	1	3	3	3

1 - Slightly; 2 - Moderately; 3 – Substantially