Mandsaur University

Subject Name	L	T	P	Credit
Physics-III (Thermal Physics & Statistical Mechanics)	3	1	4	6

Course Objectives:

- Applying thermodynamic principles in order to interpret thermodynamic systems and predict their behaviors.
- The students will introduce about the enthalpy and Joule-Thompson Effect.
- The course will give knowledge about the Maxwell's law of distribution of velocities.
- The students will introduce about the Law of equipartition of energy.
- The course will give knowledge about the theory of radiation.

Unit-1

Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature. Laws of thermodynamics and internal energy, conversion of heat into work, Various Thermo dynamical Processes, Applications of First Law: General Relation between C_P and C_V, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Coefficient, Reversible and irreversible processes, Entropy, Carnot's cycle & theorem, Entropy changes in reversible and irreversible processes

Unit-2

Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations and applications - Joule-Thompson Effect, Expression for ($C_P - C_V$), C_P/C_V, TdS equations.

Unit-3

Kinetic Theory of Gases: Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order),

Unit-4

Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases.

Unit-5

Theory of Radiation: Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh- Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law.

Statistical Mechanics: Maxwell-Boltzmann law, distribution of velocity, Quantum statistics, Fermi-Dirac distribution law, Bose-Einstein distribution law, comparison of three statistics.

Text Books:-

1. M.W. Zemansky, Richard Dittman, "Heat and Thermal Physics", McGraw-Hill, Vol. 2,1981.
2. S. Garg, R. Bansal and Ghosh, "Thermal Physics", Tata McGraw-Hill, 2ndEdition,1993.
3. Carl S. Helrich,"Modern Thermodynamics with Statistical Mechanics", Springer, Vol. 2, 2009.
4. Sears & Salinger, "Thermodynamics, Kinetic Theory & Statistical Thermodynamics" Narosa Publications, Vol. 3, 1988.
5. S.J. Blundell and K.M. Blundell, "Concepts in Thermal Physics", Oxford University Press, 2nd Ed., 2012.
6. I.Prakash& Ramakrishna, "A Text Book of Practical Physics", Kitab Mahal, 11th Ed., 2011.
7. Michael Nelson and Jon M. Ogborn, "Advanced level Physics Practical's", Heinemann Educational Publishers, 4th Edition, reprinted 1985.
8. D.P.Khandelwal, "A Laboratory Manual of Physics for undergraduate classes", Vani Pub., Vol.2., 1985.

References:-

1. R. P. Goyal, "Unified Physics III Semester", Shivlal Agrawal and Company Publishers.
2. A.B. Gupta, H.P. Roy, "Thermal Physics and Statistical Physics", Books and Allied (P) Ltd, Calcutta. 3. Brijlal and N. Subrahmanyam, "Heat and Thermodynamics", S. Chand & Company Ltd

Course Outcomes:

- The use of Laws of thermodynamics.
- The use of Enthalpy and relation between C_P and C_V.
- The use of Maxwell's law of distribution of velocities.
- The use of Law of equipartition of energy and its applications.
- The use of the Planck's law, Wien's law and Rayleigh- Jeans Law and also understand about the statistical mechanics.

List of Experiments:-

1. To study conversion of mechanical energy into heat using Joule's calorimeter.
2. To determine heating efficiency of electrical kettle with various voltages.
3. To determine thermo electromotive force by a thermocouple method.
4. To determine heat conductivity of bad conductors of different geometry by Lee's method.
5. To verify Newton's law of cooling.
6. To determine the specific heat of a liquid using cooling method.
7. To determine mechanical equivalent of heat by Calorimeter.

Mandsaur University

Subject Name (Code)	L	T	P	Credit
Mathematics-III (MAT170)	3	1	0	4

Course Objectives:

- To know about applications of discrete mathematics in the field of computer science
- Basic concepts of sets, logic functions and graph theory are applied to Boolean Algebra and logic networks
- Basic concepts of functions and algebraic structures are applied to finite state machines and coding theory.
- To know about the application of congruence in the basic program.

Unit-I

Set Theory and Relation and Theorem proving Techniques: Introduction to Sets, Finite and Infinite Sets, Unaccountably Infinite Sets. Introduction to Functions and relations, Properties of Binary relations, Closure, Partial Ordering Relations. Pigeonhole Principle, Permutation and Combinations, Mathematical Induction, Principle of Inclusion and Exclusion.

Unit-II

Recurrence Relations: Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive algorithms, Linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Generating functions, Solution by method of generating functions.

Unit-III

Logic set and Theory: Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers.

Unit-IV

Graph Theory: Definition, examples and basic properties of graphs, pseudo graphs, complete graphs, bi--partite graphs, isomorphism of graphs, paths and circuits, Eulerian circuits, Hamiltonian cycles, the adjacency matrix, weighted graph, travelling salesman's problem, shortest path, Dijkstra's algorithm, Floyd---Warshall algorithm.

Unit-V

Divisibility theory and Theory of Congruences: Preliminaries , Divisibility theory of the integers , Primes and their distribution, Fundamental Theorem of Arithmetic , The theory of congruences, Fermat's theorem, Number theoretic functions, Euler's generalization of Fermat's theorem

Reference Books:

1 C.L.Liu, "Elements of Discrete Mathematics" Tata Mc Graw-Hill Edition.
2 Kenneth H. Rosen, "Discrete Mathematics and its applications", McGraw Hill.
3 Deo, Narsingh, "Graph Theory With application to Engineering and Computer.Science", PHI.
4 D. M. Burton,Elementary Number Theory, 7th ed., Tata McGraw-Hill, New Delhi, 2012.

Mandsaur University

Subject Name (Code)	L	T	P	Credit
Mathematics-IV (MAT180)	3	1	0	4

Course Outcomes:

- The student will be familiar with relational algebra, Functions and graph theory, finite state machines, lossless machines.
- Basic knowledge of Algebra of Logic, Boolean algebra, Graph Theory and useful for field of Network analysis, Digital Electronics, Network synthesis, Neural Network.
- Student learns about the use graph theory in network.
- Basic fundamentals of used in various fields of Engineering and Computer Science.

Course Objectives:

- Provide a first approach to the subject of algebra, which is one of the basic pillars of modern mathematics

- Abstract algebra gives to student a good mathematical maturity and enables to build mathematical thinking and skill.
- Basic knowledge of various types of Matrices, properties and its basic theorems.
- Study of certain structures such as vector spaces, Finite dimensional vector spaces.

Unit-I

Abstract Algebra-I: Definition and basic properties of group, Order of an element of a group, Abelian groups, Subgroups, Algebra of subgroups, Cyclic groups and their simple properties, Coset decomposition and related theorems, Lagrange's theorem and its consequences.

Unit-II

Abstract Algebra-II: Normal sub group, Quotient groups, homomorphism and isomorphism of groups (definition only), Kernel of homomorphism of groups, fundamental theorem of homomorphism of groups, Permutation groups (even and odd permutations), Alternating groups, Cayley's theorem.

Unit-III

Abstract Algebra-III: Definition and types Rings, cancellation law of Rings, property of Rings, Subring, Integral Domain, Field, Subfield with basic theorem. Division Ring, Ring Homomorphism, Polynomial Ring.

Unit-IV

Linear Algebra-I: Definition and examples of vector spaces, subspaces, Sum and direct sum of subspaces, Linear span, Linear dependence, independence and their basic properties, Basis, Finite dimensional vector spaces, Existence theorem for basis, Invariance of the number of elements of a basis set, Dimension , Dimension of sums of vector subspaces.

Unit-V

Linear Algebra-II: Linear transformations and their representation as matrices, the algebra of linear transformations, The rank- nullity theorem, Eigen values and Eigen vectors of a linear transformation, Diagonalisation, Quotient space and its dimension.

Reference Books:

1 A first Course in Abstract Algebra, Jhon B. Fraliegh, Pearson Education India, 2003.
2 N. Jacobson, Basis Algebra, Vols, I & II. W.H. Freeman, 1980
3 Topics in Algebra, I, Wiley Eastern Ltd., New Delhi, 1977.
4 Seymour Lipschutz, Linear Algebra, Schaum Publishing Co., New York.

Course Outcomes:

- Students will be able to effectively write abstract mathematical proofs in a clear and logical manner.

Subject Name (Code)	L	T	P	Credit
Mathematics-V (MAT190)	3	1	0	4

- Students uses this theorems to solve problems in number theory and theory of polynomials over a field, demonstrate ability to think critically by recognizing patterns and principles of algebra and relating them to the number system.
- Student learns about the use matrices in image processing and MATLAB.
- Basic fundamentals of used in various fields of Engineering and Computer Science.

List of Experiments

1 Program to find a rank of matrix.

2 Program to find a solution of simultaneous linear system.

3 Program to check a set is group or not.

4 Program to find the dimension of vector space.

Course Objectives:

- To understand the basics of convergence and continuity of sequences, series and their methods.

- Revise basic knowledge of Functions and Differentiation with application.
- Provide a first approach to the subject of real analysis, which is one of the basic pillars of pure mathematics.
- Real and complex Analysis gives to student a good mathematical maturity and enables to build mathematical thinking and skill.

Unit-I

Real Analysis-I: Real line, bounded sets, suprema and infima, completeness property of R, Archimedean property of R, intervals. Concept of cluster points and statement of Bolzano-Weierstrass theorem.Real Sequence, Bounded sequence, Cauchy convergence criterion for sequences. Cauchy's theorem on limits, order preservation and squeeze theorem, monotone sequences and their convergence (monotone convergence theorem without proof).

Unit-II

Real Analysis-II: Infinite series. Cauchy convergence criterion for series, positive term series, geometric series, comparison test, convergence of p-series, Root test, Ratio test, alternating series, Leibnitz's test (Tests of Convergence without proof), Definition and examples of absolute and conditional convergence. Sequences and series of functions, Point wise and uniform convergence.Mn-test, Power series and radius of convergence.Riemann Integral and its properties.

Unit-III

Complex Analysis-I: Limits, Continuity, Functions of complex variable, Derivatives, Cauchy-Riemann equations, sufficient conditions for differentiability, Analytic function, Harmonic Conjugate function, Line Integral, Cauchy's Theorem, Cauchy's Integral formula, Singular points, Poles & Residues, Residue Theorem, Application of Residues theorem for evaluation of real integrals.

Unit-IV

Complex Analysis-II: Liouville's theorem and fundamental theorem of algebra. Convergence of sequences and series, Taylor series and its examples.Laurent series and its examples, absolute and uniform convergence of power series.

Unit-V

Vector Calculus: Differentiation of Vectors, Scalar and Vector point function, Geometrical meaning of Gradient, Unit normal vector and Directional derivative, Physical interpretation of Divergence and Curl. Line integral, Surface integral and Volume integral, Green's Theorem, Stoke's Theorem and Gauss divergence Theorem.

Reference Books:

1 R.G. Bartle and D. R Sherbert, *Introduction to Real Analysis,* John Wiley and Sons (Asia) P. Ltd., 2000.
2 T.M. Apostol, *Calculus* (Vol. I), John Wiley and Sons (Asia) P. Ltd., 2002.
3 K.A. Ross, *Elementary Analysis- The Theory of Calculus Series*- Undergraduate Texts in Mathematics, Springer Verlag, 2003.

Subject Name (Code)	L	T	P	Credit
Mathematics-VI (MAT200)	3	1	0	4

4 James Ward Brown and Ruel V. Churchill, *Complex Variables and Applications,* 8th Ed., McGraw – Hill International Edition, 2009.
5 Joseph Bak and Donald J. Newman, *Complex analysis,* 2nd Ed., Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., 1997.
6 P.C. Matthew's, *Vector Calculus*, Springer Verlag London Limited, 1998.

Course Outcomes:

- Student learns about the use of convergence, continuity, Riemann integral, various practical problems and further uses.
- Useful for the field of Control system, Network analysis, Transmission Lines.
- Applicable in the field of Physics, EMT and Transmission Line.

Course Objectives:

- Students to understand the Applications of mathematics in the field of Engineering and computer science.

- Basic knowledge of distribution.
- Basic knowledge of various types rule to solve differential equation.
- Study of certain testsuch as t-test, z-test and f-test.

Unit-I

Approximations, Errors, Zeros of Polynomials and Iterative methods: Numerical approximation, Representation of integers and real numbers in computers, fixed and floating point arithmetic, normalized floating point numbers, Round off and truncation errors, relative and absolute errors. Zeros of single transcendental equations and zeros of polynomials using bisections, false position, Newton-Raphson method, Convergence of solutions.

Unit-II

Interpolation and Numerical Integration: Forward, Backward, central and divided difference formulas, Lagrange's interpolation, Inverse interpolation for equal and unequal intervals. Newton Cote's formula, Simpson's 1/3rd and 3/8th rule, Gauss Legendre (two and three points) integration formula.

Unit-III

Solution of Equations: Solutions of simultaneous linear equations – Gauss elimination method, Gauss-seidal iterative methods. Runge-Kutta fourth order method, Euler's method, Picard's method, Taylor's series method.

Unit-IV

Distribution: Binomial distribution, Poisson distribution, normal distribution, χ^2 distribution, Rectangular distribution, hypergeometric distribution.

Unit-V

Elementary Theory: Hypothesis testing for sampling: Small samples, t, z and f tests. Chi-square test. Large samples: Comparison of large samples, testing the significance of the difference between the means of two large samples.

Reference Books:

1. B. S. Grewal "Numerical Methods in Engineering & Science".
2. V. Rajaraman, "Computer Oriented Numerical Methods".
3. M. Ray and HarSwarup Sharma, "Mathematical Statistics".
4. Iyenger M. K. Jain & R. K. Jain, "Numerical Methods for scientific and engineering computation", Wiley Eastern (New Age).

Course Outcomes:

- Coursework is designed to provide students the opportunity to learn key concept of Applications of mathematics in the field of Computer Science.
- Student will learn about the basic application of mathematics in various practical problems and further uses.

- Student learns about the use numerical interpolation in MATLAB.
- Basic fundamentals of used in various fields of Engineering and Computer Science.

List of Experiments

5 Program to find a solution of algebraic equation.

6 Program to find a solution of transcendental equation.

7 Program to design an algorithm.

8 Program to find the zeros of polynomials.

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Subject Name	L	T	P	Credits
Digital Electronics	3	1	-	4

Course objectives:

- To gain basic knowledge of digital electronics circuits and its levels.
- To understand and examine the structure of various number system and its conversation.
- To learn about the basic requirements for a design application.
- To enable the students to understand, analyze and design various combinational and sequential circuits.
- To understand the logic functions, circuits, truth table and Boolean algebra expression.

Unit-I

Number systems Decimal, Binary, Octal and Hexadecimal numbers, Codes: ASCII code, Hamming Code , BCD code, Gray code, Error detection & Correcting code , Excess-3 code, Binary arithmetic, 1's Complement and 2's Complement, Data types.

Unit-II

Introduction to logic gates: AND,OR,NOT, Universal gates: NAND ,NOR ,Exclusive gates, Boolean algebra, Boolean Laws ,Demorgan's theorem, Karnaugh map method: SOP & POS , Minterm,Maxterm, Cases with don't care terms.

Unit-III

Combinational circuits ,Half adder, Half subtractor, Full adder, Full subtractor circuits, Decoders, Encoders, Multiplexers, Demultiplexers, Program Control, Instruction Sequencing, Idea about Arithmetic circuits.

Unit-IV

Sequential Circuits, Flip-flops,Classification of flip flop RS, D, JK flip flops, Master Slave JK flip flop, Introduction to Shift Registers: SISO, SIPO, PIPO, PISO, Data transfer, Mode of Data transfer, Synchronous and Asynchronous transfer, Handshaking.

Unit-V

Introduction to various Semiconductors memories, RAM: SRAM,DRAM,MRAM and ROM and its type , Associative memory, Memory Hierarchy , Cache memory, Hit Ratio ,Mapping techniques.

Reference Books:

1. BARTEE, "Digital Computer Fundamental" TMH Publication
2. MALVINO, " Digital Computer Electronics" TMH Publication
3. MORRIS MANO, " Computer System Architecture" PHI Publication

Course Outcomes:

- Skill to build and troubleshoot digital logic circuits.
- Skill to use the methods of systematic reduction of Boolean expression using K- Map.
- Ability to interpret logic gates and its operations.
- Familiarization with semiconductor memories in electronics.

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Subject Name	L	T	P	Credit
Data Structure using C	3	1	4	6

Course Objectives:

- To teach efficient storage mechanisms of data for an easy access.
- To design and implementation of various basic and advanced data structures.
- To introduce various techniques for representation of the data in the real world.
- To develop application using data structures.
- To teach the concept of protection and management of data.

Unit-I

Introduction: Elementary data organization, Data Structure definition, Categories of data structures, Data structure operations, Applications of data structures, Abstract Data type, Algorithms complexity and time-space trade off, Big-O notation, Array, Pointers, functions.
Stack: Stack, Operations on stack, Recursion, Polish Notation: Infix, Prefix, Postfix, Conversion from one to another using stack, Multiple Stack.
Queue: Queue, Application of Queue, Circular Queue, Dequeue, Priority Queue.

Unit-II

Linked List: Singly Linked list, Operation on Singly Linked list, Header node, Stack and Queue Linked list. Doubly Linked List, Circular Linked list. Application Linked list,

Unit-III

Trees: definitions-height, depth, order, degree, parent and child relationship etc; Binary Trees, Basic operations on Binary tree, representation of binary tree, complete binary tree, almost complete binary tree; Tree traversals - preorder, inorder and postorder traversals, Threaded binary trees; **B-tree-** definition, order, degree, insertion & deletion operations, AVL Tree.

Unit-IV

Searching and Sorting: sequential search, binary search, sorting- Bubble sort, selection sort, insertion sort, quick sort, merge sort, Heap sort, Hash Table, Collision resolution Techniques.

Unit-V

Graphs: Introduction to graphs, Definition, Terminology, .Directed, Undirected & Representation of graphs, Graph Traversal-Depth first & Breadth first search. minimum spanning Tree, Shortest path algorithm; kruskals & dijkstras algorithm

Reference Books:

1. Fundamentals Of Data Structure, By S. Sawhney & E. Horowitz
2. Date Structure : By lipschuists (Schaum's .outline Series Mcgraw Hill publication)
3. TennenBaum A.M. & others: Data Structures using C & C++; PHI
4. Yashwant Kanetkar, Understanding Pointers in C, BPB.

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Course Outcomes:

- Students will be able to use linear and non-linear data structures like stacks, queues, linked list etc.
- Student will be able to choose appropriate data structure as applied to specified problem definition.
- Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
- Understand and apply various searching and sorting algorithms.
- Learn to apply concepts of graph theory.

List of Experiments

1. Write a program to implement insertion () and deletion () operation in array.
2. Write a program for addition, subtraction, multiplication and transpose of matrix.
3. Write a program to create, initialize, assign and access a pointer variable.
4. Write a program to find factorial of number using recursion.
5. Write a program to swap two numbers using call by value and call by reference.
6. Write a program to implement Push () and Pop () operation in stack using array.
7. Write a program to implement insertion () and deletion () operation in queue using array.
8. Write a program to create 5 nodes in single linked list.
9. Write a program to insert an element at the end, beginning and at the end position in single linked list.
10. Write a program to delete an element at the end, beginning and at the end position in single linked list.
11. Write a program to implement stack using linked list.
12. Write a program to search an element in array using linear search and binary search.
13. Write a program to sort an array using insertion sort.
14. Write a program to sort an array using bubble sort.
15. Write a program to sort an array using selection sort.
16. Write a program to sort an array using quick sort.
17. Write a program to implement tree traversal technique.
18. Write a program to implement graph traversal technique.
19. Write a program to implement kruskal's and prim's algorithm.

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Subject Name	L	T	P	Credits
Web Designing Lab	-	-	4	2

Course Objectives

- Introduces HTML using an HTML editor includes web terminology, HTML5.
- Learn about the site management, links, lists, tables, forms, video, iframes, working with graphics, and accessibility.
- Introduces style sheets (CSS) and responsive (mobile) web design. Covers the creation of multipage websites using these technologies.

List of Experiments

1. Create a webpage with HTML describing your department. Use paragraph and list tags.
2. Write a program which shows headings five time in ascending order. Align the heading also.
3. Write a program which show four paragraph under four headings.
4. Write a program for formatting the text & marked highlighted text.
5. Create links on the words e.g. "Wi-Fi" and "LAN" to link them to Wikipedia pages.
6. Insert an image and create a link such that clicking on image takes user to other page.
7. Change the background color of the page. At the bottom create a link to take user to the top of the page.
8. Create a table to show your class time-table.
9. Use tables to provide layout to your HTML page describing your university infrastructure.
10. Embed Audio and Video into your HTML web page.
11. Write a HTML program for designing registration form.
12. Write a HTML program for designing login form.
13. Write a HTML program using various semantic tags of HTML5, like header, section, nav etc.
14. Write HTML program which contains cascaded style sheet for p, h2, h3, body and font attribute.
15. Write HTML program which contains external style sheet with user defined Classes.

16. Write HTML program which contains cascaded style sheet with border attributes of style sheet.
17. Write HTML program which contains cascaded style sheet with margin attributes of style sheet
18. Write HTML program which contains external style sheet with background attributes of style sheet.
19. Write a HTML program to use various font properties available in CSS.
20. Write a HTML program to embed YouTube video in webpage using iframe.

Course Outcomes

- Use knowledge of HTML and CSS code and an HTML editor to create personal and/or business websites following current professional and/or industry standards.
- Use critical thinking skills to design and create websites.
- Completion of a multi-page web site
- Students will communicate ideas and business topics through written content on a web page.
- Student will be able to design good website using HTML/CSS