Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)

(AICTE Model Curriculum Based Scheme)

Bachelor of Technology (B.Tech.) IV Semester (Information Technology)

w.e.f. July 2023

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	MA41	BSC	Discrete Structure	70	20	10	-	-	100	3	1	-	4
2	IT42	PCC	Analysis and Design of Algorithm	70	20	10	30	20	150	3	-	2	4
3	IT43	PCC	Computer Architecture	70	20	10	30	20	150	3	-	2	4
4	IT44	PCC	Principles of Communication	70	20	10	30	20	150	3	-	2	4
5	IT45	PCC	System Analysis and Software Engineering	70	20	10	-	-	100	3	1	-	4
6	IT46	ESC	Software Lab-II	-	-	-	30	20	50	-	-	4	2
Total				**350**	**100**	**50**	**120**	**80**	**700**	**15**	2	**10**	**22**
7	IT47	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	8
8	IT48	MC	NSS/NCC/Swatchhata Abhiyan/Rural Outreach	Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum 8 credits against additional MOOC courses in subject code IT47 for the award of Honours (Minor Specialization).									

Note: MOOC/NPTEL subjects shall be taken with permission of HOD/Coordinator.

1 hour lecture (L) = 1 credit	1 hour Tutorial (T) = 1 credit	2 hour Practical (P) = 1 credit

BSC: Basice Science Course, PCC: Professional Core Course, ESC: Engineering Science Course, DLC: Distance Learning Course, MC: Mandatory Course

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(AICTE Model Curriculum Based Scheme and Syllabus)

Bachelor of Technology (B.Tech.) IV Semester, Branch (CS/IT/AI&DS)

COURSE CONTENT **w.e.f. July 2023**

Subject Code	Subject Name	Maximum marks Allotted			Total marks	Hours/Week			Total Credit
MA41	DISCRETE STRUCTURE	Theory			100	L	T	P	4
		End Sem	Mid-Sem Exam	Quiz/ Assignment		3	1	0	
		70	20	10					

Module 1: Set theory, relation and function (08 Hours)

Definition of sets, countable and uncountable sets, Venn Diagram, proofs of some general identities on sets relation: Definition, types of relation, composition general identities on sets relation: Definition, types of relation, composition ordering relation Function: Definition one to one, into and onto function, inverse function, composition of functions recursively defined functions, pigeonhole principle.

Module 2: Posets, Hasse diagram and lattices (08 Hours)

Introduction ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. Propositional logic Proposition, first order logic, Basic logical operation, truth tables tautologies, contractions, Algebra of Proposition, logical implications, logical equivalence, Rules of inference, Predicates, the statement function.

Module 3: Theorem proving techniques (06 Hours)

Mathematical induction, Recurrence Relation and Generating Function: Introduction to recurrence relation and recursive algorithm, linear recurrence relations with constant coefficients, homogeneous solutions, particular solutions Total solution, generating functions, Solution by method of generating functions.

Module 4: Algebraic structure: Group, Ring, Field (10 Hours)

Definition properties types: Groups, Semi groups, Monoid groups, Abelian group, Properties of groups, Subgroup, Cyclic groups, Cosets, Normal subgroup, Homomorphism & Isomorphism of groups, Rings and Fields and finite fields: definition and examples.

Module 5: Graph theory (08 Hours)

Introduction and basic terminology of graphs, Planer graphs Multigraphs and weighted graphs Isomorphic graphs, Paths, Cycles and connectivity, shortest path in weighted graph Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number.

Books Reference:

1. Elements of Discrete Mathematics by C. L. Liu Tata McGraw-Hill Edition.
2. Discrete Mathematical structure with application in CS by Trembly, J.P. & Manohar; Mc Graw Hill.
3. Graph Theory with application to engineering and computer science by Deo, Narsingh; PHI.
4. Discrete Mathematics by Seymour Lipschutz and and mark Lipson Schaum's Outlines Tata McGraw-Hill Pub.

Course Outcomes:

At the end of the course the students will:

1. Solve basic problems based on set theory, relation and function.
2. Apply the concepts of Posets, Hasse diagram and Lattices to solve branch specific problems.
3. Establish the results employing theorem proving techniques.
4. Use the concept of Algebraic structures to solve branch specific problems.
5. Apply the concept of Graph theory to solve branch specific engineering related problems.

Dr. D. P. Chauhan
H.O.D,
Deptt. of App. Mathematics

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COURSE CONTENT

Subject Code	Subject Name and Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total	L	T	P	
		End Sem	Mid Sem Exam	Quiz Assign ment	End Sem	Lab Work					
IT42	Analysis and Design algorithm	70	20	10	30	20	150	3	-	2	4

Module I
Algorithm properties. Analysis of Algorithms: Priori analysis and Posteriori analysis. Worst, Best and Average Vcase analysis. RAM model for analysis. Space and Time Complexities of algorithms. Step count and Recurrence, Relation. Asymptotic notations Big O , Big Ω, θ, little o, little ω.

Module II
Introduction to divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, merge sort, quick sort, and Stassen's matrix multiplication.

Module III
Study of Greedy strategy, examples of greedy method like optimal merge patterns, Huffman coding, minimum spanning trees, knapsack problem, job sequencing with deadlines, single source shortest path algorithm, etc.

Module IV
Concept of dynamic programming, problems based on this approach such as 0/1 knapsack, multistage graph, reliability design, Floyd-Warshall algorithm, etc. Backtracking concept and its examples like 8 queen's problem, Hamiltonian cycle, Graph coloring problem etc.

Module V
Introduction to branch & bound method, examples of branch and bound method like traveling salesman problem etc. Lower bound theory and its use in solving algebraic problem. Deterministic and Non Deterministic Algorithm.NP-completeness: P, NP, NP-Hard and NP-Complete problems.

Text Books:
1. Horowitz & Sahani; Analysis & Design of Algorithm
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 2003.

Reference Books:
1. Coremen Thomas, Leiserson CE, Rivest RL; Introduction to Algorithms; PHI.
2. Dasgupta; algorithms; TMH
3. Ullmann; Analysis & Design of Algorithm;
4. Michael T Goodrich, Robarto Tamassia, Algorithm Design, Wiely India

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List of Experiments:

1. Perform recursive binary and linear search
2. Short a given set of elements using Heap sort technique.
3. Sort a given set of elements using Merge short technique
4. Find solution of Knapsack problem using Greedy approach
5. Implement o/1 knapsack problem using dynamic programming.
6. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
7. Sort a given set of elements using Quick sort technique.
8. Find minimum cost spanning tree of a given undirected graph using Kruskal's algorithm.
9. Print all the nodes reachable from a given starting node in a digraph using Breadth first search technique.
10. Implement all pair shortest paths problem using Floyd's algorithm.
11. Find minimum cost spanning tree for a given undirected graph using Prim's algorithm.
12. Print all the nodes reachable from a given starting node in a given digraph using Depth first search technique.
13. Compute the transitive closure of a given directed graph using Warshall's algorithm.
14. Implement n-Queens problem using backtracking technique.

Course Outcomes:

CO1 - To understand the space and time complexities and asymptotic notations for algorithms.

CO2 - To familiarize with divide and conquer techniques based algorithms.

CO3 - To understand Greedy strategy and job sequencing with deadlines.

CO4 - To understand the dynamic programming approach and based algorithms.

CO5 - To introduce with the branch and bound methods, deterministic and non-deterministic algorithms.

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COURSECONTENT

Subject Code	SubjectNameand Title	MaximumMarksAllotted						Hours/Week			Total Credits
		Theory			Practical		Total	L	T	P	
		End Sem	MidSem Exam	Quiz Assignment	End Sem	Lab Work					
IT43	Computer Architecture	70	20	10	30	20	150	3	-	2	4

Module I
Computer Basics and CPU: Von Newman model, various subsystems, CPU, Memory, I/O, System Bus, CPU and Memory registers, Program Counter, Accumulator, Instruction register, Micro operations, Register Transfer Language, Instruction Fetch, decode and execution, data movement and manipulation, Instruction formatsand addressing modes of basic computer.

Module II
Control Module Organization: Hardwired control Module , Micro programmed control Module Control Memory, Address Sequencing, Micro Instruction formats, Micro program sequencer, Microprogramming, Arithmetic and Logic Module: Arithmetic Processor, Addition, subtraction, multiplicationanddivision,FloatingpointanddecimalarithmeticandarithmeticModules,designof arithmetic Module.

Module III
System Organization: Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, Asynchronous data transfer, I/O processor Multiprocessors: Pipeline and Vector processing, Instruction and arithmetic pipelines, Vector and array processors,Interconnection structure and inter-processor communication.

Module IV
Memory organization: Memory Maps, Memory Hierarchy, Cache Memory - Organizationand mappings. Associative memory, Virtual memory, Memory Management Hardware.

Module V
Introduction to Microprocessor: 8085 architecture and organization, instruction set , counters and timing delays, stacks and subroutines , 8085 I/O structure, Interrupts , basic Interfacing concept , memory mapped and I/Omapped I/O, basic programming.

Text Books:
1. MorrisMano:Computer SystemArchitecture,PHI.
2. Gaonkar:MicroprocessorArchitecture,Programming,Applicationswith8085;PenramInt.

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List of Experiments :

1. REVERSING AN ARRAY A block of 16 bytes are residing at locations standing from BLOCK1 WAP to transfer the block in reverse order at locations starting form BLOCK. 2.

2. SORTING IN ASCENDING ORDER: A block (16 bytes are residing at locations starting from DATA: write a program to arrange the word in the same location in ascending order.

3. BINARY ADDITION: 16 bytes are residing at location starting from DATA WAP: to add all bytes and store the result location SUM and SUM+1.

4. BCD ADDITION: 16 BCD NUMBER are residing at location starting from DATA WAP: to add all bytes and store the result location SUM and SUM+1

5. MULTIPLICATION: Two bytes are residing at location DATA 1 and DATA 2. Write a program to multiply the two bytes and store the result at location PROD 1 and PROD 2.

6. BINARY TO BCD: A binary number is residing at location BIN > WAP to convert the binary number into its equivalent BCD and store the result at BCD and BCD + 1

7. BCD TO BINARY: A BCD number is residing at location BCD; write a program to convert the BCD number into its equivalent binary and store the result at BIN.

8. MULTIBYTE ADDITION: Two 10 bytes are residing at location starting from DATA 1 and DATA 2 respectively. Write a program to add them up and store the result at location starting from RESULT (result space 11 bytes)

9. MULTIBYTE BCD ADDITION: Two 6 digit BCD numbers are residing at location starting from DATA 1 and DATA 2 respectively. Write a program to add them up and store the result at locations starting from RESULT (Result space 7 bytes.).

10. RST 6.5: A block of 16 bytes is residing at location starting from DATA reverse the block and store the bytes at REVERSE whenever the RST 6.5 key is pressed.

11. EDITING OF ASCII STRING: A string of ASCII characters is residing at locations starting from READ which contain "IS BE $ AN $ ENGINEER". Edit string in such a way that it should contain "1 $ will $ be $ Engineer" keep the edited string in the same locations. Product the string from further editing. ($ stands for a blank).

12. SIGNED BINARY ADDITION: A block of 16 signed binary numbers is residing at location NUMBERS. Add them up and store the result (in signed binary) at locations from RESULT.

13. ASCII CODE CONVERSION: A string of 16 ASCII characters are residing at locations starting from DATA. The string consists of codes for capital letters, small letters and BCD digits (0-9) Convert the ASCII characters in such a way that the codes for capital letters be converted into corresponding codes for small letters, codes for small letters into that of capital letters and codes for BCD digits into that of BCD number and store them at the same locations.

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14. PARITY CHECK: A block of 32 bytes is residing at DATA count the number (BCD) of times even and odd PARITY bytes are appearing consecutive memory locations. Keep the count at MATCH.

15. SERIES GENERATION: Two BCD number a and b are residing at locations DATA 1 and DATA 2 respectively. Write a program to form a series in BCD with the elements of a. a + 2b, a + 4b, a+ 6b, Stop the generation of the series whenever any element of the series in BCD with the elements of the series exceeds (99). Store the result at locations starting from RESULT. Count the number (BCD) of elements in the series and store it a NUMBER.

Course Outcomes:

CO 1. To give overview of computer basics, organization and subsystems.

CO 2. To familiarize with different control generation techniques and design of A.L.U.

CO 3. To familiarize with data transfer modes and processing techniques.

CO 4.To compare various memory management techniques and mapping.

CO 5. To introduce with the microprocessor 8085 architecture and its instruction set.

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Subject Code	Subject Name and Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total	L	T	P	
		End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work					
IT44	PRINCIPLES OF COMMUNICATION	70	20	10	30	20	150	3	-	2	4

Module I
Data and signal-Analog and digital signals, Time and frequency domain, Composite signals, Bandwidth, bit rate, bit length, Baseband and broadband transmission, Attenuation, distortion, noise, Nyquist bit rate ,Shannon capacity, Throughout, delay ,Jitter, Bandwidth delay product.

Module II
Sampling theorem, quantization, PCM, Delta modulation, Adaptive delta modulation, DPCM, bandwidth of PCM and delta modulation. ASK, BPSK, QPSK, DPSK, BFSK.

Module III
Data transmission – Parallel and serial transmission, synchronous, and Asynchronous transmission, Simplex, half duplex and full duplex , unipolar and polar line codes, Non return to zero codes, return to zero codes, bipolar line codes, bauds , modem, Line configurations Point to point and point to multipoint configuration. Multiplexer:TDM, FDM, WDM. Data compression devices, Inverse multiplexer.

Module IV
Digital interface standards: RS-232 standard, hand shaking, connecting a DTE in RS-232 C, RS 449, RS-422A andRS-423A standards. High-speed desktop serial interfaces. Remote digital transmission carrier ISDN, Packet data network, Modems, multispeed modems, high speed modems, Error Correcting modems, data compression in modems. Short-wave modems.

Module V
Data Integrity, sources of error control approaches. Implementation of error control Echo checking parity checkingand cyclical purity, Hammering code, checksums, Cyclical Redundancy check. Security and security measures. Transmission media-Guided and unguided media, twisted pair, Unshielded twisted pair and Shielded twisted pair, coaxial cable.

Text Book:

1. Data & Computer Communication, William Stallings – Pearson Education

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Subject Code	Subject Name and Title	Maximum Marks Allotted						Hours/Week			Total Credits
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		End Sem	Mid Sem Exam	Quiz Assignment	End Sem	Lab Work					
IT45	System Analysis And Software Engineering	70	20	10	-	-	100	3	1	-	4

Module I
Introduction of system development: Approach to system development Structured System Analysis and Design, Prototype, Joint Application Development Role and Need of Systems Analyst Qualifications and responsibilities System Analysis as a Profession, Development Life Cycle (SDLC)Various phases of SDLC: Study Analysis Design, Development, Implementation, Maintenance, Documentation: Principles of Systems ,Documentation.

Module II
The Software Product and Software Process: Software Product and Process Characteristics Software Process Models: Linear Sequential Model, Prototyping Model, RAD Model, Evolutionary Process Models like Incremental Model Spiral Model, Component Assembly Model, RUP and Agile processes. Software Process customization and Improvement, CMM, Product and Process Metrics

Module III
Requirement Elicitation & Software design: Functional and Non-functional requirements, Requirement Sources and Elicitation Techniques, Use case Modeling System and Software Requirement Specifications, Requirement Validation Traceability, Design Concepts and Principles Software Domain Modeling and UML, Architectural Design, Architectural Views and Styles, User Interface Design, Object-Oriented Design, Subsystem design, Object design, Function-oriented Design Data flow diagrams,ERD, Context diagrams SA/SD design method, Coupling & cohesion.

Module IV
Software Analysis and Testing: Software Analysis and Testing Software Static and Dynamic analysis, Code inspections, Software Testing Fundamentals Software Test Process, Testing Levels Test Criteria Test Case Design, Test Oracles, Test Techniques, Black-Box Testing, White-Box Module Testing and Module Testing Frameworks, Integration Testing. System Testing and other Specialized Testing. Test Metrics, Testing Tools.

Module V
Software Maintenance & Software Project Measurement: Need and Types of Maintenance, Software Configuration Management (SCM) Software Change Management, Version Control Change control and Reporting Program Comprehension Techniques, Re-engineering. Reverse Engineering. Tool Support. Project Management Concepts, Feasibility Analysis, Project and Process Planning. Resources Allocations, Software efforts, Schedule, and Cost estimations, Project Scheduling and Tracking, Risk Assessment and Mitigation, Software Quality Assurance (SQA). Project Plan, Project Metrics.

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Reference Books:

1. Hoffer J. A, George J.F, Valacich J.S, and Panigrahi P.K "Modern Systems Analysis and Design", PearsonEducation, 2007.
2. A .Dennis and B. H.Wixom, "Systems Analysis and Design", John Wiley & Sons, Inc.
3. Pankaj Jalote "An Integrated Approach to Software Engineering', 3rd Edition, Narosa Pub, 2005
4. R s Presaman, "Software Engineering: A Practitioner's Approach*, Sixth edition 2006, Mc Graw-Hill.
5. Rajib Mall, "Fundamentals of Software Engineering* Second Edition, PHI Learning.
Sommerville, "Software Engineering Pearson Education.

Course Outcomes:

CO1. To discuss various types of systems and their environment and boundaries.

CO2. To familiarize with System Development Life Cycle.

CO3. To understand the system planning and fact gathering techniques.

CO4. To understand the system design and modeling.

CO5. To give the overview of the system implementation and maintenance.

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