DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

Evaluation Scheme & Syllabus

For

B.Tech. 2nd Year

Artificial Intelligence and Data Science

Artificial Intelligence and Machine Learning

Computer Science & Design

On

AICTE Model Curriculum

(Effective from the Session: 2022-23)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

B.TECH (COMPUTER SCIENCE AND ENGINEERING

Artificial Intelligence and Data Science
Artificial Intelligence and Machine Learning
Computer Science & Design

SEMESTER- III

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KOE031-038 / KAS302	Engineering Science Course/ Maths IV	3	1	0	30	20	50		100		150	4
2	KAS301/ KVE 301	Technical Communication/Universal Human values	2 3	1 0	0 0	30	20	50		100		150	3
3	KCS301	Data Structure	3	1	0	30	20	50		100		150	4
4	KCS302	Computer Organization and Architecture	3	1	0	30	20	50		100		150	4
5	KCS303	Discrete Structures & Theory of Logic	3	0	0	30	20	50		100		150	3
6	KCS351	Data Structures Using C Lab	0	0	2				25		25	50	1
7	KCS352	Computer Organization Lab	0	0	2				25		25	50	1
8	KCS353	Discrete Structure & Logic Lab	0	0	2				25		25	50	1
9	KCS354	Mini Project or Internship Assessment*	0	0	2			50				50	1
10	KNC301/ KNC302	Computer System Security/Python Programming	2	0	0	15	10	25		50			0
11		MOOCs (Essential for Hons. Degree)											
		Total										**950**	**22**

*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.

SEMESTER- IV

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KAS402/ KOE041-048	Maths IV/Engg. Science Course	3	1	0	30	20	50		100		150	4
2	KVE401/ KAS401	Universal Human Values/ Technical Communication	3 2	0 1	0 0	30	20	50		100		150	3
3	KCS401	Operating Systems	3	0	0	30	20	50		100		150	3
4	KCS402	Theory of Automata and Formal Languages	3	1	0	30	20	50		100		150	4
5	KCS403	Microprocessor	3	1	0	30	20	50		100		150	4
6	KCS451	Operating Systems Lab	0	0	2				25		25	50	1
7	KCS452	Microprocessor Lab	0	0	2				25		25	50	1
8	KCS453	Python Language Programming Lab	0	0	2				25		25	50	1
9	KNC402/ KNC401	Python Programming/Computer System Security	2	0	0	15	10	25		50			0
10		MOOCs (Essential for Hons. Degree)											
		Total										**900**	**21**

B.TECH. (COMPUTER SCIENCE AND ENGINEERING
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THIRD SEMESTER (DETAILED SYLLABUS)

KCS 301	**DATA STRUCTURE**	
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.	**K_1, K_2**
CO 2	Discuss the computational efficiency of the sorting and searching algorithms.	**K_2**
CO 3	Implementation of Trees and Graphs and perform various operations on these data structure.	**K_3**
CO 4	Understanding the concept of recursion, application of recursion and its implementation and removal of recursion.	**K_4**
CO 5	Identify the alternative implementations of data structures with respect to its performance to solve a real world problem.	**K_5, K_6**
DETAILED SYLLABUS		**3-1-0**

Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Basic Terminology, Elementary Data Organization, Built in Data Types in C. Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big Oh, Big Theta and Big Omega, Time-Space trade-off. Abstract Data Types (ADT) **Arrays**: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Array Application of arrays, Sparse Matrices and their representations. **Linked lists:** Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplications of Single variable & Two variables Polynomial.	08
II	**Stacks:** Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Tradeoffs between iteration and recursion. **Queues:** Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	08
III	**Searching:** Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution Techniques used in Hashing. **Sorting:** Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort.	08
IV	**Graphs:** Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and	08

	Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.	
V	**Trees:** Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer(Linked List) Representation, Binary Search Tree, Strictly Binary Tree ,Complete Binary Tree . A Extended Binary Trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Constructing Binary Tree from given Tree Traversal, Operation of Insertation , Deletion, Searching & Modification of data in Binary Search . Threaded Binary trees, Traversing Threaded Binary trees. Huffman coding using Binary Tree. Concept & Basic Operations for AVL Tree , B Tree & Binary Heaps	08

Text books:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India.
3. Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
4. Thareja, "Data Structure Using C" Oxford Higher Education.
5. AK Sharma, "Data Structure Using C", Pearson Education India.
6. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.
7. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India.
8. P. S. Deshpandey, "C and Data structure", Wiley Dreamtech Publication.
9. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education.
10. Berztiss, AT: Data structures, Theory and Practice, Academic Press.
11. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill.
12. Adam Drozdek "Data Structures and Algorithm in Java", Cengage Learning

KCS 302	COMPUTER ORGANIZATION AND ARCHITECTURE	
	Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
	At the end of course , the student will be able to understand	
CO 1	Study of the basic structure and operation of a digital computer system.	K_1, K_2
CO 2	Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations.	K_2, K_4
CO 3	Implementation of control unit techniques and the concept of Pipelining	K_3
CO 4	Understanding the hierarchical memory system, cache memories and virtual memory	K_2
CO 5	Understanding the different ways of communicating with I/O devices and standard I/O interfaces	K_2, K_4

DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction**: Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes.	**08**
II	**Arithmetic and logic unit:** Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers	**08**
III	**Control Unit:** Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming.	**08**
IV	**Memory:** Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.	**08**
V	**Input / Output**: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	**08**

Text books:

1. Computer System Architecture - M. Mano
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012
3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998. Reference books
4. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006.
5. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression, 2011.
6. David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier, a division of reed India Private Limited, Fifth edition, 2012
7. Structured Computer Organization, Tannenbaum(PHI)

KCS 303	DISCRETE STRUCTURES & THEORY OF LOGIC	
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 traversal methods for trees and graphs.	K_1, K_4
CO 5	Model problems in Computer Science using graphs and trees.	K_2, K_6

DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	**Set Theory**: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets. 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	**Trees:** Definition, Binary tree, Binary tree traversal, Binary search tree. **Graphs:** Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring, Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences. **Combinatorics**: Introduction, Counting Techniques, Pigeonhole Principle	**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.

4. Deo, 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

KCS 351 DATA STRUCTURE USING C LAB

Write C Programs to illustrate the concept of the following:

1. Sorting Algorithms-Non-Recursive.
2. Sorting Algorithms-Recursive.
3. Searching Algorithm.
4. Implementation of Stack using Array.
5. Implementation of Queue using Array.
6. Implementation of Circular Queue using Array.
7. Implementation of Stack using Linked List.
8. Implementation of Queue using Linked List.
9. Implementation of Circular Queue using Linked List.
10. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
11. Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm.

KCS 352 COMPUTER ORGANIZATION LAB

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER.
4. Implementing 4x1 and 8x1 MULTIPLEXERS.
5. Verify the excitation tables of various FLIP-FLOPS.
6. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
7. Design of an 8-bit ARITHMETIC LOGIC UNIT.
8. Design the data path of a computer from its register transfer language description.
9. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
10. Implement a simple instruction set computer with a control unit and a data path.

KCS 353 DISCRETE STRUCTURE & LOGIC LAB

Programming Language/Tool Used: C and Mapple

1. Write a program in C to create two sets and perform the Union operation on sets.
2. Write a program in C to create two sets and perform the Intersectison operation on sets.
3. Write a program in C to create two sets and perform the Difference operation on sets.
4. Write a program in C to create two sets and perform the Symmetric Difference operation.
5. Write a program in C to perform the Power Set operation on a set.
6. Write a program in C to Display the Boolean Truth Table for AND, OR , NOT .
7. Write a C Program to find Cartesian Product of two sets
8. Write a program in C for minimum cost spanning tree.
9. Write a program in C for finding shortest path in a Graph

Note: Understanding of mathematical computation software Mapple to experiment the followings (exp. 10 to 25):

10. Working of Computation software
11. Discover a closed formula for a given recursive sequence vice-versa
12. Recursion and Induction
13. Practice of various set operations
14. Counting
15. Combinatorial equivalence
16. Permutations and combinations
17. Difference between structures, permutations and sets
18. Implementation of a recursive counting technique
19. The Birthday problem
20. Poker Hands problem
21. Baseball best-of-5 series: Experimental probabilities
22. Baseball: Binomial Probability
23. Expected Value Problems
24. Basketball: One and One
25. Binary Relations: Influence

B.TECH.

Artificial Intelligence and Data Science
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FOURTH SEMESTER (DETAILED SYLLABUS)

KCS 401	**OPERATING SYSTEM**	
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Understand the structure and functions of OS	K_1, K_2
CO 2	Learn about Processes, Threads and Scheduling algorithms.	K_1, K_2
CO 3	Understand the principles of concurrency and Deadlocks	K_2
CO 4	Learn various memory management scheme	K_2
CO 5	Study I/O management and File systems.	K_2,K_4

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction** : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	**08**
II	**Concurrent Processes**: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.	**08**
III	**CPU Scheduling:** Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	**08**
IV	**Memory Management:** Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	**08**
V	**I/O Management and Disk Scheduling**: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	**08**

Text books:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education
3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
4. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition,
5. TMH 5. William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education

KCS 402	THEORY OF AUTOMATA AND FORMAL LANGUAGES	
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars	K_4, K_6
CO 2	Analyze and design, Turing machines, formal languages, and grammars	K_4, K_6
CO 3	Demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving	K_1, K_5
CO 4	Prove the basic results of the Theory of Computation.	K_2,K_3
CO 5	State and explain the relevance of the Church-Turing thesis.	K_1, K_5

DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	**Basic Concepts and Automata Theory:** Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition, Finite Automata with output- Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata, Myhill-Nerode Theorem, Simulation of DFA and NFA	**08**
II	**Regular Expressions and Languages:** Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem, Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability- Decision properties, Finite Automata and Regular Languages, Regular Languages and Computers, Simulation of Transition Graph and Regular language.	**08**
III	**Regular and Non-Regular Grammars**: Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Programming problems based on the properties of CFGs.	**08**
IV	**Push Down Automata and Properties of Context Free Languages**: Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata(DPDA) and Deterministic Context free Languages(DCFL), Pushdown Automata for Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming problems based on the properties of CFLs.	**08**
V	**Turing Machines and Recursive Function Theory** : Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem, Post's Correspondance Problem, Introduction to Recursive Function Theory.	**08**

Text books:

1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia
2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill
3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI
4. Mathematical Foundation of Computer Science, Y.N.Singh, New Age International

KCS 403	MICROPROCESSOR	
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Apply a basic concept of digital fundamentals to Microprocessor based personal computer system.	K_3, K_4
CO 2	Analyze a detailed s/w & h/w structure of the Microprocessor.	K_2,K_4
CO 3	Illustrate how the different peripherals (8085/8086) are interfaced with Microprocessor.	K_3
CO 4	Analyze the properties of Microprocessors(8085/8086)	K_4
CO 5	Evaluate the data transfer information through serial & parallel ports.	K_5

DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	Microprocessor evolution and types, microprocessor architecture and operation of its components, addressing modes, interrupts, data transfer schemes, instruction and data flow, timer and timing diagram, Interfacing devices.	**08**
II	Pin diagram and internal architecture of 8085 microprocessor, registers, ALU, Control & status, interrupt and machine cycle. Instruction sets. Addressing modes. Instruction formats Instruction Classification: data transfer, arithmetic operations, logical operations, branching operations, machine control and assembler directives.	**08**
III	Architecture of 8086 microprocessor: register organization, bus interface unit, execution unit, memory addressing, and memory segmentation. Operating modes. Instruction sets, instruction format, Types of instructions. Interrupts: hardware and software interrupts.	**08**
IV	Assembly language programming based on intel 8085/8086. Instructions, data transfer, arithmetic, logic, branch operations, looping, counting, indexing, programming techniques, counters and time delays, stacks and subroutines, conditional call and return instructions	**08**
V	Peripheral Devices: 8237 DMA Controller, 8255 programmable peripheral interface, 8253/8254programmable timer/counter, 8259 programmable interrupt controller, 8251 USART and RS232C.	**08**

Text books:

1. Gaonkar, Ramesh S , "Microprocessor Architecture, Programming and Applications with
2. 8085", Penram International Publishing.
3. Ray A K , Bhurchandi K M , "Advanced Microprocessors and Peripherals", TMH
4. Hall D V ,"Microprocessor Interfacing', TMH
5. Liu and, " Introduction to Microprocessor", TMH
6. Brey, Barry B, "INTEL Microprocessors", PHI
7. Renu Sigh & B.P. Gibson G A , " Microcomputer System: The 8086/8088 family'' ,PHI
8. Aditya P Mathur Sigh, "Microprocessor, Interfacing and Applications M Rafiqzzaman, "Microprocessors, Theory and Applications
9. J.L. Antonakos, An Introduction to the Intel Family of Microprocessors, Pearson, 1999

KCS 451 OPERATING SYSTEM LAB

1. Study of hardware and software requirements of different operating systems (UNIX,LINUX,WINDOWS XP, WINDOWS7/8
2. Execute various UNIX system calls for
    i. Process management
    ii. File management
    iii. Input/output Systems calls
3. Implement CPU Scheduling Policies:
    i. SJF
    ii. Priority
    iii. FCFS
    iv. Multi-level Queue
4. Implement file storage allocation technique:
    i. Contiguous(using array)
    ii. Linked –list(using linked-list)
    iii. Indirect allocation (indexing)
5. Implementation of contiguous allocation techniques:
    i. Worst-Fit
    ii. Best- Fit
    iii. First- Fit
6. Calculation of external and internal fragmentation
    i. Free space list of blocks from system
    ii. List process file from the system
7. Implementation of compaction for the continually changing memory layout and calculate total movement of data
8. Implementation of resource allocation graph RAG)
9. Implementation of Banker‟s algorithm
10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
11. Implement the solution for Bounded Buffer (producer-consumer)problem using inter process communication techniques-Semaphores
12. Implement the solutions for Readers-Writers problem using inter process communication technique -Semaphore

KCS 452 MICROPROCESSOR LAB

1. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085.
4. To find the largest and smallest number in an array of data using 8085 instruction set.
5. To write a program to arrange an array of data in ascending and descending order.
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set.
7. To write a program to initiate 8251 and to check the transmission and reception of character.
8. To interface 8253 programmable interval timer to 8085 and verify the operation of 8253 in six different modes.
9. To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave.
10. Serial communication between two 8085 through RS-232 C port**.**

KCS 453 PYTHON LANGUAGE PROGRAMMING LAB

1. To write a python program that takes in command line arguments as input and print the number of arguments.
2. To write a python program to perform Matrix Multiplication.
3. To write a python program to compute the GCD of two numbers.
4. To write a python program to find the most frequent words in a text file.
5. To write a python program find the square root of a number (Newton's method).
6. To write a python program exponentiation (power of a number).
7. To write a python program find the maximum of a list of numbers.
8. To write a python program linear search.
9. To write a python program Binary search.
10. To write a python program selection sort.
11. To write a python program Insertion sort.
12. To write a python program merge sort.
13. To write a python program first n prime numbers.
14. To write a python program simulate bouncing ball in Pygame.