INSTITUTE OF ENGINNERING AND TECHNOLOGY LUCKNOW

(An Autonomous Constituent Institute of Dr. A.P.J. Abdul Kalam Technical University, Lucknow)

Evaluation Scheme & Syllabus

For

B. Tech. Second Year
(Computer Science and Engineering)

AS PER

AICTE MODEL CURRICULUM

[Effective from the Session: 2019-20]

B.TECH (COMPUTER SCIENCE AND ENGINEERING)

SEMESTER- III

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme			End Semester			Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KOE031-38/ 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	1	0	30	20	50		100		150	3
			3	0	0								
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.

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
		SEMESTER- IV											
1	KAS402/ KOE041-48	Maths IV/Engg. Science Course	3	1	0	30	20	50		100		150	4
2	KVE401/ KAS301	Universal Human Values/ Technical Communication	3	0	0	30	20	50		100		150	3
			2	1	0								
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)
THIRD SEMESTER (DETAILED SYLLABUS)

<table>
<tr><td colspan="3" align="center">DATA STRUCTURE (KCS301)</td></tr>
<tr><td colspan="2" align="center">Course Outcome (CO)</td><td align="center">Bloom's Knowledge Level (KL)</td></tr>
<tr><td colspan="3" align="center">At the end of course , the student will be able to understand</td></tr>
<tr><td>CO 1</td><td>Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.</td><td align="center">K_1, K_2</td></tr>
<tr><td>CO 2</td><td>Discuss the computational efficiency of the sorting and searching algorithms.</td><td align="center">K_2</td></tr>
<tr><td>CO 3</td><td>Implementation of Trees and Graphs and perform various operations on these data structure.</td><td align="center">K_3</td></tr>
<tr><td>CO 4</td><td>Understanding the concept of recursion, application of recursion and its implementation and removal of recursion.</td><td align="center">K_4</td></tr>
<tr><td>CO 5</td><td>Identify the alternative implementations of data structures with respect to its performance to solve a real world problem.</td><td align="center">K_5, K_6</td></tr>
<tr><td colspan="2" align="center">DETAILED SYLLABUS</td><td align="center">3-1-0</td></tr>
<tr><td align="center">Unit</td><td align="center">Topic</td><td align="center">Proposed Lecture</td></tr>
<tr><td align="center">I</td><td>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.</td><td align="center">08</td></tr>
<tr><td align="center">II</td><td>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.</td><td align="center">08</td></tr>
<tr><td align="center">III</td><td>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.</td><td align="center">08</td></tr>
<tr><td align="center">IV</td><td>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 Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.</td><td align="center">08</td></tr>
</table>

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

Computer Organization and Architecture (KCS302)	
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)

Discrete Structures & Theory of Logic (KCS303)		
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		**3-0-0**
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

Data Structure using C Lab (KCS351)

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.

Computer Organization Lab (KCS352)

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.

Discrete Structure & Logic Lab (KCS353)

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. (COMPUTER SCIENCE AND ENGINEERING)

FOURTH SEMESTER (DETAILED SYLLABUS)

Operating systems (KCS401)		
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

Theory of Automata and Formal Languages (KCS402)	
Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand	

	Course Outcome	Bloom's Knowledge Level (KL)
CO 1	Analyse and design finite automata, pushdown automata, Turing machines, formal languages, and grammars	K_4, K_6
CO 2	Analyse 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 Internationa

Microprocessor (KCS403)		
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

Operating Systems Lab (KCS451)

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

Microprocessor Lab (KCS452)

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.

Python Language Programming Lab (KCS453)

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.

Engineering Science Courses for B.Tech.(AICTE Model Curriculum) 2nd Year
(effective from the session 2019-20)

Sl.No.	Subject Codes	Subject	Periods			Evaluation Scheme			End Semester			Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KOE031/041	Engineering Mechanics	3	1	0	30	20	50		100		150	4
2	KOE032/042	Material Science	3	1	0	30	20	50		100		150	4
3	KOE033/043	Energy Science & Engineering	3	1	0	30	20	50		100		150	4
4	KOE034/044	Sensor & Instrumentation	3	1	0	30	20	50		100		150	4
5	KOE035/045	Basics Data Structure & Algorithms	3	1	0	30	20	50		100		150	4
6	KOE036/046	Introduction to Soft Computing	3	1	0	30	20	50		100		150	4
7	KOE037/047	Analog Electronics Circuits	3	1	0	30	20	50		100		150	4
8	KOE038/048	Electronics Engineering	3	1	0	30	20	50		100		150	4

<div style="text-align:center">SEMESTER- III/IV</div>

Sl.No.	Subject	
1	Engineering Mechanics	To be offered to any Engg. Branch except ME/CE/AG and allied branches
2	Material Science	
3	Energy Science & Engineering	To be offered to any Engg. Branch except EE and allied branches
4	Sensor & Instrumentation	
5	Basics Data Structure & Algorithms	To be offered to any Engg. Branch except CSE and allied branches
6	Introduction to Soft Computing	
7	Analog Electronics Circuits	To be offered to any Engg. Branch except EC and allied branches
8	Electronics Engineering	

Important Note: CH/BT/TX Engg. and allied branches can be offered any of the above listed ES.

ENGINEERING MECHANICS

UNIT-I:
Two-dimensional force systems: Basic concepts, Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel position, resultant of a force system, simplest resultant of two dimensional concurrent and non-concurrent force systems, distribution of force systems, free body diagrams, equilibrium and equations of equilibrium.
Friction: Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction.

UNIT-II:
Beam: Introduction, shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams.
Trusses: Introduction, simple truss and solution of simple truss, methods of F-joint and methods of sections.

UNIT-III:
Centroid and moment of inertia: Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem, perpendicular axis theorem, principle moment of inertia, mass moment of inertia of circular ring, disc, cylinder, sphere, and cone about their axis of symmetry.

UNIT-IV:
Kinematics of rigid body: Introduction, plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity.
Kinetics of rigid body: Introduction, force, mass and acceleration, work and energy, impulse and momentum, D'Alembert's principle and dynamic equilibrium.

UNIT-V:
Simple stress and strain: Introduction, normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants, one-dimensional loading of members of varying cross sections, strain energy.
Pure bending of beams: Introduction, simple bending theory, stress in beams of different cross sections.
Torsion: Introduction, torsion of shafts of circular cross sections, torque and twist, shear stress due to torque.

Books and References:

1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010).
3. A Textbook of Engineering Mechanics, R.K. Bansal, Laxmi Publications.
4. Engineering Mechanics, R.S. Khurmi, S.Chand Publishing.
5. Meriam J.L. and Kraige L.G., "Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2", Third Edition, John Wiley & Sons (1993).
6. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3 rd Edition, Vikas Publishing House Pvt. Ltd., (2005).
7. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, (1998).
8. Engineering mechanics by Irving H. Shames, Prentice-Hall.

MATERIAL SCIENCE

UNIT-I:
Phase Diagrams:
Solid solutions – Hume Rothery's rules – the phase rule – single component system – one-component system of iron – binary phase diagrams – isomorphous systems – the tie-line rule – the lever rule – application to isomorphous system – eutectic phase diagram – peritectic phase diagram – other invariant reactions – free energy composition curves for binary systems – microstructural change during cooling.

UNIT-II:
Ferrous Alloys:
The iron-carbon equilibrium diagram – phases, invariant reactions – microstructure of slowly cooled steels – eutectoid steel, hypo and hypereutectoid steels – effect of alloying elements on the Fe-C system – diffusion in solids – Fick's laws – phase transformations – T-T-T-diagram for eutectoid steel – pearlitic, baintic and martensitic transformations – tempering of martensite – steels – stainless steels – cast irons.

UNIT-III:
Mechanical Properties:
Tensile test – plastic deformation mechanisms – slip and twinning – role of dislocations in slip – strengthening methods – strain hardening – refinement of the grain size – solid solution strengthening – precipitation hardening – creep resistance – creep curves – mechanisms of creep – creep-resistant materials – fracture – the Griffith criterion – critical stress intensity factor and its determination – fatigue failure – fatigue tests – methods of increasing fatigue life – hardness – Rockwell and Brinell hardness – Knoop and Vickers microhardness.

UNIT-IV:
Magnetic, Dielectric & Superconducting Materials:
Ferromagnetism – domain theory – types of energy – hysteresis – hard and soft magnetic materials – ferrites – dielectric materials – types of polarization – Langevin-Debye equation – frequency effects on polarization – dielectric breakdown – insulating materials – Ferroelectric materials – superconducting materials and their properties.

UNIT-V:
New Materials:
Ceramics – types and applications – composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics – metallic glasses: types , glass forming ability of alloys, melt spinning process, applications – shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy, applications – nanomaterials: preparation (bottom up and top down approaches), properties and applications – carbon nanotubes: types.

Text Books & References:

1. Balasubramanian, R. ―Callister's Materials Science and Engineeringǁ. Wiley India Pvt. Ltd., 2014.
2. Raghavan, V. ―Physical Metallurgy: Principles and Practiceǁ. PHI Learning, 2015.
3. Raghavan, V. ―Materials Science and Engineering: A First courseǁ. PHI Learning, 2015.
4. Askeland, D. ―Materials Science and Engineeringǁ. Brooks/Cole, 2010.

5.Smith, W.F., Hashemi, J. & Prakash, R. ―Materials Science and Engineering‖. Tata McGraw Hill Education Pvt. Ltd., 2014.
6. Wahab, M.A. ―Solid State Physics: Structure and Properties of Materials‖. Narosa Publishing House, 2009.

Energy Science and Engineering

Unit-I Energy and its Usage: Units and scales of energy use, Mechanical energy and transport, Heat energy: Conversion between heat and mechanical energy, Electromagnetic energy: Storage, conversion, transmission and radiation, Introduction to the quantum, energy quantization, Energy in chemical systems and processes, flow of CO_2, Entropy and temperature, carnot and Stirling heat engines, Phase change energy conversion, refrigeration and heat pumps, Internal combustion engines, Steam and gas power cycles, the physics of power plants. Solid-state phenomena including photo, thermal and electrical aspects

Unit-II Nuclear Energy: Fundamental forces in the universe, Quantum mechanics relevant for nuclear physics, Nuclear forces, energy scales and structure, Nuclear binding energy systematics, reactions and decays, Nuclear fusion, Nuclear fission and fission reactor physics, Nuclear fission reactor design, safety, operation and fuel cycles

Unit-III Solar Energy: Introduction to solar energy, fundamentals of solar radiation and its measurement aspects, Basic physics of semiconductors, Carrier transport, generation and recombination in semiconductors, Semiconductor junctions: metal-semiconductor junction & p-n junction, Essential characteristics of solar photovoltaic devices, First Generation Solar Cells, Second Generation Solar Cells, Third Generation Solar Cells

Unit-IV Conventional & non-conventional energy source: Biological energy sources and fossil fuels, Fluid dynamics and power in the wind, available resources, fluids, viscosity, types of fluid flow, lift, Wind turbine dynamics and design, wind farms, Geothermal power and ocean thermal energy conversion, Tidal/wave/hydro power

Unit-V Systems and Synthesis: Overview of World Energy Scenario, Nuclear radiation, fuel cycles, waste and proliferation, Climate change, Energy storage, Energy conservation. Engineering for Energy conservation: Concept of Green Building and Green Architecture; Green building concepts, LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption

Reference/Text Books
1. Energy and the Challenge of Sustainability, World Energy Assessment, UNDP, New York, (2000).
2. Perspective of Modern Physics, A. Beiser, McGraw-Hill International Editions (1968).
3. Introduction to Modern Physics, H.S. Mani and G.K.Mehta, East-West Press (1988).
4. Introduction to Electrodynamics, D. J. Griffiths, Fourth Edition, Prentice Hall (2013).
5. Introductory Nuclear Physics, R. K. Puri and V.K. Babbar, Narosa Publishing House (1996).
6. Physics of Solar Cells: From Basic Principles to Advanced Concepts by Peter Wurfel, John Wiley & Sons, 2016
7. Principles of Solar Engineering, D.Y. Goswami, F.Kreith and J.F. Kreider, Taylor and Francis, Philadelphia, 2000.

SENSOR AND INSTRUMENTATION

Pre-requisites of course: Basic Electrical Engineering

Course Outcomes:	Knowledge Level, KL
Upon the completion of the course, the student will be able to:	
CO 1 Apply the use of sensors for measurement of displacement, force and pressure.	K_3
CO2 Employ commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.	K_3
CO3 Demonstrate the use of virtual instrumentation in automation industries.	K_2
CO4 Identify and use data acquisition methods.	K_3
CO5 Comprehend intelligent instrumentation in industrial automation.	K_2

Detailed Syllabus:

Unit- I:
Sensors & Transducer: Definition, Classification & selection of sensors, Measurement of displacement using Potentiometer, LVDT & Optical Encoder, Measurement of force using strain gauge, Measurement of pressure using LVDT based diaphragm & piezoelectric sensor.

Unit-II:
Measurement of temperature using Thermistor, Thermocouple & RTD, Concept of thermal imaging, Measurement of position using Hall effect sensors, Proximity sensors: Inductive & Capacitive, Use of proximity sensor as accelerometer and vibration sensor, Flow Sensors: Ultrasonic & Laser, Level Sensors: Ultrasonic & Capacitive.

Unit -III:
Virtual Instrumentation: Graphical programming techniques, Data types, Advantage of Virtual Instrumentation techniques, Concept of WHILE & FOR loops, Arrays, Clusters & graphs,
Structures: Case, Sequence & Formula nodes, Need of software based instruments for industrial automation.

Unit-IV:
Data Acquisition Methods: Basic block diagram, Analog and Digital IO, Counters, Timers, Types of ADC: successive approximation and sigma-delta, Types of DAC: Weighted Resistor and R-2R Ladder type, Use of Data Sockets for Networked Communication.

Unit V:
Intelligent Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self-testing & self-communicating, Application of smart sensors: Automatic robot control & automobile engine control.

Text Books:

1. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013

2. D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013.

3. S. Gupta, J.P. Gupta / PC interfacing for Data Acquisition & Process Control, 2nd ED / Instrument Society of America, 1994.

4. Gary Johnson / Lab VIEW Graphical Programing II Edition / McGraw Hill 1997.

Reference Books:

1. Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012.

2. A.D. Helfrick and W.D. cooper,Modern Electronic Instrumentation & Measurement Techniques, PHI – 2001

3. Hermann K.P. Neubert, "Instrument Transducers" 2nd Edition 2012, Oxford University Press.

Basics Data Structure and Algorithms

	Course Outcome (CO)	Bloom's Knowledge Level (KL)
	At the end of course , the student will be able to understand	
CO 1	Understand and analyze the time and space complexity of an algorithm	K_2, K_4
CO 2	Understand and implement fundamental algorithms (including sorting algorithms, graph algorithms, and dynamic programming)	K_2, K_3
CO 3	Discuss various algorithm design techniques for developing algorithms	K_1, K_2
CO 4	Discuss various searching, sorting and graph traversal algorithms	K_2, K_3
CO 5	Understand operation on Queue , Priority Queue , D-Queue.	K_2

K_1- Remember, K_2- Understand, K_3- Apply, K_4- Analyze, K_5- Evaluate, K6- Create

Unit	Topic	Proposed Lecture

Basics Data Structure and Algorithms

Detailed Syllabus

Unit	Topic	Proposed Lecture
I	**Introduction to data structure and Algorithms:** Performance analysis of Algorithm, time complexity, Big-oh notation, Elementary data organization data structure operations, Recurrences, Arrays, Operation on arrays, representation of arrays in memory, single dimensional and multidimensional arrays, spare matrices, Character storing in C, String operations.	08
II	**Stack And Queue and Link List:** Stack operation, PUSH and POP, Array representation of stacks, Operation associated with stacks Application of stacks, Recursion, Polish experession, Representation Queue, operation on Queue , Priority Queue , D-Queue , Singly and circularly linked list, List operations Lists implementations	08
III	**Trees** : Basic terminology, Binary Trees, Binary tree representation, Algebraic/expressions, Complete Binary Trees, Extended binary tree, representing binary tress in memory, linked representation of Binary trees, Traversing binary trees & Searching in binary trees, Inserting in binary search trees, Complexity of searching algorithm, Heaps, general trees, Threaded binary tree.	08
IV	**Graphs:** Terminology & representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, adjacency Matrices, Transversal, connected component and spanning trees, Minimum Cost spanning tree, Prims and Kruskal Algorithm, BFS, DFS, Shortest path and transitive closure, Activity networks, topological sort and critical paths.	08
V	**Searching and Sorting:** Linear search, binary Search, Internal and External sorting, Bubble sorting, selection sort, Insertion sort, quick sort, Two way merge sort, Heap sort, sorting on different keys, practical consideration for internal sorting, External Sorting, Storage Devices : Magnetic tapes, Disk Storage, Sorting with disks and Indexing techniques, introduction to B tree and B+ tree, File organization and storage management, Introduction to hoisting.	08

Text books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, Introduction to Algorithms, PHI.
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication.
3. Weiss, "Data Structure & Algorithm Analysis in C", Addision Wesley.
4. Basse, "computer Algorithms: Introduction to Design & Analysis", Addision Wesley.
5. Lipschutz, "Data structure, "Schaum series.
6. Aho, hopcropt, Ullman, "Data Structure & Algorithm", Addision Wesley.
7. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008

Introduction to Soft Computing

	Course Outcome (CO)	Bloom's Knowledge Level (KL)
	At the end of course , the student will be able to understand	
CO 1	Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.	K_1, K_2
CO 2	Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic	K_2, K_3
CO 3	Describe with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.	K_4
CO 4	Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.	K_2, K_3
CO 5	Develop some familiarity with current research problems and research methods in Soft Computing Techniques.	K_5, K_6

K_1- Remember, K_2- Understand, K_3- Apply, K_4- Analyze, K_5- Evaluate, K6- Create

	Introduction to Soft Computing	
	Detailed Syllabus	
Unit	**Topic**	**Proposed Lecture**
I	Introduction to Soft Computing, **ARTIFICIAL NEURAL NETWORKS** Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self-organizing networks - Hopfield network.	08
II	**FUZZY SYSTEMS** Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.	08
III	**NEURO - FUZZY MODELING** Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing – Evolutionary computation	08
IV	**GENETIC ALGORITHMS** Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method.	08
V	**APPLICATION OF SOFT COMPUTING** Optimiation of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques.	08

Text books:

1. An Introduction to Genetic Algorithm Melanic Mitchell (MIT Press)
2. Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhnizer (Springer)
3. Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley)
4. Neural Networks and Learning Machines Simon Haykin (PHI)
5. Sivanandam, Deepa, " Principles of Soft Computing", Wiley
6. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
7. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
8. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
9. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
10. Wang, "Fuzzy Logic", Springer

Analog Electronics Circuits	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	Diode circuits, amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.	8
II	High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier, various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues, feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.	8
III	Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators.	8
IV	Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load, differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR, Op-Amp design: Design of differential amplifier for a given specification, design of gain stages and output stages, compensation.	8
V	Op-Amp applications: Review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications, active filters: Low pass, high pass, band pass and band stop, design guidelines.	8

Text/Reference Books:
1. J.V. Wait, L.P. Huelsman and GA Korn, "Introduction to Operational Amplifier theory and applications," McGraw Hill, 1992.
2. J. Millman and A. Grabel, "Microelectronics," 2nd edition, McGraw Hill, 1988.
3. P. Horowitz and W. Hill, "The Art of Electronics," 2nd edition, Cambridge University Press, 1989.
4. A.S. Sedra and K.C. Smith, "Microelectronic Circuits,"Saunder's College11 Publishing, 4th edition.
5. Paul R. Gray and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits," John Wiley, 3rd edition.
6. Muhammad H. Rashid, "Electronic Devices and Circuits," Cengage publication, 2014.

Course Outcomes:
At the end of this course students will demonstrate the ability to:
1. Understand the characteristics of diodes and transistors.
2. Design and analyze various rectifier and amplifier circuits.
3. Design sinusoidal and non-sinusoidal oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
5. Design LPF, HPF, BPF, BSF.

Electronics Engineering	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	PN junction diode: Introduction of semiconductor materials; Semiconductor diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, diode equivalent circuits, transition and diffusion capacitance, Zener diodes breakdown mechanism (Zener and avalanche).	8
II	Diode application: Series, parallel and series, parallel diode configuration, half and full wave rectification, clippers, clampers, Zener diode as shunt regulator, voltage-multiplier circuits special purpose two terminal devices : light-emitting diodes, Varactor (Varicap) diodes, tunnel diodes, liquid-crystal displays.	8
III	Bipolar junction transistors and field effect transistor: Bipolar junction transistor: Transistor construction, operation, amplification action, common base, common emitter, common collector configuration dc biasing BJTs: operating point, fixed-bias, emitter bias, voltage-divider bias configuration. Collector feedback, emitter-follower configuration. Bias stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (re Model), Field effect transistor: Construction and characteristic of JFETs. AC analysis of CS amplifier, MOSFET (depletion and enhancement) type, transfer characteristic.	8
IV	Operational amplifiers: Introduction and block diagram of Op-Amp, ideal & practical characteristics of Op-Amp, differential amplifier circuits, practical Op-Amp circuits (inverting amplifier, non-inverting amplifier, unity gain amplifier, summing amplifier, integrator, differentiator), Op-Amp parameters: input offset voltage, output offset voltage, input biased current, input offset current differential and common-mode operation.	8
V	Electronic instrumentation and measurements: Digital voltmeter: Introduction, RAMP techniques digital multimeters: Introduction Oscilloscope: introduction, basic principle, CRT, block diagram of oscilloscope, simple, measurement of voltage, current phase and frequency using CRO, introduction of digital storage oscilloscope and comparison of DSO with analog oscilloscope.	8

Text /Reference Books:
1. Robert L. Boylestand / Louis Nashelsky, "Electronic Devices and Circuit Theory," Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication.
3. Meetidehran/ A.K. singh "fundamental of electronics Engineering", New age international publisher.

Course Outcomes:
At the end of this course students will demonstrate the ability to:
1. Understand the concept of PN junction and special purpose diodes.
2. Study the application of conventional diode and semiconductor diode.
3. Analyse the I-V characteristics of BJT and FET.
4. Analyzethe of Op-Amp, amplifiers, integrator, and differentiator.
5. Understand the concept of digital storage oscilloscope and compare of DSO with analog oscilloscope

Mathematics-IV
(PDE, Probability and Statistics)
Computer/Electronics/Electrical & Allied Branches, CS/IT, EC/IC, EE/EN,
Mechanical& Allied Branches, (ME/AE/AU/MT/PE/MI/PL)
Textile/Chemical & Allied Branches, TT/TC/CT, CHE/FT

Subject Code	KAS302/KAS402					
Category	Basic Science Course					
Subject Name	MATHEMATICS-IV					
Scheme and Credits	**L-T-P**	**Theory Marks**	**Sessional**		**Total**	**Credit**
			Test	**Assig/Att.**		
	3—1—0	100	30	20	150	4
Pre- requisites (if any)	Knowledge of Mathematics I and II of B. Tech or equivalent					

Course Outcomes

The objective of this course is to familiarize the students with partial differential equation, their application and statistical techniques. It aims to present the students with standard concepts and tools at an intermediate to superior level that will provide them well towards undertaking a variety of problems in the discipline.

The students will learn:
- The idea of partial differentiation and types of partial differential equations
- The idea of classification of second partial differential equations, wave , heat equation
  and transmission lines
- The basic ideas of statistics including measures of central tendency, correlation, regression and their properties.
- The idea s of probability and random variables and various discrete and continuous probability distributions and their properties.
- The statistical methods of studying data samples, hypothesis testing and statistical quality control, control charts and their properties.

Module I: Partial Differential Equations

Origin of Partial Differential Equations, Linear and Non Linear Partial Equations of first order, Lagrange's Equations, Charpit's method, Cauchy's method of Characteristics, Solution of Linear Partial Differential Equation of Higher order with constant coefficients, Equations reducible to linear partial differential equations with constant coefficients.

Module II: Applications of Partial Differential Equations:

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

Module III: Statistical Techniques I:

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

Module IV: Statistical Techniques II:

Probability and Distribution: Introduction, Addition and multiplication law of probability, Conditional probability, Baye's theorem, Random variables (Discrete and Continuous Random variable) Probability mass function and Probability density function, Expectation and variance, Discrete and Continuous Probability distribution: Binomial, Poission and Normal distributions.

Module V: **Statistical Techniques III:**

Sampling, Testing of Hypothesis and Statistical Quality Control: Introduction , Sampling Theory (Small and Large) , Hypothesis, Null hypothesis, Alternative hypothesis, Testing a Hypothesis, Level of significance, Confidence limits, Test of significance of difference of means, T-test, F-test and Chi-square test, One way Analysis of Variance (ANOVA).Statistical Quality Control (SQC) , Control Charts , Control Charts for variables ($\overline{X}$ and R Charts), Control Charts for Variables (p, np and C charts).

Text Books
1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003(Reprint).
3. S. Ross: A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.

Reference Books
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
2.T.Veerarajan : Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi.
3. R.K. Jain and S.R.K. Iyenger: Advance Engineering Mathematics; Narosa Publishing House, New Delhi.
4. J.N. Kapur: Mathematical Statistics; S. Chand & Sons Company Limited, New Delhi.
5. D.N.Elhance,V. Elhance & B.M. Aggarwal: Fundamentals of Statistics; Kitab Mahal Distributers, New Delhi.

COURSE OUTCOMES

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

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

Evaluation methodology to be followed:

The evaluation and assessment plan consists of the following components:

a. Class attendance and participation in class discussions etc.
b. Quiz.
c. Tutorials and assignments.
d. Sessional examination.
e. Final examination.

Award of Internal/External Marks:

Assessment procedure will be as follows:
1. These will be comprehensive examinations held on-campus (Sessionals).
2. Quiz.
    a. Quiz will be of type multiple choice, fill-in-the-blanks or match the columns.
    b. Quiz will be held periodically.
3. Tutorials and assignments
    a. The assignments/home-work may be of multiple choice type or comprehensive type at least one assignment from each Module/Unit.
    b. The grades and detailed solutions of assignments (of both types) will be accessible online after the submission deadline.
4. Final examinations. These will be comprehensive external examinations held on-campus or off campus (External examination) on dates fixed by the Dr. APJ Abdul Kalam Technical University, Lucknow.

Technical Communication
(KAS301/401)
(Effective from the session 2019-20)

L T P
2 1 0

Unit -1 Fundamentals of Technical Communication:
Technical Communication: Features; Distinction between General and Technical Communication; Language as a tool of Communication; Dimensions of Communication: Reading & comprehension; Technical writing: sentences; Paragraph; Technical style: Definition, types & Methods; The flow of Communication: Downward; upward, Lateral or Horizontal; Barriers to Communication.

Unit - II Forms of Technical Communication:
Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Expert Technical Lecture: Theme clarity; Analysis & Findings; 7 Cs of effective business writing: concreteness, completeness, clarity, conciseness, courtesy, correctness, consideration, C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

Unit - III Technical Presentation: Strategies & Techniques
Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Unit - IV Technical Communication Skills:
Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and non verbal means.

Unit - V Dimensions of Oral Communication & Voice Dynamics:
Code and Content; Stimulus & Response; Encoding process; Decoding process; Pronunciation Etiquette; Syllables; Vowel sounds; Consonant sounds; Tone: Rising tone; Falling Tone; Flow in Speaking; Speaking with a purpose; Speech & personality; Professional Personality Attributes: Empathy; Considerateness; Leadership; Competence.

Reference Books

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.
2. Personality Development and Soft Skills by Barun K. Mitra, OUP, 2012, New Delhi.
3. Spoken English- A Manual of Speech and Phonetics by R.K.Bansal & J.B.Harrison, Orient Blackswan, 2013, New Delhi.
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Practical Communication: Process and Practice by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2014, Delhi.

6. Modern Technical Writing by Sherman, Theodore A (et.al); Apprentice Hall; New Jersey; U.S.
7. A Text Book of Scientific and Technical Writing by S.D. Sharma; Vikas Publication, Delhi.
8. Skills for Effective Business Communication by Michael Murphy, Harward University, U.S.
9. Business Communication for Managers by Payal Mehra, Pearson Publication, Delhi.

Course Outcomes

1. Students will be enabled to **understand** the nature and objective of Technical Communication relevant for the work place as Engineers.

2. Students will **utilize** the technical writing for the purposes of Technical Communication and its exposure in various dimensions.

3. Students would imbibe inputs by presentation skills to **enhance** confidence in face of diverse audience.

4. Technical communication skills will **create** a vast know-how of the application of the learning to promote their technical competence.

5. It would enable them to **evaluate** their efficacy as fluent & efficient communicators by learning the voice-dynamics.

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KVE401	**Universal Human Values and Professional Ethics**	3	0	0	3

Objectives:

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcome:

On completion of this course, the students will be able to

1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society
4. Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
5. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Catalogue Description

Every human being has two sets of questions to answer for his life: a) what to do? and, b) how to do?. The first set pertains to the value domain, and the other to the skill domain. Both are complimentary, but value domain has a higher priority. Today, education has become more and more skill biased, and hence, the basic aspiration of a human being, that is to live with happiness and prosperity, gets defeated, in spite of abundant technological progress. This course is aimed at giving inputs that will help to ensure the right understanding and right feelings in the students in their life and profession, enabling them to lead an ethical life. In this course, the students learn the process of self-exploration, the difference between the Self and the Body, the naturally acceptable feelings in relationships in a family, the comprehensive human goal in the society, the mutual fulfillment in the nature and the co-existence in existence. As a natural outcome of such inputs, they are able to evaluate an ethical life and profession ahead.

UNIT-1	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

UNIT-1   **Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-2   **Understanding Harmony in the Human Being - Harmony in Myself**

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail,   Programs   to ensure Sanyam and Swasthya.

UNIT-3   **Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**

Understanding harmony in the Family- the basic unit of human interaction , Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship, Understanding the meaning of *Vishwas*; Difference between intention and competence, Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family!.

UNIT-4   **Understanding Harmony in the Nature and Existence - Whole existence as Co-existence**

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

UNIT-5   **Implications of the above Holistic Understanding of Harmony on Professional Ethics**

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b)   Ability   to identify the scope and characteristics of people-friendly and eco-friendly

production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

References:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Mode of Evaluation:

Assignment/ Seminar/Continuous Assessment Test/Semester End Exam

COMPUTER SYSTEM SECURITY

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	To discover software bugs that pose cyber security threats and to explain how to fix the bugs to mitigate such threats	K_1, K_2
CO 2	To discover cyber attack scenarios to web browsers and web servers and to explain how to mitigate such threats	K_2
CO 3	To discover and explain mobile software bugs posing cyber security threats, explain and recreate exploits, and to explain mitigation techniques.	K_3
CO 4	To articulate the urgent need for cyber security in critical computer systems, networks, and world wide web, and to explain various threat scenarios	K_4
CO 5	To articulate the well known cyber attack incidents, explain the attack scenarios, and explain mitigation techniques.	K_5, K_6

DETAILED SYLLABUS		3-1-0
Unit	**Topic**	**Proposed Lecture**
I	**Computer System Security Introduction**: Introduction, What is computer security and what to l earn? , Sample Attacks, The Marketplace for vulnerabilities, Error 404 Hacking digital India part 1 chase. **Hijacking & Defense:** Control Hijacking ,More Control Hijacking attacks integer overflow ,More Control Hijacking attacks format string vulnerabilities, Defense against Control Hijacking - Platform Defenses, Defense against Control Hijacking - Run-time Defenses, Advanced Control Hijacking attacks.	08
II	**Confidentiality Policies:** Confinement Principle ,Detour Unix user IDs process IDs and privileges , More on confinement techniques ,System call interposition ,Error 404 digital Hacking in India part 2 chase , VM based isolation ,Confinement principle ,Software fault isolation , Rootkits ,Intrusion Detection Systems	08
III	**Secure architecture principles isolation and leas:** Access Control Concepts , Unix and windows access control summary ,Other issues in access control ,Introduction to browser isolation . **Web security landscape :** Web security definitions goals and threat models , HTTP content rendering .Browser isolation .Security interface , Cookies frames and frame busting, Major web server threats ,Cross site request forgery ,Cross site scripting ,Defenses and protections against XSS , Finding vulnerabilities ,Secure development.	08
IV	**Basic cryptography:** Public key cryptography ,RSA public key crypto ,Digital signature Hash functions ,Public key distribution ,Real world protocols ,Basic terminologies ,Email security certificates ,Transport Layer security TLS ,IP security , DNS security.	08
V	**Internet Infrastructure:** Basic security problems , Routing security ,DNS revisited ,Summary of weaknesses of internet security ,.Link layer connectivity and TCP IP connectivity , Packet filtering firewall ,Intrusion detection.	08

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Text books:

1. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.

2. Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.

3. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.

4. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press, 2001.

Mapped With : https://ict.iitk.ac.in/product/computer-system-security/

PYTHON PROGRAMMING	
Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand	

CO 1	To read and write simple Python programs.	K_1, K_2
CO 2	To develop Python programs with conditionals and loops.	K_2, K_4
CO 3	To define Python functions and to use Python data structures –- lists, tuples, dictionaries	K_3
CO 4	To do input/output with files in Python	K_2
CO 5	To do searching ,sorting and merging in Python	K_2, K_4

DETAILED SYLLABUS		3-1-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** The Programming Cycle for Python , Python IDE, Interacting with Python Programs , Elements of Python, Type Conversion. **Basics:** Expressions, Assignment Statement, Arithmetic Operators, Operator Precedence, Boolean Expression.	**08**
II	**Conditionals:** Conditional statement in Python (if-else statement, its working and execution), Nested-if statement and Elif statement in Python, Expression Evaluation & Float Representation. **Loops:** Purpose and working of loops , While loop including its working, For Loop , Nested Loops , Break and Continue.	**08**
III	**Function:** Parts of A Function , Execution of A Function , Keyword and Default Arguments ,Scope Rules. **Strings :** Length of the string and perform Concatenation and Repeat operations in it. Indexing and Slicing of Strings. **Python Data Structure :** Tuples , Unpacking Sequences , Lists , Mutable Sequences , List Comprehension , Sets , Dictionaries **Higher Order Functions:** Treat functions as first class Objects , Lambda Expressions	**08**

IV	**Sieve of Eratosthenes:** generate prime numbers with the help of an algorithm given by the Greek Mathematician named Eratosthenes, whose algorithm is known as Sieve of Eratosthenes. **File I/O :** File input and output operations in Python Programming **Exceptions and Assertions** **Modules :** Introduction , Importing Modules , **Abstract Data Types :** Abstract data types and ADT interface in Python Programming. **Classes :** Class definition and other operations in the classes , Special Methods (such as _init_, _str_, comparison methods and Arithmetic methods etc.) , Class Example , Inheritance , Inheritance and OOP.	**08**
V	**Iterators & Recursion:** Recursive Fibonacci , Tower Of Hanoi **Search :** Simple Search and Estimating Search Time , Binary Search and Estimating Binary Search Time **Sorting & Merging:** Selection Sort , Merge List , Merge Sort , Higher Order Sort	**08**

Text books:

 1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)

2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

3.John V Guttag, ―Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013

4.Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

5.Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.,, 2015.

6.Kenneth A. Lambert, ―Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012.

7.Charles Dierbach, ―Introduction to Computer Science using Python: A Computational ProblemSolving Focus, Wiley India Edition, 2013.

8.Paul Gries, Jennifer Campbell and Jason Montojo, ―Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013.

Mapped With : https://ict.iitk.ac.in/product/python-programming-a-practical-approach/

List of MOOCs (NPTEL) based recommended Courses for B. Tech Students (AICTE Model Curriculum)

1. Developing Soft Skills and personality   8 Weeks-3 Credits
2. Enhancing Soft Skills and personality   8 Weeks-3 Credits
3. Spearing Effectively   8 Weeks-3 Credits
4. Introduction to Industry 4.0 and Industrial Internet of Things   12 Weeks-4 Credits
5. Emotional Intelligence.   8 Weeks-3 Credits
6. Patent Law for engineers and Scientist.   12 Weeks-4 Credits

Note:

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