EVALUATION SCHEME
B. TECH. COMPUTER SCIENCE & ENGINEERING
II-YEAR (III-SEMESTER)
(Effective from session: 2021-22)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1.	TCS-231	DATA STRUCTURE	3	1	0	40	40	80	120	200	4
2.	TCS-232	DISCRETE STRUCTURE	3	1	0	40	40	80	120	200	4
3.	TCS-233	DATABASE MANAGEMENT SYSTEM	3	1	0	40	40	80	120	200	4
4.	TES-231	DIGITAL ELECTRONICS	3	1	0	40	40	80	120	200	4
5.	TBS-231	MATHEMATICS-III	3	1	0	40	40	80	120	200	4
PRACTICAL											
6.	PCS-231	DATA STRUCTURE LAB	0	0	2	10	15	25	25	50	1
7.	PCS-232	BASIC PROGRAMMING IN PYTHON	0	0	2	10	15	25	25	50	1
8.	PCS-233	DATABASE MANAGEMENT SYSTEM LAB	0	0	2	10	15	25	25	50	1
9.	PES-231	DIGITAL ELECTRONICS LAB	0	0	2	10	15	25	25	50	1
10.	PCS-234	INDUSTRIAL TRAINING	0	0	2	0	50	50	0	50	1
11.	GPP 231	GENERAL PROFICIENCY	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			**15**	**5**	**10**	**240**	**310**	**600**	**700**	**1300**	**25**

EVALUATION SCHEME
B. TECH. COMPUTER SCIENCE & ENGINEERING
II-YEAR (IV-SEMESTER)
(Effective from session: 2021-22)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1.	TCS-241	COMPUTER ORGANIZATION & ARCHITECTURE	3	1	0	40	40	80	120	200	4
2.	TCS-242	OPERATING SYSTEMS	3	1	0	40	40	80	120	200	4
3.	TCS-243	OBJECT ORIENTED PROGRAMMING	3	1	0	40	40	80	120	200	4
4.	TCS-244	THEORY OF COMPUTATION	3	1	0	40	40	80	120	200	4
5.	THS-241	MANAGEMENT 1 (ORGANIZATIONAL BEHAVIOUR/ FINANCE & ACCOUNTING)	3	0	0	30	30	60	90	150	3
6.	TMC-242	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	15	10	25	50	75	0
PRACTICAL											
7.	PCS-241	COMPUTER ORGANIZATION & ARCHITECTURE LAB	0	0	2	10	15	25	25	50	1
8.	PCS-242	OPERATING SYSTEMS LAB	0	0	2	10	15	25	25	50	1
9.	PCS-243	OBJECT ORIENTED PROGRAMMING LAB	0	0	2	10	15	25	25	50	1
10.	GPP 241	GENERAL PROFICIENCY	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			**17**	**4**	**6**	**235**	**295**	**530**	**695**	**1225**	**22**

EVALUATION SCHEME
B. TECH. COMPUTER SCIENCE & ENGINEERING
III-YEAR (V-SEMESTER)
(Effective from session: 2022-23)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1.	TCS-351	SOFTWARE ENGINEERING	3	1	0	40	40	80	120	200	4
2.	TCS-352	DESIGN & ANALYSIS OF ALGORITHMS	3	1	0	40	40	80	120	200	4
3.	TCS-353	JAVA PROGRAMMING	3	1	0	40	40	80	120	200	4
4.	TCS-354	COMPILER DESIGN	3	1	0	40	40	80	120	200	4
5.	THS-351	PRINCIPLES OF MANAGEMNET	3	0	0	30	30	60	90	150	3
6.	ECS-31X	ELECTIVE-I	3	0	0	30	30	60	90	150	3
7.	TMC-351	CONSTITUTION OF INDIA	2	0	0	15	10	25	50	75	0
PRACTICAL											
8.	PCS-351	SOFTWARE ENGINEERING LAB	0	0	2	10	15	25	25	50	1
9.	PCS-352	DESIGN & ANALYSIS OF ALGORITHMS LAB	0	0	2	10	15	25	25	50	1
10.	PCS-353	JAVA PROGRAMMING LAB	0	0	2	10	15	25	25	50	1
11.	PCS-354	INDUSTRIAL TRAINING	0	0	2	0	50	50	0	50	1
12.	GPP 351	GENERAL PROFICIENCY	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			**20**	**4**	**8**	**265**	**375**	**640**	**785**	**1425**	**26**

ELECTIVE-I

ECS-311MICROPROCESSORS AND MICROCONTROLLER

ECS-312 QUEUING THEORY AND MODELING

ECS-313 COMPUTER GRAPHICS

ECS-314 FAULT TOLERANT COMPUTING

ECS-315GRAPHTHEORY

EVALUATION SCHEME
B. TECH. COMPUTER SCIENCE & ENGINEERING
III-YEAR (VI-SEMESTER)
(Effective from session: 2022-23)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1.	TCS-361	ARTIFICIAL INTELLIGENCE	3	1	0	40	40	80	120	200	4
2.	TCS-362	COMPUTER NETWORKS	3	1	0	40	40	80	120	200	4
3.	ECS-32X	ELECTIVE-II	3	0	0	30	30	60	90	150	3
4.	ECS-33X	ELECTIVE-III	3	0	0	30	30	60	90	150	3
5.	TOE-XY	OPEN ELECTIVE-I	3	0	0	30	30	60	90	150	3
PRACTICAL											
6.	PCS-361	ARTIFICIAL INTELLIGENCE LAB	0	0	2	10	15	25	25	50	1
7.	PCS-362	COMPUTER NETWORKS LAB	0	0	2	10	15	25	25	50	1
8.	PCS-363	MINI PROJECT	0	0	4	-	-	50	50	100	2
9.	GPP 361	GENERAL PROFICIENCY	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			**15**	**2**	**08**	**190**	**250**	**490**	**610**	**1100**	**21**

ELECTIVE-II
ECS-321 CRYPTOGRAPHY & NETWORK SECURITY
ECS-322 DISTRIBUTED SYSTEMS
ECS-323 REAL TIME SYSTEM
ECS-324INFORMATION THEORY AND CODING
ECS-325 DATA VISUALIZATION

ELECTIVE-III
ECS-331 EMBEDDED SYSTEMS
ECS-332 WEB TECHNOLOGY
ECS-333MOBILE COMPUTING
ECS-334QUANTUM COMPUTING
ECS-335 AUGEMENTED REALITY (AR)/VIRTUAL REALITY (VR)

EVALUATION SCHEME
B. TECH. COMPUTER SCIENCE & ENGINEERING
IV-YEAR (VII-SEMESTER)
(Effective from session: 2023-24)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1.	TCS-471	DATA SCIENCE	3	1	0	40	40	80	120	200	4
2.	ECS-44X	ELECTIVE-IV	3	0	0	30	30	60	90	150	3
3.	ECS-45X	ELECTIVE-V	3	0	0	30	30	60	90	150	3
4.	TOE-XY	OPEN ELECTIVE-II	3	0	0	30	30	60	90	150	3
5.	THS-471	ENGINEERING ECONOMICS	3	0	0	30	30	60	90	150	3
PRACTICAL											
6.	PCS-471	DATA SCIENCE LAB	0	0	2	10	15	25	25	50	1
7.	PCS-472	PROJECT-I	0	0	8	-	-	100	100	200	4
8.	PCS-473	INDUSTRIAL TRAINING	0	0	2	0	0	50	0	50	1
9.	GPP 471	GENERAL PROFICIENCY	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			**15**	**1**	**12**	**170**	**225**	**545**	**605**	**1150**	**22**

ELECTIVE-IV
ECS-441 BLOCKCHAIN
ECS-442 INTERNET-OF-THINGS
ECS-443 DIGITAL IMAGE PROCESSING
ECS-444 MULTI-AGENT INTELLIGENT SYSTEMS
ECS-445NETWORK PROGRAMMING

ELECTIVE-V

ECS-451 SOFT COMPUTING
ECS-452 CLOUD COMPUTING
ECS-453RELIABLE COMPUTING
ECS-454SOFTWARE PROJECT MANAGEMENT
ECS-455DATA MINING

EVALUATION SCHEME
B. TECH. COMPUTER SCIENCE & ENGINEERING
IV-YEAR (VIII-SEMESTER)
(Effective from session: 2023-24)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1.	ECS-46X	ELECTIVE-VI	3	0	0	30	30	60	90	150	3
2.	TOE-XY	OPEN ELECTIVE-III	3	0	0	30	30	60	90	150	3
3.	TOE-XY	OPEN ELECTIVE-IV	3	0	0	30	30	60	90	150	3
PRACTICAL											
4.	PCS-481	PROJECT-II	0	0	16	-	-	200	200	400	8
5.	PCS-482	SEMINAR	0	0	2	-	-	50	0	50	1
6.	GPP 481	GENERAL PROFICIENCY	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			**9**	**0**	**18**	**90**	**140**	**480**	**470**	**950**	**18**

ELECTIVE-VI

ECS-461 MACHINE LEARNING
ECS-462 AD-HOC AND SENSOR NETWORKS
ECS-463 CYBER SECURITY
ECS-464 COMPUTAIONAL COMPEXITY
ECS-465 DATA ANALYTICS

OPEN ELECTIVE COURSES OFFERED BY CSED

S.NO.	COURSE CODE	COURSE TITLE
1.	TOE-40	DATABASE MANAGEMENT SYSTEM
2.	TOE-41	DATA STRUCTURES
3.	TOE-42	OPERATING SYSTEM
4.	TOE-43	OBJECT ORIENTED PROGRAMMING
5.	TOE-44	COMPUTER NETWORKS
6.	TOE-45	JAVA PROGRAMMING
7.	TOE-46	MACHINE LEARNING
8.	TOE-47	MOBILE COMPUTING
9.	TOE-48	WEB TECHNOLOGY
10.	TOE-49	ADHOC AND SENSOR NETWORK
11.	TOE-50	ARTIFICIAL INTELLIGENCE

EVALUATION SCHEME
B. TECH. COMPUTER SCIENCE & ENGINEERING
I-YEAR (I/II-SEMESTER)
(COMMON FOR ALL BRANCHES)
(Effective from session: 2019-20)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1.	TES-111/121	PROGRAMMING FOR PROBLEM SOLVING	3	1	0	40	40	80	120	200	4
PRACTICAL											
2.	PES-111/121	PROGRAMMING FOR PROBLEM SOLVING LAB	0	0	2	10	15	25	25	50	1

TES-111/ 121 Programming For Problem Solving

B.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Course Outcomes

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

- Illustrate the flowchart and design analgorithm for a given problem and to develop C programs using operators
- Develop conditional and iterativestatements to write C programs
- Exercise user defined functions to solvereal time problems
- Use Pointers toaccess arrays, strings and functions.
- Exercise user defined data typesincluding structures and unions to solve problems
- Exercise files concept to show input andoutput of files in C

Unit 1-Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.). Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code..

Unit 2-Mathematical Expressions: Arithmetic expressions and precedence ,Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops.

Unit 3-Function and Arrays: Function, Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference, Recursion, Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series etc.
Arrays (1-D, 2-D), Character arrays and Strings.

Unit 4-Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection,Quick sort or Merge sort), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Unit 5-Structure: Structures, Defining structures and Array of Structures,Union, Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation).File handling (only if time is available, otherwise should be done as part of the lab)

Text Books

1. Byron Gottfried, Schaum's Outline of Programming with C,McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, TataMcGraw-Hill

Reference Books

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall ofIndia

PES-111/121 Programming For Problem Solving Lab

B.Tech. Semester –II (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			Exam.	**:25 Marks**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs.**

Course Outcomes

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

- Develop conditional and iterativestatements programs
- Exercise user defined functions to solvereal time problems
- Develop programs using pointers, strings and arrays.
- Inscribe C programs using pointers andto allocate memory using dynamic memorymanagement functions.
- Exercise files concept to show input andoutput of files in C

Note :The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

Tutorial 1: Problem solving using computers:

Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:

Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

Tutorial 8: Recursion, structure of recursive calls

Lab 8: Recursive functions

Tutorial 9: Pointers, structures, Union and dynamic memory allocation

Lab 9: Pointers and structures

Tutorial 10: File handling:

Lab 10: Fileoperations

TCS-231/TOE-41 Data Structure
B.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Course outcomes:

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

- Analyze the algorithms to determine the time and computation complexity and justify thecorrectness.
- ImplementSearch problem (Linear Search and Binary Search) in real scenarios
- ImplementStacks, Queues and linked list and analyze the same to determine the time and computational complexity.
- Write an algorithm for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
- Implement Graph search and traversal algorithms and determine the time and computationcomplexity

Unit 1-Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques and their complexityanalysis.

Unit 2-Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and theiranalysis.

Unit 3-Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexityanalysis.

Unit 4-Trees and Graphs: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms andanalysis.**Graph:** Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Unit 5-Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods,Hashing.

Books

1. An Introduction To Data Structures and Application by Jean Paul Tremblay & Pal G. Sorenson (McGraw Hill)
2. R.L. Kruse, B.P. Leary, C.L. Tondo, Data structure and program design in C , PHI
3. R. B. Patel, Expert Data Structures With C, Khanna Publications, Delhi, India, 3rd Edition 2008.
4. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.
5. Data Structures and Algorithms by A. V. Aho, J. E. Hopcroft and T. D. Ullman, Original edition, AddisonWesley, 1999, Low Price Edition.

TCS 232Discrete Structures
B.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Course Outcomes

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

- Express it in terms of predicates, quantifiers and logical connectives
- Derive the solution using deductive logic and prove the solution based on logicalinference
- Classify mathematical problem and its algebraicstructure
- Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra
- Develop the given problem as graph networks and solve with techniques of graphtheory

Unit 1- Set Theory: Introduction to set theory, Set operations, Algebra of Sets, Combination of sets, Duality, Finite and infinite sets, Classes of sets, Power sets, Multi sets, Cartesian Product, Representation of relations, Types of relation, Binary relation, Equivalence relations and partitions, Partial ordering relations and lattices, Mathematics Induction, Principle of Inclusion and Exclusion, Propositions.
Function and its types: Composition of function and relations, Cardinality and inverse relations, Functions and Pigeonhole principles.

Unit 2- Propositional Calculus: Basic operations; AND(^), OR(v), NOT(~), True value of a compound statement, propositions, tautologies and contradictions.

Unit 3- Recursion and Recurrence Relation: linear recurrence relation with constant coefficients, Homogeneous solutions, Particular solutions, Total solution of a recurrence relation using generating functions.

Unit 4- Algebraic Structures: Definition, elementary properties of Algebraic structures, examples of a Monoid, sunmonoid, semi group, groups and rings, Homomorphism, Isomorphism and automorphism, Subgroups and Normal subgroups, Cyclic groups, Integral domain and fields, Rings, Division Ring.

Unit 5- Graphs and Trees: Introduction to graphs, Directed and undirected graphs, Homomorphic and Isomorphic graphs, Subgraphs, Cut points and bridges, Multigraph and Weighted graphs, Paths and circuits, Shortest path in weighted graph, Eulerian path and circuits, Hamilton paths and circuits, Planar graphs, Eular's formula, Trees, Rooted trees, Spanning trees and cut-sets, Binary trees and its traversals.

Books

1. Elements of Discrete Mathematics C. L. Liu, 1985, McGraw-Hill.
2. Concrete Mathematics: A Foundation for Computer Science, Ronald Graham, Donald Knuth and Oren Patashik, 1989, Addison-Wesley.
3. Mathematical structures for Computer Science, Judith L. Gersting, 1993, Computer Science Press.
4. Applied discrete structures for Computer Science, Doerr and Levasseur, (Chicago: 1985, SRA)
5. Discrete Mathematics by A. Chtewynd and P. Diggle (Modular Mathematics series), 1995, Edward Arnold, London.
6. Schaums Outline series: Theory and Problems of Probability by S. Lipshutz, 1982, McGraw-Hill Singapore.
7. Discrete Mathematical Structures, B. Kolman and R. C. Busby, 1996, PHI.
8. Discrete Mathematical Structures with Applications to Computers by Trembley & Manohar, 1995, McGraw-Hill.
9. Discrete Mathematics & Structures, Satyender Bal Gupta, 2nd Ed. Luxmi Pub.

TCS-233/TOE-40 Database Management Systems
B.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Course Outcomes

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

- Understand the concepts of Database Management System, DDL, DML and requirement design the databases using E R method for real life applications.
- Knowledge and understanding of Relational algebra, Structured Query Language and ability to generate queries for real life applications.
- Knowledge of relational Database design and Improve the database design by normalization and Familiar with the concepts of indexing methods including B tree, and hashing.
- Understanding the concepts of transaction-processing system, ACID (atomicity, consistency, isolation, and durability) properties and concurrency control mechanism.
- Knowledge of advanced topic in DBMS: object oriented, object relational database and various applications

.

Unit 1- Introductio: Data Abstraction, DataIndependence,Data Definition Language(DDL),Data Manipulation Language(DML), 3 level Database System Architecture. **Database models:** Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulationoperations.

Unit 2-Relational Model: Structure of relational database, Relational Algebra: Fundamental operations, Additional Operations, Extended Relational-Algebra operations, Tuple Relational Calculus – Domain Relational Calculus. SQL: Basic structure, Set operations, Aggregate functions, Null Values, Nested subqueries, Views, Data Definition Language, Embedded SQL, Dynamic SQL, Domain Constraints, Referential Integrity and Triggers.

Unit 3-Relational database design: Functional Dependencies, First, Second, Third Normal Forms, Closure, Armstrong's Axioms, Canonical cover, Decomposition, Properties of Decomposition, Dependency Preservation, Boyce-Codd Normal Form, Fourth Normal Form, Fifth Normal Form.

Unit 4-Transaction processing: Transaction Concepts, ACID Properties, Two Phase Commit, Save Points, Concurrency Control techniques: Locking Protocols, Two Phase Locking, timestamp based protocol, Multi-version and optimistic Concurrency Control schemes, Databaserecovery.

Unit 5-Storage Structure, Query Processing and Advanced database: Storage structures: RAID. File Organization: Organization of Records, Indexing, Ordered Indices, B+ tree Index Files, B tree Index Files.
Query Processing: Overview, Measures of Query Cost, Query optimization. **Advanced Databse:**Object-oriented and object relational databases, logical databases, web databases, distributed databases, data warehousing and data mining**.**

Books

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts , 6thEdition,McGraw-Hill.
2. J. D. Ullman, Principles of Database and Knowledge – Base Systems, Vol 1, Computer SciencePress.

3. R. Elmasri and S. Navathe , Fundamentals of Database Systems , 5th Edition, PearsonEducation.
4. Serge Abiteboul ,Foundations of Databases, Reprint, Richard Hull, Victor Vianu,Addison-Wesley

TES-231 Digital Electronics
B.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Course Outcomes

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

- Understand the working of logicgates.
- Understand the working of synchronous and asynchronous counters
- Design and implement Combinational and Sequentiallogiccircuits.
- Understand the process of Analog to Digital conversion and Digital to Analog conversion.
- Use PLDs to implement the given logicalproblem.

Unit 1- Fundamentals of Digital Systems: Digital Systems, Binary number systems and it conversions, logic Gates: AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, canonical and standard form, binary arithmetic, one's and two's complements arithmetic, error detecting and correcting code, BCD, Gray code, Excess 3 code, Standard representation for logic functions, K-map representation, simplification oflogicfunctions using K-map, minimization of logical functions. Don't care conditions,Q-M method (Tabular Method) for boolean function minimization.

Unit 2- Combinational Circuits:, Adders, Subtractors, Multiplexer/De-Multiplexer Encoder/Decoders,BCD arithmetic, Serial Adder, carry look ahead adder,elementary, Magnitude comparator,basic ALU design, Encoder for BCD to seven segment display.

Unit 3- Sequential Logic And Its Applications: Storage elements: latches & flip flops, Characteristic Equations of Flip Flops, Flip Flop Conversion, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters: Johnson & Ring Counter.

Unit 4- Synchronous & Asynchronous Sequential Circuits: Analysis of clocked sequential circuits with state machine designing, State reduction and assignments, Design procedure. Analysis procedure of Asynchronous sequential circuits, circuit with latches, design procedure, Reduction of state and flow table, Race-free state assignment, Hazards.

Unit 5-Memory and Programmable logic: ROM, RAM, PAL, PLA, Implementation of digital functions using PLDs. Introduction to Hardware Description Language, Behavioral, Dataflow and gate level modelling, Simple HDL codes for combinational circuits and sequential circuits

Text/References

1. R. P. Jain, Modern Digital Electronics, McGraw Hill Education,2009.
2. M. M. Mano, Digital logic and Computer design, Pearson Education India,2016.
3. Kumar, Fundamentals of Digital Circuits, Prentice Hall India, 2016.

TBS-231 Mathematics-III
B.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Note : To be provided by ASHD

PCS-231 Data Structure Lab
B.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			Exam.	**:25 Marks**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs.**

COURSE OUTCOMES

Upon successful completion of this course, the students will be able to

- Develop programs using dynamic memory allocation and linked list ADT.
- Apply Stack and Queue to solve problems.
- Implement the concept of hashing in real time dictionaries.
- Identify and implement the suitable data structures for the given problem.
- Solve real world problems by finding minimum spanning tree and Shortest path algorithm.

LIST OF EXPERIMENTS

1. Write programs to implement the following using an array.
    a) Stack ADT
    b) Queue ADT
2. Write programs to implement the following using a singly linked list.
    a) Stack ADT
    b) Queue ADT
3. Write program to implement the deque (double ended queue) ADT using a doubly linked list.
4. Write a program to perform the following operations:
    a) Insert an element into a binary search tree.
    b) Delete an element from a binary search tree.
    c) Search for a key element in a binary search tree.
5. Write a program to implement circular queue ADT using an array.
6. Write a program to implement all the functions of a dictionary (ADT) using hashing.
7. Write a program to perform the following operations on B-Trees and AVL-trees:
    a) Insertion.
    b) Deletion.
8. Write programs for the implementation of BFS and DFS for a given graph.
9. Write programs to implement the following to generate a minimum cost spanning tree:
    a) Prim's algorithm.
    b) Kruskal's algorithm.
10. Write a program to solve the single source shortest path problem.
(Note: Use Dijkstra's algorithm).
11. Write program that uses non-recursive functions to traverse a binary tree in:
    a) Pre-order.
    b) In-order.
    c) Post-order.
12. Write programs for sorting a given list of elements in ascending order using the following sorting methods:
    a) Quick sort.
    b) Merge sort.

PCS-232Basic Programming in Python Lab
B.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			Exam.	**:25 Marks**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs.**

COURSE OUTCOMES

Upon successful completion of this course, the students will be able to

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python

LIST OF EXPERIMENTS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

PCS-233 Database Management System Lab
B.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			Exam.	**:25 Marks**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs.**

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to

- Understand, appreciate and effectively explain the concepts of database Technologies.
- Declare and enforce integrity constraints on a database using RDBMS.
- Devise a complex query using SQL DML/DDL commands.
- Create views and use in-built functions to query a database.
- Write PL/SQL programs including stored procedures, stored functions and triggers.
- Design and build GUI applications using a 4GL.

LIST OF EXPERIMENTS

1. Build the following database schemas and perform the manipulation operations on these schemas using SQL DDL,DML,TCL and DCL commands.

   (I) Database Schema for a customer-sale scenario

   Customer(Custid : integer, cust_name: string)
   Item(item_id: integer, item_name: string, price: integer)
   Sale(bill_no: integer, bill_data: date, cust_id: integer, item_id: integer, qty_sold: integer)

   For the above schema, perform the following:-

   a) Create the tables with the appropriate integrity constraint
   b) Insert around 10 records in each of the tables
   c) List all the bills for the current date with the customer namesand item numbers
   d) List the total Bill details with the quantity sold, price of theitem and the final amount
   e) List the details of the customer who have bought a productwhich has a price>200
   f) Give a count of how many products have been bought byeach customer
   g) Give a list of products bought by a customer having cust_idas 5
   h) List the item details which are sold as of today
   i) Create a view which lists out the bill_no, bill_date, cust_id, item_id, price, qty_sold, amount
   j) Create a view which lists the date wise daily sales for the last one week
   k) Identify the normalization of this schema. Justify your answer.
   l) If the schema is not normalized then normalize the schema.

   (II) Database Schema for a Employee-pay scenario

   Employee(emp_id : integer, emp_name: string)
   Department (dept_id: integer, dept_name:string)
   Paydetails(emp_id : integer, dept_id: integer, basic: integer,deductions: integer, additions: integer, DOJ: date)
   payroll(emp_id : integer, pay_date: date)

   For the above schema, perform the following:—

   a) Create the tables with the appropriate integrity constraints
   b) Insert around 10 records in each of the tables
   c) List the employee details department wise

d) List all the employee names who joined after particular date
e) List the details of employees whose basic salary is between 10,000 and 20,000
f) Give a count of how many employees are working in each department
g) Give a names of the employees whose netsalary>10,000
h) List the details for an employee_id=5
i) Create a view which lists out the emp_name, department, basic, deductions,netsalary
j) Create a view which lists the emp_name and his netsalary
k) Identify the normalization of this schema. Justify your answer
l) If the schema is not normalized then normalize the schema.

2. Construct a PL/SQL program to find largest number from the given three numbers.
3. Build a PL/SQL program to generate all prime numbers below 100.
4. Construct a PL/SQL program to demonstrate %type and %row type attributes.
5. Develop a PL/SQL procedure to find reverse of a given number.
6. Create a PL/SQL procedure to update the salaries of all employees by 10% in their basic pay.
7. Execute a PL/SQL procedure to demonstrate IN, OUT and INOUT parameters.
8. Design a PL/SQL trigger before/after update on employee table for each row/statement.
9. Create a PL/SQL trigger before/after delete on employee table for each row/statement.
10. Build a PL/SQL trigger before/after insert on employee table for each row/statement.
11. Design and build the following applications using SQL and front end tool and generate report
    - Student information system for your college.
    - Hospital Management System.
    - A video library management system.
    - Inventory management system for a hardware / sanitary item shop.
    - Banking System.
    - Railway Reservation System
    - Car Insurance Company

PES-231 Digital Electronics Lab
B.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			Exam.	**:25 Marks**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs.**

COURSE OUTCOMES

Upon successful completion of this course, the students will be able to

- Describe the basic concept of Number System and number Conversion.
- Implement different methods used for simplification of Boolean functions.
- Implement the concept of multiplexer
- Implement and analyse the combinational circuits and Sequential circuits.
- Implement synchronous sequential circuits.

LIST OF EXPERIMENTS

1. To verify the De-Morgan's theorems using NAND/NOR gates.
2. To design the full adder and half adder using AND, OR and X- OR gates.
3. To implement the logic circuits using decoder.
4. To implement the logic circuits using multiplexer.
5. To design parity generator and checker circuits.
6. To design and implement RS FLIP FLOP using basic latches.
7. Realization and testing of basic logic gates using discrete components.
8. Realization and testing of CMOS IC characteristics.
9. Realization and testing of TTL IC characteristics.
10. Realization and testing of RAM circuit using IC 7489.
11. Realization and testing of Interfacing of CMOS- TTL and TTL- CMOS ICS.

PCS-234 Industrial Training
B.Tech. Semester –III (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:50 Marks**
			Exam.	**:--**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs**

- The main objective of Industrial Training is to expose the students to actual working environment and enhance their knowledge and skill from what they have learned in the college.
- Another purpose of this program is to enhance the good qualities of integrity, responsibility and self confidence. All ethical values and good working practices must be followed by student.
- It is also to help the students about the safety practices and regulations inside the industry and to instill the spirit of teamwork and good relationship between students and employees.

TCS-241 Computer Organization & Architecture

B.Tech. Semester –IV (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Course outcomes

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

- Draw the functional block diagram of a single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instructionset.
- Understand the concept of Pipelining and multiprocessor.
- Draw a flowchart for concurrent access to memory organization.
- Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with theCPU.
- Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and CISC &RISCmethodology

Unit 1- Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL representation and interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some commonCPUs, RISC and CISC Architecture.

Unit 2- Basic processing unit: signed number representation, Fixed point arithmetic, Addition and subtraction of signed numbers, multiplication of positive numbers, signed operand multiplication algorithm,Booth multiplication algorithm, division algorithm, floating point numbers and its arithmetic operation. Fundamental concepts: Execution of a complete instruction, Multiple bus organization, Hardwired control, Micro programmed control.

Unit 3- Peripheral devices and their characteristics: Input-outputsubsystems, I/O device interface, I/O transfers–programcontrolled, interrupt driven and DMA, software interrupts and exceptions,Programs and processes – role of interrupts in process statetransitions, I/O device interfaces – SCII, USB

Unit 4- Pipelining& Multiprocessor: Basic concepts of pipelining, throughput and speedup, pipeline hazards, Introduction to parallel processors, Symmetric shared memory and Distributed shared memory multiprocessors, Performance issues of symmetric and distributed shared memory, Synchronization.

Unit 5- Memory organization: Basic concepts, concept of hierarchical memory organization Semiconductor RAM, ROM, Speed, Size and cost, Cache memory and its mapping, replacement algorithms, writepolicies, Virtual memory, Memory management requirements, Associative memories, Secondary storage devices.

Books

1. David A. Patterson and John L. Hennessy “Computer Organization and Design: The Hardware/Software Interface” , 5th Edition, Elsevier.
2. CarlHamacher “ Computer Organization and EmbeddedSystems” , 6th Edition, McGraw Hill HigherEducation.
3. Miles Murdoccaa and Vincent Heuring “Computer Architecture and Organization: An integrated Approach” 2nd edition,Wiley Publication.

TCS-242 /TOE-42 Operating Systems
B.Tech. Semester –IV (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Course Outcomes

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

- Create processes andthreads.
- Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, ResponseTime.
- Develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the accesstime.
- Design and implement file managementsystem.
- Develop the I/O management functions in OS

Unit 1- Introduction: Concept of Operating Systems, Generationsof Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS -Layered, Microkernel Operating Systems, Concept of Virtual Machine.

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads,

Unit 2- Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.**Inter-process Communication:** Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer-Consumer Problem, Semaphores, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problemetc.

Unit 3- Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection andRecovery.

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memoryallocation–Fixed and variable partition– Internal and External fragmentation and Compaction; Paging: Principleof operation – Page allocation –Hardware support for paging, Protection and sharing, Disadvantages ofpaging.

Unit 4- Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used(LRU).

Unit 5- File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency andperformance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

Suggested Books

1. AviSilberschatz, Peter Galvin, Greg Gagne , Operating System Concepts Essentials, 9th Edition by, Wiley Asia StudentEdition.
2. William Stallings , Operating Systems: Internals and Design Principles, 5th Edition, Prentice Hall ofIndia.

TCS-243/TOE-43 Object Oriented Programming
B.Tech. Semester –IV (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Course Outcomes

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

- Specify simple abstract data types and design implementations, using abstraction functions to documentthem.
- Recognise features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on objectidentity.
- Name and apply some common object-oriented design patterns and give examples of theiruse.
- Design applications with an event-driven graphical userinterface.
- Design the convenient way for handling of files

Unit 1- Object oriented programming concepts: objects, classes, methods and messages, abstraction and encapsulation, inheritance, abstract classes, polymorphism. Introduction to C++ Classes and objects: classes, structures and classes, unions and classes, friend functions, friend classes, inline functions, parameterized constructors, static class members, scope resolution operator, nested classes, local classes, passing objects to functions, returning objects; object assignment. Arrays, Pointers, References and Dynamic Allocation Operators: Arrays of Objects, Pointers to Objects, Type Checking, This Pointer, Pointers to Derived Types, Pointers to Class Members, References, Dynamic Allocation Operators.

Unit 2- Function Overloading And Constructors: Function Overloading, Overloading Constructors, Copy Constructors, Finding the Address of Overloaded Functions, Default Function Arguments, Function Overloading and Ambiguity. Operator overloading: Creating member Operator Function, Operator Overloading Using Friend Function, Overloading New and Delete, Overloading Special Operators, Overloading Comma Operator.

Unit 3- Inheritance And Polymorphism: Inheritance: Base-Class Access Control, Inheritance and Protected Members, Inheriting Muitiple Base Classes, Constructors, Destructors and Inheritance, Granting Access, Virtual Base Classes. Polymorphism: Virtual Functions, Virtual Attribute and Inheritance, Virtual Functions and Hierarchy, Pure Virtual Functions, Early vs. Late Binding Run-Time Type ID and Casting Operators: RTTI, Casting Operators, Dynamic Cast.

Unit 4- Templates And Exception Handling: Templates: Generic Functions, Applying Generic Functions, Generic Classes, Type name and Export Keywords, Power of Templates, Exception Handling: Fundamentals, Handling Derived Class Exceptions Exception Handling Options, Understanding terminate() and unexpected(), uncaught_exception () Function, Exception and bad_exception Classes — Applying Exception Handling.

Unit 5- I/O Streams: Streams and formatted 1/O, File: File Classes, File Operations. Namespaces: Namespaces, std namespace. Standard Template Library: Overview, Container Classes, General - Theory of Operation, Lists, String Class, Final Thoughts on STL.

Text Books

1. Herbert Schildt, “C++: The Complete Reference”, 4th Edition, Tata McGraw-Hill, 2003.
2. Paul Deitel, Harvey Deitel, “C++ How to Program”, 8th Edition, Prentice Hall, 2011.

TCS-244 Theory of Computation
B.Tech. Semester –IV (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Course Outcomes

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

- Write a formal notation for strings, languages andmachines.
- Design finite automata to accept a set of strings of alanguage.
- Design context free grammars to generate strings of context free language
- Determine equivalence of languages accepted by Push Down Automata and languages generated by context freegrammars
- Distinguish between computability and non-computability and Decidability andundecidability.

Unit 1- Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.

Unit 2- Regular languages and finite automata: Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, pumping lemma for regular languages, minimization of finite automata.

Unit 3- Context-free languages and pushdown automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.

Unit 4- Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG. Turing machines: The basic model for Turing machines (TM), Turing-recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.

Unit 4- Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems aboutlanguages.

Books

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.
2. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science,Springer.
3. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.

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THS-241 Management 1 (Organizational Behaviour/ Finance & Accounting)
B.Tech. Semester –IV (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs.**

Note : To be provided by ASHD

TMC-242 Essence of Indian Traditional Knowledge
B.Tech. Semester –IV (Computer Science & Engg.)

L	T	P		
2	-	-	**Class Work**	**:25 Marks**
			Exam.	**:50 Marks**
			Total	**:75 Marks**
			Duration of Exam	**: 3 Hrs.**

Note : To be provided by ASHD

PCS-241 Computer Organization & Architecture Lab
B.Tech. Semester –IV (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			Exam.	**:25 Marks**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs.**

Course Outcome:
Upon successful completion of this course, students should be able to:

- Recognize basic logic gates with IC chips.
- Design combinational circuits using IC Chips.
- Connect the theory of computer organization with hardware.
- Implement the concept of adders
- Apply fundamentals of digital design and extend the learning to design sequential circuits.

LIST OF EXPERIMENTS

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 and Implementing 4x1 and 8x1 MULTIPLEXERS.
4. Verify the excitation tables of various FLIP-FLOPS.
5. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
6. Design of an 8-bit ARITHMETIC LOGIC UNIT.
7. Design the data path of a computer from its register transfer language description.
8. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
9. Write an algorithm and program to perform matrix multiplication of two n * n matrices on the 2-D mesh SIMD model, Hypercube SIMD Model or multiprocessor system.
10. Study of Scalability for Single board Multi-board, multi-core, multiprocessor using Simulator.

PCS-242 Operating Systems Lab
B.Tech. Semester –IV (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			Exam.	**:25 Marks**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs.**

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to

- Understand the system calls and I/O system calls in UNIX
- Evaluate the process scheduling algorithms FCFS,SJF, Priority and Round robin
- Simulate the process communication through various techniques
- Simulate memory management schemes
- Simulate File allocation Techniques

(Implement the following on LINUX or other UNIX like platform. Use C for high level language implementation)

LIST OF EXPERIMENTS

1. Write programs using the following system calls of UNIX operating system: fork, exec,getpid, exit, wait, stat, opendir, readdir
2. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)
3. Write C programs to simulate UNIX commands like ls, grep, etc.
4. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time (2 sessions)
5. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time (2 Sessions).
6. Developing Application using Inter Process communication (using shared memory and pipes)
7. Simulate the Producer – Consumer problem using semaphores (using UNIX system calls).
8. Simulate First fit, best fit and Worst fit memory management algorithms.
9. Simulate Page Replacement Algorithms(FIFO, LRU and Optimal)
10. Simulate Paging memory management scheme

PCS 243: Object Oriented Programming Lab
B.TECH Semester-IV (Computer Science & Engineering)

L	T	P
-	-	2

Class Work	**:25 Marks**
Exam.	**:25 Marks**
Total	**:50 Marks**
Duration of Exam	**: 3 Hrs**

COURSE OUTCOMES

Upon successful completion of this course, students will be able to

- Design object oriented programs with static members and friend functions using C++
- Implement C++ programs with operator overloading and type conversions
- Develop class templates for various data structures like stack, queue and linked list.
- Create classes with necessary exception handling
- Construct simple test applications using polymorphism.

LIST OF EXPERIMENTS

1. Design C++ classes with static members, methods with default arguments, friend functions. (For example, design matrix and vector classes with static allocation, and a friend function to do matrix-vector multiplication).
2. Implement Matrix class with dynamic memory allocation and necessary methods. Give proper constructor, destructor, copy constructor, and overloading of assignment operator.
3. Implement complex number class with necessary operator overloading and type conversions such as integer to complex, double to complex, complex to double etc.
4. Overload the new and delete operators to provide custom dynamic allocation of memory.
5. Develop C++ class hierarchy for various types of inheritances.
6. Design a simple test application to demonstrate dynamic polymorphism and RTTI.
7. Develop a template of linked-list class and its methods.
8. Develop templates of standard sorting algorithms such as bubble sort, insertion sort and quick sort.
9. Design stack and queue classes with necessary exception handling.
10. Write a C++ program that randomly generates complex numbers (use previously designed Complex class) and write them two per line in a file along with an operator (+, -, *, or /). The numbers are written to file in the format (a + ib). Write another program to read one line at a time from this file, perform the corresponding operation on the two complex numbers read, and write the result to another file (one per line).

TCS-351 Software Engineering
B.Tech. Semester –V (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Course Outcomes

Upon Successful completion ofthis course, the students will be able to

- Identify appropriate software design model based on requirement analysis.
- Formulate Software Requirements Specification (SRS) reports for the real world application
- Translate a specification into a design and identify the components to build the architecture
- Plan a software engineering process to account for quality issues and non-functionalrequirements
- Estimate the work to be done, resources required and the schedule for a software project plan

Unit 1- Software and Software Engineering: Software characteristics, software crisis, software engineering paradigms. Planning a software project-software cost estimation , project scheduling, personal planning, team structure. Software configuration management, quality assurance, project monitoring, risk management.

Unit 2- Software Requirement Analysis: Structured analysis, object oriented analysis, software requirement specification, validation.

Unit 3- Design and Implementation of Software: software design fundamentals, design methodology (structured design and object oriented design), design verification, monitoring and control coding.

Unit 4- Testing : Testing fundamentals, white box and black box testing software testing software testing strategies: unit testing, integration testing, validation testing , system testing, debugging.

Unit 5- Software Reliability: Metric and specification, fault avoidance and tolerance, exception handling, defensive programming.Software Maintenance – maintenance characteristics, maintainability, maintenance tasks, maintenance side effects.CASE tools.

Books

1. Pressman S.Roger, Software Engineering, Tata McGraw-Hill
2. Jalote Pankaj, An integrated approach to software engineering , Narosa Publishing House
3. Sommerville lan, Software Engineering, 5th ed., Addison Wesley-2000
4. Fairley Richard, Software, Software Engineering Concepts, Tata McGraw-Hill

TCS-352 Design & Analysis of Algorithms

B.Tech. Semester –V (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Course Outcomes

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

- Analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedyalgorithms.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it.
- Analyze randomized algorithms and approximation algorithms.

Unit 1- Introduction: Characteristics of algorithm,**Analysis of algorithm:** Asymptotic analysis of complexity bounds – best, average and worst-case behavior,Sorting techniques and their performance analysis, Time and space trade-offs, **Analysis of recursive algorithms through recurrence relations:** Substitution method, Recursion tree method andMasters theorem.

Unit 2- Fundamental Algorithmic Strategies: Brute-Force, Greedy,Dynamic Programming, Branch- and-Bound and Backtracking methodologies for the designof algorithms, Illustrations of these techniques for Problem-Solving, Knapsack, Matrix Chain Multiplication, Activity selection and LCS Problem.

Unit 3- Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS), Shortest path algorithms, Minimum Spanning Tree, Topological sorting, Network FlowAlgorithm, Binomial Heap and Fibonacci Heap.

Unit 4- Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard, Standard NP-complete problems and Reductiontechniques.

Unit 5- Advanced Topics: Approximation algorithms and Randomized algorithms, Distributed Hash Table

Books

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, 4TH Edition, MITPress/McGraw-Hill.
2. E. Horowitz etal ,Fundamentals of Algorithms .

Reference books

1. Jon Kleinberg and ÉvaTardos,Algorithm Design, 1ST Edition, Pearson.
2. Michael T Goodrich and Roberto Tamassia,Algorithm Design: Foundations, Analysis, and Internet Examples, Second EditionWiley.

TCS-354 Complier Design
B.Tech. Semester –V (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Course Outcomes

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

- Develop the lexicalanalyser
- Design top-down and bottom-up parsers
- Develop syntax directed translationschemes
- Draw DAG representation for problem statement
- Develop algorithms to generate code for a targetmachine

Unit 1- Introduction: Phases of compilation and overview.
LexicalAnalysis(scanner): Regular languages, finite automata, regular expressions, from regular expressions to finite automata, scanner generator (lex, flex).

Unit 2- Syntax Analysis (Parser): Context-free languages and grammars, push-down automata, LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom- up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc, bison) Semantic Analysis: Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree.

Unit 3- Symbol Table: Its structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and scope. Intermediate Code Generation: Translation of differentlanguagefeatures, different types of intermediate forms.

Unit 4- Code Generation: Issues in the design of a code generator, The target machine, Run-time storage management, Basic blocks and flow graphs, Next-use information, A simple code generator, Register allocation and assignment, The Directed Acyclic Graph (DAG) representation of basic blocks, Generating code from DAGs.

Unit 5- Code Improvement (optimization): Analysis: control-flow, data-flow dependence etc.;
Code improvement local optimization, globaloptimization, loop optimization, peep-hole optimization etc.

Books

1. Aho A.V. and Ullaman J.D. Principles of Compiler Design, Addison Wesley
2. Donovan, J, System Programming , TMH
3. D.M. Dhamdhere: Compiler construction- Principles and Practice Mc Milan India
4. David Grics: Compiler Construction for digital computer

TCS 353/TOE-45 JAVA Programming
B.Tech. Semester –V (Computer Science &Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to

• Write Java programs with properly-designed constants, variables, methods and stringhandling to solve simple problems.
• Design Java object classes based on Object-Oriented concepts
• Use simple try-catch blocks for Exception Handling and manage I/O streams oriented interactions.
• Develop multi-thread programming for concurrency control based applications
• Construct user interfaces for Java applications and applets using GUI elements

Unit 1- Java Basics And Oops: The Genesis of Java, Overview of Java, Data Types, Variables, and Arrays, Operators, Control Statements, Introducing Classes, Methods and Classes, Inheritance: Basics, Using Super, Creating a Multilevel Hierarchy, Method overriding, Using Abstract Classes.

Unit 2- Multithreaded Programming In Java: Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces Definitions and Implementations, Exception Handling: Types, Try and Catch, Throw, Multithreaded Programming: Creating Threads, Creating Multiple Threads, Thread Priorities, Synchronization, Inter Thread Communication, Suspending, Resuming and Stopping Threads.

Unit 3- I/O And Exploring Java I/O: I/O Basics, Reading Console Input, Writing Console output, Native Methods, I/ O Classes and Interfaces, File, The Byte Streams, The Character Streams, Using Stream I/ O, Serialization. String Handling, Special string operations, Character extraction, string comparison, Modifying a String.

Unit 4- Applets, Event Handling And Awt: Applet Basics, Applet Architecture, Applet Display Methods, Passing parameters to applets, Event Handling, Delegation Event Model, Event Classes, Event Listener Interfaces, Working with Windows, Graphics, Colors and Fonts, Using AWT Controls, Layout Managers and Menus.

Unit 5- JDBC, RMI And Servlets: The Design of JDBC, The Structured Query Language, JDBC Configuration, Executing SQL, Query Execution Statements, Scrollable and Updatable Result Sets, Row Sets , Metadata, RMI, Architecture , A simple client/server application using RMI, Servlets , Life cycle of a servlet, The javax.servlet Package , The javax.servlethttp Package , Handling HTTP Requests and Responses.

TEXT BOOK(S)

1. D.Norton, Herbert Schildt, “Java 2 - The Complete Reference” 5th Edition, Tata McGraw Hill, 2011.
2. Hortsmann& Cornell, “CORE JAVA 2 Advanced Features – VOL-II”, Pearson Education, 2002.

REFERENCES

1. Deitel&Deitel, “Java How to Program”, Prentice Hall of India, 2010.
2. Herbert Schildt, “Java: A Beginner's Guide”, Tata McGraw Hill, 2007.
3. Keyur Shah, “Gateway to java programmer sun certification”, Tata Mc Graw Hill, 2002.

THS-351 Principles of Managemnet
B.Tech. Semester –V (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Note : To be provided by ASHD

ECS-311 Micoprocessors and Microcontroller
B.Tech. Semester –V (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to

- Understand the basics of 8085 microprocessor and its instruction set.
- Understand the 8086 architecture and its instruction set.
- Understand the 8086 programming.
- Know about the 8089 microprocessor's interfaces and their architecture
- Describe the evolution and various types of advanced micoprocesors.

Unit 1- Introduction to Microprocessors: Evolution of Microprocessors, Classification of microprocessors, Basic functional blocks of a microprocessor, Microprocessor- based system (Organization of microcomputer).

Unit 2- 8085 MICROPROCESSOR: Architecture; Addressing modes; Instruction Set: Data transfer instructions, Arithmetic instructions, Logical instructions, Branching instructions, Machine control instructions; Timing diagram of 8085 instructions; Assembly Language Programming.

Unit 3- 8086 MICROPROCESSOR: Architecture, Physical address, segmentation, memory organization, Bus cycle, Instruction Set, Addressing modes, difference between 8085 & 8086, Assembler Directives , Assembly Language Programming of 8086.

Unit 4- 8051 MICROCONTROLLERS: Fundamental differences of microprocessors and microcontroller, Introduction to Architecture and instruction set of 8051 microcontroller, Direct Memory Access and DMA Controlled I/O, Numeric Processor 8087 and I/O Processor 8089, Introduction to ARM Microcontroller.

Unit 5- ADVANCE MICROPROCESSORS: Architecture and functional description of Programmable Peripheral Interface (8255), operating modes: BSR, I/O mode- Mode 0, 1 and 2, Programmingof 8255, Architecture and functional description of USART (8251), Priority Interrupt Controller (8259), Memory Interfacing, Introduction to 80286, 80386, 80486 microprocessors

Books:

1. R.S Gaonkar,"Microprocessor Architecture, Programming and Applications with 8085/8080A", Wiley Eastern Limited
2. Barry B. Brey, Intel Microprocessors, 8th Edition , Pearson Education/Prentice Hall
3. Y.-C. Liu and G. A. Gibson, "Microprocessor Systems: The 8086/8088 family Architecture, Programming & Design", PHI.
4. A. K. Ray and K M Bhurchandi, "Advanced Microprocessors and Peripherals", TMH.
5. D.V. Hall, "Microprocessors and Interfacing", TMH, 2nd Ed.

ECS-312 Queuing Theory and Modeling
B.Tech. Semester –V (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

On successful completion of this course, the students will

- Have a fundamental knowledge of the basic probability concepts.
- Have a well-founded knowledge of standard distributions which can describe real life phenomena.
- Acquire skills in handling situations involving more than one random variable and functions of random variables.
- Understand the phenomena which evolve with respect to time in a probabilistic manner.
- Exposed the basic characteristic features of a queuing system and queuing models.

Unit 1- Probability Models : Sample Space, Events and their algebra, graphical methods of representing events, Probability Axioms and their applications, Condition probability, Independence of Events, Bayes' Rule and Bernoulli Trials.

Unit 2- Random variables, and their event spaces: Probability mass function, Distribution functions, some discrete distributions (Bernoulli, Binomial, Geometric, Poisson, uniform, Probability Generating Function, Discrete random vectors, Continuous random variables: pdf some continuous distributions (Gamma, Normal), Exponential functions of random variables, joint1y distributed random variables.

Unit 3- Expectation: Expectation of functions of more than one random variable, Moments and transforms of some distributions (Uniform, Bernoulli, Binomial, Geometric, Poisson. Exponential, Gamma, Normal), Computation of mean time to failure.

Unit 4- Stochastic Processes: Classification of stochastic processes, the Bernoulli process, renewal process, renewal model of program behavior.

Unit 5- Markov Chains: Computation of n-step transition probabilities, State classification and limiting distributions, Irreducible finite chains with aperiodic states, M/G/l queuing system, Discrete parameter BirthDeath processes, Analysis of program execution time. Continuous parameter Markov Chains, Birth-Death process with special cases, Non-Birth-Death Processes.

Books

1. K.S. Trivedi, Probability, Statistics with Reliability, Queuing and Computer Science Applications, PHI, 2001.
2. J.F. Hayes, Modeling of Computer Communication Networks, Khanna Publishing, Delhi.
3. W. Feller, An Introduction to Probability Theory and its applications. 2vo1s. Wiley Eastern, 1975.
4. L. Kleinroek, Queuing Systems, vol.2, John Wiley, 1976.

ECS-313 Computer Graphics

B.Tech. Semester –V (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcome

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

- Understand various graphics packages and standards
- Explain the algorithms that form the foundation of computer graphics
- Provide 3D representation for their applications
- Classify transformation techniques
- Interpret parallel and oblique projections and their applications

Unit 1- Introduction to computer graphics & graphics systems: Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations, Visualization & image processing, RGB color model, direct coding, lookup table, storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc., Active & Passive graphics devices, Computer graphics software.

Unit 2- Points & lines: Line drawing algorithms; DDA algorithm, Bresenhan's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

Unit 3- 2D transformation & viewing Basic transformations: Translation , rotation, scaling, Matrix representations & homogeneous coordinates, transformations between coordinate systems, reflection shear, Transformation of points, lines , parallel lines, intersecting lines. Viewing pipeline, Window to viewport co-ordinate transformation , clipping operations , point clipping , line clipping, clipping circles, polygons & ellipse.

Unit 4- 3D transformations: Translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane, general parallel projection transformation, clipping, viewport clipping, 3D viewing.

Unit 5- Curves representation: Surfaces , designs , Bezier curves , B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves. Hidden surfaces Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer"s algorithm, scan-line algorithm; Hidden line elimination, wire frame methods , fractal - geometry. **Color & shading models** Light & color model, interpolative shading model and Texture

Text Books

1. Hearn, Baker – " Computer Graphics (C version 2nd Ed.)" – Pearson education
2. Z. Xiang, R. Plastock – " Schaum"s outlines Computer Graphics (2nd Ed.)" – TMH
3. D. F. Rogers, J. A. Adams – " Mathematical Elements for Computer Graphics
4. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI

ECS-314 Fault Tolerant Computing
B.Tech. Semester –V (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

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

- Understand research problems and challenges in fault tolerance computing
- Identify the state-of-the-art techniques and tools to address research problems and challenges;
- Develop strong technical reviewing, writing, and presentation skills.
- Design a more reliable systems that can tolerate S/W faults
- Design a more reliable systems that can tolerate H/W faults

Unit 1- Basics of Fault Tolerance: Fault Classification, Types of Redundancy, Basic Measures of Fault Tolerance,Reliability concepts, Failures & faults, Reliability and Failure rate, Relation between reliability and mean time between failure, maintainability and availability, Fault Tolerant Design: Basic concepts-static, dynamic, hybrid, triple modular redundant system (TMR), Data redundancy, Time redundancy and software Redundancy concepts.

Unit 2- Hardware Fault Tolerance: canonical and Resilient Structures- Series and Parallel Systems, Non-Series/Parallel Systems, *M*-of-*N* Systems, Voters, Variations on *N*-Modular Redundancy, Duplex Systems, Other Reliability Evaluation Techniques-Poisson Processes, Markov Models, Fault-Tolerance Processor-Level Techniques, Watchdog Processor, Simultaneous Multithreading for Fault Tolerance, Byzantine Failures, Byzantine Agreement with Message Authentication.

Unit 3- Testability for Hardware: testability for combinational circuits: Basic concepts of Testability, Controllability and observability, The Reed Muller's expansion technique, use of control and syndrome testable designs. Design for testability by means of scan: Making circuits Testable, Testability Insertion, Full scan DFT technique- Full scan insertion, flip-flop Structures, Full scan design and Test, Scan Architectures full scan design, Shadow register DFT, Partial scan methods, multiple scan design, other scan designs.

Unit 4- Software Fault Tolerance: Acceptance Tests Single-Version Fault Tolerance- Wrappers, Software Rejuvenation, Data Diversity, Software Implemented Hardware Fault Tolerance (SIHFT), *N*-Version Programming- Consistent Comparison Problem, Version Independence, Recovery Block Approach- Basic Principles, Success Probability Calculation, Distributed Recovery Blocks, Preconditions, Postconditions, and Assertions, Exception-Handling- Requirements from Exception-Handlers, Basics of Exceptions and Exception-Handling, Language Support, Software Reliability Models- Jelinski–Moranda Model, Littlewood–Verrall Model, Musa–Okumoto Model, Model Selection and Parameter Estimation, Fault-Tolerant Remote Procedure Calls-Primary-Backup Approach, The Circus Approach.

Unit 5- Checkpointing: Basics of checkpoint, Checkpoint Level, Optimal Checkpointing- An Analytical Model, Time Between Checkpoints-A First-Order Approximation, Optimal Checkpoint Placement, Reducing Overhead, Reducing Latency, Checkpointing in Distributed Systems-The Domino Effect and Livelock, A Coordinated Checkpointing Algorithm, Time-Based Synchronization, Diskless Checkpointing, Message Logging, Checkpointing in Shared-Memory Systems- Bus-Based Coherence Protocol, Directory-Based Protocol, Checkpointing in Real-Time Systems.

TEXTBOOKS:

- Israel Koren And C. Mani Krishna, "Fault-Tolerant Systems, Morgan Kaufmann publisher
- Parag K. Lala, "Fault Tolerant & Fault Testable Hardware Design", 1984, PHI
- Zainalabedin Navabi, "Digital System Test and Testable Design using HDL models and Architectures", Springer International Edition.
- Miron Abramovici, Melvin A. Breuer and Arthur D. Friedman, "Digital Systems Testing and Testable Design", Jaico Books

ECS-315 Graph Theory
B.Tech. Semester –V (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

Upon successful completion of this module students will be able to

- Understand the basic concept of a walk, path and circuit in a graph.
- To perform the basic operation of Euler graph and digraph
- Discuss the various spanning trees algorithms.
- Understand the concept of edge connectivity, vertex connectivity and separable graphs.
- Derive the relations between the reduced incidence matrix, the fundamental cycle matrix, and the fundamental cut-set matrix of a graph G.

UNIT I INTRODUCTION: Introduction to Graphs : Introduction- Basic definition – Application of graphs – finite, infinite and bipartite graphs – Incidence and Degree – Isolated vertex, pendant vertex and Null graph. Paths and circuits – Isomorphism, sub graphs, walks, paths and circuits, connected graphs, disconnected graphs and components.

UNIT II EULERIAN AND HAMILTONIAN GRAPHS : Euler graphs, Operations on graphs, Hamiltonian paths and circuits, Travelling salesman problem. Directed graphs – types of digraphs, Digraphs and binary relation, Directed paths and connectedness – Euler graphs.

UNIT III TREES AND GRAPH ALGORITHMS : Trees – properties, pendant vertex, Distance and centres in a tree - Rooted and binary trees, counting trees, spanning trees, Prim's algorithm and Kruskal's algorithm, Dijkstra's shortest path algorithm, Floyd-Warshall shortest path algorithm.

UNIT IV CONNECTIVITY AND PLANAR GRAPHS : Vertex Connectivity, Edge Connectivity, Cut set and Cut Vertices, Fundamental circuits, Planar graphs, Kuratowski's theorem (proof not required), Different representations of planar graphs, Euler's theorem, Geometric dual.

UNIT V: GRAPH REPRESENTATIONS AND VERTEX COLOURING : Matrix representation of graphs Adjacency matrix, Incidence Matrix, Circuit Matrix, Path Matrix. Coloring- Chromatic number, Chromatic polynomial, Matchings, Coverings, Four color problem and Five color problem.

Text Books

1. Narsingh Deo, Graph Theory: With Application to Engineering and Computer Science, Prentice Hall of India, 2003.

References

1. R.J. Wilson, Introduction to Graph Theory, Fourth Edition, Pearson Education, 2003.

TMC-351 Constitution of India
B.Tech. Semester –V (Computer Science & Engg.)

L	T	P		
2	-	-	**Class Work**	**:25 Marks**
			Exam.	**:50 Marks**
			Total	**:75 Marks**
			Duration of Exam	**: 3 Hrs**

Note : To be provided by ASHD

PCS-351 Software Engineering Lab
B.Tech. Semester –V (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			Exam.	**:25 Marks**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcome

Upon successful completion of this course, the student will be able to

- Apply software development practices in projects
- Express project requirements in IEEE SRS format
- Design using standard design methodologies
- Implement the project using a programming language and platform
- Test and debug the project

LIST OF EXERCISE

1. Prepare the SRS document. You should identify the appropriate requirements for each problem.
2. Draw the Use Case diagrams, Domain Models, and Class Diagrams using Rational Rose. Draw the Sequence Diagrams and Collaboration Diagrams for each Use Case, using Rational Rose.; Draw the State Chart Diagrams and Activity Diagrams using Rational Rose, wherever necessary.;
3. Develop the corresponding software using Java with an interactive GUI and appropriate Database.
4. Develop software to automate the bookkeeping activities of a 5-star hotel. The local newspaper andmagazine delivery agency wants to automate the various clerical activities associated with its business. Develop a software for this.
5. A small automobile spare parts shop sells the spare parts for vehicles of several makes and models.Each spare part is typically manufactured by several small industries. To streamline the sales and supply ordering, theshop owner wants to automate the activities associated with his business. Develop a software for this.
6. Develop asoftware for the automation of the dispensary of your Institute. Develop a software for automating various activitiesof an Estate Office.
7. Develop a word processing software with some limited number of facilities such as makingbold, italics, underline, cut, copy and paste etc.
8. Develop a graphics editor software package, using which one can create/modify several common types of graphics entities.
9. Develop a software for automating various activities of the department offices of your Institute.
10. Write a C function for searching an integer value from a large sorted sequence of integer values stored in array of size 100, using the binary search method. Build the control flow graph of this function using any compiler-writing tool.

PCS-352 Design & Analysis of Algorithms Lab
B.Tech. Semester –V (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:50 Marks**
			Exam.	**:100 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs.**

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to

- Solve recurrence equations by considering time and space complexity.
- Analyze the complexities of various problems in different domains.
- Solve the problems that comprises of shortest route issue.
- Solve the problems that address the issue of dynamic programming
- Synthesize efficient algorithms in common engineering design situations.

LIST OF EXCERCISES

1. Programming that uses recurrence relations to analyze recursive algorithms.
2. Computing best, average, and worst case time complexity of various sorting techniques.
3. Performance analysis of different internal and external sorting algorithms with different type of data set.
4. Use of divide and conquer technique to solve some problem that uses two different algorithm for solving small problem.
5. Implementation of different basic computing algorithms like Hash tables, including collision-avoidance strategies, Search trees (AVL and B-trees).
6. Consider the problem of eight queens on an (8x8) chessboard. Two queens are said to attack each other if they are on the same row, column, or diagonal. Write a program that implements backtracking algorithm to solve the problem i.e. place eight non-attacking queens on the board.
7. Write a program to find the strongly connected components in a digraph.
8. Write a program to implement file compression (and un-compression) using Huffman's algorithm.
9. Write a program to implement dynamic programming algorithm to solve the all pairs shortest path problem.
10. Write a program to solve 0/1 knapsack problem using the following:
    a) Greedy algorithm.
    b) Dynamic programming algorithm.
    c) Backtracking algorithm.
    d) Branch and bound algorithm.
11. Write a program that uses dynamic programming algorithm to solve the optimal binary search tree problem.
12. Write a program for solving traveling sales persons problem using the following:
    a) Dynamic programming algorithm.
    b) The back tracking algorithm.
    c) Branch and Bound.

PCS-353 Java Programming Lab
B.Tech. Semester –V (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:50 Marks**
			Exam.	**:100 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs.**

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to

- Develop programs using object oriented concepts, exception handling and multi-threading.
- Demonstrate java features such as Inheritance, Interfaces, Polymorphism for different scenarios
- Demonstrate java features such as Abstract class and method overriding
- Design and implement data driven applications and assign responsibilities.
- Develop web application using JDBC and Servlets

LIST OF EXPERIMENTS

1. Develop a java program to find the sum of odd and even numbers in an array.
2. Develop a java program to print the prime numbers between n1 to n2 using class, objects and methods.
3. Develop a program for calculating the age of a person and display the age in the form of years, months and days.
4. Demonstrate a program for method overloading. Consider the different types of transaction modes used for transferring money. (Credit card, Debit card, Net banking etc).
5. Create a Abstract class and calculate the area of different shapes by overriding methods.
6. Develop a Library application using multiple inheritances. Consider Book, Magazines and Journals as base classes and Library as derived class. In the Book class, perform the operations like SearchBook, IssueBook, ReturnBook, RenewBook, and Fine Calculation. In the Magazines and Journals classes, perform issue and return operations.
7. Develop a program for banking application with exception handling. Handle the exceptions in following cases:
    a) Account balance <1000
    b) Withdrawal amount is greater than balance amount
    c) Transaction count exceeds 3
    d) One day transaction exceeds 1 lakh.
8. Create a Student database and store the details of the students in a table. Perform the SELECT, INSERT, UPDATE and DELETE operations using JDBC connectivity.
9. Design a login page using servlets and validate the username and password by comparing the details stored in the database.

Mini-project (Any One)

(Front End: Java, Back End: Oracle, Define classes for the application and assign responsibilities)

- Central Library OPAC Engine
- ATM Banking
- Online Shopping
- E-Ticketing System
- Student Information Management System
- City Info Browser
- E-mail Server

PCS-354Industrial Training
B.Tech. Semester –V (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:50 Marks**
			Exam.	**:--**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs**

- The main objective of Industrial Training is to expose the students to actual working environment and enhance their knowledge and skill from what they have learned in the college.
- Another purpose of this program is to enhance the good qualities of integrity, responsibility and self confidence. All ethical values and good working practices must be followed by student.
- It is also to help the students about the safety practices and regulations inside the industry and to instill the spirit of teamwork and good relationship between students and employees.

TCS-361 /TOE-50 Artificial Intelligence
B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs**

COURSE OUTCOMES
After undergoing this course, the students will be able to:

- Build intelligent agents for search and games
- Solve AI problems through programming with Python
- Learning optimization and inference algorithms for model learning
- Design and develop programs for an agent to learn and act in a structured environment.
- Form a foundation for machine learning

Unit 1- Introduction: What is AI, Foundations of AI, History of AI, The State of the Art, AI Techniques, Problem Solving: Problem solving agents,uniformed search strategies, Informed search strategies, Constraint Satisfaction Problems.

Unit 2- Knowledge Representation: Approaches and issues in knowledge representation, Knowledge Based Agents, Propositional Logic, Predicate Logic- Unification and Resolution, Weak slot –Filler Structure, Strong slot-Filler structure.

Unit 3- Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networks-representation, construction and inference, Breif introduction of Neural Networks, Fuzzy Logic and Genetic Algorithms

Unit 4- Planning and Learning: Planning with state space search, conditional planning, continuous planning, Multi-Agent planning. Forms of learning,Inducative Learning, Statistical learning method and Reinforcement learing.

Unit 5- Advanced Topics: Expert Systems- Representation- Expert System shells- Knowledge Acquisition with examples**. Game Playing-** Minimax Search Procedure, Alpha-Beta Pruning, Imperfect, Real-Time Decisions.
Swarm Intelligent Systems- Ant Colony System, Development, Application and Working of Ant Colony System..

LIST OF SUGGESTED BOOKS

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach” , 3rd Edition, Prentice Hall
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill
3. N. P. Padhy, “Artificial Intelligence and Intelligent System”, Oxford University Press, 2005
4. SarojKaushik, “Artificial Intelligence”, Cengage Learning India, 2011

TCS-362/TOE-44 Computer Networks
B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

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

- Explain the functions of the different layer of the OSIProtocol.
- Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
- Address the issues related to IPv4 and IPv6
- Configure DNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP
- Configure Bluetooth, Firewalls using open source available software andtools.

Unit 1- Data communication Components: Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spreadspectrum.

Unit 2- Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols-Pure ALOHA, Slotted ALOHA,CSMA/CD,CDMA/CA

Unit 3- Network Layer: Switching, Logical addressing – IPV4, IPV6, Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routingprotocols.

Unit 4- Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

Unit 5- Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography

Books

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw- Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice HallIndia.
3. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
4. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall ofIndia.

ECS-321 Cryptography & Network Security
B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

Upon Successful completion ofthis course, the students will be able to

- Identify the various attacks and its issues.
- Learn usage of cryptographic algorithms for avoiding basic level threats.
- Comprehend the issues involved in Integrity, Authentication and Key Management techniques.:
- Realize the importance of user authentication and Kerberos concepts.
- Acquire the knowledge of network security and its applications.

Unit 1- Introduction of Cryptography: Introduction To security: Attacks, Services and Mechanisms, Conventional Encryption: Classical Techniques, Conventional Encryption Model, and steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operations.

Unit 2- Conventional Encryption Algorithms: Double DES, Triples DES, Blowfish, International Data Encryption Algorithm,Placement of Encryption Function, Key Distribution, Random Number Generation and Traffic confidentiality

Unit 3- Public Key Encryption: Public-Key Cryptography: Principles of Public-Key Cryptosystems, RSA Algorithm, Key Management, Fermat's and Euler's Theorm, Primality Testing, Chinese Remainder Theorem.

Unit 4-Hash Functions: Message Authentication and Hash Functions: Authentication Requirements,Authentication Functions, Message Authentication Codes, Hash Function Birthday Attacks, Security of Hash Function and MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures, Digital Signature Standard (DSS).

Unit 5- Network and System Security: Authentication Applications: Kerberos, X.509, Electronic Mail Security, Pretty Good Privacy (PGP),S/Mine Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management, Web Security: Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction (SET), System Security: Intruders, Viruses, Firewall Design Principles, Trusted Systems.

Books

1. William Stallings, "Cryptography and Network Security: Principles and Practice"' Prentice hall, New Jersey
2. Johannes A. Buchmann, "Introduction to Cryptography" Springer-Verlag
3. Atul Kahate, "Cryptography and Network Security" TMH
4. Network Security Bible : Eric Cole, Wiley dreamtech India Pvt. Ltd.
5. Practical Cryptography “Bruce Schneier” Wiley dreamtech India Pvt. Ltd

ECS-322 Distributed Systems
B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

COURSE OUTCOMES
Upon Successful completion of this course, the students will be able to

- Acquire the theoretical and conceptual foundations of distributed computing.
- Conceptualize the ideas of distributed operating systems and its issues.
- Understand the issues involved in distributed resource environment
- Realize the importance of transaction and how to recovery the system from deadlocks.
- Explore the principles of fault tolerance and its protocols.

Unit 1- Distributed Environment: Introduction, Limitations, Remote Procedure Call, Remote Object Invocation, Message-Oriented Communication, Unicasting, Multicasting and Broadcasting, Group Communication.

Unit 2-Distributed Operating Systems: Issues in Distributed Operating System, Threads in Distributed Systems, Clock Synchronization, Causal Ordering, Global States, Election Algorithms, Distributed Mutual Exclusion, Distributed Deadlock, Agreement Protocols

Unit 3- Distributed Resource Management: Distributed Shared Memory, Data-Centric Consistency Models, Client-Centric Consistency Models, Distributed File Systems, Sun NFS.

Unit 4- Distributed Transaction Processing: Transactions, Nested Transactions, Locks, Optimistic Concurrency Control, Timestamp Ordering, Comparison, Flat and Nested Distributed Transactions, Atomic Commit Protocols, Concurrency Control in Distributed Transactions, Distributed Deadlocks, Transaction Recovery, Overview of Replication And Distributed Multimedia Systems.

Unit 5- Fault Tolerance And Consensus: Introduction to Fault Tolerance, Distributed Commit Protocols, Byzantine Fault Tolerance, Impossibilities in Fault Tolerance.

TEXT BOOK(S)

1. A.S.Tanenbaum, M.Van Steen, “Distributed Systems”, Pearson Education, 2007.
2. MukeshSinghal, NiranjanG.Shivaratri “Advanced Concepts in Operating Systems”, McGrawHill Series in Computer Science, 2011.

REFERENCES

1. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and Design”, 3rd Edition, Pearson Education Asia, 2002.
2. M.L.Liu, “Distributed Computing Principles and Applications”, Pearson Addison Wesley, 2004.
3. Andrew S.Tenenbaum “Modern Operating system”, 3rd Edition, Pearson Addison Wesley, 2008.

ECS-323 Real Time System

B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

Upon successful completion of this course, the students will be able to

- Grasp a fundamental understanding of goals, components and evolution of real time systems
- Explain the concepts of real time scheduling
- Learn the scheduling policies of modern operating systems
- Understand the resource access control techniques in real time systems.
- Understand the concept of real time communication

Unit 1-Introduction: Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

Unit 2-Real Time Scheduling: Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

Unit 3-Resources Access Control: Effect of Resource Contention and Resource Access Control (RAC), Nonpreemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, PreemptionCeiling Protocol, Access Control in Multiple-Unit Resources, Controlling ConcurrentAccesses to Data Objects.

Unit 4-Multiprocessor System Environment: Multiprocessor and Distributed System Model, Multiprocessor Priority-Ceiling Protocol,Schedulability of Fixed-Priority End-to-End Periodic Tasks, Scheduling Algorithms for Endto-End Periodic Tasks, End-to-End Tasks in Heterogeneous Systems, Predictability andValidation of Dynamic Multiprocessor Systems, Scheduling of Tasks with Temporal Distance Constraints.

Unit 5-Real Time Communication: Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols, Real Time Protocols,Communication in Multicomputer System, An Overview of Real Time Operating Systems.

Books

1. Jane W. S. Liu , Real Time Systems, Pearson Education Publication.
2. Prof. Albert M. K. Cheng, John Wiley, Real-Time Systems: Scheduling, Analysis, and Verification , Sons Publications

ECS-324Information Theory And Coding

B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

Upon successful completion of this course, the students will be able to

- Measure and analyze the quantity of information associated to events or random variables.
- Determine the limits of communications systems in terms of source and channel coding.
- Examine linear block codes and the algebraic structures used in the construction and in the decoding of cyclic codes.
- Calculate the error probability of a channel coding system with hard or soft decoding.
- Describe the coding techniques used in composite codes like LDPC and turbo codes that can reach the channel capacity

Unit 1-Introduction to information theory, information associated to an event, entropy, joint entropy, conditional entropy, mutual information, relationship between entropy and mutual information, the Venn diagram, chain rules for entropy and mutual information, Log sum inequality,

Unit 2-Markov chains, data processing theorem, entropy of continuous random variables. Data compression, example of codes, Kraft-Macmillan inequality, source coding and entropy, Huffman codes. Channels, channel coding, channel capacity and the general random coding theorem.

Unit 3-Introduction to channel coding , basic concepts of block codes like Hamming distance Hard decoding and performance over a binary symmetric channel, soft decoding and performance over a Gaussian channel with a BPSK input.

Unit 4-Linear block codes, generator matrix, parity check matrix, singleton bound, Syndrome table and decoding over a binary symmetric channel, examples of linear block codes, Recall of arithmetic structures, vector Space, Galois field, cyclic codes, BCH codes, Peterson decoding algorithm, Reed Solomon codes. Convolution codes, structure, Trellis diagram, state diagram, transfer function calculation, Recursive Systematic convolutional codes.

Unit 4-Introduction to composite codes, LDPC codes, Tanner graph, Iterative decoding of LDPC codes over an erasure channel, Soft-Input Soft-Output decoding, A posteriori probability and Log likelihood ratio, Iterative decoding of LDPC codes over a Gaussian channel, encoding and iterative decoding of turbo codes.

Books

1. T. M. Cover, J. A, Thomas, “Elements of information theory,” Wiely Interscience, 2nd Edition, 2006
2. R. W. Hamming, “Coding and information theory,” Prentice Hall Inc., 1980.

ECS-325 Data Visualization

B.Tech. Semester – VI (Computer Science & Engg.)

L	T	P
3	-	-

Class Work :60 Marks
Exam. :90 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

Course Outcomes:

- Learn to design and create data visualizations.
- Learn to conduct exploratory data analysis using visualization.
- Craft visual presentations of data for effective communication.
- Use knowledge of perception and cognition to evaluate visualization designalternatives.
- Design and evaluate color palettes for visualization based on principles of perception.
- Apply data transformations such as aggregation and filtering for visualization.

Unit 1 Introduction to Data Visualization: A Brief History of Data Visualization, need of DataVisualization, Good Graphics, Static Graphics, Data Visualization through their Graph Representations.

Unit 2 High-dimensional Data Visualization, Multivariate Data Glyphs: Principlesand Practice, Linked Views for Visual Exploration, Linked Data Views, Visualizing Trees andForests, Display of Geographically Referenced Statistical Data, Multidimensional Scaling,Huge Multidimensional Data Visualization, Multivariate Visualization by Density Estimation,Structured Sets of Graphs.

Unit 3Methodologies: Regression by Parts: Fitting Visually Interpretable Models with GUIDE,Structural Adaptive Smoothing by Propagation–Separation Methods, Smoothing Techniquesfor Visualization, Data Visualization via Kernel Machines, Visualizing cluster Analysis andFinite Mixture Models, Visualizing Contingency Tables.

Unit 4 Mosaic Plots and Their Variants,Parallel Coordinates: Visualization, Exploration, and Classification of High-DimensionalData, Matrix Visualization, Visualization in Bayesian Data Analysis.

Unit 5Applications: Exploratory Graphics of a Financial Dataset, Visualizing Functional Data withan Application, eBay's Online Auctions, Visualization for Genetic Network Reconstruction.

Text books:

- Data Visualization with Python: Create an impact with meaningful data insights using interactive and engaging visuals, February 2019, by Mario Dobler, Packt Publishing
- Mastering Python Data Visualization Paperback, October 2015 by Kirthi Raman, Packt Publishing

Reference books:

- Data Visualization – A Practical Introduction Paperback – Import, 4 Jan 2019by Kieran Healy Chen,
- Handbook of data visualization. Springer Science & Business Media.by Chun-houh, Wolfgang Karl Härdle, and Antony Unwin, eds.

ECS-331 Embedded Systems
B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

Upon successful completion of this course, the students will be able to

- Develop assembly language programs for 8051 and its applications in the field of information technology using different types of interfacing
- Acquire knowledge on embedded systems basics and describe the architecture and operations of ARM processor
- Develop skills in writing small programs for ARM processor
- Apply different types of interfaces with interrupt handling mechanism
- Understand the multiple process operating environments and use standard system call interfaces to monitor and control processes

Unit 1-Review of Embedded Hardware: Gates: Timing Diagram- Memory –microprocessors Buses Direct Memory Access-Interrupts- Built-ins on the Microprocessor-Conventions used on Schematics chematic. Interrupts Microprocessor Architecture-Interrupt Basics- Shared Data Problem-Interrupt latency.

Unit 2-Microchip PIC Micro controller: Introduction, CPU Architecture- Registers- Instruction sets addressing modes- Loop timing- Timers- Interrupts, Interrupt timing, I/O Expansion, I2C Bus Operation Serial EEPROM, Analog to Digital converter, UART-Baud Rate- Data Handling-Initialization, Special Features – Serial Programming-Parallel Slave Port.

Unit 3-Embedded Microcomputer Systems: Motorola MC68H11 Family Architecture, Registers , Addressing modes Programs. Interfacing methods parallel I/O interface, Parallel Port interfaces, Memory Interfacing, High Speed I/O Interfacing, Interrupts-Interrupt service routine-Features of interrupts-Interrupt vector and Priority, Timing generation and measurements, Input capture, Output compare, Frequency Measurement, Serial I/O devices RS 232,RS485.

Unit 4-Software Development: Round–Robin, Round robin with Interrupts, function-Queue- Scheduling Architecture, Algorithms. Introduction to - Assembler- Compiler –Cross Compilers and Integrated Development Environment (IDE). Object Oriented Interfacing, Recursion, Debugging strategies, Simulators

Unit 5-Real Time Operating Systems: Task and Task States, Tasks and data, Semaphores and shared Data Operating system Services-Message queues-Timer function-Events-Memory Management, Interrupt Routines in an RTOS environment, Basic design using RTOS.

Books

1. David E Simon, “An embedded software primer”, Pearson Education Asia, 2001
2. John B Pitman, “Design with PIC Micro controllers”, Pearson Education Asia, 1998
3. Jonartthan W. Valvano, “Embedded Micro computer Systems, Real time Interfacing”, Thomson learning 2001.

ECS-332/TOE-48Web Technology

B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

Upon successful completion of this course, the students will be able to

- Learn the best practices for designing Web forms and Usability Reviews
- Understand the principles behind the design and construction of Web applications
- Develop the application for XML parsers
- Develop the application that implements the concept of CGI
- Develop and Deploy an Enterprise Application using ASP.NET

Unit 1-Web Architecture: History of Web, Protocols governing Web, Creating Websites for individual and Corporate, World, Cyber Laws, Web Applications, Writing Web Projects, Identification of Objects, Target Users, Web Team, Planning and Process of Web Development Phases.

Unit 2-HTML and XML: HTML Basic concepts, Good web design, Images and Anchors, Style sheets, positioning with style sheets. Basic Interactivity and HTML: FORMS, form control, new and emerging form elements.

XML: Relationship between HTML, SGML and XML, Basic XML, Valid documents, ways to use XML,XML for data files,embedding XML into HTML documents. Converting XML to HTML for Display, Displaying XML using CSS and XSL, rewriting HTML as XML, the future of XML.

Unit 3-CGI using PERL Introduction to CGl, Alternative technologies, The Hypertext Transport protocol, URLs, HTTP, Browser requests, Server Responses, Proxies, Content Negotiation, The common Gateway Interface, The CGl Environment, Environment variables, CGI Qutput, forms and CGI, Sending Data to the server, form Tags, Decoding from input, Architectural Guidelines, Coding Guidelines, Efficiency and optimization.

Unit 4-ASP. NET: A simple ASP.NET application, Writing ASP.NET Code, ASP.NET Objects, Introduction to Forms: Web forms, user controls, custom controls, creating controls at runtime. Validity ASP.NET Pages: using validations controls, Customizing validation.

Unit 5-DATABASE: Creating Databases, SQL statements, Using Datasets, Data binding, Data binding Controls. Files: Reading and writing files using ASP.NET.

Books

1. Jeffrey C. Jackson, “Web Technologies: A Computer Science Perspective”, Prentice Hall, 2007
2. Herbert Schildt, “Java: The Complete Reference”, McGraw-Hill Professional, 2006.

Reference Books

1. Thomas. A Powell, HTML: The Complete Reference, Tata McGraw-Hill Publications.
2. Scott Guelich, Shishir Gundavaram, Gunther Birznieks; CGI Programming with PERL: Creating Dynamic Web pages, 2/e, O’ Reilly.

ECS-333/TOE-47 Mobile Computing
B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcome
Upon completion of this course, the students will be able to

- Impart knowledge of mobile and wireless computing systems and techniques.
- Understand the knowledge of wireless network
- Understand the concepts of mobile discovery process.
- Understand the concepts routing protocols.
- Understand the working of mobile tracking in wireless network

Unit 1- Introduction : Issues, Challenges, and benefits of Mobile Computing, IEEE 802.11 & Bluetooth, Wireless Multiple access protocols.

Unit 2- Data Management Issues:data replication for mobile computers, adaptive Clustering for Mobile Wireless networks, LEACH and TORA.

Unit 3- Distributed location Management: pointer forwarding strategies, Process communication techniques, Socket Programming, RPC, RMI, Mobile IP, TCP Over wireless. Hidden and exposed terminal problems,

Unit 4- Mobile Agents Computing: Security and fault tolerance, transaction processing in Mobile computing environment. Mobile Agent Systems: Aglets, PMADE, Case Studies.

Unit 5- Routing Protocols: Routing Protocol, Dynamic State Routing (DSR), Ad hoc On-Demand Distance Vector (AODV), and Destination Sequenced Distance – Vector Routing (DSDV), Cluster Based Routing Protocol (CBRP).

Books

1. Tanenbaum, A.S., Computer Networks, 4th Ed., Pearson Education.
2. Milojicic, D., Douglis, F. and Wheeler R., (ed.), Mobility Processes, Computers and Agents, Addison Wesley.
3. Lange, D.B. and Oshima, M., Programming and Deploying Java Mobile Agents with Aglets, Addison Wesley.
4. Schildt, H., The Complete Reference Java 2, 5th Ed., McGraw-Hill.
5. Stevens, W. R., Unix network Programming: Vol. II, 2nd Ed., Pearson Education.
6. Hansman, U. and Merck, L., Principles of Mobile computing, 2nd Ed., Springer.

ECS-334 Quantum Computing

B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

At the end of this course, the students will be able to

- Explain the working of a Quantum Computing program
- Understand its architecture and programing model
- Develop quantum logic gate circuits
- Develop quantum algorithm
- Program quantum algorithm on major toolkits

Unit 1- Introduction to Quantum Computing: Motivation for studying Quantum Computing ,Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc.) Origin of Quantum Computing , Overview of major concepts in Quantum Computing, Qubits and multi-qubits states, Bloch Sphere representation,Quantum Superposition, Quantum Entanglement

Unit 2-Math Foundation for Quantum Computing: Matrix Algebra: basis vectors and orthogonality, inner product and Hilbert spaces, matrices, and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen vectors.

Unit 3-Building Blocks for Quantum Program : Architecture of a Quantum Computing platform, Details of q-bit system of information representation: Block Sphere ,Multi-qubits States ,Quantum superposition of qubits (valid and invalid superposition).,Quantum Entanglement ,Useful states from quantum algorithmic perceptive e.g. Bell State Operation on qubits: Measuring and transforming using gates. Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlled gates, Ising, Deutsch, swap etc. Programming model for a Quantum Computing Program Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits.

Unit 4-. Quantum Algorithms:Basic techniques exploited by quantum algorithms. Amplitude amplification , Quantum Fourier Transform, Phase Kick-back , Quantum Phase estimation , Quantum Walks , Major Algorithms ,Shor's Algorithm ,Grover's Algorithm ,Deutsch's Algorithm,Deutsch -Jozsa Algorithm

Unit 5-Toolkits :OSS Toolkits for implementing Quantum program , IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM)

LIST OF SUGGESTED BOOKS

1. Michael A. Nielsen, "Quantum Computation and Quantum Information", Cambridge University Press.
2. David McMahon, "Quantum Computing Explained", Wiley IBM Experience:

ECS-335Augemented Reality (Ar)/Virtual Reality (Vr)

B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcome

Upon completion of the course, students will be able to

- Understand geometric modelling and Virtual environment.
- Study about Virtual Hardware and Software
- Present geometric model for VR systems
- Identify which type hardware and software is suiable to design their own VR systems
- Develop Virtual Reality applications.

Unit 1-Introduction to Virtual Reality: Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark,3D Computer Graphics: Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modelling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, Realism-Stereographic image.

Unit 2-Geometric Modelling: Geometric Modelling: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

Unit 3-Virtual Environment: Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Non-linear interpolation, the animation of objects, linear and non-linear translation. Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

Unit 4-VR Hardware and Software: Human factors: Introduction, the eye, the ear, the somatic senses.
VR Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. VR Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML

Unit 5-VR Applications: Introduction, Engineering, Entertainment, Science, Training. The Future: Virtual environment, modes of interaction.

LIST OF SUGGESTED TEXT BOOKS

1. John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2007.
2. Anand R., “Augmented and Virtual Reality”, Khanna Publishing House, Delhi.
3. Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.
4. Grigore C. Burdea, Philippe Coiffet , “Virtual Reality Technology”, Wiley Inter Science, 2nd Edition, 2006.

PCS-361 Artificial Intelligence lab
B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			Exam.	**:25 Marks**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs**

COURSE OUTCOMES

After undergoing this course, the students will be able to

- Build intelligent agents for search and games
- Solve AI problems through programming with Python
- Learning optimization and inference algorithms for model learning
- Solve game challenging problems
- Design and develop programs for an agent to learn and act in a structured environment.

LIST OF PRACTICALS

1. Write a programme to conduct uninformed and informed search.
2. Write a programme to conduct game search.
3. Write a programme to construct a Bayesian network from given data.
4. Write a programme to infer from the Bayesian network.
5. Write a programme to run value and policy iteration in a grid world.
6. Write a programme to do reinforcement learning in a grid world.
7. Mini Project work.

PCS-362 Computer Networks Lab
B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P
-	-	2

Class Work	**:25 Marks**
Exam.	**:25 Marks**
Total	**:50 Marks**
Duration of Exam	**: 3 Hrs**

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

- Learn about hardware component like RJ-45 connector, CAT-6 Cable etc.
- Implement the various services of data link layer.
- Configuration of router, hub, switch etc
- Configuration of server in programming mode they will learn about socket programming, client server programming for deeply understanding TCP/ IP model and various protocols.
- Configure their own Network management systems

In simulation area, they will work on Cisco networking, NS-2 or NS-3 tools for more clear understanding about computer network

1. Installation and configuration of NS2 and Qual Net
2. Creating a network: nodes, links and queues, Creating connections, traffic and computing routers Insertion of errors and analysis of trace file.
3. Study of basic network command and network configuration commands.
4. Simple project on NS2 – wired, wireless and combination of wired and wireless
5. Implementation of new protocols in NS2
6. Simulation study of pure ALOHA protocol;
7. Simulation study of slotted ALOHA protocol;
8. Simulation study of Token Bus LAN protocol;
9. Simulation study of Token Ring LAN protocol;
10. Simulation study of WAN protocol like Frame Relay, X. 25
11. Study of 802. 11 wireless LAN protocols.
12. Implement the Distance Vector Routing protocol for finding the shortest path.
13. Write a program to connect server with client and passes information from one system to another and vice versa that by creating / establishing connection.

PCS-363 Mini Project

B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P
-	-	4

Class Work	**:50 Marks**
Exam.	**:50 Marks**
Total	**:100 Marks**
Duration of Exam	**: 3 Hrs**

Motives:

1. To enable students to discover potential research areas in the field of IT
2. To enable students to create very precise specifications of the IT solution to be designed.
3. To introduce students to the vast array of literature available of the various research challenges in the field of IT
4. To enable students to use all concepts of IT in creating a solution for a problem
5. To offer students a glimpse into real world problems and challenges that need IT based solutions

TCS-471 Data Science

B.Tech. Semester –VII (Computer Science & Engg.)

L	T	P		
3	1	-	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

Upon successful completion of this course, the students will be able to

- Demonstrate the mathematical foundations needed for data science.
- Collect, explore, clean,and manipulate data.
- Demonstrate the basic concepts of machine learning
- Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering.
- Build data science applications using Python based toolkits.

Unit 1-Introduction to Data Science: Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting

Unit 2-Introduction to Programming Tools for Data Science: Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK Visualizing Data: Bar Charts, Line Charts, Scatterplots Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning , Manipulating Data, Rescaling, Dimensionality Reduction

Unit 3-Mathematical Foundations: Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution

Unit 4-Machine Learning: Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks- Learning and Generalization, Overview of Deep Learning.

Unit 5-Case Studies of Data Science Application: Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis.

LIST OF SUGGESTED BOOKS

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media
2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media
3. Jain V.K., "Data Sciences", Khanna Publishing House, Delhi.

ECS-441 Blockchain
B.Tech. Semester –VII (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

COURSE OUTCOMES
At the end of this course, the students will be able to

- Understand block chain technology.
- Develop block chain based solutions and write smart contract using Hyperledger Fabric and Ethereum frameworks.
- Build and deploy block chain application for on premise and cloud based architecture.
- Develop the concepts for safe use of crypto currency
- Integrate ideas from various domains and implement them using block chain technology

Unit 1-Introduction: Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chainBasic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

Unit 2-Understanding Block chain with Crypto currency: Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, Hashcash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

Unit 3-Understanding Block chain for Enterprises: Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

Unit 4-Enterprise application of Block chain: Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Identity on Block chain

Unit 5-Block chain application development: Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda

LIST OF SUGGESTED BOOKS

1. Melanie Swan, “Block Chain: Blueprint for a New Economy”, O’Reilly, 2015
2. Josh Thompsons, “Block Chain: The Block Chain for Beginners- Guide to Block chain Technology and Leveraging Block Chain Programming” Daniel Drescher, “Block Chain Basics”, Apress; 1st edition, 2017

ECS-442 Internet-of-Things
B.Tech. Semester –VII (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes
Upon completion of this course, the students will be able to

- Understand the application areas of IOT
- Explore interconnection and integration of the physical world
- Design & develop IOT Devices
- Realize the revolution of Internet in Mobile Devices, Cloud &Sensor Networks
- Understand the building blocks of Internet of Things and their characteristics.

Unit 1-INTRODUCTION TO IOT: Internet of Things - Physical Design- Logical Design- IOT Enabling Technologies - IOT Levels & Deployment Templates - Domain Specific IOTs - IOT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology

Unit 2-IOT ARCHITECTURE: M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture

Unit 3-IOT PROTOCOLS: Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP - Security

Unit 4-BUILDING IOT WITH RASPBERRY PI & ARDUINO: Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks - Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

Unit 5-CASE STUDIES AND REAL-WORLD APPLICATIONS: Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT

Books

1. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach‖, Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Things‖, Springer, 2011.
3. Honbo Zhou, ―The Internet of Things in the Cloud: A Middleware Perspective‖, CRC Press, 2012.
4. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.

ECS-443 Digital Image Processing
B.Tech. Semester –VII (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

Upon completion ofthis course, the students will be able to

- Understanding the fundamentals of digital image processing.
- Knowledge and understanding of image processing in spatial domain.
- Familiar with concepts of digital image processing in Frequency domain.
- Fundamentals of color image processing and Morphological Image Processing.
- Knowledge and understanding of image Registration and image features.

Unit 1-Introduction: Digital Image Processing, The origins of Digital Image Processing, Examples of Digital Image Processing application, Fundamental steps in Digital Image processing, Components of Image Processing system Fundamentals: Elements of Visual Perception, Light and Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some basic Relationships between Pixels, Linear and Nonlinear Operations.

Unit 2-Image Enhancement in the spatial domain: Background, Some basic gray level transformation, Introduction of Histogram processing, Enhancement using Arithmetic/Logic operations, Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters, Image Enhancement in the Frequency Domain: Introduction.

Unit 3-Image Restoration: Model of the Image Degradation/Restoration process, Noise Models, Restoration in the presence of noise only spatial filtering, Inverse filtering, Minimum Mean Square Error (Wiener) filtering, Geometric mean filter, Geometric Transformations,

Unit 4-Image Compression: Fundamentals, Lossy Compression, Lossless Compression, ImageCompression models, Error-free Compression : Variable length coding, LZW coding, Bit plane coding, Run length coding, Introduction to JPEG.

Unit 5-Morphology: Dilation, Erosion, Opening and Closing, Hit-and Miss transform, Morphological **Algorithms :** Boundry Extraction, Region filling, Extraction of connected components, Convex Hull, **Image Segmentation:** Definition, characteristics of segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region based segmentation. Introduction to Representation & Description, Introduction to Object Recoginition.

References

1. Rafael C. Gonzalez and Richard E.Woods. ,Digital Image Processing: Addision Wesley.
2. Anil K. Jain , Fundamentals of Digital Image Processing, PHI.
3. B. Chanda & D. Dutta Majumber , Digital Image Processing and Analysis , PHI.
4. Dwayne Phillips , Image Processing in C , BPB

ECS-444 Multi-Agent Intelligent Systems

B.Tech. Semester –VII (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

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

- Understand the notion of an agent, how agents are distinct from other software paradigms
- Understand the key issues associated with constructing agents capable of intelligent autonomous action, and the main approaches taken to developing such agents
- Understand the key issues in designing societies of agents that can effectively cooperate in order to solve problems.
- Understand the key types of multi-agent interactions possible in such systems
- Understand the main application areas of agent-based solutions, and be able to develop a meaningful agent-based system using a contemporary agent development platform.

Unit 1-Introduction: what is an agent?: agents and objects; agents and expert systems; agents and distributed systems; typical application areas for agent systems.

Unit 2-Intelligent Agents: the design of intelligent agents - reasoning agents (eg AgentO), agents as reactive systems (eg subsumption architecture); hybrid agents (eg PRS)

Unit 3-Layered agents: Agents (eg Interrap) a contemporary (Java-based) framework for programming agents (eg the Jack language, the JAM! system).

Unit 4-Multi-Agent Systems: Classifying multi-agent interactions - cooperative versus non-cooperative; zero-sum and other interactions; what is cooperation? how cooperation occurs - the Prisoner's dilemma and Axelrod's experiments; Interactions between self-interested agents: auctions & voting systems: negotiation; Interactions between benevolent agents:

Unit 5-Cooperative distributed problem solving (CDPS), partial global planning; coherence and coordination; Interaction languages and protocols: speech acts, KQML/KIF, the FIPA framework. **Advanced topics:** One issue selected from the contemporary research literature, perhaps by guest lecturer..

Books

1. Michael Wooldridge ,An Introduction to MultiAgent Systems - Second Edition. (Wiley, 2009)
2. Rafael H. Bordini, Jomi Fred Hubner and Michael Wooldridge , Programming Multi-agent Systems in AgentSpeak Using Jason. (Wiley, 2007)

ECS-445 Network Programming

B.Tech. Semester –VII (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

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

- To impart the knowledge of socket programming
- Understand the basic concept of TCP/IP model
- Understand the basic concept of Middleware communications
- To impart the knowledge of web programming
- Understand the basic concepts of client server programming.

Unit 1- Socket Programming: Creating sockets, Posix data type, Socket addresses, Assigning address to a socket, Java socket programming, Thread programming, Berkeley Sockets: Overview, socket address structures, byte manipulation & address conversion functions, elementary socket system calls – socket, connect, bind, listen, accept, fork, exec, close, TCP ports (ephemeral, reserved), Berkeley Sockets: I/O asynchronous & multiplexing models, select & poll functions, signal & fcntl functions, socket implementation (client & server programs), UNIX domain protocols

Unit 2- APIs & Winsock Programming: Windows socket API, window socket & blocking I/O model, blocking sockets, blocking functions, timeouts for blocking I/O, API overview, Different APIs & their programming technique, DLL & new API's, DLL issues, Java Beans.

Unit 3- Web Programming: Java network programming, packages, RMI, Overview of Javascript, WAP architecture & WAP services, Web databases, Component technology, CORBA concept, CORBA architecture, CGI programming.

Unit 4- Cryptography: Firewall & security techniques Cryptography, Digital Signature.

Unit 5- Client/Server Programming: Client side programming: Creating sockets, Implementing generic network client, Parsing data using string Tokenizer, Retrieving file from an HTTP server, Retrieving web documents by using the URL class. Server side programming: Steps for creating server, Accepting connection from browsers, creating an HTTP server, Adding multithreading to an HTTP server.

Books:

1. Steven.W.R: UNIX Network Programming, PHI (VOL I& II)
2. Window Socket Programming by Bobb Quinn and Dave Schutes
3. Davis.R: Windows Network Programming, Addison Wesley
4. NETWORK PROGRAMMING With Windows Socket By Baner .P., PH New Jersey

ECS-451 Soft Computing
B.Tech. Semester –VII (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

Upon completion ofthis course, the students will be able to

- Knowledge of the fundamentals of soft computing and applications of soft computing to solve various problems.
- Understanding of Fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
- Understanding of the principles of Artificial Neural Network, different types of neural network and their applicability.
- Familiar with the concepts of Genetic algorithms, and various techniques
- Classification problems and fundamentals of Machine Learning and classification and various applications.

Unit 1- Introduction to Genetic Algorithm: Genetic Operators and Parameters, Genetic Algorithms in Problem Solving, Theoretical Foundations of Genetic Algorithms, Implementation Issues.

Unit 2- Artificial Neural Networks & Learning : Neural Model and Network Architectures, Perceptron Learning, Supervised Hebbian Learning, Backpropagation, Associative Learning.

Unit 3- Competitive Networks: Hopfield Network, Computing with Neural Nets and applications of Neural Network.

Unit 4- Introduction to Fuzzy Sets: Operations on Fuzzy sets, Fuzzy Relations, Fuzzy Measures, Applications of Fuzzy Set Theory to different branches of Science and Engineering.

Unit 5- Knowledge discovery in databases: Data mining and web mining using soft computing techniques. Soft computing approaches to information systems project management.

Books

1. M. Mitchell, An Introduction to Genetic Algorithms, Prentice-Hall, 1998.
2. D. E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley, 1989.
3. S. V. Kartalopoulos, Understanding Neural Networks and Fuzzy Logic: Basic Concepts and Applications, IEEE Press - PHI, 2004.
4. S. Rajasekaran & G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, PHI, 2003.
5. S. N. Sivanandam & S. N. Deepa, Principles of Soft Computing, Wiley - India, 2007

ECS-452 Cloud Computing
B.Tech. Semester –VII (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

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

- Impart the knowledge of cloud computing and technologies, issues in cloud computing etc.
- ldentify the architecture, infrastructure and delivery models of cloud computing
- Apply suitable virtualization concept.
- Choose the appropriate Programming Models and approach for Servsces
- Address the core issues of cloud computing such as security, privacy and interoperability

Unit 1- Introduction to Cloud Computing: Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud, Comparison among SAAS, PAAS, IAAS Cloud computing platforms: Infrastructure as service: Amazon EC2,Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing

Unit 2- Introduction to Cloud Technologies: Study of Hypervisors Compare SOAP and REST Webservices, AJAX and mashups-Web services: SOAP and REST, SOAP versus REST, AJAX: asynchronous 'rich' interfaces, Mashups: user interface services Virtualization Technology: Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization Multitenant software: Multi-entity support, Multi-schema approach, Multi-tenance using cloud data stores, Data access control for enterprise applications,

Unit 3- Data in the cloud: Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo. Map-Reduce and extensions: Parallel computing, The map-Reduce model, Parallel efficiency of Map-Reduce, Relational operations using Map-Reduce, Enterprise batch processing using Map-Reduce, Introduction to cloud development, Example/Application of Mapreduce, Features and comparisons among GFS,HDFS etc,
Cloud computing security challenges: Virtualization security management- virtual threats, VM Security Recommendations, VM-Specific Security techniques, Secure Execution Environments and Communications in cloud

Unit 4- Issues in cloud computing: Implementing real time application over cloud platform Issues in Intercloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment. Cloud Middleware. Mobile Cloud Computing. Inter Cloud issues. A grid of clouds, Sky computing, load balancing, resource optimization, resource dynamic reconfiguration, Monitoring in Cloud

Unit 5- Cloud computing platforms: Installing cloud platforms and performance evaluation Features and functions of cloud platforms: Xen Cloud Platform, Eucalyptus, OpenNebula, Nimbus, TPlatform, Apache Virtual Computing Lab (VCL), Enomaly Elastic Computing Platform

Books

1. Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper, Cloud Computing for Dummies (Wiley India Edition)
2. Gautam Shroff, Enterprise Cloud Computing, Cambridge
3. Ronald Krutz and Russell Dean Vines Cloud Security, Wiley-India

ECS-453/TOE-50 Reliable Computing

B.Tech. Semester –VII (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

Upon successful completion of this course, the students will be able to

- Learn basic model of reliability and faults
- Understand the principles behind reliability
- Understand Hardware fault tolerance
- Understand Software fault tolerance
- Learn the programming tools in designing reliable systems

Unit 1-Reliability& fault: Definition, System reliability, Parameter values, Reliability models for hardware redundancy , Testing: Various testing methods, Definition, Fault types, Detection, Redundancy, Data diversity, Reversal checks, Byzantine failures, Integrated failure handling..

Unit 2- Hardware Fault Tolerance:-Definition, Fault types, Detection, Redundancy, Data diversity, Reversal checks, Byzantine failures, Integrated failure handling.canonical and Resilient Structures- Series and Parallel Systems, Non-Series/Parallel Systems, *M*-of-*N* Systems, Voters, Variations on *N*-Modular Redundancy, Duplex Systems, Other Reliability Evaluation Techniques-Poisson Processes, Markov Models, Fault-Tolerance Processor-Level Techniques, WatchdogProcessor, Simultaneous Multithreading for Fault Tolerance, Byzantine Failures, Byzantine Agreement with Message Authentication.

Unit 3-Testability for Hardware: testability for combinational circuits: Basic concepts of Testability, Controllability and observability, The Reed Muller's expansion technique, use of control and syndrome testable designs. Design for testability by means of scan: Making circuits Testable, Testability Insertion, Full scan DFT technique- Full scan insertion, flip-flop Structures, Full scan design and Test, Scan Architecturesfull scan design, Shadow register DFT, Partial scan methods, multiple scan design, other scan designs.

Unit 4- Software Fault Tolerance: Acceptance Tests Single-Version Fault Tolerance- Wrappers, Software Rejuvenation, Data Diversity, Software Implemented Hardware Fault Tolerance (SIHFT), *N*-Version Programming-Consistent Comparison Problem, Version Independence, Recovery Block Approach- Basic Principles, Success Probability Calculation, Distributed Recovery Blocks, Preconditions, Postconditions, and Assertions, Exception-Handling- Requirements from Exception-Handlers, Basics of Exceptions and Exception-Handling

Unit 5-Programming Languages and Tools: Desired Language Characteristics, Data typing, control structures, Hierarchical decomposition, Packages, Exception handling, Over loading and Generics, Multi tasking, Task scheduling, Timing specification., Flex, Euclid, Environments, Run time support.

Books

1. Israel Koren And C. Mani Krishna, "Fault-Tolerant Systems, Morgan Kaufmann publisher
2. C. Siva Ram Murthy and G. Manimaran, 'Resource Management in Real Time Systems and Networks', the MIT Press, 2001.
3. Phillip A. Laplante, 'Real-Time Systems Design and Analysis – An Engineers Hand book', Printice Hall India, 3rd edition, 1997.

ECS-454Software Project Management

B.Tech. Semester –VII (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

COURSE OUTCOMES

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

- Produce the quality product without defects.
- Complete the task with better quality on time.
- Format their process of modelling
- Streamline their activities to yield better result
- Manage the people and control the defects.

Unit 1- Basic Concepts: Product, Process and Project, Definition, Components of Software Project Management(SPM), Challenges and Opportunities, Tools and Techniques, Managing Human Resource and Technical Resource, Costing and pricing of projects, Training and development, Project management technique, Product Life Cycle , Project Life Cycle Models.

Unit 2- Format Process Models And Their Use: Definition and Format Model for a Process, ISO 9001 and CMM Models and their relevance to Project Management, Other Emerging Models like People CMM

Unit 3- Umbrella Activities In Projects: Metrics, Methods and Tools for Metrics, Issues of Metrics in multiple Projects, Configuration Management, Software Quality Assurance, Quality Standards and Certifications, Process and Issues in obtaining Certifications, Risk issues in Software Development and Implementation, Identification of Risks , Resolving and Avoiding risks, Tools and Methods for Identifying Risk Management.

Unit 4- Instream Activities In Project: Project Initiation, Project Planning, Execution and Tracking, Project Wind up, Concept of Process, Project Database.

Unit 5- Engineering And Issues In Project Management: Requirements, Design, Development, Testing, Maintenance, Deployment, Engineering Activities and Management Issues in Each Phase, Special Considerations in Project Management for India and Geographical Distribution Issues.

TEXT BOOK(S)

1. Royce and Walker, “Software Project Management”, 2nd Edition, Pearson Education, 2002.

REFERENCES

1. Bob Hughes and Mike Cotterell, “Software Project Management”, 5th Edition, Tata McGrawHill, 2011.
2. Kelker, S. A, “Software Project Management”, 2nd Edition, Prentice Hall, 2003.
3. Gopalaswamy Ramesh, "Managing Global Projects", 1st Reprint Edition, Tata McGraw Hill,2006.
4. Robert K. Wysocki, “Executive's Guide to Project Management”, 2nd Edition, John Wiley &Sons, 2011.
5. Teresa and luckey, Joseph Phillips, “Software project Management for dummies”, 3rd Edition, Wiley publishing Inc., 2006.

ECS-455 Data Mining
B.Tech. Semester –VII(Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcome

Students who successfully complete this course should be able to

- Interpret the contribution of data warehousing and data mining to the decision-support level of organizations
- Evaluate different models used for OLAP and data preprocessing
- Categorize and carefully differentiate between situations for applying different data-mining techniques: frequent pattern mining, association, correlation, classification, prediction, and cluster and outlier analysis
- Design and implement systems for data mining
- Evaluate the performance of different data-mining algorithms
- Propose data-mining solutions for different applications

Unit 1- DATA WAREHOUSE: Data Warehousing - Operational Database Systems vs Data Warehouses - Multidimensional Data Model - Schemas for Multidimensional Databases – OLAP operations – Data Warehouse Architecture – Indexing – OLAP queries & Tools.

Unit 2- DATA MINING & DATA PREPROCESSING: Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

Unit 3- ASSOCIATION RULE MINING: Introduction - Data Mining Functionalities - Association Rule Mining - Mining Frequent Itemsets with and without Candidate Generation - Mining Various Kinds of Association Rules - Constraint – Based Association Mining.

Unit 4- CLASSIFICATION & PREDICTION: Classification vs Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Unit 5- CLUSTERING: Cluster Analysis - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High- Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

BOOKS:

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”,Second Edition, Elsevier, Reprinted 2011.
2. K.P. Soman, Shyam Diwakar and V. Ajay, “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Easter Economy Edition

PCS-471 Data Science Lab

B.Tech. Semester –VII (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			Exam.	**:25 Marks**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs**

COURSE OUTCOMES:

Upon successful completion of the course, the students will be able to

- Understand the R Programming Language.
- Exposure on Solving of data science problems.
- Understand The classification and Regression Model.
- To implementation of various control structures in R
- To implementation data transpose operations in R

List of Experiments

i. Study of data analysis using MS-Excel(Prerequisite)

1. Study of basic Syntaxes in R

2. Implementation of vector data objects operations

3. Implementation of matrix, array and factors and perform va in R

4. Implementation and use of data frames in R

5. Create Sample (Dummy) Data in R and perform data manipulation with R

6. Study and implementation of various control structures in R

7. Data Manipulation with dplyr package

8. Data Manipulation with data.table package

9. Study and implementation of Data Visualization with ggplot2

10. Study and implementation data transpose operations in R

PCS-472 Project-I

B.Tech. Semester –VII (Computer Science & Engg.)

L	T	P		
-	-	8	**Class Work**	**:100 Marks**
			Exam.	**:100 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs**

The objective of Project-Iis to enable the student to take up investigative study in the broad field of Computer Science & Engineering, either fully theoretical/practical or involving both theoretical and practical work which is to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work.

Key Points:

- Survey and study of published literature on the assigned topic.
- Working out a systematic approach to the problem related to the assigned topic.
- Conducting preliminary Analysis, Modelling, Simulation and Experiment
- Preparing a report on the study conducted for presentation to the Department
- Final Seminar, as oral Presentation before a Departmental Committee.

PCS-473 Industrial Training
B.Tech. Semester –VII (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:50 Marks**
			Exam.	**:--**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs**

- The main objective of Industrial Training is to expose the students to actual working environment and enhance their knowledge and skill from what they have learned in the college.
- Another purpose of this program is to enhance the good qualities of integrity, responsibility and self confidence. All ethical values and good working practices must be followed by student.
- It is also to help the students about the safety practices and regulations inside the industry and to instill the spirit of teamwork and good relationship between students and employees.

ECS-461/TOE-46 Machine Learning

B.Tech. Semester –VIII (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcome

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

- Understand complexity of Machine Learning algorithms and their limitations;
- Understand modern notions in data analysis oriented computing;
- Capableof applying common Machine Learning algorithms in practice and implementing their own
- Capable of performing distributed computations
- Capable of performing experiments in Machine Learning using real-world data

Unit 1- INTRODUCTION: Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression.

Unit 2- LINEAR MODELS: Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multilayer Perceptron in Practice – Examples of using the MLP – Overview – Deriving BackPropagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.

Unit 3- TREE AND PROBABILISTIC MODELS: Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map

Unit 4- DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS: Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process

Unit 5- GRAPHICAL MODELS: Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

References

1. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series) Third Edition, MIT Press, 2014
2. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014
3. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, First Edition, Cambridge University Press, 2012.
4. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

ECS-462 /TOE-49 ADHOC and Sensor Networks
B.Tech. Semester –VIII (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

Upon successful completion of this course, the students will be able to

- Impart the trends in emerging field of wireless ad hoc and sensor networking.
- Focus on layered communication modeling, such as the media access control and network layer.
- Learn the need of energy management systems
- Address quality of service issues and network reliability for transmission of real-time information.
- Learn the various routing protocols of ad hoc and sensor networks

Unit 1- ADHOC NETWORKS INTRODUCTION: Introduction to Wireless Communication Technology, Characteristics of the Wireless Channel, IEEE 802.11a/b Standard, Origin of Ad-hoc Packet Radio Networks, Architecture of PRNETS, Introduction to Ad-hoc Wireless Networks, Heterogeneity in Mobile Devices.

Unit 2- ADHOC NETWORK ROUTING PROTOCOLS: Introduction -to designing a Routing Protocol, Classifications of Routing Protocols, Wireless Routing Protocol (WRP), Source—Initiated On—Demand Approaches, Ad hoc On-Demand Distance Vector Routing , AODV, Introduction to Multicast Routing Protocol, Classifications of Multicast Routing Protocols.

Unit 3- QoS AND ENERGY MANAGEMENT: Introduction to QoS in Ad hoc Wireless Networks, Classifications of QoS Solutions, Classification of Energy Management Schemes, Transmission Power Management Schemes, System Power Management Schemes.

Unit 4- WSN INTRODUCTION: Characteristic requirements, Challenges of sensor networks Emerging technologies for wireless sensor networks, Advantages of sensor networks, Sensor network applications.

Unit 5- WSN PROTOCOLS: Communication protocols, MAC protocaols, Namlng and Addressing-Routing protocols, Energy efficient routing.

Text Books

1. C. Siva Ram Murthy and B.S. Manoj, “Ad Hoc ereless Networks Archltectures and Protocols”, 2nd Edition, Pearson Education, 2007.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach”, Elsevier, 2007.
3. Holger Karl & Andreas Willig, “Protocols and Archltectures for Wireless Sensor Networks”, John
4. Wiley, 2005.

ECS-463 Cyber Security
B.Tech. Semester –VIII (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

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

- Understand, appreciate, employ, design and implement appropriate security technologies and policies to protect computers and digital information.
- Identify & Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real time scenarios
- Protect their organizations from the scenarios of passive and active attacks
- Identify common trade-offs and compromises that are made in the design and development process of Information Systems
- Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection

Unit 1- Cyber Security ConceptsEssential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits. Information Gathering (Social Engineering, Foot Printing & Scanning). Open Source/ Free/ Trial Tools: nmap, zenmap, Port Scanners, Network scanners.

Unit 2- Cryptography and Cryptanalysis: Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls, VPN Security, Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec. Open Source/ Free/ Trial Tools: Hash Values Calculations MD5, SHA1, SHA256, SHA 512, Steganography (Stools)

Unit 3- Infrastructure and Network Security: Introduction to System Security, Server Security, OS Security, Physical Security, Introduction to Networks, Network packet Sniffing, Network Design Simulation. DOS/ DDOS attacks. Asset Management and Audits, Vulnerabilities and Attacks. Intrusion detection and Prevention Techniques, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation. Open Source/ Free/ Trial Tools: DOS Attacks, DDOS attacks, Wireshark, Cain & abel, iptables/ Windows Firewall, snort, suricata, fail2ban

Unit 4- Cyber Security Vulnerabilities & Safe Guards: Internet Security, Cloud Computing &Security, Social Network sites security, Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, IT Audit, Authentication. Open Web Application Security Project (OWASP), Web Site Audit and Vulnerabilities assessment.

Unit 5- Malware: Explanation of Malware, Types of Malware: Virus, Worms, Trojans, Rootkits, Robots, Adware's, Spywares, Ransom wares, Zombies etc., OS Hardening (Process Management, Memory Management, Task Management, Windows Registry/ services another configuration), Malware Analysis.Open Source/ Free/ Trial Tools: Antivirus Protection, Anti Spywares, System tuning tools, Anti Phishing.

LIST OF SUGGESTED BOOKS

1. William Stallings, "Cryptography and Network Security", Pearson Education/PHI, 2006.

2. V.K. Jain, "Cryptography and Network Security", Khanna Publishing House.

ECS-464 Computational Compexity

B.Tech. Semester –VIII (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

On successful completion of this module, the student should

- Be familiar with the limits of models of computation under the Church-Turing hypothesis.
- Be familiar with the complexity classes P, NP, Co-NP, NP-hard, and others.
- Be aware of various complexity reductions
- Be able to evaluate specific algorithms in terms of worst- and average-case complexity of performance.

Unit 1- Computability: Review of Turing Machines, view of PDAs, 2DFAs, FAs as restricted TMs and related theorems. Tape reduction, and robustness of the model. Encoding and Enumeration of Turing Machines, Undecidability.

Unit 2- Rice-Myhill-Shapiro theorem: Relativisation. Arithmetic and Analytic Hierarchy of languages. Proof of Godel's incompleteness theorem based on computability. Kolmogorov Complexity. Resource bounded computation. Notion of a computational resource. Blum's Speedup theorem.

Unit 3- Time Complexity: Time as a resource, Linear Speedup theorem. Crossing Sequences and their applications. Hierarchy theorems. P vs NP. Time Complexity classes and their relationships. Notion of completeness, reductions. Cook-Levin Theorem. Ladner's theorem. Relativization Barrier : Baker-Gill-Solovoy theorem.

Unit 4- Space Complexity: Space as a resource. PSPACE, L and NL. Reachability Problem, Completeness results. Savitch's theorem, Inductive Counting to show Immerman-Szelepscenyi theorem. Reachability Problems**,** Expander Graphs, SL=L

Unit 5- Complexity of Counting & Randomization : Counting Problems. Theory of #P-completeness. The complexity classes PP, ParityP, BPP, RP, BPP is in P/poly, Toda's theorem.

Text Books

1. Dexter Kozen ,Automata and Computability
2. Dexter Kozen ,Theory of Computation
3. Du and Ko , Theory of Computational Complexity

ECS-465 Data Analytics
B.Tech. Semester –VIII (Computer Science & Engg.)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 Marks**
			Total	**:150 Marks**
			Duration of Exam	**: 3 Hrs**

Course Outcomes

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

- Appreciate the fundamentals and describe what Big Data Analytics is.
- Understand the Big Data flow and apply necessary components to build a Big Data Analytics System.I.
- Identify and successfully apply appropriate techniques and tools to solve Big Data problems.
- Analyze the requirements for a Big Data Analytics System for departmental organizational requirements using Hadoop.
- Understand Big Data ecosystem, specifically PIG and Hive.

Unit 1- INTRODUCTION TO BIG DATA: Introduction To Big Data Platform – Challenges Of Conventional Systems – Web Data – Evolution Of Analytic Scalability, Analytic Processes And Tools, Analysis Vs Reporting – Modern Data Analytic Tools, Stastical Concepts: Sampling Distributions, Resampling, Statistical Inference, Prediction Error.

Unit 2- DATA ANALYSIS: Regression Modeling, Multivariate Analysis, Bayesian Modeling, Inference And Bayesian Networks, Support Vector And Kernel Methods, Analysis Of Time Series: Linear Systems Analysis, Nonlinear Dynamics – Rule Induction – Neural Networks: Learning And Generalization, Competitive Learning, Principal Component Analysis And Neural Networks; Fuzzy Logic: Extracting Fuzzy Models From Data, Fuzzy Decision Trees, Stochastic Search Methods.

Unit 3- MINING DATA STREAMS: Introduction To Streams Concepts – Stream Data Model And Architecture – Stream Computing, Sampling Data In A Stream – Filtering Streams – Counting Distinct Elements In A Stream – Estimating Moments – Counting Oneness In A Window – Decaying Window – Realtime Analytics Platform(RTAP) Applications – Case Studies – Real Time Sentiment Analysis, Stock Market Predictions.

Unit 4- FREQUENT ITEMSETS AND CLUSTERING: Mining Frequent Itemsets – Market Based Model – Apriori Algorithm – Handling Large Data Sets In Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets In A Stream – Clustering Techniques – Hierarchical – K- Means – Clustering High Dimensional Data – CLIQUE And PROCLUS – Frequent Pattern Based Clustering Methods – Clustering In Non-Euclidean Space – Clustering For Streams And Parallelism.

Unit 5- FRAMEWORKS AND VISUALIZATION: MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – S3 – Hadoop Distributed File Systems – Visualizations – Visual Data Analysis Techniques, Interaction Techniques; Systems And Applications.

BOOKS

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. Anand Rajaraman And Jeffrey David Ullman, Mining Of Massive Datasets,Cambridge University Press, 2012.
3. Bill Franks, Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analystics, John Wiley & Sons, 2012.
4. Glenn J. Myatt, Making Sense Of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O‟Reilly, 2011.

PCS-481 Project-II

B.Tech. Semester –VIII (Computer Science & Engg.)

L	T	P		
-	-	16	**Class Work**	**:200 Marks**
			Exam.	**:200 Marks**
			Total	**:400 Marks**
			Duration of Exam	**: 3 Hrs**

The object of Project II is to enable the student to extend further the investigative study taken up under project I, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership.

- Review and finalization of the Approach to the Problem relating to theassigned topic.
- Preparing an Action Plan for conducting the investigation, including team work.
- Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed.
- Final development of product/process, testing, results, conclusions and future directions.
- Preparing a paper for Conference presentation/Publication in Journals, if possible.
- Preparing a Dissertation in the standard format for being evaluated by the Department.
- Final Seminar Presentation before a Departmental Committee.

PCS-482 Seminar

B.Tech. Semester –VIII (Computer Science & Engg.)

L	T	P		
-	-	2	**Class Work**	**:50 Marks**
			Exam.	**:--**
			Total	**:50 Marks**
			Duration of Exam	**: 3 Hrs**

COURSE OUTCOMES

Upon successful completion of this course, the students will be able to

- Express themselves fluently and appropriately in social and professional contexts.
- Develop the sub-skills required for paper presentations and group discussions.
- Acquire the soft skills and interpersonal skills which will help them to excel in their workplace needed for these functions.

SEMINAR: Seminar presentation on the themes allotted:

Each student should collect materials from Books, Internet, Journals and Newspapers for hlslher theme and prepare a short Seminar for 4 to 5 Pages. During the seminar session each student is - expected to prepare and present a topic, for duration of about 15 to 20 minutes. It should be followed by a Viva Voce during which others should come forward to question, clarify, supplement or evaluate. The student is evaluated based on the presentation skill, concept and Query clarification. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report. A Faculty is to be allotted and he / she will guide and monitor the progress of the student and maintain the attendance also. The seminar will be assessed by a committee appointed by the department.

Some of the themes like:

- Cloning
- Artificial satellites Cyber Revolution Space research Nano Technology Robotics ‘
- Artificial intelligence Role of Fibre Optics
- Industrial development and ecological issues
- Recent trends in Automobiles
- Hazards of E-waste
- Mobile Jammer T
- Touch Screen Technology :
- 4G Technology .
- Tsunami Warning System A\P
- Blue Tooth Technology
- Blockchain
- Machine Learning
- Virtual Reality