

EVALUATION SCHEME
B. TECH. ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
II-YEAR (III-SEMESTER)
(Effective from session: 2022-23)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME			ESE	Subject Total	Credits
			L	T	P	SESSIONAL EXAM					
						CT	TA	Total			
THEORY											
1.	TCS-231	DATA STRUCTURE	3	1	0	30	20	50	100	150	3
2.	TAI-231	PYTHON PROGRAMMING	3	1	0	30	20	50	100	150	3
3.	TAI-232	DISCRETE MATHEMATICS	3	1	0	30	20	50	100	150	3
4.	TEC-232	DIGITAL ELECTRONICS	3	1	0	30	20	50	100	150	3
5.	TAH-234	CONSTITUTION OF INDIA	2	0	0	30	20	50	100	150	0
PRACTICAL											
6.	PCS-231	DATA STRUCTURE	0	0	2	10	15	25	25	50	1
7.	PAI-231	PYTHON PROGRAMMING LAB	0	0	2	10	15	25	25	50	1
8.	PEC-232	DIGITAL ELECTRONICS LAB	0	0	2	10	15	25	25	50	1
9.	PAI-233	INDUSTRIAL TRAINING	0	0	2	0	0	50	0	50	1
10.	GPP 231	GENERAL PROFICIENCY	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			14	4	8	180	195	425	675	1000	16

EVALUATION SCHEME
B. TECH. ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
II-YEAR (IV-SEMESTER)
(Effective from session: 2022-23)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
			L	T	P	SESSIONAL EXAM			ESE	Subject Total	Credits
						CT	TA	Total			
THEORY											
1.	TAI-241	ARTIFICIAL INTELLIGENCE	3	1	0	30	20	50	100	150	3
2.	TCS -242	OPERATING SYSTEMS	3	1	0	30	20	50	100	150	3
3.	TAI -243	DESIGN & ANALYSIS OF ALGORITHMS	3	1	0	30	20	50	100	150	3
4.	TCS -244	THEORY OF COMPUTATION	3	1	0	30	20	50	100	150	3
5.	TAH-243	STASTATICAL METHODS	3	1	0	30	20	50	100	150	3
6.	THS-246	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	30	20	50	100	150	0
PRACTICAL											
7.	PAI-241	ARTIFICIAL INTELLIGENCE 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.	PAI-243	DESIGN & ANALYSIS OF ALGORITHMS LAB	0	0	2	10	15	25	25	50	1
10.	PCS-244	LINUX / UNIX PROGRAMMING LAB	1	0	2	10	15	25	25	50	2
11.	GPP 241	GENERAL PROFICIENCY	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			18	5	8	220	230	450	700	1150	20

EVALUATION SCHEME
B. TECH. ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
III-YEAR (V-SEMESTER)
(Effective from session: 2023-24)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME			ESE	Subject Total	Credits
			L	T	P	SESSIONAL EXAM					
						CT	TA	Total			
THEORY											
1.	TAI-351	DATABASE MANAGEMENT SYSTEMS	3	1	0	30	20	50	100	150	3
2.	TAI -352	COMPUTER ORGANIZATION & ARCHITECTURE	3	1	0	30	20	50	100	150	3
3.	TCS -353	COMPILER DESIGN	3	1	0	30	20	50	100	150	3
4.	TCS-354	COMPUTER NETWORKS	3	1	0	30	20	50	100	150	3
5.	EAI-31X	ELECTIVE-I	3	1	0	30	20	50	100	150	3
PRACTICAL											
6.	PAI -351	DATABASE MANAGEMENT SYSTEMS LAB	0	0	2	10	15	25	25	50	1
7.	PAI -352	PYTHON FOR DATA PRE-PROCESSING AND VISUALIZATION LAB	0	0	2	10	15	25	25	50	1
8.	PAI-353	INDUSTRIAL TRAINING	0	0	2	0	0	50	0	50	1
9.	PCS-354	COMPUTER NETWORKS LAB	0	0	2	10	15	25	25	50	1
10.	GPP 351	GENERAL PROFICIENCY	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			15	5	8	180	195	425	575	1000	19

ELECTIVE-I

EAI-311 SOFTWARE ENGINEERING

EAI-312 COMPUTER GRAPHICS

EAI-313WEB TECHNOLOGY

EAI-314REAL TIME SYSTEM

EVALUATION SCHEME
B. TECH. ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
III-YEAR (VI-SEMESTER)
(Effective from session: 2024-25)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1.	TAI-361	MACHINE LEARNING	3	1	0	30	20	50	100	150	3
2.	TAI-362	DATA SCIENCE	3	1	0	30	20	50	100	150	3
3.	TAI-363	JAVA PROGRAMMING	3	1	0	30	20	50	100	150	3
4.	TAH-362	ORGANIZATIONAL BEHAVIOUR	2	3	0	30	20	50	100	150	2
5.	EAI-32X	ELECTIVE-II	3	1	0	30	20	50	100	150	3
6.	EAI-33X	ELECTIVE-III	3	1	0	30	20	50	100	150	3
PRACTICAL											
7.	PAI-361	MACHINE LEARNING LAB	0	0	2	10	15	25	25	50	1
8.	PAI-362	DATA SCIENCE LAB	0	0	2	10	15	25	25	50	1
9.	PAI-363	JAVA PROGRAMMING LAB	0	0	2	10	15	25	25	50	1
10.	PAI-364	MINI PROJECT	0	0	4	0	0	50	50	100	2
11.	GPP 361	GENERAL PROFICIENCY	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			17	8	8	210	215	475	725	1200	22

ELECTIVE-II

EAI-321 NATURAL LANGUAGE PROCESSING
EAI-322 DISTRIBUTED SYSTEMS
EAI-323 DIGITAL IMAGE PROCESSING
EAI-324 GENETIC ALGORITHM AND ITS APPLICATIONS
EAI-325 MICROPROCESSORS

ELECTIVE-III

EAI-331 NATURE INSPIRED COMPUTING
EAI-332 VIRTUALIZATION AND CLOUD COMPUTING
EAI-333 DATA MINING AND PREDICTIVE MODELLING
EAI-334 HUMAN COMPUTER INTERACTION
EAI-335 FUZZY LOGIC

EVALUATION SCHEME
B. TECH. ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
IV-YEAR (VII-SEMESTER)
(Effective from session: 2024-25)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME			ESE	Subject Total	Credits
			L	T	P	SESSIONAL EXAM					
						CT	TA	Total			
THEORY											
1.	TAI-471	SOFT COMPUTING	3	1	0	30	20	50	100	150	3
2.	EAI-44X	ELECTIVE-IV	3	1	0	30	20	50	100	150	3
3.	EAI-45X	ELECTIVE-V	3	1	0	30	20	50	100	150	3
4.	TOE-XY	OPEN ELECTIVE-I	3	0	0	30	20	50	100	150	2
5.	TAH-473	ENGINEERING ECONOMICS	2	3	0	30	20	50	100	150	2
PRACTICAL											
6.	PAI-471	SOFT COMPUTING LAB	0	0	2	10	15	25	25	50	1
7.	PAI-472	PROJECT-I	0	0	8	0	0	100	100	200	4
8.	PAI-473	INTERNSHIP/ 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			14	6	12	160	165	475	625	1100	19

ELECTIVE-IV

EAI-441 CRYPTOGRAPHY & NETWORK SECURITY
EAI-442 INTERNET-OF-THINGS
EAI-443 INFORMATION RETRIEVAL
EAI-444 KNOWLEDGE BASED SYSTEM
EAI-445 QUANTUM COMPUTING

ELECTIVE-V

EAI-451 DEEP LEARNING
EAI-452 AUGEMENTED VIRTUAL REALITY
EAI-453 DATA VISUALIZATION
EAI-454 APPLICATIONS OF AI IN INDUSTRIES-I
EAI-455 PATTERN CLASSIFICATION

EVALUATION SCHEME
B. TECH. ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
IV-YEAR (VIII-SEMESTER)
(Effective from session: 2023-24)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME			ESE	Subject Total	Credits
			L	T	P	SESSIONAL EXAM					
						CT	TA	Total			
THEORY											
1.	TAI-481	OPTIMIZATION TECHNIQUES	3	1	0	30	20	50	100	150	3
2.	EAI-46X	ELECTIVE-VI	3	1	0	30	20	50	100	150	3
3.	TOE-XY	OPEN ELECTIVE-II	3	0	0	30	20	50	100	150	2
PRACTICAL											
4.	PAI-481	OPTIMIZATION TECHNIQUES LAB	0	0	2	10	15	25	25	50	1
5.	PAI-482	PROJECT-II	0	0	16	0	0	200	200	400	8
6.	PAI-483	SEMINAR	0	0	2	0	0	50	0	50	1
7.	GPP 481	GENERAL PROFICIENCY	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			9	2	20	100	125	475	535	1000	18

ELECTIVE-VI

EAI-461 EMBEDDED SYSTEMS
EAI-462 APPLICATIONS OF AI IN INDUSTRIES-II
EAI-463 BLOCKCHAIN
EAI-464 BIG DATA ANALYTICS
EAI-465 ROBOTICS AND ITS APPLICATIONS

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. ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
I-YEAR (I/II-SEMESTER)
(COMMON FOR ALL BRANCHES)
(Effective from session: 2021-22)

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
			L	T	P	SESSIONAL EXAM			ESE	Subject Total	Credits
						CT	TA	Total			
THEORY											
1.	TCS-111/121	PROGRAMMING FOR PROBLEM SOLVING	3	1	0	30	20	50	100	150	3
PRACTICAL											
2.	PCS-111/121	PROGRAMMING FOR PROBLEM SOLVING LAB	0	0	2	10	15	25	25	50	1

TCS-111/ 121 PROGRAMMING FOR PROBLEM SOLVING

B.Tech. Semester –I/II (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Outcomes

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

- Illustrate the flowchart and design algorithm for a given problem and to develop C programs using operators
- Develop conditional and iterative statements to write C programs
- Exercise user defined functions to solve real time problems
- Use Pointers to access arrays, strings and functions.
- Exercise user defined data types including structures and unions and input and output files to solve problems

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), Step by step working methodology process of (Bubble, Insertion and Selection,Quick sort or Merge sort), Finding roots of equations.

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 of India

PCS-111/121 Basic Computer Engineering Lab

B.Tech. Semester –I/II (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:25 Marks
-	-	2	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 iterative statements programs
- Exercise user defined functions to solve real time problems
- Develop programs using pointers, strings and arrays.
- Develop C programs using pointers and to allocate memory using dynamic memory management functions.
- Exercise files concept to show input and output of files in C

Tutorial 1: Problem solving using computers:

Lab 1: 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 & 9: Numerical methods (Root finding, numerical differentiation, numerical integration):

Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls

Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation

Lab 11: Pointers and structures

Tutorial 12: File handling:

Lab 12: File operations

TCS-231/TOE-41 Data Structure
B.Tech. Semester –III (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course outcomes:

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

- Understand the concept of the algorithm to determine time and computational complexity, dynamic memory management.
- Solve the search problem in real scenario's.
- Understand the data like arrays, linked lists, stack and queues.
- Solve the problems in trees and graphs.
- Understand and implement the algorithms for sorting searching, deletion and insertion.

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 complexity analysis.

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 their analysis.

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 complexity analysis.

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 and analysis. **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.

TAI-232 Discrete Mathematics

B.Tech. Semester –III (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 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 logical inference
- Classify mathematical problem and its algebraic structure
- Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra
- Develop the given problem as graph networks and solve with techniques of graph theory

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, Mathematics Induction.

Function and its types: Composition of function and relations, Cardinality and inverse relations, Functions, logic and proofs injective, surjective and bijective functions.

Unit 2- Propositional Calculus: Basic operations; AND(\wedge), OR(\vee), NOT(\sim), True value of a compound statement, propositions, tautologies and contradictions. Partial ordering relations and lattices.

Lattice theory: Partial ordering ,posets, lattices as posets, properties of lattices as algebraic systems, sublattices, and some special lattices.

Unit 3-Combinations:The Basic of Counting, Pigeonhole Principles, Permutations and Combinations ,Principle of Inclusion and Exclusion.

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, summonoid, 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, Euler'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 Patashnik, 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 Lvasseur, (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.

TAI-231 Python Programming

B.Tech. Semester –III (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types
- Apply the basics of programming in the Python language
- Solve coding tasks related to conditional execution, loops
- Develop user defined function and standard modules in python programming.
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming.

Unit 1- Introduction and Syntax of Python Program: Features of Python-

Interactive, Object oriented, Interpreted, platform independent, Python building blocks - Identifiers, Keywords, Indentation, Variables, Comments, Python environment setup - Installation and working of IDE, Running Simple Python script to display 'welcome' message, Python variables, Python Data Types: Numbers, String, Tuples, Lists, Dictionary. Declaration and use of data types, Built in Functions.

Unit 2- Python Operators and Control Flow statements: Basic

Operators: Arithmetic, Comparison/Relational, Assignment, Logical, Bitwise, Membership, Identity operators, Python Operator Precedence, Control Flow: Conditional Statements (if, if...else, nested if), Looping in python (while loop, for loop, nested loops), loop manipulation using continue, pass, break, else.

Unit 3- Data Structures in Python: String: Concept, escape characters, String special operations, String formatting operator, Single quotes, Double quotes, Triple quotes, Raw String, Unicode strings, Built-in String methods. Lists: Defining lists, accessing values in list, deleting values in list, updating lists, Basic List Operations, Built-in List functions. Tuples: Accessing values in Tuples, deleting values in Tuples, and updating Tuples, Basic Tuple operations, Built-in Tuple functions. Sets: Accessing values in Set, deleting values in Set and updating Sets, Basic Set operations, Built-in Set functions. Dictionaries: Accessing values in Dictionary, deleting values in Dictionary and updating Dictionary, Basic Dictionary operations, Built-in Dictionary functions.

Unit 4-

Python Functions, modules, and Packages: Use of Python built-in functions (e.g. type/data conversion functions, math function etc.), user defined functions: Function definition, Function calling, function arguments and parameter passing, Return statement, Scope of Variables: Global variable and Local Variable. Modules: Writing modules, importing modules, importing objects from modules, Python built-in modules (e.g. Numeric and mathematical module, Functional Programming Module), Packages.

Unit 5- Object- Oriented Programming, File I/O Handling and Exception Handling in Python:

Creating Classes and Objects, Method Overloading and Overriding, Data Hiding, Data abstraction, Inheritance and composition classes, Customization via inheritance specializing inherited methods. I/O Operations: Reading keyboard input, Printing to screen. File Handling: Opening file in different modes, accessing file contents using standard library functions, Reading, and writing files, closing a file, Renaming and deleting files, File related standard functions. Exception Handling: Introduction, Exception handling - 'try: except: 'statement, 'raise' statement, User defined exceptions.

Text Books:

- Charles R. Severance, “Python for Everybody: Exploring Data Using Python 3”, 1st Edition, CreateSpace Independent Publishing Platform, 2016.
- Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2ndEdition, Green Tea Press, 2015.
- ChSatyanarayana, “Python Programming”, 1st Edition, universities press (india) private limited 2018.

Reference Books:

- Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014
- Mark Lutz, “Programming Python”, 4th Edition, O’Reilly Media, 2011. ISBN-13: 978-9350232873
- Wesley J Chun, “Core Python Applications Programming”, 3rdEdition, Pearson Education India, 2015. ISBN-13: 978-9332555365
- Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, “Data Structures and Algorithms in Python”, 1stEdition, Wiley India Pvt Ltd, 2016. ISBN-13: 978- 8126562176
- ReemaThareja, “Python Programming using problem solving approach”, Oxford university press, 2017

TEC-232 Digital Electronics
B.Tech. Semester –III (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Outcomes

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

- Understand the working of logic gates.
- Understand the working of synchronous and asynchronous counters
- Design and implement Combinational and Sequential logic circuits.
- Understand the process of Analog to Digital conversion and Digital to Analog conversion.
- Use PLDs to implement the given logical problem.

Unit 1- Fundamentals of Digital Systems: Digital Systems, Binary number systems and its 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 of logic functions 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.

TAH-234 Constitution of India
B.Tech. Semester –III (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

COURSE OBJECTIVE:- The Course aims to develop the critical understanding of Constitutional arrangements in the Country.

UNIT I: INTRODUCTION AND HISTORY OF INDIAN CONSTITUTION: (8 hours)

Constitution: Meaning, Indian Constitution: Sources and constitutional history, Formation of Drafting Committee (Composition and Working)

UNIT II: PHILOSOPHY OF INDIAN CONSTITUTION: (8 hours)

Preamble, Salient features

UNIT III: CONSTITUTIONAL RIGHTS AND DUTIES: (8hours)

Constitution: Meaning and Features, Fundamental Rights and Duties, Right to Equality, Right to Freedom Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy. Fundamental Duties.

UNIT IV: COMPONENTS OF GOVERNANCE (7 hours)

Parliament: Composition, Qualifications and Disqualifications, Powers and Functions, Council of Ministers, Executive: President, Governor, Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions

UNIT V: LOCAL ADMINISTRATION AND ELECTION COMMISSION: (8 hours)

District Administration, Municipalities: Role of CEO and elective representatives, Tri-Level Panchayat system: Zila Panchayat, Block and Village and role of appointed and elected officials. Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and functioning.

TEXT BOOKS:

1. 'Indian Polity' by Laxmikanth
2. 'Indian Administration' by Subhash Kashyap
3. 'Indian Constitution' by D.D. Basu
4. 'Indian Administration' by Avasti and Avasti

COURSE OUTCOME:-

- CO-1 Ability to understand the concept of Constitution
- CO-2 Ability to understand the Role of Indian constitution.
- CO-3 Overview of various Constitutional Rights and Duties
- CO-4 Ability to understand the Tri-Level Democratic arrangement.
- CO-5 Ability to gather the knowledge regarding Administration and Election Commission.

PCS-231 Data Structure Lab
B.Tech. Semester –III ((ARTIFICIAL INTELLIGENCE & MACHINE LEARNING))

L	T	P	Class Work	:25 Marks
-	-	2	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.

PAI-231PythonProgrammingLab
B.Tech. Semester –III (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

Course Outcomes

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

- Run Python Programs at interactive and script mode.
- Implement Python programs with conditionals and loops.
- Develop Python programs stepwise by defining functions and calling them.
- Use Python lists, tuples and dictionaries for representing compound data.
- Read and write data from/to files in Python

List of experiments:

Exercise 1 - Basics

- a) Running instructions in Interactive interpreter and a Python Script
- b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 - Operations

- a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
- b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

- a) Write a Program for checking whether the given number is a even number or not.
- b) Using a for loop, write a program that prints out the decimal equivalents of $1/2$, $1/3$, $1/4$, . . . , $1/10$
- c) Write a program using a for loop that loops over a sequence. What is sequence ?
- d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow - Continued

- a) Find the sum of all the primes below two million.

Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

- b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

- c) Linear search and Binary search
- d) Selection sort, Insertion sort

Exercise - 5 - DS

- a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure
- b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise - 6 DS - Continued

- a) Write a program combine_lists that combines these lists into a dictionary.
- b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 Files

- a) Write a program to print each line of a file in reverse order.
- b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 8 Functions

- a) Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

If (distance between two balls centers) \leq (sum of their radii) then (they are colliding)

- b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 9 Functions - Continued

- a) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
- b) Write a function dups to find all duplicates in the list.
- c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

- a) Write a function cumulative_product to compute cumulative product of a list of numbers.
- b) Write a function reverse to reverse a list. Without using the reverse function.
- c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise - 11–Python Packages

- a) Install packages requests, flask and explore them. using (pip)
- b) Plot graphs using python and Matplotlib.
- c) Data Analysis using numpy and Pandas Libraries

PEC-232 Digital Electronics Lab
B.Tech. Semester –III (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:25 Marks
-	-	2	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.

PAI-233 Industrial Training
B.Tech. Semester –III (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

About Industrial Training

It is an organized method or activity of enhancing and improving skill set and knowledge of engineering students which boost their performance and consequently helping them to meet their career objectives. Industrial Training is an essential component in the development of the practical and professional skills required for an Engineer and an aid to prospective employment

Objectives of Industrial Training

- 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.

Course Outcomes

At the end of Industrial Training, the students will be able to

- Understand organizational issues and its impact on organization and employees.
- Identify industrial problems and suggest possible solutions.
- Relate, apply and adapt relevant knowledge, concepts and theories within an industrial organization, practice and ethics.
- Apply technical knowledge in an industry to solve real world problems.
- Demonstrate effective group communication, presentation, self-management and report writing skills.

TAI-241/TOE-50 Artificial Intelligence
B.Tech. Semester –IV (Computer Science &Engg.)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

COURSE OUTCOMES

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

- Understand the fundamentals of Artificial Intelligence.
- Knowledge of the concepts of propositional logics
- Knowledge gaining of default and non-monotonic logic and understanding of the concepts of neural network.
- Representation of impression and uncertainty, probabilistic techniques.
- Demonstrate the Fuzzy logic concepts and different techniques and their understanding for various applications and intelligent search techniques.

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, Brief 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, Inductive Learning, Statistical learning method and Reinforcement learning.

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-242/TOE-42 Operating Systems
B.Tech. Semester –IV (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Outcomes

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

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

Unit 1- Introduction: Concept of Operating Systems, Generation of 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, Dining Philosopher Problem etc.

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

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

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 and performance.

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

Suggested Books

1. Avi Silberschatz, Peter Galvin, Greg Gagne, Operating System Concepts Essentials, 9th Edition by, Wiley Asia Student Edition.
2. William Stallings, Operating Systems: Internals and Design Principles, 5th Edition, Prentice Hall of India.

TAI-243 Design & Analysis of Algorithms

B.Tech. Semester –IV ((ARTIFICIAL INTELLIGENCE & MACHINE LEARNING))

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 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 greedy algorithms.
- 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 and Masters theorem.

Unit 2- Fundamental Algorithmic Strategies: Brute-Force, Greedy, Dynamic Programming, Branch- and-Bound and Backtracking methodologies for the design of 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 Flow Algorithm, 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 Reduction techniques.

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, MIT Press/McGraw-Hill.
2. E. Horowitz et al, Fundamentals of Algorithms .

Reference books

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

TCS-244 Theory of Computation
B.Tech. Semester –IV (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 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 and machines.
- Design finite automata to accept a set of strings of a language.
- 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 free grammars
- Distinguish between computability and non-computability and Decidability and undecidability.

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 about languages.

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.

TAH-243 Statistical Methods

B.Tech. Semester –IV (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Unit I: Basic Probability (10 lectures)

Addition and multiplication laws of probability, Conditional probability, independent and dependent events, mutually exclusive events, use of Binomial expansion, Baye's theorem, expectation of random variables.

Unit II: Discrete Random variable and Continuous Random variable (6 lectures) Random variable, types of random variable, mathematical expectation of the sum of two discrete random variable, Continuous random variables, probability density function, expected value of a continuous random variable, constant of continuous probability distribution.

Unit III: Basic Statistics (9 lectures)

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal, Correlation and regression - Rank correlation, Karl Pearson's coefficient of correlation.

Unit IV: Applied Statistics (8 lectures)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas, fitting of the curve $y = ae^{bx}$, fitting of the curve $y = ax+bx^2$, fitting of the curve $y=ax+b/x$. Statistical quality control method, control charts, means chart & R-chart.

Unit V: Sampling Theory (7 lectures)

Sampling: types of sampling, sampling distribution of the variance, testing a hypothesis, Null hypothesis, errors, level of significance, test of significance, confidence limits, test of significance of large samples($N>30$), sampling distribution of the proportion, comparison of large samples, the t-distribution for small sample, chi-square test of goodness of fit.

Suggested Text Books/Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal BookStall, 2003 (Reprint).
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

TAH-246 Essence of Indian Traditional Knowledge
B.Tech. Semester –IV (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

COURSE OBJECTIVE:- The Course aims to develop the critical understanding to get a knowledge of Indian Culture

UNIT I: INTRODUCTION TO INDIAN CULTURE: (8 hours)

Introduction to Culture: Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

UNIT II: INDIAN LANGUAGES, CULTURE AND LITERATURE: (8 hours)

Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of Indian Languages and Literature

UNIT III: RELIGION AND PHILOSOPHY: (8 hours)

Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT IV: FINE ARTS IN INDIA (ART, TECHNOLOGY & ENGINEERING): (7 hours)

Indian Painting, Indian handicrafts, Music, Indian Architecture (ancient, medieval and modern), Science and Technology in India

UNIT V: EDUCATION SYSTEM IN INDIA: (8 hours)

Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

TEXT BOOKS:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005
2. "Science in Sanskrit", Samskrita Bharti Publisher, ISBN 13: 978-8187276333, 2007
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450 494-X, 2004.
4. S. Narain, "Examinations in ancient India", Arya Book Depot, 1993
5. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989

COURSE OUTCOME:-

CO-1 Understand philosophy of Indian culture.

CO-2 Distinguish the Indian languages

CO-3 Learn the philosophy of ancient, medieval and modern India.

CO-4 Acquire the information about the fine arts in India. Know the contribution of scientists of different eras.

CO-5 To gather the knowledge regarding Administration and Election Commission.

PAI-241 Artificial Intelligence Lab
B.Tech. Semester –IV (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

COURSE OUTCOMES

After undergoing this course, the students will be able to

- Discuss Artificial Intelligence techniques for building well engineered and efficient intelligent systems.
- Describe the nature of AI problem and provide the solution as a particular type.
- 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 python program to implement simple Chatbot?
2. Implementation of following algorithms:
 - a. A* and Uniform cost search algorithms.
 - b. Implement AO* Search algorithm.
 - c. Write a python program to implement Breadth First Search Traversal.
 - d. Implementation of TSP using heuristic approach.
3. Implementation of Hill-climbing to solve 8- Puzzle Problem.
4. Write a python program to implement Water Jug Problem?
5. Write a program to implement Hangman game using python.
6. Write a program to implement Tic-Tac-Toe game using python.
7. Write a Program for Expert System by Using Forward Chaining.
8. Write a python program to remove stop words for a given passage from a text file using NLTK?
9. Write a python program to implement stemming for a given sentence using NLTK?
10. Write a python program to implement Lemmatization using NLTK.
11. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
12. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

PCS-242 Operating SystemsLab
B.Tech. Semester –IV (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:25 Marks
-	-	2	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

PAI-243 Design & Analysis of Algorithms Lab
B.Tech. Semester –IV (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:25 Marks
-	-	2	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

- 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 EXERCISES

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-244 LINUX / UNIX PROGRAMMING
B.Tech. Semester – IV (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

- To demonstrate the basic knowledge of Linux commands and file handling utilities by using Linux shell environment.
- To evaluate the concept of shell scripting programs by using an AWK and SED commands.
- Use tracing mechanisms for debugging.
- Compile source code into object and executable modules.
- Use advanced network tools.

LIST OF EXPERIMENTS

1. Study of Unix/Linux general purpose utility command list (man, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown etc.), vi editor, .bashrc, /etc/bashrc and environment variables.
2. Write a shell script program to: a)display list of user currently logged in; b) to copy contents of one file to another.
3. Write a program using sed command to print duplicated lines of Input.
4. Write a grep/egrep script to find the number of words character, words and lines in a file.
5. Write an awk script to: a). develop a Fibonacci series; b) display the pattern of given string or number.
6. Write a shell script program to a) display the process attributes; b) change priority of processes; c) change the ownership of processes; d)to send back a process from foreground ; e) to retrieve a process from background ; f) create a Zombie process
7. Write a program to create a child process and allow the parent to display “parent” and the child to display “child” on the screen
8. Write a makefile to compile a C program.
9. Study to execute programs using gdb to utilize its various features like breakpoints, conditional breakpoints. Also write a shell script program to include verbose and xtrace debug option for debugging.
10. Study to use ssh, telnet, putty, ftp, ncftp and other network tools.

TAI-351/TOE-40 Database Management Systems
B.Tech. Semester –V(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Outcomes

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

- W 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, Data Independence,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 manipulation operations.

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, Database recovery.

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

TCS-353 Compiler Design
B.Tech. Semester –V (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L **T** **P**
3 **1** **-**

Class Work **:50 Marks**
Exam. **:100 Marks**
Total **:150 Marks**
Duration of Exam **: 3 Hrs.**

Course Outcomes

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

- Develop the lexical analyser
- Design top-down and bottom-up parsers
- Develop syntax directed translation schemes
- Draw DAG representation for problem statement
- Develop algorithms to generate code for a target machine

Unit 1- Introduction: Phases of compilation and overview.

Lexical Analysis (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 different language features, 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, global optimization, 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 Gries: Compiler Construction for digital computer

TAI-352 Computer Organization & Architecture
B.Tech. Semester –V (Artificial Intelligence&MachineLearning)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 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.
- Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU.
- Design the connection between I/O address from the CPU and the I/O interface.
- Understand the concept of Pipelining and multiprocessor.
- Draw a flowchart for concurrent access to memory and cache coherency in parallel processors.

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 Common CPUs, 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-Output Subsystems, I/O Device Interface, I/O Transfers– Program Controlled, Interrupt Driven and DMA, Software Interrupts and Exceptions, Programs and Processes – Role of Interrupts in Process State Transitions, I/O Device Interfaces – SCII, USB.

Unit 4- Pipelining& Multiprocessor: Basic Concepts of Pipelining, Throughput and Speedup, Instruction Pipeline, 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, Main Memory: RAM, ROM, Speed, Size and cost, Cache Memory and its Mapping, Replacement Algorithms, Write Policies, Virtual Memory, Memory Management Requirements, Associative Memory, Secondary storage devices.

Books

1. David A. Patterson and John L. Hennessy “Computer Organization and Design: The Hardware/Software Interface” , 5th Edition, Elsevier.
2. M. Morris Mano, “Computer System Architecture”, Third Edition, Pearson Prentice Hall.
3. Carl Hamacher “ Computer Organization and Embedded Systems” , 6th Edition, McGraw Hill Higher Education.
4. Miles Murdocca and Vincent Heuring “Computer Architecture and Organization: An integrated Approach” 2nd edition, Wiley Publication.

TCS-354/TOE-44 Computer Networks
B.Tech. Semester –V (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 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 OSI Protocol.
- 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 and tools.

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 Routing protocols.

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 Hall India.
3. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India

EAI-311 Software Engineering
B.Tech. Semester –V (Artificial Intelligence&MachineLearning)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Outcomes

Upon Successful completion of this 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-functional requirements
- Estimate the work to be done, resources required and the schedule for a software project plan

Unit 1- : Introduction to Software Engineering: Introduction, software applications, importance of software evolution of software, Software Components, Software Characteristics, Software Crisis & myths. Software Engineering paradigms: introduction, principles & Processes, Software Quality Attributes. Comparison between software engineering & computer science, & software engineering & Engineering. Some terminologies: product & process, deliverables and milestones, measures, metric & indicators. Programs & software products. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, RAD model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

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 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, software certification- requirement, types of certification, third part certification. Software Re-Engineering, reverse software Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, CASE: introduction, levels of case, architecture, case building blocks, objectives, case repository, characteristics of case tools, categories, Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Books

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

EAI-312 Computer Graphics

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

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Outcome

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

- Develop the understanding of fundamentals of Graphics concepts, and standards
- Understand the algorithms that form the foundation of computer graphics.
- Provide 3D representation for their applications
- Understand various transformation techniques and their application
- 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 Painter'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

EAI-313 /TOE-48 Web Technology

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

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

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

- Plan, design, create, and implement a web site;
- Use the concept of xml, css and DHTML
- Develop a static and dynamic websites.
- Establish the database connectivity over a website.

UNIT-I Introduction to HTML: HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;

Introduction to JavaScript: Scripts, Objects in Java Script, Dynamic HTML with Java Script

XML: Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX

UNIT-II Java Beans: Introduction to Java Beans, Advantages of Java Beans, JDK Introspection, Using Bound properties, Bean Info Interface, Constrained properties Persistence, Customizes, Java Beans API, Introduction to EJB's

UNIT-III Web Servers and Servlets: Tomcat web server, Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, The javax.servelet Package, Reading Servlet parameters, Reading Initialization parameters. The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues.

UNIT-IV Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC Setting Up and JSP Environment: Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat

UNIT-V JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Date between Pages – Sharing Session and Application Data – Memory Usage Considerations.

TEXT BOOKS, AND/OR REFERENCE MATERIAL:

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech
2. The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH (Chapters: 25)
3. Java Server Pages –Hans Bergsten, SPD O'Reilly.
4. Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia
5. JoelSklar, "Web Warriar guide to web design technologies", Cengage Learning, New Delh

EAI-314 Real Time System

B.Tech. Semester –V (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 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, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses 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 End-to-End Periodic Tasks, End-to-End Tasks in Heterogeneous Systems, Predictability and Validation 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

PAI-351 Database Management System Lab
B.Tech. Semester –V (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:25 Marks
-	-	2	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/DDDL commands.
- Create views and use in-built functions to query a database.
- Write PL/SQL programs including stored procedures, stored functions and triggers.

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 names and item numbers
- d) List the total Bill details with the quantity sold, price of the item and the final amount
- e) List the details of the customer who have bought a product which has a price > 200
- f) Give a count of how many products have been bought by each customer
- g) Give a list of products bought by a customer having cust_id as 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

PAI-352 Python for Data Pre-processing and Visualization Lab
B.Tech. Semester –V(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

Course Objectives:

The main objective of this course to know the basics of data visualization and understand the importance of data visualization, design and use of visual components. And to provide comprehensive knowledge of python programming paradigms required for Data Analytics.

Course Outcomes:

By the end of this lab, the student can:

- Employ efficient storage and data operations using NumPy arrays.
- Apply powerful data manipulations using Pandas.
- Perform Read and write operations on CSV, JSON and XML files
- Apply the basis of Data cleanup operation on the given dataset.
- Do data pre-processing and visualization using matplotlib, Pandas and seaborn.

List of experiments:

1. Perform following with the help of NumpyLibrary
 - a. Create NumPyndarray: A Multidimensional Array Object
 - i. Data Types for ndarrays
 - ii. Arithmetic with NumPy Arrays
 - iii. Basic Indexing and Slicing
 - iv. Boolean Indexing
 - v. Fancy Indexing
 - vi. Transposing Arrays and Swapping Axes
 - b. Universal Functions: Fast Element-Wise Array Functions
 - c. Array-Oriented Programming with Arrays
 - i. Expressing Conditional Logic as Array Operations
 - ii. Mathematical and Statistical Methods
 - iii. Methods for Boolean Arrays
 - iv. Sorting
 - v. Unique and Other Set Logic
 - d. File Input and Output with Arrays
 - e. Linear Algebra
 - f. Pseudorandom Number Generation
2. Perform following with the help of PandasLibrary
 - a. Introduction to pandas Data Structures
 - i. Series
 - ii. DataFrame
 - iii. index Objects
 - b. Essential Functionality
 - i. Reindexing
 - ii. Dropping Entries from an Axis
 - iii. Indexing, Selection, and Filtering
 - iv. Integer Indexes
 - v. Arithmetic and Data Alignment

- vi. Function Application and Mapping
 - vii. Sorting and Ranking
 - viii. Axis Indexes with Duplicate Labels
 - c. Summarizing and Computing Descriptive Statistics
 - i. Correlation and Covariance
 - ii. Unique Values, Value Counts, and Membership
- 3. Data Loading, Storage, and File Formats
 - a. Reading and Writing Data in Text Format
 - i. Reading Text Files in Pieces
 - ii. Writing Data to Text Format
 - iii. Working with Delimited Formats
 - iv. JSON Data
 - v. XML and HTML: Web Scraping
 - b. Binary Data Formats
 - i. Using HDF5 Format
 - ii. Reading Microsoft Excel Files
 - a. Interacting with Web APIs
 - b. Interacting with Databases
- 4. Perform Data Cleaning and Preparation
 - a. Handling Missing Data
 - i. Filtering Out Missing Data
 - ii. Filling In Missing Data
 - b. Data Transformation
 - i. Removing Duplicates
 - ii. Transforming Data Using a Function or Mapping
 - iii. Replacing Values
 - iv. Renaming Axis Indexes
 - v. Discretization and Binning
 - vi. Detecting and Filtering Outliers
 - vii. Permutation and Random Sampling
 - viii. Computing Indicator/Dummy Variables
 - c. String Manipulation
 - i. String Object Methods
 - ii. Regular Expressions
 - iii. Vectorized String Functions in pandas
- 5. Data Wrangling: Join, Combine, and Reshape
 - a. Hierarchical Indexing
 - i. Reordering and Sorting Levels
 - ii. Summary Statistics by Level
 - iii. Indexing with a DataFrame's columns
 - b. Combining and Merging Datasets
 - i. Database-Style DataFrame Joins
 - ii. Merging on Index
 - iii. Concatenating Along an Axis
 - iv. Combining Data with Overlap
 - c. Reshaping and Pivoting
 - i. Reshaping with Hierarchical Indexing
 - ii. Pivoting "Long" to "Wide" Format
 - iii. Pivoting "Wide" to "Long" Format
- 6. Visualization with Matplotlib
 - a. Importing matplotlib
 - b. show() or No show()? How to Display Your Plots
 - c. Saving Figures to File
 - d. Simple Line Plots
 - e. Adjusting the Plot: Line Colors and Styles

- f.** Adjusting the Plot: Axes Limits
- g.** Labeling Plots
- h.** Simple Scatter Plots
- i.** Visualizing Errors
- j.** Visualizing a Three-Dimensional Function
- k.** Two-Dimensional Histograms and Binnings
- l.** Customizing Plot Legends
- m.** Customizing Colorbars
- n.** Multiple Subplots
- o.** Text and Annotation
- p.** Customizing Ticks 275
- q.** Customizing Matplotlib: Configurations and Stylesheets
- r.** Three-Dimensional Plotting in Matplotlib
- s.** Plotting with pandas and seaborn libraries

PAI-353 Industrial Training
B.Tech. Semester –V (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L T P
- - 2

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

About Industrial Training

It is an organized method or activity of enhancing and improving skill set and knowledge of engineering students which boost their performance and consequently helping them to meet their career objectives. Industrial Training is an essential component in the development of the practical and professional skills required for an Engineer and an aid to prospective employment

Objectives of Industrial Training

- 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.

Course Outcomes

At the end of Industrial Training, the students will be able to

- Understand organizational issues and its impact on organization and employees.
- Identify industrial problems and suggest possible solutions.
- Relate, apply and adapt relevant knowledge, concepts and theories within an industrial organization, practice and ethics.
- Apply technical knowledge in an industry to solve real world problems.
- Demonstrate effective group communication, presentation, self-management and report writing skills.

PCS-354 Computer Networks Lab
B.Tech. Semester –V (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:25 Marks
-	-	2	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

TAI-361/TOE-46 Machine Learning
B.Tech. Semester – VI (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L T P
3 1 -

Class Work :50 Marks
Exam. :100 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;
- Apply common Machine Learning algorithms in practice and implementing their own
- Perform distributed computations
- Perform 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

APPLICATIONS OF MACHINE LEARNING:

Strategies, guidelines for good design, performance measurement, Reading Data, PreProcessing Data, handwriting recognition, object detection, face detection.

References

1. Jason Bell, —Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014
2. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
3. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

TAI-362 Data Science

B.Tech. Semester –VI (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

COURSE OUTCOMES (CO)

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

- Identify and execute basic syntax and programs in R.
- Perform the Matrix operations using R built in functions
- Apply non numeric values in vectors
- Create the list and data frames
- Exploit the graph using ggplot.

Unit -I: Overview of R: History and Overview of R- Basic Features of R-Design of the R System- Installation of R- Console and Editor Panes- Comments- Installing and Loading R Packages- Help Files and Function Documentation Saving Work and Exiting R- Conventions- R for Basic Math- Arithmetic- Logarithms and Exponentials E-Notation- Assigning Objects- Vectors- Creating a Vector- Sequences, Repetition, Sorting, and Lengths- Subsetting and Element Extraction- Vector-Oriented Behaviour

Unit-II: Matrices and Arrays: Defining a Matrix – Defining a Matrix- Filling Direction- Row and Column Bindings- Matrix Dimensions Subsetting- Row, Column, and Diagonal Extractions- Omitting and Overwriting- Matrix Operations and Algebra- Matrix Transpose- Identity Matrix- Matrix Addition and Subtraction- Matrix Multiplication Matrix Inversion-Multidimensional Arrays- Subsets, Extractions, and Replacements

Unit-III: Non-Numeric Values: Logical Values- Relational Operators- Characters- Creating a String- Concatenation- Escape Sequences Substrings and Matching- Factors- Identifying Categories- Defining and Ordering Levels- Combining and Cutting

Unit-IV: Lists and Data Frames: Lists of Objects-Component Access-Naming-Nesting-Data Frames-Adding Data Columns and Combining Data Frames-Logical Record Subsets-Some Special Values-Infinity-NaN-NA-NULLAttributes-Object-Class-Is-Dot Object-Checking Functions-As-Dot Coercion Functions

Unit -V: Basic Plotting: Using plot with Coordinate Vectors-Graphical Parameters-Automatic Plot Types-Title and Axis Labels Color-Line and Point Appearances-Plotting Region Limits-Adding Points, Lines, and Text to an Existing Plot-ggplot2 Package-Quick Plot with qplot-Setting Appearance Constants with Geoms-- Reading and Writing Files- R-Ready Data Sets- Contributed Data Sets- Reading in External Data Files- Writing Out Data Files and Plots- Ad Hoc Object Read/Write Operations.

TEXT BOOKS

- TilmanM.Davies,“THE BOOK OF R - A FIRST PROGRAMMING AND STATISTICS” Library of Congress Cataloging-in-Publication Data,2016.

REFERENCE BOOKS

- Roger D. Peng, ”R Programming for Data Science”Lean Publishing, 2016.
- Hadley Wickham, Garrett Grolemond, ” R for Data Science”, OREILLY Publication,2017

- Steven Keller, “R Programming for Beginners”, CreateSpace Independent Publishing Platform 2016.
- Kun Ren ,”Learning R Programming”, Packt Publishing,2016

E BOOKS

- https://web.itu.edu.tr/~tokerem/The_Book_of_R.pdf

MOOC

- <https://online-learning.harvard.edu/subject/r> CURRICULUM AND SYLLABUS B.TECH. – DATA SCIENCE 62
- <https://www.udemy.com/course/r-basics/>
- <https://www.datacamp.com/courses/free-introduction-to-r>

TAI-363/TOE-45 JAVA Programming
B.Tech. Semester –VI (Computer Science & Engg.)

L	T	P	Class Work	:50 Marks
3	1	-	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:

- Design Java object classes based on Object-Oriented concepts and use simple try-catch blocks for Exception Handling.
- Demonstrate multi-thread programming concepts for concurrency control based applications.
- Manage I/O streams oriented interactions and string handling.
- Construct user interfaces for Java applications using swing, AWT and event handling components.
- Design web based applications using JDBC and servlets.

Unit 1- Java Basics And OOP: 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. Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces Definitions and Implementations, Exception Handling: Types, try, catch and throw Keywords.

Unit 2- Multithreaded Programming In Java: 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- Swing, Event Handling And AWT: Swing Basics, JApplet, Icons and Labels, Text Fields, Buttons, Combo Boxes. Event Handling, Delegation Event Model, Event Classes, Event Listener Interfaces. Introducing the AWT: Working with Windows, Graphics, Text, 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, 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. Hortsman& 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 McGraw Hill, 2002.

TAH-362 ORGANIZATIONAL BEHAVIOUR
B.Tech. Semester –VI (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L 2	T 1	P -	Class Work Exam. Total Duration of Exam	:50 Marks :100 Marks :150 Marks : 3 Hrs.
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COURSE OBJECTIVE: The Course aims to provide an understanding of Human Relations and Behavior at the individual, group and organizational level in the changing global scenario.

UNIT I: FUNDAMENTALS OF OB: (8hours)

Definition, scope & importance of OB, Relationship between OB and the individual, Theoretical framework cognitive, behaviorist and social cognitive, Limitations of OB

UNIT II: ATTITUDE: (8 hours)

Importance of attitude in an organization, components of attitude, Developing Emotional intelligence at the workplace, Definition and importance of personality for performance, Types of personality and Significant personality traits suitable to the workplace. Perception, Motivation, the content theories (Maslow's Need Hierarchy & Herzberg's two factor model theory)

UNIT III: FOUNDATIONS Of Group Behavior: (8 hours)

Meaning of group behavior & group dynamics, Types of Groups, Need of Work Teams in organizations, Team effectiveness & Team building. Concept of Leadership, Styles of leadership, Transformational leadership and Success stories of today's Global and Indian leaders.

UNIT IV: ORGANIZATIONAL CULTURE: (8 hours)

Meaning of organizational culture, Creating & Sustaining organization culture Types of culture (Strong-Weak, Soft- Hard, & Formal- Informal), Creating positive organizational culture, Workplace spirituality.

UNIT V: ORGANIZATIONAL CHANGE: (8 hours)

Definition & nature of organizational change, Types of change, Forces that act as stimulants to change. Implementing organizational change (How to overcome change, Approaches to manage change, Kurt Lewin's –Three step model, Leading the change process, Dealing with Individual & Group Resistance, Intervention Strategies for facilitating organizational change, Developing organizations).

TEXT BOOKS

1. Bhattacharaya, Deepak Kumar (2016). *Organizational Behaviour*, 2nd edition. Oxford – New Delhi.
2. Nahavandi, Afsaneh; Robert B. Denhardt; Janet V. Denhardt and Maria P. Aristigueta (2017) *Organizational Behaviour*. Sage
3. Kumar, Arun and N Meenakshi (2016). *Organizational Behaviour – Text and cases*, 1st edition. . Vikas – New Delhi
4. Singh, Kavita (2015). *Organizational Behaviour: Text & Cases*, 3rd edition. Vikas – New Delhi.
5. Luthans, Fred (2006). *Organizational Behaviour*, 11th edition. Tata McGraw Hill – New Delhi.

COURSE OUTCOME-

- CO-1. Understanding of scope & significance of OB with regard to cognitive framework.
- CO-2 Understanding of the behavior with overview of attitude, personality and perception.
- CO-3 To enhance overall skills for organizational effectiveness.
- CO-4 To develop the understanding of the how to create and sustain organization culture.
- CO-5 To develop problem-solving capabilities for effectively managing the organizational processes.

EAI-321: Natural Language Processing
B.Tech. Semester –VI (Artificial Intelligence & Machine Learning)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Outcomes

- Describe the concepts of morphology, syntax, semantics, discourse & pragmatics of natural language.
- Demonstrate understanding of the relationship between NLP and statistics & machine learning.
- Discover various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parts-of-speech tagging, parsing and semantic analysis.
- Develop systems for various NLP problems with moderate complexity.
- Evaluate NLP systems, identify shortcomings and suggest solutions for these shortcomings.

Unit 1

Introduction to NLP

NLP – introduction and applications, NLP phases, Difficulty of NLP including ambiguity; Spelling error and Noisy Channel Model; Concepts of Parts-of-speech and Formal Grammar of English.

Unit 2

Language Modelling: N-gram and Neural Language Models

Language Modelling with N-gram, Simple N-gram models, Smoothing (basic techniques), Evaluating language models; Neural Network basics, Training; Neural Language Model, Case study: application of neural language model in NLP system development.

Unit 3

Parts-of-speech Tagging

Parts-of-speech Tagging: basic concepts; Tagset; Early approaches: Rule based and TBL; POS tagging using HMM, Introduction to POS Tagging using Neural Model.

Unit 4

Parsing

Basic concepts: top down and bottom-up parsing, treebank; Syntactic parsing: CKY parsing; Statistical Parsing basics: Probabilistic Context Free Grammar (PCFG); Probabilistic CKY Parsing of PCFGs.

Unit 5

Semantics

Vector Semantics; Words and Vector; Measuring Similarity; Semantics with dense vectors; SVD and Latent Semantic Analysis; Embeddings from prediction: Skip-gram and CBOW; Concept of Word Sense; Introduction to WordNet

Books

1. Jurafsky Dan and Martin James H. "Speech and Language Processing" ,Prentice Hall, 3rd Edition, 2018.
2. James Allen, "Natural Language Understanding", Benjamin & Cummings Publishing Co., 1995.
3. Ronald Hausser, "Foundations of Computational Linguistics", Spring &Verleg, 1999.

EAI-322 Distributed Systems
B.Tech. Semester –VI (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 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.

EAI-323 Digital Image Processing

B.Tech. Semester –V (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Outcomes

Upon completion of this 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, An introduction to mathematical tool used in digital image processing.

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, Concept of Sampling.

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.

Unit 4-Image Compression: Fundamentals, Lossy Compression, Lossless Compression, Image Compression models, Error-free Compression : Variable length coding, LZW coding, Bit plane coding, Run length coding, Introduction to JPEG, introduction to color image processing, color fundamentals, color models, Pseudocolor image processing.

Unit 5-Morphology and Segmentation: Erosion, Dilation, Duality, Opening and Closing, Hit-and Miss transform, Morphological **Algorithms** :Boundary Extraction, Hole filling, Extraction of connected components, Convex Hull, Concept of Thinning and Thickning.

Image Segmentation: Definition, characteristics of segmentation Detection of Discontinuities, Thresholding, Region based segmentation. Introduction Object Recognition, pattern and Pattern classes.

References

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

EAI-324: Genetic Algorithms and its Applications
B.Tech. Semester –VI (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Outcomes

- Explain the principles underlying Evolutionary Computation in general and Genetic Algorithms in particular.
- Get acquainted with the theoretical foundation of genetic algorithms.
- Apply Evolutionary Computation Methods to find solutions to complex problems
- Analyze and experiment with parameter choices in the use of Evolutionary Computation
- Summarize current research in Genetic Algorithms and Evolutionary Computing

Unit -I

Introduction

A brief history of evolutionary computation, Elements of Genetic Algorithms, A simple genetic algorithm, Applications of genetic algorithms
Evolving computer programs, data analysis & prediction, evolving neural networks, Modeling interaction between learning & evolution, modeling sexual selection, measuring evolutionary activity.

Unit -II

Theoretical Foundation of genetic algorithm

Schemas & Two-Armed and k-armed problem, royal roads, exact mathematical models of simple genetic algorithms, Statistical- Mechanics Approaches.

Unit -III

Computer Implementation of Genetic Algorithm

Data structures, Reproduction, crossover & mutation, mapping objective functions to fitness form, fitness scaling, coding, a multiparameter, mapped, fixed point coding, discretization and constraints.

Unit -IV

Applications of genetic algorithms

The risk of genetic algorithms, De Jong & function optimization, Improvement in basic techniques, current application of genetic algorithms.

Unit -V

Advanced operators & techniques in genetic search

Dominance, duplicity, & abeyance, inversion & other reordering operators. Other micro operators, Niche & speciation, multiobjective optimization, knowledge based techniques, genetic algorithms & parallel processors.

REFERENCES

1. David E. Goldberg, “Genetic algorithms in search, optimization & Machine Learning” Pearson Education, 2006
2. Melanle Mitchell, “An introduction to genetic algorithms”, Prentice Hall India, 2002.
3. Michael D. Vose, “The simple genetic algorithm foundations and theory, Prentice Hall India, 1999
4. Masatoshi Sakawa, “Genetic Algorithms & Fuzzy Multiobjective Optimization”, Kluwer Academic Publisher, 2001
5. D. Quagliarella, J Periaux, C Poloni& G Winter, “Genetic Algorithms in Engineering & Computer science”, John Wiley & Sons, First edition, 1997
6. PinakiMzumder, Elizabeth M. Raudnick, “Genetic Algorithms for VLSI design, layout and test automation”, Pearson Education, 2006

EAI-325 Microprocessors

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

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 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 microprocessors.

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, Programming of 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

EAI-331 Nature Inspired Computing

B.Tech. Semester –VI (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Outcome

Upon completion of the course, Students will be able to

- Explain the basics Natural systems.
- Describe the concepts of Natural systems and its applications.
- Apply and Analyze the Basic Natural systems functions (operations).
- Analyze and identify Natural design considerations.
- Apply and analyze Integration of Hardware and software in Natural applications.

UNIT I - INTRODUCTION

From Nature to Nature Computing , Philosophy , Three Branches: A Brief Overview, Individuals, Entities and agents - Parallelism and Distributivity Interactivity ,Adaptation Feedback-Self-Organization-Complexity, Emergence and ,Bottom-up Vs Top-Down- Determination, Chaos and Fractals.

UNIT II - Computing Inspired by Nature

Evolutionary Computing, Hill Climbing and Simulated Annealing, Darwin's Dangerous Idea, Genetics Principles, Standard Evolutionary Algorithm -Genetic Algorithms, Reproduction-Crossover, Mutation, Evolutionary Programming, Genetic Programming

UNIT III - SWARM INTELLIGENCE

Introduction - Ant Colonies, Ant Foraging Behaviour, Ant Colony Optimization, SACO and scope of ACO algorithms, Ant Colony Algorithm (ACA), Swarm Robotics, Foraging for food, Social Adaptation of Knowledge , Particle Swarm Optimization (PSO)

UNIT IV – IMMUNO COMPUTING

Introduction- Immune System, Physiology and main components, Pattern Recognition and Binding , Immune Network Theory- Danger Theory, Evaluation Interaction Immune Algorithms , Introduction – Genetic algorithms , Bone Marrow Models , Forest's Algorithm, Artificial Immune Networks

UNIT V - COMPUTING WITH NEW NATURAL MATERIALS

DNA Computing: Motivation, DNA Molecule , Adleman's experiment , Test tube programming language, Universal DNA Computers , PAM Model , Splicing Systems , Lipton's Solution to SAT Problem , Scope of DNA Computing , From Classical to DNA Computing

References

1. Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007
2. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.
3. Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006.
4. Marco Dorrijo, Thomas Stutzle," Ant Colony Optimization", PHL,2005

EAI-332: Virtualization and Cloud Computing
B.Tech. Semester –VI (Artificial Intelligence & Machine Learning)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Objective: To impart the knowledge of cloud computing and technologies, issues in cloud computing etc.

COURSE OUTCOMES

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

- Identify the architecture, infrastructure and delivery models of cloud computing
- Apply suitable virtualization concept.
- Choose the appropriate Programming Models and approach for Services.
- Address the core issues of cloud computing such as security, privacy and interoperability

UNIT I: FUNDAMENTALS

Distributed System Models and Enabling Technologies, Computer Clusters for Scalable Parallel Computing, Virtual Machines and Virtualization Of Clusters and Data Centers, Computing Clouds, Service-Oriented Architecture, Cloud Programming And Software Environments.

UNIT II: VIRTUALIZATION

Basics of Virtualization: Characteristics, Taxonomy of Virtualization Techniques, Hardware Level Virtualization, Operating System Level Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Case Study: XEN, VMware.

UNIT III: CLOUD ARCHITECTURE AND SERVICES

Cloud Architecture, Cloud Services: Infrastructure as a Service, Platform as a Service, Software as a Service, Types of Cloud: Private Cloud, Public Cloud, Hybrid Cloud, Community Cloud, Challenges, Cloud Applications.

UNIT IV: SECURITY IN THE CLOUD

Security Overview, Cloud Security Challenges and Risks, Software-as-a-Service Security, Security Governance, Risk Management, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security.

UNIT V: CLOUD PLATFORMS AND TOOLS

Amazon web services: Compute Services, Storage Services, Communication Services, Google App Engine: Architecture, Application Life Cycle, Cost Model , Microsoft Azure: Core Concepts, SQL Azure - Tool kits: CloudSim , Eucalyptus.

TEXT BOOK(S)

1. RajkumarBuyya, Christian Vecchiola and S. ThamaraiSelvi, “Mastering Cloud Computing Foundations and Applications Programming”, 1st Edition, Morgan Kaufmann imprints in Elsevier, 2013.

REFERENCES

1. Kai Hwang, Geoffrey C Fox and Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, 1st Edition, Morgan Kaufmann Publishers, 2012.
2. John W. Rittinghouse and James F. Ransome, “Cloud Computing: Implementation, Management, and Security”, 1st Edition, CRC Press, 2010.
3. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud”, 1st Edition, O'Reilly Media Inc, 2009.
4. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, “Cloud Computing, A Practical Approach”, 1st Edition, McGraw Hill Osborne Media, 2009.

EAI-333 Data Mining and Predictive Modelling
B.Tech. Semester –VI(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 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, ShyamDiwakar 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

EAI-334 Human Computer Interaction

B.Tech. Semester –VI (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Outcome

Upon completion of the course, Students will be able to

- Explain the capabilities of both humans and computers from the viewpoint of human information processing.
- Describe typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms.
- Apply an interactive design process and universal design principles to designing HCI systems.
- Describe and use HCI design principles, standards and guidelines.
- Analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems.
- Discuss tasks and dialogs of relevant HCI systems based on task analysis and dialog design.
- Analyze and discuss HCI issues in groupware, ubiquitous computing, virtual reality, multimedia, and World Wide Web-related environments.

UNIT I:Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design, The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT II:Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

UNIT III:Screen Designing:- Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT IV:Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT V:Software tools – Specification methods, interface – Building Tools. Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

References

1. Alan Dix, Janet Finckay, Greg Ford, Abowd, Russell Beaulieu, Human – Computer Interaction., Pearson Education
2. Rogers, Sharp. Wiley Dreamtech , Interaction Design Precept
3. Soren Lauesen, User Interface Design, Pearson Education.

EAI-335 Fuzzy Logic
B.Tech. Semester –V (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

OBJECTIVES:

- To impart knowledge on fuzzy logic principles
- To understand Fuzzy Logic Methods
- To understand the fuzzy logic controllers
- To understand the data analysis
- To understand the uses of fuzzy logic

Unit – I: Introduction to Fuzzy Logic: Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT II: Fuzzy Logic System Components: Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT III : Fuzzy Logic controllers

Fuzzy logic controllers – principles – review of control systems theory – various industrial applications of FLC adaptive fuzzy systems – fuzzy decision making – Multiobjective decision making , Fuzzy Logic classification: fuzzy classification – means clustering – fuzzy pattern recognition – image processing applications – systactic recognition – fuzzy optimization.

UNIT IV: Fuzzy Data analysis: introduction, methods for fuzzy data analysis, algorithmic approaches, and knowledge based approaches, neural net approaches, dynamic fuzzy data analysis, problem descriptions, similarities of function, approaches for analysis dynamic systems, tools for fuzzy data analysis.

UNIT V: Applications Fuzzy Logic

Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

TEXT BOOK:

- Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.

REFERENCE BOOKS:

- Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.

PAI-361 Machine Learning Lab
B.Tech. Semester – VI (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

- Make use of Data sets in implementing the machine learning algorithms
- Understand the implementation procedures for the machine learning algorithms.
- Design Java/Python programs for various Learning algorithms.
- Apply appropriate data sets to the Machine Learning algorithms.
- Identify and apply Machine Learning algorithms to solve real world problems.

LIST OF EXPERIMENTS

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypothesis consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a news sample.
4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test datasets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your dataset.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

PAI-362 Data Science lab

B.Tech. Semester –VI (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:25 Marks
-	-	2	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

PAI-363 Java Programming Lab
B.Tech. Semester –VI (Computer Science &Engg.)

L	T	P	Class Work	:25 Marks
-	-	2	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

- Develop programs using object oriented concepts and exception handling.
- Demonstrate java features such as Inheritance, Interfaces, Polymorphism for different scenarios
- Deal with real world multithreading problems with a more practical approach.
- Design and implement window components for creating Java based applications
- Create web applications 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

PAI-364 Mini Project
B.Tech. Semester –VI (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

Course Objectives

On successful completion of this course, the students shall be able to

- Discover potential research areas in the field of information technology
- Create very precise specifications of the IT solution to be designed
- Have introduction to the vast array of literature available about the various research challenges in the field of IT
- Use all concepts of IT in creating a solution for a problem
- Have a glimpse of real world problems and challenges that need IT-based solutions.

TAI-471 Soft Computing

B.Tech. Semester – VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L T P
3 1 -

Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

Course Outcomes:

Upon completion of this 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 Algorithms- Basic Concepts, Encoding: Binary Encoding, Value Encoding, Permutation Encoding, Tree Encoding, Why Genetic Algorithms, Genetic Operators and Parameters, Genetic Algorithms in Problem Solving, Theoretical Foundations of Genetic Algorithms, Implementation Issues.

Unit 2- Artificial Neural Networks & Learning : Introduction to Learning concept: Supervised Learning, Unsupervised Learning and Reinforcement Learning, Neural Model and Network , , Architectures, Model of Artificial Neuron, Different Activation Functions, Perceptron network, Perceptron Learning, Supervised Hebbian Learning, Adaptive Linear Neuron, Backpropagation network, Backpropagation learning, Fundamentals of Associative Memory, Associative memory models, Auto associative memory, Bi-directional hetero associative memory.

Unit 3 Competitive Networks: Introduction to Competitive Neural Networks, Principles of Competitive Learning, Hopfield Network, Computing with Neural Nets and applications of Neural Network.

Unit 4 Introduction to Fuzzy Sets: introduction to fuzzy sets, difference between fuzzy sets and crisp sets theory, Operations on Fuzzy sets, Fuzzy properties, Fuzzy Relations, Fuzzy Measures, Applications of Fuzzy Set Theory to different branches of Science and Engineering.

Unit 5 Knowledge discovery in databases: KDD process, star schema, snowflake schema Data mining and web mining using soft computing techniques. Soft computing approaches to information systems project management.

Books

- M. Mitchell, An Introduction to Genetic Algorithms, Prentice-Hall, 1998.
- D. E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley, 1989.
- S. V. Kartalopoulos, Understanding Neural Networks and Fuzzy Logic: Basic Concepts and Applications, IEEE Press - PHI, 2004.

- S. Rajasekaran & G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, PHI, 2003.
- S. N. Sivanandam & S. N. Deepa, Principles of Soft Computing, Wiley - India, 2007

EAI-441 Cryptography & Network Security
B.Tech. Semester – VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L T P
3 1 -

Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

Course Outcomes: Upon Successful completion of this 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 Theorem, 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/MIME 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

- William Stallings, "Cryptography and Network Security: Principles and Practice" Prentice hall, New Jersey
- Johannes A. Buchmann, "Introduction to Cryptography" Springer-Verlag
- Atul Kahate, "Cryptography and Network Security" TMH
- Network Security Bible : Eric Cole, Wiley dreamtech India Pvt. Ltd.
- Practical Cryptography — Bruce Schneier | Wiley dreamtech India Pvt. Ltd

EAI-442 Internet of Things

B.Tech. Semester – VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L T P
3 1 -

Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

Course Outcomes: After successful completion of this course, student will be able to

- Understand general concepts of Internet of Things (IoT).
- Analyze various M2M and IoT architectures with devices, sensors and applications.
- Apply design concept to IoT solutions with different protocols.
- Create IoT solutions using sensors, actuators and Devices.
- Application of IoT in Real Life and various field of Technology.

Unit 1 FUNDAMENTALS OF IoT- Evolution of Internet of Things, Enabling Technologies, IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects. Sensor Networks, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models & APIs.

Unit 2 M2M Communication, 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, Industry 4.0 concepts.

Unit 3 IoT Protocols: Protocol Standardization for IoT, M2M and WSN Protocols, SCADA and RFID Protocols, Unified Data Standards, Protocols IEEE802.15.4 BACNet Protocol Modbus, Zigbee architecture, Network Layer, 6LowPAN, COAP, Security in IoT and Home Appliances.

Unit 4 IoT Reference Architecture - Getting Familiar with IoT Architecture, Operational and Deployment. Constraints affecting design in IoT world- Introduction, Technical Design Constraints building IoT with RASPBERRY PI, IoT device building block, IoT platform Arduino

Unit 5 Domain specific applications of IoT: Home automation, Industry applications, Surveillance applications, smart cities Participatory sensing, Data analytics for IoT, Amazon web service for IoT, Cloud for IoT, Commercial building Automation.

Books

- ArshdeepBahga, Vijay Madiseti, —Internet of Things – A hands-on approach, Universities Press, 2015
- Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.
- Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012.
- Jan Ho" ller, VlasiosTsiatsis, 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.

EAI-443 Information Retrieval

B.Tech. Semester – VII (Artificial Intelligence & Machine Learning)

L T P
3 1 -

Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

COURSE OUTCOMES:

- Demonstrate genesis and diversity of information retrieval situations for text and hyper media.
- Describe hands-on experience store, and retrieve information from www using semantic approaches.
- Demonstrate the usage of different data/file structures in building computational search engines.
- Analyze the performance of information retrieval using advanced techniques such as classification, clustering, and filtering overmultimedia.
- Analyze ranked retrieval of a very large number of documents with hyperlinks between them.

UNIT – I: Boolean retrieval, the term vocabulary and postings lists, Dictionaries and tolerant retrieval, Introduction to index-construction and index-compression. Scoring, term weighting and the vector space model, Computing scores in a complete search system

UNIT – II: Evaluation in information retrieval, Introduction to Relevance feedback and query expansion. Probabilistic information retrieval, review of basic probability theory, the probability ranking principle, The Binary Independence Model.

UNIT – III: Language models for information retrieval, The query likelihood model, Language modeling versus other approaches to IR, Text classification and Naive Bayes, Feature Selection, Vector space classification, Support vector machines and machine learning on documents.

UNIT – IV: Flat clustering: Evaluation of clustering, K-means- Cluster cardinality in K-means, Model-based clustering, Hierarchical clustering- Hierarchical agglomerative clustering, Single-link and complete-link clustering, Group-average agglomerative clustering, Centroid clustering, Divisive clustering, Matrix decomposition and latent semantic indexing.

UNIT – V: Introduction to Web search basics, Web characteristics: web graph, Spam, Web crawling and indexes: overview, Crawling: Crawler architecture, DNS resolution, URL frontier, Link analysis: The Web as a graph, PageRank: Markov chains, PageRank computation, Topic-specific PageRank.

Text books:

1. Manning, C.D., Raghavan, P. and Schütze, H., Introduction to Information Retrieval, Cambridge University Press, England, 2012.
2. Butcher, S., Clarke, C.L.A. and Gordon V Cormack, Information Retrieval: Implementing and Evaluating Search Engines, MIT Press, 2010.

Reference books:

1. Grossman, D.A. and Ophir, F., Information Retrieval: Algorithms and Heuristics, Springer, 2013.
2. Frakes, W.B., Pearson, Information Retrieval: Data Structures and Algorithms, Prentice Hall, 2002.

EAI-444 KNOWLEDGE BASED SYSTEM

B.Tech. Semester – VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L T P
3 1 -

Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

Course Outcomes: By the end of this course, the student will be able to:

- Understand propositional and first-order logic, Represent information in first-order logical formulas, and perform formula unification/matching.
- Understand forward and backward automated inference and formulate problems as state-space search.
- Develop programs for breadth-first, depth-first, heuristic, and hill-climbing searches and Represent information in semantic networks.
- Understand constraint networks, constraint satisfaction, and develop programs for constraint satisfaction.
- Understand genetic operators, genetic optimization and genetic learning, and write programs for this purpose and Understand Bayes rules, Bayesian belief networks, and evidence accumulation.

UNIT I: Knowledge representation in first-order logic, matching and unification of first-order logic formulae , Rule-based expert systems, rule firing, forward and backward chaining , Automated planning and problem-solving, total-order problem solvers, least-commitment planning, hierarchical problem solving .

UNIT II : Search methods, depth-first search, breadth-first search, heuristic search, greedy search, A* algorithms, hill climbing, Structured knowledge representation; representing knowledge using frames, objects and semantic networks; first-order logic correspondence; matching; inheritance; defaults; and automated inference,

UNIT III: Constraints, constraint networks, constraint satisfaction, node and arc consistency, compound labeling, constraint satisfaction algorithms, problem reduction, back jumping, interval constraints, interval calculus, algorithms for interval constraint satisfaction .

UNIT IV: Genetic algorithms, genetic representation of knowledge, fitness functions, genetic operators, genetic search and optimization, genetic learning, Bayesian probabilistic networks, fundamentals of probability theory, likelihood vectors and conditional probability matrices, hierarchical propagation of evidence, computational algorithms for general networks.

UNIT V: Dempster-Shafer theory of evidence, belief interval representations for uncertainty, evidence accumulation and propagation, Knowledge-based decision systems, utility theory, utility functions, decision networks, decision-theoretic knowledge systems, sequential decision problems, value iteration .

EAI-445 Quantum Computing

B.Tech. Semester – VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L T P
3 1 -

Class Work :50 Marks
Exam. :100 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 programming 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: Bloch Sphere , Multi-qubits States , Quantum superposition of qubits (valid and invalid superposition) , Quantum Entanglement , Useful states from quantum algorithmic perspective 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)

SUGGESTED BOOKS

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

EAI-451 Deep Learning

B.Tech. Semester – VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L T P

3 1 -

Class Work :50 Marks

Exam. :100 Marks

Total :150 Marks

Duration of Exam : 3 Hrs.

Course Outcomes:

- Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.
- Become familiar with neural networks
- This topics course aims to present the mathematical, statistical and computational challenges of building stable representations for high-dimensional data
- Discussing recent models from supervised learning
- Discussing recent models from unsupervised learning

Unit 1

INTRODUCTION : Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates.

Unit 2

DEEP NETWORKS : History of Deep Learning- A Probabilistic Theory of Deep Learning Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks-Convolutional Networks- Generative Adversarial Networks (GAN), Semisupervised Learning.

Unit 3

DIMENSIONALITY REDUCTION: Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization.

Unit 4

OPTIMIZATION AND GENERALIZATION : Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience.

Unit 5

A brief introduction to Directed Graphical Models, A brief introduction to Markov Networks, Restricted Boltzmann Machines.

Text books:

- Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
- Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
- Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
- Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

EAI-452 Augmented Virtual Reality

B.Tech. Semester – VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L T P
3 1 -

Class Work :50 Marks
Exam. :100 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 suitable 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.

TEXT BOOKS

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

EAI-453 Data Visualization

B.Tech. Semester – VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L T P
3 1 -

Class Work :50 Marks
Exam. :100 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 design alternatives.
- 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 Data Visualization, Good Graphics, Static Graphics, Data Visualization through their Graph Representations.

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

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

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

Unit 5 Applications: Exploratory Graphics of a Financial Dataset, Visualizing Functional Data with an 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 2019 by Kieran Healy Chen,
- Handbook of data visualization. Springer Science & Business Media. by Chun-houh, Wolfgang Karl Härdle, and Antony Unwin, eds.

EAI-454 APPLICATIONS OF AI IN INDUSTRIES-I

B.Tech. Semester – VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L T P
3 1 -

Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

Course Outcomes:

At the end of this course, each student will be able to

- Understand the fundamental concepts of Machine Learning.
- Understand the applications of ML in Banking, Insurance and Securities.
- Demonstrate AI applications developed by Education sectors.
- Demonstrate knowledge on future applications of healthcare using ML.
- Understand the principles of AI applications through case studies.

Unit 1: A Brief Introduction to Machine Learning

Paradigms, Knowledge Representation, Data Acquisition, Data Pre-Processing, Feature Extraction and Processing, Feature Ranking and Selection, Feature Reduction, Model Learning, Evaluation and Deployment

Unit 2: Machine Learning in Banking and Securities

Introduction, Analytics and Machine Learning Applications in Banking and Securities, Fraud Detection, Effective Application Screening, More Customer Acquisition and Retention, Better Knowledge of Customer Buying Habits, Efficient Cross-Selling, Improved Collections, Marketing Optimization, Increased Customer Lifetime Value, Effective Feedback Management.

Unit 3: Machine Learning in Healthcare and Life Sciences

Introduction, An Overview of Provider, Payer and Life Sciences Analytics, Business Value of Health Analytics - Value Life Cycle, Healthcare Analytics Framework- Key Drivers, Security, Privacy, and Risk Analytics in Healthcare, Meaningful Use and Role of Analytics - Complying with Regulatory Imperatives, Measuring the Impact of social media in Healthcare.

Unit 4: Machine Learning in Education

Introduction, Current Challenges in the Education Sector - Multiple Modes of Education, Rapidly Changing Education Trends, Targeting the Right Population, Curbing the Dropout Rate, Planning and Budgeting for Sustainable Expansion, Effective Development of Instructor and Curriculum, The Consequences of these Challenges - High Dropout Rate, Higher Debt Pressure on Dropouts, Increasing Loan Defaults, Failure of the Education System, Universities Lose Revenues, How Analytics Can Help? - What-if Scenarios Creation for Planning, Budgeting and Forecasting, Analytics for Educators, Analytics for Pupils, Smart Governance and Management of Education Programs, Career Prediction and Assisting Students in Choosing their Career Paths.

Unit 5: Machine Learning in Insurance

Introduction, Insurance Industry Overview, Emerging Trends - New Product Guidelines, Standard Proposal Forms and Need-Based Sales, Multi Tie-up for Banks, Role of Machine Learning in Insurance, Sales and Channel Management - Channel Strategy Optimization, Sales Reporting, Channel Management, Channel Analysis, Channel Profitability, Operations Management - New Business Processing, New Business Leakages, Customer Retention/Persistency, Attrition Analysis, Predicting Customer Behavior - Social Media Analytics, Use of GPS-Enabled Devices and CCTV Footage, Claims Management - Claims Payment Management, Claims Analysis, Marketing Management in Insurance Industry - Customer Segmentation, Product Management, Campaign Analysis, Profitability Management in Insurance Industry - Premium Analysis, Financial Analysis, Product Profitability Analysis, Underwriting Loss Analysis, Risk Management in Insurance - Reinsurance, Underwriting

EAI-455 Pattern Recognition

B.Tech. Semester – VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L T P
3 1 -

Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

Course Outcomes

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

- Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques.
- Summarize, analyze, and relate research in the pattern recognition area verbally and in writing.
- Apply performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature.
- Apply pattern recognition techniques to real-world problems such as document analysis and recognition.
- Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers.

Unit 1

Basics of Probability, Random Processes and Linear Algebra: Probability: independence of events, conditional and joint probability, Bayes' theorem; Random Processes: Stationary and nonstationary processes, Expectation, Autocorrelation, Cross-Correlation, spectra; Linear Algebra: Inner product, outer product, inverses, eigen values, eigen vectors;

Unit 2

Bayes Decision Theory: Minimum-error-rate classification, Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions, discrete features, Parameter Estimation Methods: Maximum-Likelihood estimation: Gaussian case; Maximum a Posteriori estimation; Bayesian estimation: Gaussian case.

Unit 3

Unsupervised learning and clustering: Criterion functions for clustering; Algorithms for clustering: K-Means, Hierarchical and other methods; Cluster validation; Gaussian mixture models; Expectation-Maximization method for parameter estimation; Maximum entropy estimation.

Unit 4

Sequential Pattern Recognition: Hidden Markov Models (HMMs); Discrete HMMs; Continuous HMMs, Nonparametric techniques for density estimation: Parzen-window method; K-Nearest and Neighbour method

Unit 5

Dimensionality reduction: Fisher discriminant analysis; Principal component analysis; Factor Analysis, Linear discriminant functions: Gradient descent procedures; Perceptron; Support vector Machines, Non-metric methods for pattern classification: Non-numeric data or nominal data; Decision

Text Books:

- R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001
- S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009
- C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

TAH-473 Engineering Economics

B.Tech. Semester – VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L T P
2 1- -

Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

COURSE OBJECTIVE- The Course aims to make student understand various social, legal and economic factors effecting business world so that to help take risk and challenges for Managerial Decision Making.

UNIT I: INTRODUCTION & OVERVIEW : (8 hours)

Introduction to Economics, Evolution, Nature and Significance of Economics, Fundamental Principles, Relation of Science, Engineering and Technology to Economics.

UNIT II: MICRO AND MACRO ECONOMICS : (8 hours)

Meaning, Nature, Significance of Micro and Macro Economics, Importance of Micro and Macro Economics, Differences and Interrelationship between Micro and Macro Economics, Economic Static and Dynamic Analysis.

UNIT III: DEMAND & SUPPLY ANALYSIS : (8 hours)

Demand Analysis for Decision Making-Determinants of demand, Law of demand, Law of supply; Indifference Curve Analysis; elasticity of demand, Price, Income and Substitution effect.

UNIT IV: MONEY AND BANKING: (8 hours)

Evolution of Money (Barter Process), Functions of Money, Value of Money, Inflation and Measure to control it. Introduction to Banking, Banking structure in India, Commercial and Central Banking in India.

UNIT V: CENTRAL BANKING: (8 hours)

Definition of Central Banking, Evolution of Central Banking, Functions of a Central Bank, Difference between Commercial and Central Banks, Monetary and Fiscal Policies with their objectives

TEXT BOOKS

1. Dwivedi, D.N. (2015). *Managerial Economics, 8th edition. Vikas – New Delhi.*
2. Mithani, D.M. (2017). *Managerial Economics: Theory & Applications. Himalayan – Mumbai.*
3. Maheswari, Y. (2013). *Managerial Economics, 13th edition. Prentice Hall – New Delhi*
4. Agarwal, Vanita (2013). *Managerial Economics. Pearson – New Delhi*
5. Salvatore, Dominick (2015). *Managerial Economics in a Global Economy, 8th edition. Oxford University Publication – New Delhi*
6. Hirschey, Mark (2013). *Managerial Economics. Cengage – New Delhi*

COURSE OUTCOME

- CO-1 Helps to know the application of engineering to economics.
- CO-2 The learning outcome for the students would be they get the actual difference between micro and macro economics.
- CO-3 It gives students an introduction to the tools used by micro-economists and serves as a foundation to many economics courses that follow such as labor, financial and industrial economics.
- CO-4 Provide the ability to use theories in analyzing economic phenomena for solving monetary problems.
- CO-5 Helps in understanding the concept of banking operations in India.

PAI-471 Soft Computing Lab

B.Tech. Semester – VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L T P
- - 2

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

Course Outcomes

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

- Understand Fuzzy concepts
- Learn neural networks with back propagation and without preparation
- Learn the operators of genetic algorithms
- Practice on crisp partitions
- Implement SVM classification by Fuzzy concepts.

list of practical

1. Create a perceptron with appropriate number of inputs and outputs. Train it using fixed increment learning algorithm until no change in weights is required. Output the final weights
2. Write a program to implement artificial neural network without back propagation.
3. Write a program to implement artificial neural network with back propagation.
4. Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform max-min composition on any two fuzzy relations.
5. Implement travelling sales person problem (tsp) using genetic algorithms.
6. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on soya bins data. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.
7. Implement linear regression and multi-regression for a set of data points
8. Implement crisp partitions for real-life iris dataset
9. Write a program to implement Hebb's rule Write a program to implement Delta rule.
10. Write a program to implement logic gates

PAI-472 Project-I

B.Tech. Semester –VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

Course Objectives

On successful completion of this course, the students shall be able to

- Take up investigative study in the broad field of Computer Science & Engineering, either fully theoretical/practical or involving both the theoretical and practical work
- Take up project assigned by the Department on an individual basis or in a group under the guidance of a supervisor
- Survey and study published literature on the assigned topic, identify the research gaps and work out a systematic approach to the problem related to the assigned topic
- Conduct preliminary analysis, modeling, simulation and experiment
- Prepare a report on the study conducted and make presentation before the Department

The objective of Project-I is 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.

PAI-473 Industrial Training
B.Tech. Semester –VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

About Industrial Training

It is an organized method or activity of enhancing and improving skill set and knowledge of engineering students which boost their performance and consequently helping them to meet their career objectives. Industrial Training is an essential component in the development of the practical and professional skills required for an Engineer and an aid to prospective employment

Objectives of Industrial Training

- 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.

Course Outcomes

At the end of Industrial Training, the students will be able to

- Understand organizational issues and its impact on organization and employees.
- Identify industrial problems and suggest possible solutions.
- Relate, apply and adapt relevant knowledge, concepts and theories within an industrial organization, practice and ethics.
- Apply technical knowledge in an industry to solve real world problems.
- Demonstrate effective group communication, presentation, self-management and report writing skills.

TAI-481 Optimization Technique
B.Tech. Semester –VIII (Artificial Intelligence&Machine Learning)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Outcome:

- Be able to use Matlab to implement optimization algorithms.
- Be able to model engineering minima/maxima problems as optimization problems.

UNIT I

Engineering application of Optimization, Formulation of design problems as mathematical programming problems. Introduction to linear Programming: Introduction to Linear Programming Problems, Formulation of Linear Programming Problems, Graphical method for solution of LPP, Additional Examples, Solving LPPs: The simplex method for solution of LPP, the essentials of simplex method, setting up the simple method, The Algebra of the simplex method, simplex method in Tabular form. Tie Breaking in simplex method, Solution of maximization and minimization problems, Big-M method, Two phase method, Unbounded and degenerate solution of LPP, Duality in Linear programming.

UNIT II

General Structure of Optimization Algorithms, Constraints, The Feasible Region. Game Theory: The formation of two persons, Zero sum games, solving simple games, games with mixed strategies, Graphical solution Procedure, Solving by LP.

UNIT III

Branches of Mathematical Programming: Optimization using calculus, Graphical Optimization, Linear Programming, Quadratic Programming, Integer Programming, Semi Definite Programming.

UNIT IV

Optimization Algorithms like Genetic Optimization, Particle Swarm Optimization, Ant Colony Optimization etc., Classical Optimization techniques, advance Optimization techniques.

UNIT V

Real life Problems and their mathematical formulation as standard programming problems. Recent trends: Applications of ant colony optimization, genetics and linear and quadratic programming in real world application, Non-linear constrained optimization models. Inventory Theory: Components of inventory models, Deterministic continuous review models, A deterministic periodic review model, A stochastic continuous review model.

References

1. Dimitris Bertsimas; Robert Weismantel (2005). Optimization over integers. Dynamic Ideas. ISBN 978-0-9759146-2-5.
2. John K. Karlof (2006). Integer programming: theory and practice. CRC Press. ISBN 978-0-8493-1914-3.
3. H. Paul Williams (2009). Logic and Integer Programming. Springer. ISBN 978-0-387-92279-9.

4. Pulleyblank; Gerhard Reinelt; Giovanni Rinaldi; Laurence A. Wolsey, eds. (2009). *50 Years of Integer Programming 1958-2008: From the Early Years to the State-of-the- Art*. Springer. ISBN 978-3-540-68274-5.
5. Der-San Chen; Robert G. Batson; Yu Dang (2010). *Applied Integer Programming: Modeling and Solution*. John Wiley and Sons. ISBN 978-0-470-37306-4.

EAI-461 Embedded Systems

B.Tech. Semester –VIII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 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 schematic. 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. Jonarthan W. Valvano, “Embedded Micro computer Systems, Real time Interfacing”, Thomson learning 2001.

EAI- 462 Applications of AI in Industries-II
B.Tech. Semester –VIII (Computer Science &Engg.)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Learning Outcomes:

At the end of this course, each student will be able to

- Understand the fundamental concepts of Machine Learning.
- Understand the applications of ML in communication, media and government.
- Demonstrate AI applications developed by retail and supply chain.
- Demonstrate knowledge on future applications of energy and utilities using ML.
- Understand the principles of AI applications through case studies.

Unit 1: A Brief Introduction to Machine Learning

Paradigms, Knowledge Representation, Data Acquisition, Data Pre-Processing, Feature Extraction and Processing, Feature Ranking and Selection, Feature Reduction, Model Learning, Evaluation and Deployment

Unit 2: Machine Learning in Government

Introduction, Machine Learning and Analytics for Government - An Overview, Emerging Technologies for the Public Sector - Preparing for Big Data, Innovative Use Cases, Government Applications of the Internet of Things - Smart Cities, Motivations and Challenges for Government Use of the Internet of Things, Government Sponsored Healthcare and Life Sciences Projects - Genomics, Neuroscience, Government Use of Big Data for Cybersecurity - Illustrative Cybersecurity Solutions, Illustrative Case Studies - Dubai's Smart City Initiative, San Diego Supercomputer Center, National Center for Supercomputing Applications, Translational Genomics Research Institute, The Food and Drug Administration (FDA)'s Initiative to Detect and Study Patterns of Food Related Illness and Diseases

Unit 3: Machine Learning in Communication, Media and Entertainment

Introduction, Change in Landscape with the Advent of Smartphone and Social Media, The Benefactors of Big Data in Media and Entertainment Industry - Video Publishers, Media Owners, Gaming Companies, Television Channels, Analytics and Machine Learning Applications in Communication, Media and Entertainment Industries, Prediction of Audience Interests, Deriving Insights into Customer Churn, Optimizing Media Program Schedules, Content Monetization, Effective Targeting of Advertisements.

Unit 4: Machine Learning in Energy and Utilities

Introduction, Smart Grids, Demand Response, Revenue Management, Fraud and Loss Prevention, Energy Efficiency, Compliance, Asset Maintenance and Management, Customer Care and Management, Forecasting and Load Management.

Unit 5: Machine Learning in Retail and Supply Chain

Introduction, Merchandising Analysis - Assortment Planning, Product Placement, Space Allocation, Product Adjacency, Market Basket Analysis, Marketing Analytics - Promotions, Pricing, Personalization, Campaigns, Store Operations Analytics - Workforce Effectiveness, Shrinkage, Inventory, Store Performance, Supply Chain Analytics - Logistics, Inventory, Supplier Performance, Demand Forecasting, Bull-Whip Effect

EAI-463Blockchain

B.Tech. Semester –VII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

COURSE OUTCOMES

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

- Understand Blockchain technology.
- Develop Blockchain based solutions and write smart contract using Hyperledger Fabric and Ethereum frameworks.
- Build and deploy Blockchain 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 Blockchain technology

Unit 1-Introduction: Overview of Blockchain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Blockchain, Transactions, Distributed Consensus, Public vs Private Blockchain, Understanding Crypto currency toBlockchain, Permissioned Model of Blockchain, Overview of Security aspects of Blockchain. Basic 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 Blockchain with Crypto currency:Bitcoin and Blockchain: 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, HashcashPoW, BitcoinPoW, 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 Blockchain for Enterprises: Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned Blockchains, Execute contracts, State machine replication, Overview of Consensus models for permissioned Blockchain- 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 Blockchain: 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 Blockchain

Unit 5-Blockchain 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. Daniel Drescher. “Blockchain Basics: A Non-Technical Introduction in 25 Steps”, Apress.
2. Antony Lewis, “The Basics of Bitcoins and Blockchains: An Introduction to Cryptocurrencies and the Technology that Powers Them (Cryptography, Crypto Trading, Digital Assets)”, Mango Publications.
Melanie Swan, “Blockchain: Blueprint for a New Economy”, O’Reilly, 2015

EAI-464 Big Data Analytics

B.Tech. Semester –VIII (Artificial Intelligence & Machine Learning)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 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.

Big Data Analytics: Analytics 1.0, Analytics 2.0, Analytics 3.0, Traditional BI vs. Big Data Environment

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, Spark for Batch processing, Spark SQL, data flow processing libraries (Beam, Spark Streaming, Flink).

Hive: Introduction to Hive, History of Hive and Recent Releases of Hive, Hive Features,Hive Integration and Work Flow, Hive Data UNITS, Hive Architecture, Hive Primitive Data Types and Collection Types, Hive File Formats Hive Query Language - Statements: DDL, DML, Hive Partitions, Bucketing, Views, Sub Query, Joins, Hive User Defined Function, Aggregations in Hive, Group by and Having, Serialization and Deserialization, Hive Analytic Functions

BOOKS

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. AnandRajaraman And Jeffrey David Ullman, Mining Of Massive Datasets,Cambridge University Press, 2012.

EAI-465 Robotics and its applications
B.Tech. Semester –VIII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

L	T	P	Class Work	:50 Marks
3	1	-	Exam.	:100 Marks
			Total	:150 Marks
			Duration of Exam	: 3 Hrs.

Course Outcomes

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

- Explain the basic concepts of working of robot
- Analyze the function of sensor in robot and design the robotic arm with various tools
- Program the robot for a typical application and path planning using robotic vision
- Understand the various robot programming languages
- Conduct and design the experiments for various robot operations and Use the advanced techniques for robot processing

Unit I: Introduction: Introduction, brief history, types, classification and usage, science and technology of robots, Artificial Intelligence in Robotics, some useful websites, textbooks and research journals

UNIT II :Elements of Robots-Joints, Links, Actuators, and Sensors: Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kind of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders-tachometers-strain gauge based force torque sensor-proximity and distance measuring sensors-and vision

UNIT III: End Effectors: Classification of end effectors-tools as end effectors-drive system for grippers-mechanical adhesive- vacuum magnetic-grippers-hooks and scoops-gripper force analysis-and gripper design- active and passive grippers, Introduction, path planning-overview-road map path planning-cell decomposition path planning- potential field path planning-obstacle avoidance-case studies

UNIT IV: Vision system

Robotic vision systems-image representation-object recognition-and categorization-depth measurement- image data compression-visual inspection-software considerations

UNIT V: Robot Programming

Introduction to robot languages-VAL-RAPID-language-basic commands-motion instructions- pick and place operation using industrial robot manual mode-automatic mode-subroutine command based programming-move master command language-introduction-syntax-simple problems

Reference:

- Rodney. "Achieving Artificial Intelligence through Building Robots." Boston: Massachusetts Institute of Technology, 1986.
- Horswill, Ian. "The Polly System." AI and Mobile Robots.
- Vaughan, R. N. Sumpter, A. Frost, and S. Cameron. "Experiments in Automatic Flock Control." Edinburgh, UK, 1998.
- Mark Yim, David G. Duff, and Kimon D. Roufas. "PolyBot: a Modular Reconfigurable Robot." IEEE International Conference on Robotics & Automation. April 2000.
- Martin, Martin C. and Hans Moravec. "Robot Evidence Grids." CMU RI TR 96-06, 1996.
- Moravec, Hans. "Robots, After All." Communications of the ACM. October 2003. Vol. 46, No. 10.

PAI-481 Optimization Techniques Lab

B.Tech. Semester –VIII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

Course Outcomes

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

- Understand the basic principles and concepts of Python
- Explore the applicability of programming skills in Python.
- Summarize various optimization techniques like LPP models .
- Analyze the transportation, inventory and assignment problems.
- Explain the concepts of sequencing, game theory and dynamic programming.

List of Experiments

1. Matrix Operations
2. Matrix Operations
3. Minimum Cost Path
4. Finding Maximum Number In An Array
5. Array Sorting
6. Linear Programming Problem
7. Queuing Problem
8. Sequencing Problem
9. Game Theory
10. Assignment Problem
11. Dynamic Programming Problem
12. Inventory Problem
13. Examinations

PAI-482 Project-II

B.Tech. Semester –VIII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

Course Objectives

On successful completion of this course, the students shall be able to

- Extend further the investigative study taken up under Project-I, either fully theoretical/practical or involving both the 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 and obtain a good training in R&D work and technical leadership
- Review and finalize the approach to the problem relating to the assigned topic and prepare an action plan for preparing conducting the investigation and assign responsibilities for team work
- Conduct detailed analysis, modeling, simulation, design, problem solving or experiment as needed on the assigned topic
- Develop product/process, test, draw results and conclusions, and give direction for future research and prepare a paper for conference presentation/publication in journals, if possible
- Prepare a project report in the standard format for being evaluated by the Department and make final presentation on the project

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 the assigned topic and 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 and 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.

PAI-483 Seminar

B.Tech. Semester –VIII (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

Course Objectives

On successful completion of this course, the students shall be able to

- Express themselves fluently and appropriately in social and professional contexts
- Develop the sub-skills required for paper presentation and group discussions
- Acquire the soft skills and interpersonal skills which will help them in their workplace needed for these functions
- Collect materials from books, Internet, journals, and newspapers for the seminar theme and prepare a short seminar report
- Make presentation on the topic, answer the queries/questions that come forward, clarify and supplement if necessary, and submit a report

SEMINAR: Seminar presentation on the themes allotted:

Each student should collect materials from Books, Internet, Journals and Newspapers for his/her 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