SCHEME AND SYALLABUS

B. Tech. Computer Science & Engineering

(ARTIFICIAL INTELLIGENCE & MACHINE LEANRING)

Evaluation Schemes form I Year to IV Year

w.e.f. 2020-2021

G. B. PANT INSTITUTE OF ENGINEERING & TECHNOLOGY

GHURDAURI, PAURI GARHWAL, Uttarakhand-246194

(An Autonomous Institution of the Government of Uttarakhand)

EVALUATION SCHEME
B. TECH. ARTIFICIAL INTELLIGENCE & MACHINE LEANRING
II-YEAR (III-SEMESTER)
(Effective from session: 2021-22)

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

EVALUATION SCHEME
B. TECH. ARTIFICIAL INTELLIGENCE & MACHINE LEANRING
II-YEAR (IV-SEMESTER)
(Effective from session: 2021-22)

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

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

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1.	TAI-351	DATABASE MANAGEMENT SYSTEMS	3	1	0	40	40	80	120	200	4
2.	TAI -352	COMPILER DESIGN	3	1	0	40	40	80	120	200	4
3.	TAI -353	COMPUTER ORGANIZATION & ARCHITECTURE	3	1	0	40	40	80	120	200	4
4.	TES-351	MICROPROCESSORS	3	0	0	30	30	60	90	150	3
5.	THS-351	PRINCIPLES OF MANAGEMNET	3	0	0	30	30	60	90	150	3
6.	EAI-31X	ELECTIVE-I	3	0	0	30	30	60	90	150	3
7.	TMC-351	CONSTITUTION OF INDIA	2	0	0	15	10	25	50	75	0
PRACTICAL											
8.	PAI -351	DATABASE MANAGEMENT SYSTEMS LAB	0	0	2	10	15	25	25	50	1
9.	PAI -352	PYTHON FOR DATA PRE-PROCESSING AND VISUALIZATION LAB	0	0	2	10	15	25	25	50	1
10.	PAI-353	INDUSTRIAL TRANING	0	0	2	0	0	50	0	50	1
11.	GPP 351	GENERAL PROFICIENCY	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			**20**	**3**	**6**	**245**	**310**	**595**	**730**	**1325**	**24**

ELECTIVE-I

EAI-311 SOFTWARE ENGINEERING

EAI-312 ARTIFICIAL NEURAL NETWORKS

EAI-313 COMPUTER GRAPHICS

EAI-314 FUZZY LOGIC

EAI-315 DIGITAL IMAGE PROCESSING

EVALUATION SCHEME

B. TECH. ARTIFICIAL INTELLIGENCE & MACHINE LEANRING
III-YEAR (VI-SEMESTER)
(Effective from session: 2022-23)

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

ELECTIVE-II
EAI-321 NATURAL LANGUAGE PROCESSING
EAI-322 DISTRIBUTED SYSTEMS
EAI-323 REAL TIME SYSTEM
EAI-324 INFORMATION THEORY AND CODING
EAI-325 GENERATIC ALGORITHM AND ITS APPLICATIONS

ELECTIVE-III
EAI-331 NATURAL INSPIRED COMPUTING
EAI-332 WEB TECHNOLOGY
EAI-333 VISUALIZATION AND CLOUD COMPUTING
EAI-334 DATA MINING AND PREDICTIVE MOLDING
EAI-335 HUMAN COMPUTER INTERACTION

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

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1.	TAI-471	DEEP LEARNING	3	1	0	40	40	80	120	200	4
2.	EAI-44X	ELECTIVE-IV	3	0	0	30	30	60	90	150	3
3.	EAI-45X	ELECTIVE-V	3	0	0	30	30	60	90	150	3
4.	TOE-XY	OPEN ELECTIVE-II	3	0	0	30	30	60	90	150	3
5.	THS-471	ENGINEERING ECONOMICS	3	0	0	30	30	60	90	150	3
PRACTICAL											
6.	PAI-471	DEEP LEARNING 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			**15**	**1**	**12**	**170**	**225**	**545**	**605**	**1150**	**22**

ELECTIVE-IV
EAI-441 CRYPTOGRAPHY & NETWORK SECURITY
EAI-442 INTERNET-OF-THINGS
EAI-443 INFORMATION RETRIEVAL
EAI-444 MULTI-AGENT INTELLIGENT
EAI-445 QUANTUM COMPUTING

ELECTIVE-V

EAI-451 SOFT COMPUTING
EAI-452 AUGEMENTED VIRTUAL REALITY
EAI-453 DATA SCIENCE
EAI-454 ARTIFICIAL INTELLIGENCE FOR HEALTH AND MEDICINE
EAI-455 PATTERN CLASSIFICATION

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

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

ELECTIVE-VI

EAI-461 ADHOC & SENSOR NETWORK
EAI-462 COMPUTER VISION
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 LEANRING
I-YEAR (I/II-SEMESTER)
(COMMON FOR ALL BRANCHES)
(Effective from session: 2020-21)

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

TES-111/ 121 Programming For Problem Solving

B.Tech. Semester –II (Artificial Intelligence & Machine Leanring)

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

Course Outcomes

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

- Illustrate the flowchart and design analgorithm for a given problem and to develop C programs using operators
- Develop conditional and iterative statements to write C programs
- Exercise user defined functions to solve real time problems
- Use Pointers toaccess 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 ofIndia

PES-111/121 Programming For Problem Solving Lab

B.Tech. Semester –II (Artificial Intelligence & Machine Leanring)

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

Course Outcomes

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

- Develop conditional and iterative statements programs
- Exercise user defined functions to solvereal time problems
- Develop programs using pointers, strings and arrays.
- Develop C programs using pointers andto 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:

Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:

Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

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

Tutorial 5: 1D Arrays: searching, sorting:

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

Tutorial 8 &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-44 Data Structure
B.Tech. Semester –III (Artificial Intelligence & Machine Leanring)

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

Course outcomes:

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

- Understand the concept of the algoritm to determine time and computational complexity, dynamic memory management.
- Solve the search probem 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, delection 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 complexityanalysis.

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

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

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

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

Books

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

TAI-231 Python Programming

B.Tech. Semester –III (Artificial Intelligence & Machine Leanring)

L	T	P		
3	1	0	**Class Work**	**:80 Marks**
			Exam.	**:120 Marks**
			Total	**:200 Marks**
			Duration of Exam	**: 3 Hrs.**

Course Outcomes:

- Developessentialprogrammingskillsincomputerprogrammingconceptslikedatatypes
- Applythe basicsofprogramminginthePython language
- Solvecodingtasksrelatedconditionalexecution,loops
- Develop user defined function and standard modules in python programming.
- Solvecodingtasksrelatedtothefundamentalnotionsandtechniquesusedinobject-orientedprogramming.

Unit 1- Introduction andSyntax of Python Program: FeaturesofPython-Interactive,Object oriented,Interpreted,platformindependent, Pythonbuildingblocks -Identifiers,Keywords, Indention, Variables,Comments, Pythonenvironmentsetup -InstallationandworkingofIDE, RunningSimplePythonscriptstodisplay'welcome'message, Python variables, PythonData Types: Numbers,String,Tuples,Lists,Dictionary.Declaration anduseofdatatypes, Built in Functions.

Unit2-PythonOperatorsandControlFlowstatements:Basic Operators:Arithmetic,Comparison/Relational,Assignment,Logical,Bitwise,Membership,Identityoperators,Python OperatorPrecedence, Control Flow: ConditionalStatements(if,if...else,nestedif), Loopinginpython(whileloop,forloop,nestedloops), loopmanipulation usingcontinue,pass,break,else.

Unit 3-DataStructuresinPython: String: Concept,escapecharacters, Stringspecialoperations, Stringformattingoperator, Singlequotes,Doublequotes, Triplequotes, RawString,Unicodestrings, Built-inStringmethods. Lists: Defining lists, accessing values in list, deletingvaluesinlist,updatinglists, BasicListOperations, Built-inListfunctions.Tuples: Accessing values in Tuples, deletingvaluesinTuples,andupdatingTuples, BasicTupleoperations, Built-inTuplefunctions.Sets: AccessingvaluesinSet,deletingvaluesinSetandupdatingSets, BasicSetoperations, Built-inSet functions. Dictionaries: Accessing values in Dictionary, deletingvaluesinDictionaryandupdatingDictionary, BasicDictionaryoperations, Built- inDictionariesfunctions.

Unit 4-
PythonFunctions,modules,andPackages:UseofPythonbuiltinfunctions(e.g.type/dataconversionfunctions,mathfunctionsetc.),zserdefinedfunctions:Functiondefinition,Functioncalling,functionargumentsandparameterpassing,Returnstatement, Scope of Variables: Globalvariable andLocalVariable. Modules:Writingmodules,importingmodules,importingobjectsfrommodules,Pythonbuilt-inmodules(e.g.Numeric and mathematicalmodule,FunctionalProgramming Module), Packages.

Unit 5-Object- Oriented Programming, File I/OHandling and Exception Handling in Python: CreatingClassesandObjects, MethodOverloadingandOverriding, DataHiding, Dataabstraction, Inheritanceandcompositionclasses, Customization via inheritancespecializinginheritedmethods.I/O Operations: Reading keyboard input,Printingtoscreen.File Handling: Opening file in differentmodes,accessingfilecontentsusingstandardlibraryfunctions,Reading,andwritingfiles,closingafile,Renamingganddeleting files, File relatedstandardfunctions.ExceptionHandling:Introduction,Exception handling - 'try: except:'statement,'raise'statement, Userdefinedexceptions.

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.
- Ch Satyanarayana, “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

TAI-232 Discrete Mathematics

B.Tech. Semester –III (Artificial Intelligence & Machine Leanring)

L T P		
3 1 0	**Class Work**	**:80 Marks**
	Exam.	**:120 Marks**
	Total	**:200 Marks**
	Duration of Exam	**: 3 Hrs.**

Course Outcomes

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

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

Unit 1- Set Theory: Introduction to set theory, Set operations, Algebra of Sets, Combination of sets, Duality, Finite and infinite sets, Classes of sets, Power sets, Multi sets, Cartesian Product, Representation of relations, Types of relation, Binary relation, Equivalence relations and partitions, 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(^), OR(v), NOT(~), True value of a compound statement, propositions, tautologies and contradictions. Partial ordering relations and lattices.
Lattice theory: Partial ordering , posets, lattices as posets, propertices 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, sunmonoid, semi group, groups and rings, Homomorphism, Isomorphism and automorphism, Subgroups and Normal subgroups, Cyclic groups, Integral domain and fields, Rings, Division Ring.

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

Books

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

TES-231 Digital Electronics
B.Tech. Semester –III (Artificial Intelligence & Machine Leanring)

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

Course Outcomes

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

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

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

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

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

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

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

Text/References

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

TBS-231 Mathematics-III
B.Tech. Semester –III (Artificial Intelligence & Machine Leanring)

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

Note : To be provided by ASHD

PCS-231 Data Structure Lab
B.Tech. Semester –III ((Artificial Intelligence & Machine Leanring)

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

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

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

LIST OF EXPERIMENTS

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

PAI-231 Python Programming Lab
B.Tech. Semester –III (Artificial Intelligence & Machine Leanring)

L	T	P		
-	-	2	**Class Work**	**:25 Marks**
			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) <= (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

PAI-232 LINUX / UNIX PROGRAMMING
B.Tech. Semester – III (Artificial Intelligence & Machine Leanring)

L T P
0 - 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.

PES-231 Digital Electronics Lab
B.Tech. Semester –III (Artificial Intelligence & Machine Leanring)

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

COURSE OUTCOMES

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

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

LIST OF EXPERIMENTS

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

PAI-233 Industrial Training
B.Tech. Semester –III (Artificial Intelligence & Machine Leanring)

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

Course Objectives

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

- Exposure to actual working environment in the industry and enhance their knowledge
- Make use of the skills that they have learnt in the institute
- Learn the good qualities of integrity, self-confidence and self-confidence
- Follow all good qualities and ethical working practices
- Learn about the safety practices and regulations inside the industry and develop the spirit of teamwork and good relationship between students and employees

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

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

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

- 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,Inducative 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

TAI-242/ TOE-42 Operating Systems
B.Tech. Semester –IV (Artificial Intelligence & Machine Leanring)

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

Course Outcomes

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

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

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

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

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

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

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

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

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

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

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

Suggested Books

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

TAI-243 Design & Analysis of Algorithms

B.Tech. Semester –IV ((Artificial Intelligence & Machine Leanring)

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

Course Outcomes

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

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

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

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

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

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

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

Books

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

Reference books

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

TAI-244 Theory of Computation
B.Tech. Semester –IV (Artificial Intelligence & Machine Leanring)

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

Course Outcomes

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

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

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

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

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

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

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

Books

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

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THS-241 Management 1 (Organizational Behaviour/ Finance & Accounting)
B.Tech. Semester –IV (Artificial Intelligence & Machine Leanring)

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

Note : To be provided by ASHD

TMC-242 Essence of Indian Traditional Knowledge
B.Tech. Semester –IV (Artificial Intelligence & Machine Leanring)

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

Note : To be provided by ASHD

PAI-241 Artificial Intelligence Lab
B.Tech. Semester –IV (Artificial Intelligence & Machine Leanring)

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

COURSE OUTCOMES

After undergoing this course, the students will be able to

- 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.

PAI-242 Operating SystemsLab
B.Tech. Semester –IV (Artificial Intelligence & Machine Leanring)

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

COURSE OUTCOMES
Upon successful completion of the course, the students will be able to
- Understand the system calls and I/O system calls in UNIX
- Evaluate the process scheduling algorithms FCFS,SJF, Priority and Round robin
- Simulate the process communication through various techniques
- Simulate memory management schemes
- Simulate File allocation Techniques

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

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

PAI-243 Design & Analysis of Algorithms Lab
B.Tech. Semester –IV (Artificial Intelligence & Machine Leanring)

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

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

LIST OF EXCERCISES

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

TAI-351/TOE-40 Database Management Systems
B.Tech. Semester –V (Artificial Intelligence & Machine Leanring)

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

Course Outcomes

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

- Write relational algebra expressions for that query and optimize the developedexpressions
- Design the databases using E-R method andnormalization.
- To udersatand the concepts of function dependencies and various normal forms.
- Determine the transaction atomicity, consistency, isolation, anddurability properties.
- Optimize its execution using Query optimization algorithms

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Unit 1-Introductio: Data Abstraction, DataIndependence,Data Definition Language(DDL),Data Manipulation Language(DML), 3 level Database System Architecture. **Database models:** Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data 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 Databse: Object-oriented and object relational databases, logical databases, web databases, distributed databases, data warehousing and data mining**.**

Books

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts , 6thEdition,McGraw-Hill.
2. J. D. Ullman, Principles of Database and Knowledge – Base Systems, Vol 1, Computer SciencePress.
3. R. Elmasri and S. Navathe , Fundamentals of Database Systems , 5th Edition, PearsonEducation.
4. Serge Abiteboul ,Foundations of Databases, Reprint, Richard Hull, Victor Vianu,Addison-Wesley

TAI-352 Complier Design
B.Tech. Semester –V (Artificial Intelligence & Machine Leanring)

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

Course Outcomes

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

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

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

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

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

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

Unit 5- Code Improvement (optimization): Analysis: control-flow, data-flow dependence etc.;

Code improvement local optimization, globaloptimization, loop optimization, peep-hole optimization etc.

Books

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

TAI-353 Computer Organization & Architecture

B.Tech. Semester –V (Artificial Intelligence & Machine Leanring)

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

Course outcomes

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

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

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

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

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

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

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

Books

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

TES-351 Micoprocessors
B.Tech. Semester –V (Artificial Intelligence & Machine Leanring)

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

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

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

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

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

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

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

Unit 5- ADVANCE MICROPROCESSORS: Architecture and functional description of Programmable Peripheral Interface (8255), operating modes: BSR, I/O mode- Mode 0, 1 and 2, Programmingof8255, 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.

THS-351 Principles of Management

B.Tech. Semester –V (Artificial Intelligence & Machine Leanring)

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

Note : To be provided by ASHD

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

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

Course Outcomes

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

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

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

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

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

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

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

Books

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

EAI-312 ARTIFICIAL NEURAL NETWORKS
B.Tech. Semester –V (Artificial Intelligence & Machine Leanring)

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

Course Outcomes:
By completing this course the student will be able to:

- To understand the biological neural network and to model equivalent neuron models.
- To understand the architecture, learning algorithm and issues of various feed forward and feedback neural networks.
- Create different neural networks of various architectures both feed forward and feed backward.
- Perform the training of neural networks using various learning rules.
- Perform the testing of neural networks and do the perform analysis of these networks for various pattern recognition applications.

UNIT - I Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

UNIT - II Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection

UNIT - III Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

UNIT - IV Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter ClassificationR16 B.TECH ECM.

UNIT - V Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm Hopfield Models – Hopfield Models, Computer Experiment

TEXT BOOKS:

- Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.

REFERENCE BOOKS:

- Artificial Neural Networks - B. Vegnanarayana Prentice Hall of India P Ltd 2005
- Neural Networks in Computer Inteligance, Li Min Fu MC GRAW HILL EDUCATION 2003
- Neural Networks -James A Freeman David M S Kapura Pearson Education 2004.
- Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006

EAI-313 Computer Graphics

B.Tech. Semester –V (Artificial Intelligence & Machine Leanring)

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

Course Outcome

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

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

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

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

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

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

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

Text Books

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

EAI-314 Fuzzy Logic

B.Tech. Semester –V (Artificial Intelligence & Machine Leanring)

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

OBJECTIVES:

- To impact 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.

EAI-315 Digital Image Processing

B.Tech. Semester –V (Artificial Intelligence & Machine Leanring)

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

Course Outcomes

Upon completion ofthis course, the students will be able to

- Understand the fundamentals of image processing.
- Implement the various image enhancement and imagerestoration techniques.
- Perform various filtering techniques
- Exemplify image analysis concepts: segmentation, edge detection and morphing
- Perform feature and object detection techniques.

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 omage 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, Image Enhancement in the Frequency Domain: Introduction.

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

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

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

References

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

TMC-351 Constitution of India
B.Tech. Semester –V (Artificial Intelligence & Machine Leanring)

L	T	P
2	-	-

Class Work	**:25 Marks**
Exam.	**:50 Marks**
Total	**:75 Marks**
Duration of Exam	**: 3 Hrs**

Note : To be provided by ASHD

PAI-351 Database Management System Lab
B.Tech. Semester –V (Artificial Intelligence & Machine Leanring)

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

COURSE OUTCOMES

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

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

LIST OF EXPERIMENTS

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

   (I) Database Schema for a customer-sale scenario

   Customer(Custid : integer, cust_name: string)

   Item(item_id: integer, item_name: string, price: integer)

   Sale(bill_no: integer, bill_data: date, cust_id: integer, item_id: integer, qty_sold: integer)

   For the above schema, perform the following:-

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

   (II) Database Schema for a Employee-pay scenario

   Employee(emp_id : integer, emp_name: string)

   Department (dept_id: integer, dept_name:string)

   Paydetails(emp_id : integer, dept_id: integer, basic: integer,deductions: integer, additions: integer, DOJ: date)

   payroll(emp_id : integer, pay_date: date)

   For the above schema, perform the following:—

   a) Create the tables with the appropriate integrity constraints

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

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

PAI-352 Python for Data Pre-processing and Visualization Lab
B.Tech. Semester –V (Artificial Intelligence & Machine Leanring)

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

CourseObjectives:

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 NumPy ndarray: 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 Leanring)

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

Course Objectives

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

- Exposure to actual working environment in the industry and enhance their knowledge
- Make use of the skills that they have learnt in the institute
- Learn the good qualities of integrity, self-confidence and self-confidence
- Follow all good qualities and ethical working practices
- Learn about the safety practices and regulations inside the industry and develop the spirit of teamwork and good relationship between students and employees

TAI-361/TOE-46 Machine Learning
B.Tech. Semester – VI (Artificial Intelligence & Machine Leanring)

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

References

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

TAI-362/TOE-44 Computer Networks
B.Tech. Semester –VI (Artificial Intelligence & Machine Leanring)

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

Course Outcomes

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

- Explain the functions of the different layer of the 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 andtools.

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

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

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

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

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

Books

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

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

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

Course Outcomes

- To acquaint the students with the concepts, algorithms and applications of natural languages.
- Gain in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- Examine NLP models and algorithms using traditional and recent approaches.
- Analyze and apply appropriate machine learning techniques to solve the real world problem in NLP.

Unit 1

Issues & Motivation: Issues; Motivation; Features of Indian Languages; Issues in Font; Coding Techniques; Sorting & Searching Issues. Morphology & parts of speech: Phonology; Words & Morphemes; Segmentation; Categorization and Lemmatization; Parts of Speech; Taggers; Rule Based; Hidden Morkov Models; Morphology Issues of Indian Languages; Transliteration.

Unit 2

Syntax & Semantics: Basic Concept of Syntax; Parsing Techniques; Lexicalized & Probabilistic Parsing; General Grammar Rules for Indian Languages; Semantics; Pragmatics; Fundamentals; Syntax & Semantics; Indian Language View Point; Statistical Techniques in Corpus Based Techniques.

Unit 3

Mobile application Architecture and Messaging: Building Indian Language Interfaces to Standard Packages; Multilingual Issues; Specialized Tools for Indian Language Processing; GIST Cards; ISCII & Unicode Issues for Indian Languages; Speech Processing & Text to Speech Issues in Indian Languages.

Unit 4

Application: Online Education Tools in Indian Languages; Web Libraries; IT in Rural, Medical & E - Governance Application in Local Languages; Automatic Taggers; Natural Language Generation; Machine Translation; Information Extraction; Retrieval; Other Applications in Indian Languages.

Books

1. James Allen, "Natural Language Understanding", Benjamin & Cummings Publishing Co., 1995
2. Ronald Hausser, "Foundations of Computational Linguistics", Spring &Verleg, 1999
3. Daniel Jurafskey& James H. Martin, "Speech & Language Processing", Prentice Hall of India, 2000
4. Steve Young &GerritBloothoof, "Corpus Based Methods in Language & Speech Processing", Kluwer Academic Publishers, 1997.

EAI-322 Distributed Systems
B.Tech. Semester –VI (Artificial Intelligence & Machine Leanring)

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

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

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

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

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

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

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

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

TEXT BOOK(S)

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

REFERENCES

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

EAI-323 Real Time System

B.Tech. Semester –VI (Artificial Intelligence & Machine Leanring)

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

Course Outcomes

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

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

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

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

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

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

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

Books

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

EAI-324 Information Theory and Coding

B.Tech. Semester –VI (Artificial Intelligence & Machine Leanring)

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

Course Outcomes

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

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

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

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

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

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

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

Books

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

EAI-325: Genetic Algorithms and its Applications
B.Tech. Semester –VI (Artificial Intelligence & Machine Leanring)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 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-331 Natural Inspired Computing

B.Tech. Semester –VI (Artificial Intelligence & Machine Leanring)

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

Course Outcome

Upon completion of the course, Students will be able to

- 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 Dorrigo, Thomas Stutzle," Ant Colony Optimization", PHI,2005

EAI-332/TOE-48 Web Technology
B.Tech. Semester –VI (Artificial Intelligence & Machine Leanring)

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

Course Outcomes

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

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

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

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

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

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

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

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

Books

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

Reference Books

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

EAI-333 Virtualization and Cloud Computing
B.Tech. Semester –VI (Artificial Intelligence & Machine Leanring)

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 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

Vision, Definition, Reference Model, Characteristics and benefits, Historical Development: Distributed Computing, Service Oriented Computing, Web2.0, Web Services - Grid.

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”, 1 stEdition, McGraw Hill Osborne Media, 2009.

EAI-334 Data Mining and Predictive Modeling
B.Tech. Semester –VI(Artificial Intelligence & Machine Leanring)

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

Course Outcome

Students who successfully complete this course should be able to

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

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

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

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

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

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

BOOKS:

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”,Second Edition, Elsevier, Reprinted 2011.
2. K.P. Soman, 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-335 Human Computer Interaction

B.Tech. Semester –VI (Artificial Intelligence & Machine Leanring)

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

Course Outcome

Upon completion of the course, Students will be able to

- 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 Word 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 Fincay, GreGoryd, Abowd, Russell Bealg, Human – Computer Interaction., Pearson Education
2. Rogers, Sharps. Wiley Dreamtech , Interaction Design Prece
3. Soren Lauesen,User Interface Design, Pearson Education.

PAI-361 Machine Learning Lab
B.Tech. Semester – VI (Artificial Intelligence & Machine Leanring)

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 learningalgorithms.
- 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 algorithmto output a description of the set of all hypothesisconsistent with the trainingexamples.
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 toclassify a newsample.
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 Computer Networks Lab
B.Tech. Semester –VI (Artificial Intelligence & Machine Leanring)

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

COURSE OUTCOMES

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

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

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

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

PAI-363 Mini Project
B.Tech. Semester –VI (Artificial Intelligence & Machine Leanring)

L	T	P		
-	-	4	**Class Work**	**:50 Marks**
			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-371 Deep Learning

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

L	T	P
3	1	-

Class Work :80 Marks
Exam. :120 Marks
Total :200 Marks
Duration of Exam : 3 Hrs.

Course Outcomes:

- Introduce major deep learning algorithms, the problem settings, and theirapplications to solve real world problems.
- Become familiar with neural networks
- This topics course aims to present the mathematical, statistical and computationalchallenges 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 LearningBackpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks-Convolutional Networks- Generative Adversarial Networks (GAN), Semisupervised Learning.

Unit 3

DIMENTIONALITY 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:

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

EAI-441 Cryptography & Network Security
B.Tech. Semester – VII (Artificial Intelligence & Machine Leanring)

L	T	P
3	-	-

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

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

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

Unit 1

Introduction of Cryptography: Introduction To security: Attacks, Services and Mechanisms, ConventionalEncryption: Classical Techniques, Conventional Encryption Model, and steganography, Classical EncryptionTechniques. 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 andTraffic confidentiality

Unit 3

Public Key Encryption: Public-Key Cryptography: Principles of Public-Key Cryptosystems, RSA

Algorithm, Key Management, Fermat's and Euler's Theorm, Primality Testing, Chinese Remainder Theorem.

Unit 4

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

Unit 5

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

Books

- William Stallings, "Cryptography and Network Security: Principles and Practice"' Prentice hall, NewJersey
- Johannes A. Buchmann, "Introduction to Cryptography" Springer-Verlag
- AtulKahate, "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 Leanring)

L T P
3 - -

Class Work :60 Marks
Exam. :90 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)(Understand)
- Recognize various devices, sensors and applications (Knowledge)
- Apply design concept to IoT solutions (Apply)
- Analyze various M2M and IoT architectures (Analyze)
- Evaluate design issues in IoT applications (Evaluate)
- Create IoT solutions using sensors, actuators and Devices (Create)

Unit 1

Introduction to IoT: Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models & APIs.

Unit 2

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics. Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT.

Unit 3

M2M vs IoT An Architectural Overview–Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. Reference Architecture and Reference Model of IoT.

Unit 4

IoT Reference Architecture- Getting Familiar with IoT Architecture, Various architectural views of IoT such as Functional, Information, Operational and Deployment. Constraints affecting design in IoT world- Introduction, Technical design Constraints.

Unit 5

Domain specific applications of IoT: Home automation, Industry applications, Surveillance applications, Other IoT application.

Books

- ArshdeepBahga, Vijay Madisetti, ―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 Leanring)

L	T	P
3	-	-

Class Work :60 Marks
Exam. :90 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:

Introduction: Retrieval strategies: vector space model, Probabilistic retrieval strategies:Simple term weights, Non binary independence model, Language models.

UNIT – II:

Retrieval Utilities: Relevance feedback, clustering, N-grams, Regression analysis, Thesauri.

UNIT – III:

Retrieval utilities: Semantic networks, parsing Cross–Language: Information Retrieval: Introduction, Crossing the Language barrier.

UNIT – IV:

Efficiency: Inverted Index, Query processing, Signature files, Duplicate document detection.

UNIT – V:

Integrating structured data and text. A historical progression, Information retrieval asrelational application, Semi Structured search using a relational schema.Distributed Information Retrieval: A theoretical Model of Distributed retrieval, web search.

Text books:

- David A. Grossman, OphirFrieder, Information Retrieval – Algorithms and Heuristics,Springer, 2nd Edition(Distributed by Universal Press), 2004

Reference books:

- Gerald J Kowalski, Mark T Maybury Information Storage and Retrieval Systems: Theoryand Implementation, Springer, 2004.
- SoumenChakrabarti, Mining the Web : Discovering Knowledge from Hypertext Data,Morgan – Kaufmann Publishers, 2002.
- Christopher D Manning, PrabhakarRaghavan, HinrichSchutze, An Introduction toInformation Retrieval By Cambridge University Press, England, 2009.

EAI-444 Multi-Agent Intelligent Systems

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

L	T	P
3	-	-

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

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

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

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

Unit 2 Intelligent Agents: the design of intelligent agents - reasoning agents (egAgentO), agents as reactivesystems (egsubsumption architecture); hybrid agents (eg PRS)

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

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

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

Books

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

EAI-445 Quantum Computing

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

L T P
3 - -

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

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

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

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

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

Unit 3Building Blocks for Quantum Program : Architecture of a Quantum Computing platform, Details of q-bitsystem of information representation: Block Sphere ,Multi-qubits States ,Quantum superposition of qubits (valid andinvalid superposition).,Quantum Entanglement ,Useful states from quantum algorithmic perceptive e.g. Bell StateOperation 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 ProgramSteps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits andqubits.

Unit 4Quantum 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 5Toolkits :OSS Toolkits for implementing Quantum program , IBM quantum experience, Microsoft Q,RigettiPyQuil (QPU/QVM)

SUGGESTED BOOKS

- Michael A. Nielsen, ―Quantum Computation and Quantum Information‖, Cambridge UniversityPress.
- David McMahon, ―Quantum Computing Explained‖, Wiley IBM Experience:

EAI-451 Soft Computing

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

L	T	P
3	-	-

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

Course Outcomes:

Upon completion ofthis course, the students will be able to

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

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

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

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

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

Unit 5 Knowledge discovery in databases: Data mining and web mining using soft computing techniques. Softcomputing 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. VijayalakshmiPai, 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-452 Augemented Virtual Reality

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

L	T	P
3	-	-

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

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

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

Unit 1 Introduction to Virtual Reality: Virtual Reality and Virtual Environment: Introduction, Computergraphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtualreality, Historical development of VR, Scientific Landmark, 3D Computer Graphics: Introduction, The Virtualworld space, positioning the virtual observer, the perspective projection, human vision, stereo perspectiveprojection, 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 boundaryrepresentation Geometrical Transformations: Introduction, Frames of reference, Modelling transformations,Instances, Picking, Flying, Scaling the VE, Collision detection Generic VR system: Introduction, Virtualenvironment, Computer environment, VR technology, Model of interaction, VR Systems.

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

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

Unit 5VR Applications: Introduction, Engineering, Entertainment, Science, Training. The Future: Virtualenvironment, 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 Science

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

L	T	P		
3	-	-	**Class Work**	**:60 Marks**
			Exam.	**:90 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

- Tilman M.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 Grolemund," 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

EAI-454 Artificial Intelligence for Health and Medicine

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

L	T	P
3	-	-

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

Course Learning Outcomes:

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

- Understand models of human and artificial intelligence, specifically computational models of intelligence.
- Comprehend a collection of machine learning models (identified and covered in the course), and their applications in medicine and healthcare.
- Identify and apply appropriate intelligent system models and computational tools to specific problems in biomedicine and healthcare.
- Analyze the performance of specific models as applied to biomedical problems, and justify their use and limitations.
- Identify, understand, and interpret methods and evidence from artificial intelligence and other relevant literature.
- Effectively communicate and disseminate knowledge in any science or engineering domain in the context of computing, systems, and/or biomedical applications.

Unit -1

Introduction to Human and Artificial Intelligence: terminologies, computational models of intelligence; conceptual frameworks from cognitive and educational psychology, neuroscience, information theory, and linguistics; philosophical foundations of AI, Review of relevant mathematical and statistical concepts: logarithmic loss, cross entropy optimizing cost functions; linear and logistic regression.

Unit-2

Forms of Learning: supervised, semi-supervised, unsupervised, active, and transfer learning. Supervised Learning: (a) Decision trees, non-parametric methods for learning, support vector machines, (b) Bio-inspired Learning (from perceptron to deep learning): neural basis of computing, classical neural networks, deep neural networks, deep belief networks, recurrent neural networks, and convolutional neural networks.

Unit -3

Unsupervised Learning: basic and advanced clustering techniques, dimensionality reduction (feature selection and feature extraction). Knowledge Representation and Reasoning: Prepositional logic, first-order logic, ontological engineering, probabilistic reasoning.

Unit -4

Time-series analysis: temporal models (probabilistic reasoning over time), Emerging paradigms and concepts in artificial social and emotional intelligence.

Unit-5

Applications: Unique characteristics and challenges in medicine and healthcare; History and status quo of intelligent and expert systems in medicine. Risk stratification, patient outcome prediction, disease progression modelling, Clinical decision-making and intelligent systems to support evidence-based medicine, Phenotype and clinical/bio-marker discovery, Relevance to personalized medicine, Analysis of tissue morphology and other medical imaging applications.

Course Reference Materials:

• Stuart Russell and Peter Norvig. 2009. Artificial Intelligence: A Modern Approach (3rd ed.). Prentice Hall Press, Upper Saddle River, NJ, USA.

• Toby Segaran. 2007. Programming Collective Intelligence (First ed.). O'Reilly.

• Tony J. Cleophas and Aeilko H. Zwinderman. 2015. Machine Learning in Medicine - a Complete Overview. Springer.

• SunilaGollapudi, S. 2016. Practical Machine Learning. Packt Publishing Ltd.

• Peter Harrington. 2012. Machine Learning in Action. Manning Publications Co., Greenwich, CT, USA.

• Selected seminal and contemporary readings from peer-reviewed literature such as Proceedings of Machine Learning in Healthcare, Artificial Intelligence in Medicine, IEEE Transactions on Biomedical and Health Informatics, and other relevant venues.

EAI-455 Pattern Recognition

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

L	T	P
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Class Work :60 Marks
Exam. :90 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 ofevents, conditional and joint probability, Bayes' theorem; Random Processes: Stationary andnonstationary processes, Expectation, Autocorrelation, Cross-Correlation, spectra; LinearAlgebra: 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 forclustering: K-Means, Hierarchical and other methods; Cluster validation; Gaussian mixturemodels;Expectation-Maximization method for parameter estimation; Maximum entropyestimation.

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

PAI-471 Deep Learning Lab

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

L	T	P
-	-	2

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

Course Objectives:

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

List of Experiments

- Installation of python and python distribution packages.
- Building a basic data classification model with a hidden layer using ANN.
- Building a deep neural network.
- Demonstrate the concept of regularization and dropout in a deep neural network.
- Building a deep neural network with different optimization algorithms.
- Building a deep neural network with different activation and cost functions.
- Develop a convolutional neural network model.
- Build a model for image classification using CNN.
- Build a model to explain transfer learning.
- Develop a model for RNN.

PAI-472 Project-I

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

L	T	P		
-	-	8	**Class Work**	**:100 Marks**
			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-Iis to enable the student to take up investigative study in the broad field of Computer Science & Engineering, either fully theoretical/practical or involving both theoretical and practical work which is to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work.

Key Points:

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

PAI-473 Industrial Training
B.Tech. Semester –VII (Artificial Intelligence & Machine Leanring)

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

Course Objectives

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

- Exposure to actual working environment in the industry and enhance their knowledge
- Make use of the skills that they have learnt in the institute
- Learn the good qualities of integrity, self-confidence and self-confidence
- Follow all good qualities and ethical working practices

Learn about the safety practices and regulations inside the industry and develop the spirit of teamwork and good relationship between students and employees

EAI-461/TOE-49 ADHOC and Sensor Networks
B.Tech. Semester –VIII (Artificial Intelligence & Machine Leanring)

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

Course Outcomes

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

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

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

Unit 2- ADHOC NETWORK ROUTING PROTOCOLS: Introduction -to designing a Routing Protocol, Classifications of Routing Protocols, Destination Sequenced Distance Vector (DSDV), Dynamic Source Routing (DSR), Cluster Switch Gateway Routing (CSGR),Zone Routing Protocol (ZRP), Wireless Routing Protocol (WRP), Source—Initiated On—Demand Approaches, Ad hoc On-Demand Distance Vector Routing , AODV, Introduction to Multicast Routing Protocol, Classifications of Multicast Routing Protocols.

Unit 3- QoS AND ENERGY MANAGEMEN: Issues and challenges in providing QoS in Adhoc Wiress Networks, Introduction to QoS in Ad hoc Wireless Networks, Classifications of QoS Solutions, Classification of Energy Management Schemes, Transmission Power Management Schemes, System Power Management Schemes. . :

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

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

Text Books

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

EAI-462 Computer Vision
B.Tech. Semester –VIII (Computer Science & Engg.)

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

Course Outcome:

- To understand the both the theoretical and practical aspects of computing with image
- To understand and described the foundation of image formation, measurement, and analysis
- To implemented common methods for robust image matching and alignment;
- Understand the geometric relationships between 2D images and the 3D world.
- To understand exposure to object and scene recognition and categorization from imagesand Able to develop the practical skills necessary to build computer vision applications.

Unit I: Digital Image Formation and low-level processing: Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.
Unit II: Feature Extraction Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.
Unit III: Shape Representation, Segmentation: Shape Representation and Segmentation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and Wavelet Descriptors, Medial Representations ,

Unit IV Object Recognition :Multiresolution analysis, Hough transforms and other simple object recognition Methods, Shape Correspondence and Shape Matching, Shape priors for recognition.

UNIT V Motion Estimation: Regularization Theory, Optical Computation, Stereo Vision, Motion Estimation, Structure from Motion.

Reference Books:

- Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
- Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003.
- Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
- K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.
- R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992

EAI-463 Blockchain
B.Tech. Semester –VII (Artificial Intelligence & Machine Leanring)

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

COURSE OUTCOMES

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

- Understand 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 Data Analytics

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

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

Course Outcomes

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

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

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

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

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

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

Unit 5- FRAMEWORKS AND VISUALIZATION: MapReduce – Hadoop, Hive,MapR – Sharding – NoSQL Databases – S3 – Hadoop Distributed File Systems – Visualizations – Visual Data Analysis Techniques, Interaction Techniques; Systems And Applications, Spark for Batch processing, Spark SQL, data flow processing libraries (Beam, Spark Streaming, Flink).

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.
3. Bill Franks, Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analystics, John Wiley & Sons, 2012.
4. Glenn J. Myatt, Making Sense Of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O"Reilly, 2011.

EAI-465 Robotics and its applications
B.Tech. Semester –VIII (Artificial Intelligence & Machine Leanring)

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

Course Outcomes

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

- Explain the basic concepts of working of robot
- Analyze the function of sensor in robot and design the robotic arm with varioustools
- 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 Data Science Lab

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

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

OBJECTIVES: The course should enable the students to:

- Understand the R Programming Language.
- Exposure on Solving of data science problems.
- Understand The classification and Regression Model.
- to implement the real problem in data science
- to desgin and implementation of regression model

LIST OF EXPERIMENTS

WEEK-1 **R AS CALCULATOR APPLICATION** a. Using with and without R objects on console b. Using mathematical functions on console c. Write an R script, to create R objects for calculator application and save in a specified location in disk

WEEK-2 **DESCRIPTIVE STATISTICS IN R** a. Write an R script to find basic descriptive statistics using summary b. Write an R script to find subset of dataset by using subset ()

WEEK-3 **READING AND WRITING DIFFERENT TYPES OF DATASETS a**. Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location. b. Reading Excel data sheet in R. c. Reading XML dataset in R.

WEEK-4 **VISUALIZATIONS** a. Find the data distributions using box and scatter plot. b. Find the outliers using plot. c. Plot the histogram, bar chart and pie chart on sample data

WEEK-5 **CORRELATION AND COVARIANCE** a. Find the correlation matrix. b. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data. c. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data

WEEK-6 **REGRESSION MODEL** Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. require (foreign), require(MASS).

WEEK-7 MULTIPLE REGRESSION MODEL Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset.

WEEK-8 REGRESSION MODEL FOR PREDICTION Apply regression Model techniques to predict the data on above dataset

WEEK-9 CLASSIFICATION MODEL a. Install relevant package for classification. b. Choose classifier for classification problem. c. Evaluate the performance of classifier.

WEEK-10 CLUSTERING MODEL a. Clustering algorithms for unsupervised classification. b. Plot the cluster data using R visualizations.

Reference Books:

- Yanchang Zhao, “R and Data Mining: Examples and Case Studies”, Elsevier, 1st Edition, 2012 Web

References: 1.http://www.r-bloggers.com/how-to-perform-a-logistic-regression-in-r/

- 2.http://www.ats.ucla.edu/stat/r/dae/rreg.htm
- 3.http://www.coastal.edu/kingw/statistics/R-tutorials/logistic.html 4. http://www.ats.ucla.edu/stat/r/data/binary.csv

SOFTWARE AND HARDWARE REQUIREMENTS FOR 18 STUDENTS: SOFTWARE: R Software , R Studio Software HARDWARE: 18 numbers of Intel Desktop Computers with 4 GB RAM

PAI-482 Project-II

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

L	T	P		
-	-	16	**Class Work**	**:200 Marks**
			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 theassigned 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 Leanring)

L	T	P		
-	-	2	**Class Work**	**:50 Marks**
			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 hlslher theme and prepare a short Seminar for 4 to 5 Pages. During the seminar session each student is - expected to prepare and present a topic, for duration of about 15 to 20 minutes. It should be followed by a Viva Voce during which others should come forward to question, clarify, supplement or evaluate. The student is evaluated based on the presentation skill, concept and Query clarification. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report. A Faculty is to be allotted and he / she will guide and monitor the progress of the student and maintain the attendance also. The seminar will be assessed by a committee appointed by the department.

Some of the themes like:

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