III Year - I Semester

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	PC	UGAI5T0922	Theory of Computation	3	-	-	3	30	70	100
2	PC	UGAI5T0222	Machine Learning	3	-	-	3	30	70	100
3	PC	UGAI5T1022	Design and Analysis of Algorithms	3	-	-	3	30	70	100
4	OE/JOE	UGBS5T0122	Employability Skills	2	-	2	3	30	70	100
5	PE	UGIT5T0322 UGAI5T0322 UGAI5T0422 UGIT5T0622	**Professional Elective-I:** a) Advanced Operating Systems b) Multi Agent Systems c) Image Processing d) Software Project Management	3	-	-	3	30	70	100
6	PC LAB	UGAI5P0522	Machine Learning Lab	-	-	3	1.5	15	35	50
7	PC LAB	UGAI5P1122	Competitive Programming Lab	-	-	3	1.5	15	35	50
8	SOC	UGAI5K0722	Bigdata Analytics	1	-	2	2	50	-	50
9	MC	UGMB5A0122	IPR & Patents	2	-	-	-	-	-	-
10	Internship	UGAI5I0822	Summer Internship(after second year)	-	-	-	1.5	50	-	50
			Total	**17**	**0**	**10**	**21.5**	**280**	**420**	**700**
Honors/Minor Course (4 Credits)										

III Year - II Semester

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	PC	UGCS6T0122	Compiler Design	3	-	-	3	30	70	100
2	PC	UGCS6T0222	Cryptography and Network Security	3	-	-	3	30	70	100
3	PC	UGAI6T0122	Deep Learning	3	-	-	3	30	70	100
4	PE	UGAI6T1122 UGAI6T0322 UGAI6T0422 UGIT6T0422	**Professional Elective-II:** a) Information Retrieval Systems b) Recommender Systems c) Computer Vision d) Design Patterns	3	-	-	3	30	70	100
5	OE/JOE	UGAI6T0522 UGAI6T0622 UGAI6T0722	Open Electives offered by other Departments / Job Oriented Elective-II a) Full Stack Development b) Devops c) Natural Language Processing	2	-	2	3	30	70	100
6	PC LAB	UGAI6P0822	Cryptography & Network Security Lab	-	-	3	1.5	15	35	50
7	PC LAB	UGAI6P0922	Deep Learning Lab	-	-	3	1.5	15	35	50
8	PC LAB	UGAI6P1022	Data Visualization Lab	-	-	3	1.5	15	35	50
9	SOC	UGBS6K0122	Advanced Communication Skills	1	-	2	2	50	-	50
10	MC	UGBS6A0222	Essence of Indian Traditional Knowledge	2	-	-	-	-	-	-
			Total	**17**	**0**	**13**	**21.5**	**245**	**455**	**700**
Internship 2 Months (Mandatory) during Summer Vacation										
Honors/Minor Course (4 Credits)										

Syllabus
III B.Tech I SEM

THEORY OF COMPUTATION
(CSE(AI&ML))

Subject Code: UGAI5T0922		**L**	**T**	**P**	**C**
III Year / I Semester		**3**	**0**	**0**	**3**

PRE-REQUISITES:

- Familiarity with Discrete Mathematics.

COURSE OBJECTIVE:

- This course serves as an introduction to the basic theory of Computer Science & formal methods of computation which will develop an ability to design grammars and automata (recognizers) for different language classes.

SYLLABUS:

UNIT I: **(10 hrs)**

Fundamentals: Strings, Alphabet, Language, Operations, Chomsky Hierarchy of Languages, Finite State Machine, Definitions, Finite Automaton Model, Acceptance of Strings and Languages, Deterministic Finite Automaton and Non Deterministic Finite Automaton, Transition Diagrams and Language Recognizers.
Finite Automata: NFA with ε Transitions - Significance, Acceptance of Languages. **Conversions and Equivalence**: Equivalence between NFA with and without ε Transitions, NFA to DFA Conversion, Minimization of FSM, Equivalence Between Two FSM 's, Finite Automata with Output- Moore and Melay Machines.

UNIT II: **(08 hrs)**

Regular Languages: Regular Sets, Regular Expressions, Identity Rules, Constructing Finite Automata for a given Regular Expressions, Conversion of Finite Automata to Regular Expressions. Pumping Lemma of Regular Sets, Closure Properties of Regular Sets (Proofs Not Required).

UNIT III: **(10 hrs)**

Grammar Formalism: Regular Grammars -Right Linear and Left Linear Grammars, Equivalence between Regular Linear Grammar and FA, Inter-Conversion.
Context Free Grammars: Context Free Grammar, Derivation Trees, Sentential Forms, Right Most and Leftmost Derivation of Strings. Ambiguity in Context Free Grammars. Minimization of Context Free Grammars. Chomsky Normal Form, Greiback Normal Form, Pumping Lemma for Context Free Languages. Enumeration of Properties of CFL (Proofs Omitted).

UNIT IV: **(08 hrs)**

Push Down Automata: Push Down Automata, Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty State and Its Equivalence. Equivalence of CFL and PDA, InterConversion. (Proofs Not Required). Introduction to DCFL and DPDA.

UNIT V:	**(08 hrs)**
Turing Machine: Turing Machine, Definition, Model, Design of TM, Computable Functions, Recursively Enumerable Languages, Church's Hypothesis, Counter Machine, Types of Turing Machines (Proofs Not Required), Linear Bounded Automata and Context Sensitive Languages.	

COURSE OUTCOMES:

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

CO1:	Summarize the fundamental concepts of automata and hierarchy of formal languages[L3].
CO2:	Develop variants of finite automata and convert one form of automata to other form of automata[L4].
CO3:	Construct grammars and automata for different language classes[L4].
CO4:	Develop abstract machines that demonstrate the properties of physical machines and able to specify the possible inputs, processes and outputs of their machines.[L4]

MAPPING OF COs TO POs:

POs/ COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	-	-	-	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1.	Hopcroft H.E, Ullman J. D, Introduction to Automata Theory Languages and Computation. Pearson Education.
2.	Nasir S.F.B, P.K. Srimani, A text book on Automata Theory, Cambridge University Press.
3.	Sipser, Introduction to Theory of Computation, Second Edition.

REFERENCE BOOKS:

1.	Daniel I.A. Cohen, Introduction to Computer Theory, John Wiley.
2.	John C Martin, Introduction to languages and the Theory of Computation, TMH
3.	Lewis H.P. & Papadimition C.H, Elements of Theory of Computation, Pearson/PHI.
4.	Mishra and Chandrashekaran Theory of Computer Science – Automata Languages and Computation, 2nd Edition, PHI.

MACHINE LEARNING

Subject Code: UGAI5T0222		L	T	P	C
III Year / I Semester		3	0	0	3

PRE-REQUISITES:

- Basic programming skills (in Python), algorithm design and basics of probability & statistics, Data Science using Python.

COURSE OBJECTIVE:

To impart knowledge on

- To discuss different learning techniques.
- To understand various machine learning procedures.
- To learn various algorithms.

SYLLABUS:

UNIT I: **(08 hrs)**

Introduction : Overview of machine Learning, Related Areas and applications, Foundations of Learning: Components of learning, learning vs design, Types of learning Models: supervised, unsupervised, reinforcement, Training vs Testing, **Theory of generalization:** generalization bound, overfitting, underfitting, approximation-generalization tradeoff, bias and variance, learning curve

UNIT II: **(08 hrs)**

Supervised Learning-I:

Introduction to Regression: Regression Vs Classification, Linear regression, single and multivariate regression; Metrics for assessing regression (Mean Squared Error, Root Mean Squared Error, Mean Absolute Error), Logistic Regression, K-Nearest Neighbors, Naïve Bayes Classifiers.

Classification Performance Measures: Confusion Matrix, Accuracy Metrics, Receiver Operator Characteristic (ROC) Curve, Case study on various classification applications

UNIT III: **(08 hrs)**

Supervised Learning-II:

Decision Trees: Introduction to Decision Trees, Algorithms for Decision Tree Construction(ID3, C4.5, CART), Truncation and Pruning

Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification, SVM Regression.

UNIT IV: **(10 hrs)**

Unsupervised Learning:

Introduction to clustering, K-means clustering, Clustering around medoids, Silhouettes, Hierarchical Clustering, K-d Trees, Case study on various clustering applications

Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

UNIT V:	(06 hrs)
Ensemble Methods: Introduction to Ensemble methods, Bagging, Committee Machines and Stacking, Boosting - Gradient Boosting, Adaptive Boosting, Random Forests-Multi-class Classification, Case studies	

COURSE OUTCOMES:

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

CO1:	Recognize the characteristics of machine learning that make it useful to real-world problems.
CO2:	Characterize machine learning algorithms as supervised, semi supervised, and unsupervised.
CO3:	Design and implement machine learning solutions to classification, regression, and clustering problems.
CO4:	Analyze and interpret the result of various Machine Learning techniques and algorithms on real world problems.

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	3
CO3	3	-	3	-	-	-	-	-	-	-	-	-	-	3
CO4	-	3	-	3	-	-	-	-	-	-	-	-	-	3

TEXT BOOKS:

1.	Stephen Marsland, "Machine Learning - An Algorithmic Perspective" 2nd Edition, CRC Press, 2015
2.	EthemAlpaydin, "Introduction to Machine Learning", 3rd Edition, MIT Press, 2014.

REFERENCE BOOKS:

1.	Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, "Learning from Data", AMLBook Publishers, 2012.
2.	P. Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press, 2012

DESIGN AND ANALYSIS OF ALGORITHMS
(CSE(AI&ML))

Subject Code: UGAIT1022		**L**	**T**	**P**	**C**
III Year / I Semester		**3**	**0**	**0**	**3**

PRE-REQUISITES:	
➢ Familiarity with Problem Solving, Discrete Mathematics and Data Structures.	
COURSE OBJECTIVE:	
➢ Students will be able to analyze the asymptotic performance of algorithms, develop algorithms and apply algorithmic design techniques for solving real world problems.	
SYLLABUS:	
UNIT I:	**(08 hrs)**
Introduction: Algorithm, Performance Analysis - Space Complexity, Time Complexity, Asymptotic Notation - Big Oh Notation, Omega Notation, Theta Notation and Little Oh Notation, probabilistic analysis, Amortized analysis.	
UNIT II:	**(08 hrs)**
Disjoint Sets: Disjoint Sets, Disjoint Set Operations - Union and Find Algorithms. **Divide and Conquer:** General method, Masters Theorem, Applications - Binary Search, Quick sort, Merge Sort, Multiplication of large integers.	
UNIT III:	**(12 hrs)**
Greedy Method: General Method, Applications - Job Sequencing with Deadlines, Knapsack Problem, Minimum Cost Spanning Trees - Prim's algorithm, krushkal's algorithm, Single Source Shortest Path Problem, Huffman coding. **Dynamic Programming:** General Method, Applications - 0/1 Knapsack Problem, Optimal binary search tree, Travelling Sales Person Problem, Longest common subsequence, Subset sum problem.	
UNIT IV:	**(08 hrs)**
Backtracking: General Method, Applications - N-Queen Problem, Sum of Subsets Problem, Graph Coloring, Hamiltonian Cycles. **Branch and Bound:** General Method, Applications - 0/1 Knapsack Problem using LC Branch and Bound Solution, FIFO Branch and Bound Solution.	
UNIT V:	**(08 hrs)**
NP-Hard and NP-Complete Problems: Basic Concepts, Non Deterministic Algorithms, NP Hard and NP Complete Classes.	

COURSE OUTCOMES:

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

CO1:	Analyze the time complexities of various algorithms using asymptotic notations.
CO2:	Design efficient algorithms using suitable design techniques.
CO3:	Investigate and solve the problems using appropriate design methods and find time efficiencies.
CO4:	Apply the knowledge of complexity classes P, NP, NP-complete and prove certain problems are NP-complete

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1.	Ellis Horowitz, Satraj Sahni and Rajasekharan, Fundamentals of Computer Algorithms, Galgotia publications Pvt. Ltd.
2.	T.H.Cormen, C.E.Leiserson, R.L.Rivest,and C.Stein, Introduction to Algorithms, 2nd edition, Pearson Education.

REFERENCE BOOKS:

1.	M.T.Goodrich, R.Tomassia, Algorithm Design: Foundations, Analysis and Internet examples, John wiley and sons.
2.	R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Introduction to Design and Analysis of Algorithms A strategic approach, Mc Graw Hill.
3.	Allen Weiss, Data structures and Algorithm Analysis in C++, Second edition, Pearson education.
4.	Aho, Ullman and Hopcroft, Design and Analysis of algorithms, Pearson education.
5.	Richard Johnson Baugh and Marcus Schaefer,Algorithms –Pearson Education.
6.	S Sridhar, Design and Analysis of Algorithms, Oxford.

EMPLOYABILITY SKILLS
(English, Aptitude and Logical Reasoning
(Common to all branches)

Subject Code: UGBS5T0120		**L**	**T**	**P**	**C**
III Year / I Semester		**2**	**0**	**2**	**3**

PREREQUISITE : Basic competency in understanding passages and the use of grammar & words correctly	
COURSE OBJECTIVE:	
➢ To expose students to further strengthen their essential grammar for placements ➢ To prepare students to acquire skills in aptitude for careers prospects ➢ To prepare students to develop logical reasoning for employment.	
SYLLABUS:	
UNIT I:	**(09 hrs)**
High frequency words: Selected 101 words with their ***basic*** meaning, commonly used synonyms and 101 words usage in sentences	
UNIT II:	**(06 hrs)**
Reading Comprehension passages: Tactics in understanding the given Comprehension passages & Practice tests	
UNIT III:	**(09 hrs)**
Interpersonal Skills: Verbal & Non-verbal Communication & Team Work **Percentages -**Percentage-Conversion of fraction to percentage and Percentage to Fraction-percentage excess & shortness, Effect of percentage change on a Number-Effect of two step change-Effect of percentage change on product.	
UNIT IV:	**(09 hrs)**
Time & Work: Rate of work -Work as a single unit -No. of persons working together – No. of man days. **Time & Distance:** Speed - Average Speed - problems on trains – Relative speed - Boats and streams	
UNIT V:	**(09 hrs)**
Coding, Decoding, Letter and Number Series: Letter Coding, Direct Letter coding, Number / Symbol coding, Substitution Coding, Deciphering message word coding and its types, Number series, Letter Series. **Data Analysis and Interpretation:** Tabulation- Pie Charts – Bar Diagrams – Line Graphs.	

COURSE OUTCOMES:

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

CO1:	Make effective use of words in receptive as well as productive communication (L3)
CO2:	Examine the Reading comprehension passages to understand and later, answer thequestions correctly (L2)
CO3:	Develop team work and interpersonal skills with groups as well as the skill of calculating percentages (L3)
CO4:	Apply the knowledge of math in distance, time related concepts (L3)
CO5:	Develop proficiency in numerical reasoning. (L3)

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	3	-	-

TEXT BOOKS:

1.	Objective English – Hari Mohan Prasad & Uma Rani
2.	Professional Communication – Globarena – IEG publications
3.	A Modern Approach to Verbal and Non-verbal Reasoning by Dr.R.S.Aggarwal
4.	Quantitative aptitude and Reasoning by R V Praveen (3rd edition)

REFERENCE BOOKS:

1.	High frequency 101 word list: https://crunchprep.com/gre/101-high-frequency- gre-words
2.	Quantitative Aptitude by Abhijit Guha – TMH Publishers

ADVANCED OPERATING SYSTEMS
(Professional Elective-I)

Subject Code: UGIT5T0322		**L**	**T**	**P**	**C**
III Year / I Semester		**3**	**0**	**0**	**3**

PRE-REQUISITES:	
➢ Operating system design and construction techniques. Concurrent programming, operating system kernels, correctness, deadlock, protection, transaction processing, design methodologies, comparative structure of different kinds of operating systems, and other topics.	
COURSE OBJECTIVE:	
➢ The aim of this module is to study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems); Hardware and software features that support these systems.	
SYLLABUS:	
UNIT I:	**(07 hrs)**
Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives. **Theoretical Foundations:** Inherent Limitations of a Distributed System, Lamport's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.	
UNIT II:	**(08 hrs)**
Distributed Mutual Exclusion: The Classification of Mutual Exclusion Algorithms. **Non-Token – Based Algorithms:** Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm. **Token-Based Algorithms:** Suzuki-Kasami's Broadcast Algorithm, Singhal'sHeurisric Algorithm, Raymond's Heuristic Algorithm.	
UNIT III:	**(07 hrs)**
Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms	
UNIT IV:	**(08 hrs)**
Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, BasicMultiprocessor System Architectures	

Multi-Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling	
UNIT V:	**(07 hrs)**
Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues **Distributed Scheduling:** Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration **Distributed Shared Memory:** Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues	

COURSE OUTCOMES:

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

CO1:	Understand the design approaches of advanced operating systems
CO2:	Analyze the design issues of distributed operating systems.
CO3:	Evaluate design issues of multi-processor operating systems.
CO4:	Identify the requirements Distributed File System and Distributed Shared Memory.
CO5:	Formulate the solutions to schedule the real time applications

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1.	Advanced Concepts in Operating Systems, MukeshSinghal, Niranjan G. Shivaratri, Tata McGraw-Hill Edition 2001

REFERENCE BOOKS:

1.	Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition – 2, 2007

ONLINE COURSES:

1. Advanced Operating System by Georgia Tech-Offered by UDACITY

MULTI AGENT SYSTEMS
(PROFESSIONAL ELECTIVE-I)

Subject Code: UGAI5T0322		**L**	**T**	**P**	**C**
III Year / I Semester		**3**	**0**	**0**	**3**

PRE-REQUISITES:

- The student should be comfortable with mathematical notation, basic computer algorithms and basics of AI.

COURSE OBJECTIVE:

- To introduce the student to the concept of an agent and multi-agent systems, and the main applications for which they are appropriate and the main issues surrounding the design of intelligent agents and multi-agent society

SYLLABUS:

UNIT I: **(07 hrs)**

Intelligent Agents: Introduction, Examples of Agents, Intelligent Agents, Agents and Objects, Agents and Expert Systems, Abstract Architectures for Intelligent Agents: Purely Reactive Agents, Perception, Agents with State. Concrete Architectures for Intelligent Agents: Logic-based Architectures, Reactive Architectures, Belief-Desire-Intention Architectures, Layered Architectures, Agent Programming Languages

UNIT II: **(07 hrs)**

MULTIAGENT SYSTEMS AND SOCIETIES OF AGENTS: Motivations, Characteristics of Multiagent Environments, Agent Communications, Agent Interaction Protocols: Coordination Protocols, Cooperation Protocols, Contract Net, Blackboard Systems, Negotiation, Multiagent Belief Maintenance, Market Mechanisms, Societies of Agents

UNIT III: **(10 hrs)**

DISTRIBUTED PROBLEM SOLVING AND PLANNING: Task Sharing in the Tower of Hanoi (Toll) Problem, Task Sharing in Heterogeneous Systems. Result Sharing: Functionally Accurate Cooperation, Shared Repositories and Negotiated Search, Distributed Constrained Heuristic Search, Organizational Structuring, Communication Strategies, Task Structures. Distributed Planning, Distributed Plan Representations, Distributed Planning and Execution

SEARCH ALGORITHMS FOR AGENTS: Constraint Satisfaction, Path-Finding Problem, Two-Player Games: Formalization of Two-Player Games, Minimax Procedure, Alpha-Beta Pruning.

UNIT IV:	**(07 hrs)**
DISTRIBUTED RATIONAL DECISION MAKING: Evaluation Criteria, Voting, Auctions, Bargaining, General Equilibrium Market Mechanisms, Contract Nets.	
UNIT V:	**(08 hrs)**
LEARNING IN MULTIAGENT SYSTEMS: A General Characterization, Learning and Activity Coordination: Reinforcement Learning, Isolated, Concurrent Reinforcement Learners, Interactive Reinforcement Learning of Coordination. Learning about and from Other Agents, Learning and Communication.	

COURSE OUTCOMES:

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

CO1:	Understand the notion of an agent, how agents are distinct from other software paradigms and understand the characteristics of applications that lend themselves to an agent-oriented solution;
CO2:	Analyse the key issues associated with Distributed rational decision making and learning in multiagent systems.;
CO3:	Understand the key issues in designing societies of agents that can effectively cooperate in order to solve problems, including an understanding of the key types of multi-agent interactions possible in such systems
CO4:	Compare different search algorithms used in multiagent systems

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	3	3	3	-	-	-	-	-	-	-	-
CO3	3	3	-	3	3	3	-	-	-	-	-	-	-	-
CO4	3	3	-	3	3	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1.	Multiagent Systems: A Modern Approach to Distributed Modern Approach to Artificial Intelligence, Gerhard Weiss, The MIT Press Cambridge, Massachusetts London, England
2.	An Introduction to MultiAgent Systems - Second Edition. Michael Wooldridge (Wiley, 2009)
3.	Programming Multi-agent Systems in AgentSpeak Using Jason. Rafael H. Bordini, Jomi Fred Hubner and Michael Wooldridge (Wiley, 2007)

REFERENCE BOOKS:

1.	Software Agents, Agent Systems and Their Applications, Mohammad Essaaidi, Maria Ganzha, and MarcinPaprzycki, , IOS Press , 2012
2.	An Introduction to Agent-Based Modelling ,Wilensky, U. & Rand, W. (2015). , MIT Press

ONLINE REFERENCES:

1.	https://www.sciencedirect.com, Multi Agent Systems - an overview | ScienceDirect Topics
2.	https://link.springer.com/content/pdf/10.1007/1-4020-8159-6_9.pdf

IMAGE PROCESSING
(Professional Elective-III)

Subject Code: UGCS7T0320		**L**	**T**	**P**	**C**
IV Year / I Semester		**3**	**0**	**0**	**3**

PRE-REQUISITES:

- Basic knowledge in Mathematics and Computer Graphics.

COURSE OBJECTIVE:

- The course objective is to provide introduction to basic concepts and methodologies to digital image processing, and to develop a foundation that can be used as the basis for further study and research in this field..

SYLLABUS:

UNIT I: **(08 hrs)**

INTRODUCTION:

Introduction to Digital Image Processing, Fundamental steps in image processing systems, Image acquisition, Sampling and quantization, Basic relationship between pixels, Mathematical tools used in image processing, Camera model of Image, Need for image transform and spatial frequencies in image processing, 2-D DFT, DCT, DST transforms.

UNIT II: **(08 hrs)**

IMAGE ENHANCEMENT:

Some basic intensity transformation functions, Histogram processing, Fundamentals of spatial filtering –smoothing spatial filters and sharpening spatial filters, combining spatial enhancement methods, Transformation and spatial filtering, Image smoothing using frequency domain filters Selective filtering and implementation.

UNIT III: **(14 hrs)**

IMAGE RESTORATION & RE-CONSTRUCTION:

Image degradation/restoration model, Noise models, Restoration in the presence of noise, linear Position invariant degradation, Estimation of degradation function and inverse filtering, Wiener filtering, Constrain least square filtering.

COLOR IMAGE PROCESSING:

Color fundamentals, Color models, Pseudo color Image Processing, Basics of full color image processing, Color transformations, Smoothing and sharpening. Introduction to Video Processing.

UNIT IV: **(07 hrs)**

IMAGE COMPRESSION AND WATER MARKING:

Lossless Compression: Variable length coding, Dictionary-based coding, LZW compression, Lossy Compression, Image Compression standards, JPEG, JPEG 2000, Digital Water Marking, Frequency Domain Water Marking, Security Attacks.

UNIT V:	**(07 hrs)**
SEGMENTATION & MORPHOLOGICAL PROCESSING: Erosion and Dilation, Opening and closing, Hit or miss transformation, some basic Morphological algorithms, Gray-Scale Morphology, Point, line and edge detection, Thresholding, Region oriented segmentation, Segmentation using morphological watersheds, Use of motion in segmentation.	

COURSE OUTCOMES:

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

CO1:	Understand the fundamentals steps in image processing.
CO2:	Analyze different filters and transformations for the enhancement of an image.
CO3:	Apply image processing techniques for restoration, reconstruction and compression of images.
CO4:	Compare various color models to perform color image processing.
CO5:	Understands the concepts of segmentation and distinguish basic morphological algorithms.

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	2	-	-	-	-	-	-	-	-	-
CO3	3	-	2	2	2	-	-	-	2	2	-	2	2	3
CO4	2	2	-	-	3	-	-	-	2	2	-	2	2	3
CO5	2	2	2	-	2	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1.	Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing, 2011, Pearson Education
2.	Anil K jain, Fundementals of Digital Image Processing, 2012, Prentice Hall of India.

REFERENCE BOOKS:

1.	S.Jayaraman,S,Esakkirajan,T.Veerakumar, Digital Image Processing, 2009, McGraw Hill Publisher
2.	B.Canda and D DuttaMjumder, Digital Image Processing and analysis, 2011/12, Prentice Hall of india

SOFTWARE PROJECT MANAGEMENT
(Professional Elective - 1)

Subject Code: UGIT5T0622		**L**	**T**	**P**	**C**
III Year / I Semester		**3**	**0**	**0**	**3**

PRE-REQUISITES:	
➢ Familiarity in Software Engineering, Programming Language, Data Base Management Systems, UML.	
COURSE OBJECTIVE:	
➢ At the end of the course the learner will be able to understand the roles of a manager. ➢ It gives practical management issues in various domains like quality, people, and risk management. ➢ Gives knowledge about project management aspects.	
SYLLABUS:	
UNIT I:	**(08 hrs)**
Introduction to Software Project Management: Project Stakeholders, Project Management Knowledge Areas, Project Management Tools and Techniques, Program and Project Portfolio Management, the Role of the Project Manager, Project Phases and the Project Life Cycle. [T1]	
UNIT II:	**(08 hrs)**
Software Project Time And Cost Management: Time management The Importance of Project Schedules, Estimating Activity Durations, Developing the Schedule, Controlling the Schedule **Cost management**: The Importance of Project Cost Management, Basic Principles of Cost Management, Estimating Costs. [T1]	
UNIT III:	**(09 hrs)**
Human Resources Management: The Importance of Human Resource Management, Keys to Managing People, Developing the Human Resource Plan, Acquiring the Project Team, Developing the Project Team, Managing the Project Team [T1]	
UNIT IV:	**(07 hrs)**
Risk Management: Introduction, nature and identification of risk, risk analysis, evaluation of risk to the schedule using Z-values, Monitoring and Controlling Risks [T1]	
UNIT V:	**(08 hrs)**
Project Integration: Strategic Planning and Project Selection, Developing a Project Charter, Developing a Project Management Plan, Directing and Managing Project Execution[T1] **Monitoring and Controlling:** Project Work, Performing Integrated Change Control, Closing Projects or Phases.[T1]	

COURSE OUTCOMES:

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

CO1:	Apply theoretical knowledge on project management and software development into practice.
CO2:	Classify different methods required in project management related to time, cost and human resource management
CO3:	Identify risks in project life cycle and plan for risk management strategies.
CO4:	Analyze project Monitoring and Controlling Activities

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	3	-	-	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1.	INFORMATION TECHNOLOGY PROJECT MANAGEMENT, Kathy Schwalbe,6th edition, Cengage Learning, 2011
2.	SOFTWARE PROJECT MANAGEMENT A Unified Framework Walker Royce Pearson Edition

REFERENCE BOOKS:

1.	Ramesh, Gopala swamy, "Managing Global Projects", Tata McGraw Hill, 2001.
2.	Jalote, "Software Project Management in Practice", Pearson Education, 2002

MACHINE LEARNING LAB

Subject Code: UGAI5P0522		L	T	P	C
III Year / I Semester		0	0	3	1.5

PRE-REQUISITES:	
➢ Familiarity with Python programming	
COURSE OBJECTIVE:	
➢ This course helps the students to implement various machine learning techniques.	
Experiments	
1.	Write a Program to perform the basic matrix operations like addition, subtraction, multiplication, Inversion, Transpose.
2.	Write a Program to find minimum & maximum elements of the matrix, trace, rank, eigenvalues, and eigenvectors of the given matrix.
3.	Write a Program to find the mean, median, standard deviation and mode using user defined functions.
4.	Load any public dataset and understand the basic information about data and statistical summary of the dataset.
5.	Write a program to implement the Linear and Non-Linear Regression for a sample training dataset stored as a .CSV file. Compute Mean Square Error by considering few test datasets.
6.	Write a program to implement the Logistic Regression for the given dataset and compute the accuracy of the classifier.
7.	Write a program to implement the naïve Bayesian classifier for the given dataset and compute the accuracy of the classifier.
8.	Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.
9.	Write a program to demonstrate the working of the decision tree algorithm. Use an appropriate dataset for building the decision tree and apply this knowledge to classify a new sample
10.	Write a program to implement Support Vector Machine algorithm to classify the given dataset. Print both correct and wrong predictions.
11.	Interpret and analyze the performance measures of different classification algorithms for the same dataset.
12.	Write a program to implement the K-mean, Hierarchical Clustering for the given dataset and compute the accuracy of the model and compare.
13.	Perform PCA on the given dataset and build different classification and clustering models.

COURSE OUTCOMES:

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

CO1:	Implement the Basic operations of Linear Algebra in Machine Learning.
CO2:	Apply various machine learning algorithms in a range of real-world applications.
CO3:	Integrate and apply their expertise to produce solutions for real-world problems.
CO4:	Interpret and Analyze results with reasoning using different ML techniques.

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	3	-	-	-	3	-	-	-	-	3
CO2	3	-	-	3	3	-	-	-	3	-	-	-	-	3
CO3	2	3	-	3	3	-	-	-	3	-	-	-	-	3
CO4	-	3	-	3	3	-	-	-	3	-	-	-	-	3

TEXT BOOKS:

1.	Tom M. Mitchell, Machine Learning , MGH.
2.	Peter Harington, Machine Learning in Action, Cengage.
3.	Sebastian raschka, Python Machine Learning, Packt Publishing

REFERENCE BOOKS:

1.	Ethem Alpaydin, Introduction to Machine Learning, PHI.
2.	Drew Conway & John Miles Wine, Machine Learning for Hackers, O'Reilly Media.

COMPETITIVE PROGRAMMING LAB

Subject Code: UGAI5P1122		L	T	P	C
III Year / Semester		0	0	3	1.5

PRE-REQUISITES:	
➢ Knowledge in any programming language	
COURSE OBJECTIVE:	
➢ The focus of this course is the development and implementation of advanced algorithms, as well as the skills required for programming competitions. ➢ The students will learn to select appropriate algorithms for a given problem, integrate multiple algorithms for solving a complex problem and implement them.	
Experiments	
1.	Demonstrate the Divide and Conquer technique by taking two problems from any of the online resource a) https://www.enjoyalgorithms.com/blog/divide-and-conquer b) https://www.geeksforgeeks.org/divide-and-conquer-algorithm-introduction/
2.	Demonstrate the Greedy method technique by taking two problems from any of the online resource a) https://www.codechef.com/tags/problems/greedy b) https://www.geeksforgeeks.org/greedy-algorithms/
3.	Demonstrate the Dynamic programming technique by taking two problems from any of the online resource. a) https://www.hackerearth.com/practice/algorithms/dynamic-programming/introduction-to-dynamic-programming-1/practice-problems/ b) https://www.codingninjas.com/codestudio/problem-lists/top-dynamic-programming-questions
4.	Implement shortest path algorithm for the given graph. a) https://www.hackerrank.com/challenges/dijkstrashortreach/problem b) https://leetcode.com/discuss/interview-question/299983/Check-YourRoute
5.	Demonstrate how to apply Backtracking technique by taking two problems from any of the online resource. a) https://leetcode.com/tag/backtracking/ b) https://www.hackerearth.com/practice/basic-programming/recursion/recursion-and-backtracking/practice-problems
6.	Implement two String related algorithms from any of the online resource a) https://leetcode.com/discuss/study-guide/1333049/

COURSE OUTCOMES:

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

CO1:	Find optimal solution by applying most suitable algorithm.
CO2:	Apply design and analysis techniques to solve various problems
CO3:	Demonstrate data structure and algorithms coding skills on a competitive programming platform.

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-		-	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	3	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	3	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1.	Competitive Programmer's Handbook by Antti Laaksonen https://cses.fi/book/book.pdf
2.	Competitive Programming by Steven and Felix https://www.comp.nus.edu.sg/~stevenha/myteaching/ competitive_programming/cp1.pdf

BIG DATA ANALYTICS

Subject Code: UGAI5K0722		L	T	P	C
III Year / I Semester		1	0	2	2

PRE-REQUISITES:

- Programming knowledge in Java
- Familiarity with OS – Linux/UNIX

COURSE OBJECTIVE:

- Impart the architectural concepts of Hadoop and introducing map reduce paradigm.
- Master the concepts of HDFS and MapReduce framework
- Practice programming tools PIG and HIVE in Hadoop eco system.
- Implement best practices for Hadoop development

Lab Syllabus:

Unit I INTRODUCTION TO BIG DATA ANALYTICS (6hrs)

Classification of Digital Data - Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Why Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop Environment - Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments - Basically Available Soft State Eventual Consistency - Top Analytics Tools.

Unit II HADOOP AND MAPREDUCE PROGRAMMING (7hrs)

Hadoop: Features – Advantages – Versions – Ecosystems – Distributions – Hadoop Versus RDBMS - Distributed Computing Challenges – History - Hadoop Overview - Use Case of Hadoop - Hadoop Distributors - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem – MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression.

Unit III DATA PROCESSING SERVICES: (8hrs)

HIVE & PIG Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having – RC File Implementation - Hive User Defined Function - Serialization and Deserialization - Hive Analytic Functions

Pig: Introduction - History and Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Parameter Substitution - Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo! - Pig Versus Hive.

Import and Export Data – Sqoop Architecture, Sqoop Job – Flume – Log Collection – Working with Twitter Stream

Lab Experiments:

Week 1, 2:

1. (i) Installation of VMWare to setup the Hadoop environment and its ecosystems.
   (ii) Use web-based tools to monitor your Hadoop setup.

Week 3:

2. Implement the following file management tasks in Hadoop:
   - Adding files and directories.
   - Retrieving files.
   - Deleting files

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

Week 4:

3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

Week 5:

4. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.

Week 6,7:

5. Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Week 8,9:

6. Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

Week 10:

7. Run Sqoop and extract data from a RDBMS store in Hadoop using MapReduce/Hive.
8. Move the data from RDBMS into HBase.

Week 11:

9.Install and Run HBase and perform basic HBase Shell Commands and DDL commands on table like create,disable, is_disable,list,enable, is_enabled, exit, alter, exists, describe, drop and drop_all

10. Perform DML like put, delete, deleteall, get, count, scan, truncate on HBase Table.

COURSE OUTCOMES:

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

CO1:	Understand the concepts of Hadoop, HDFS, Map Reduce, YARN, Pig, Hive, Sqoop, Flume and operations for analytics of big data
CO2:	Apply the knowledge of Hadoop distributed file system, Hive, Sqoop, Flume for solving real time problems
CO3:	Design solutions for applications using appropriate big data concepts.
CO4:	Conduct experiments using modern big data tools like pig, Hive, Sqoop, Flume to solve given problems.

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	3	-	-	-	-	-	-	-	3	-
CO3	-	3	3	3	3	-	-	-	-	-	-	-	3	-
CO4	-	-	-	3	3	-	-	-	-	-	-	-	3	-

TEXT BOOKS:

1.	Big Data And Business Analytics Laboratory, Jay Liebowitz, CRC Press.
2.	Hadoop: The Definitive Guide, Tom White, O'Reilly Media
3.	Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data, Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, 1st Edition, TMH.

REFERENCE BOOKS:

1.	Hadoop in 24 hrs by Tom White, Sams Teach Yourself
2.	Hadoop in Practice, Alex Holmes, Manning Publishers

INTELLECTUAL PROPERTY RIGHTS & PATENTS

Subject Code: UGMB5A0122		L	T	P	C
III Year / I Semester		2	0	0	0

COURSE OBJECTIVE:

- This course introduces about intellectual property laws, trademarks, copyrights and patents.

SYLLABUS:

UNIT I: **(06 hrs)**

Intellectual Property Law: Basics, Types, Agencies Responsible for IP Registration, International Organizations, Agencies and Treaties, Importance of IPR.
Trademark Law: Purpose of Trademarks, Types, Acquisition, Common Law Rights, Laws and Treaties Governing Trademarks, Categories, Trade Names and Business Names, Protectable Matter, Exclusions from Trademark Protection, Selecting and Evaluating a Mark, Trademark Search.

UNIT II: **(05 hrs)**

Copyright Law: Common Law Rights, Originality of Material, Fixation of Material, Works of Authorship, Exclusions, Compilations, Collections and Derivative Works.
Rights Afforded by Copyright Law: Rights of Reproduction, Derivative Works, Distribution and the First Sale Doctrine, Work Publicly, Rights to Display the Work Publicly, Other Limitations on Exclusive Rights, Moral Rights and the Visual Artists Rights, Compulsory Licenses.

UNIT III: **(07 hrs)**

Copyright Ownership and Transfers: Ownership Issues, Joint Works, Ownership in Derivative or Collective Works, Works Made for Hire, Transfers, Termination of Transfers and Duration.
Copyright Infringement: Elements, Contributory and Vicarious Infringement, Defences to Infringement, Infringement Actions.
New Developments: Protection for Computer Programs and Automated Databases, Copyright in the Electronic Age, Entertainment Notes, Recent Developments, Terms of the Trade, Semiconductor Chip Protection.

UNIT IV: **(06 hrs)**

Patent Law: Introduction, Patentability, Design Patents, Plant Patents, Double Patenting.
Patent Searches and Application: Searching, Application Process, Prosecuting the Application, Post-issuance Actions, Term and Maintenance of Patents.
Patent Ownership and Transfer: Ownership Rights, Sole and Joint Inventors, Disputes, Inventions made by Employees and Independent Contractors, Assignment of Rights, Licensing, Invention Developers and Promoters.

UNIT V: **(06 hrs)**

Patent Infringement: Direct Infringement, Inducement to Infringe, Contributory Infringement, First Sale Doctrine, Indirect Infringement, Infringement Abroad, Claims Interpretation, Defences, Remedies, Resolving a Dispute and Litigation.

New Developments: International Patent Protection, Patent Cooperation Treaty, European Patent Organization, Patent Prosecution Highway, Agreement on Trade-Related Aspects of IPR, Patent Law Treaty, Foreign Filing Licenses. **Intellectual Property Audits:** Practical Aspects of Intellectual Property Audits, Conducting the Audit, Postaudit Activity.

COURSE OUTCOMES:

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

CO1:	Understand the intellectual property law.
CO2:	Understand the need of trademark and its use.
CO3:	Familiar with copyright laws and its rights, ownership, transfers and copyright Infringement.
CO4:	Acquire the knowledge on various aspects of patents.

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	-	-	-	-	-	-	3	-	-	-	-	3	-
CO3	3	3	3	-	-	-	-	3	-	3	-	-	3	3
CO4	3	3	3	-	-	3	3	3	-	3	-	-	3	3

TEXT BOOKS:

1.	Deborah E. Bouchoux, "Intellectual Property", Cengage Learning
2.	Asha Vijay, Durafe Dhanashree and K. Toradmalle, "Intellectual Property Rights", Wiley India
3.	Neeraj Pandey and Khushdeep Dharni, "Intellectual Property Rights", PHI Learning, 2014.

REFERENCE BOOKS:

1.	Kompal Bansal & Parishit Bansal, "Fundamentals of IPR for Engineers", BS Publications.
2.	Prabhuddha Ganguli, "Intellectual Property Rights", Tata Mc-Graw Hill, New Delhi.
3.	R. Radha Krishnan, S. Balasubramanian, "Intellectual Property Rights", Excel Books. New Delhi.
4.	M. Ashok Kumar and Mohd. Iqbal Ali, "Intellectual Property Right", Serials Pub.

5.	Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
6.	Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd.
7.	T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand.
8.	Dr. A. Srinivas, "Intellectual Property Rights (Patents & Cyber Law)", Oxford University Press, New Delhi.

Syllabus
III B.Tech II SEM

COMPILER DESIGN

Subject Code: UGCS6T0122		L	T	P	C
III Year / II Semester		3	0	0	3

PRE-REQUISITES:	
➢ Familiarity with theory of computation and data structures	
COURSE OBJECTIVE:	
➢ This course introduces the basic principles of compiler and depicts the phases of the compilation process with implementation approach of each phase.	
SYLLABUS:	
UNIT I:	**(08 hrs)**
Overview of language processing, pre-processors, compiler, assembler, interpreters, pre-processors, linkers & loaders, structure of a compiler, phases of a compiler, Lexical Analysis, Role of Lexical Analysis, Lexical Analysis Vs Parsing, Token, patterns and Lexemes, Lexical Errors, Regular Expressions, Regular definitions for the language constructs, Strings, Sequences, Comments, Transition diagram for recognition of tokens, Reserved words and identifiers, Examples.	
UNIT II:	**(08 hrs)**
Syntax Analysis, discussion on CFG, LMD,RMD, parse trees, Role of a parser, classification of parsing techniques, Brute force approach, left recursion, left factoring, Top down parsing, First and Follow, LL(1) Grammars, Non-Recursive predictive parsing, Error recovery in predictive parsing.	
UNIT III:	**(12 hrs)**
Bottom up parsing, Types of Bottom up approaches, Introduction to simple LR, Why LR Parsers, Model of LR Parsers, Operator Precedence, Shift Reduce Parsing, Difference between LR and LL Parsers, Construction of SLR Tables, More powerful LR parses, construction of CLR (1), LALR Parsing tables, Dangling ELSE Ambiguity, Error recovery in LR Parsing, Comparison of all bottom up approaches with all top down approaches.	
UNIT IV:	**(10 hrs)**
Semantic analysis, SDT Schemes, evaluation of semantic rules. Intermediate code, three address code, quadruples, triples, abstract syntax trees. Types and declarations, type Checking. **Symbol tables:** use and need of symbol tables. Runtime Environment: storage organization, stack allocation, access to non-local data, heap management, parameter passing mechanisms, introduction to garbage collection, Reference counting garbage collectors.	
UNIT V:	**(08 hrs)**
Code generation: Issues, target language, Basic blocks & flow graphs, Simple	

code generator, Peephole optimization, Register allocation and assignment. Machine independent code optimization, semantic preserving transformations, global common sub expression elimination, copy propagation, dead code elimination, constant folding, strength reduction, loop optimization. Instruction scheduling, inter procedural optimization.

COURSE OUTCOMES:

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

CO1:	Demonstrate an understanding of the design of a compiler including its phases and components.
CO2:	Distinguish the lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation
CO3:	Analyze the runtime structures used to represent language constructs and typical programming languages
CO4:	Analyze the techniques used for intermediate code generation and optimization
CO5:	Apply appropriate parsing techniques to design a parser for the given language

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1.	Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D. Ullman ,Compilers Principles Techniques and Tools-,2nd ed, Pearson
2.	Kenneth C Louden, Compiler construction, Principles and Practice, CENGAGE.

REFERENCE BOOKS:

1.	K. Muneeswaran, Compiler Design, Oxford.
2.	Keith D.Cooper & Linda Torczon, Engineering a compiler, 2nd edition, Morgan Kaufman.
3.	http://www.nptel.iitm.ac.in/downloads/106108052/
4.	V. Raghavan, Principles of compiler design, 2nd ed, TMH.
5.	Yunlinsu, Implementations of Compiler, A new approach to Compilers including the algebraic methods, SPRINGER.

CRYPTOGRAPHY AND NETWORK SECURITY

Subject Code: UGCS6T0222		L	T	P	C
III Year / II Semester		3	0	0	3

PRE-REQUISITES:

- Computer Networks
- Computer Hardware.

COURSE OBJECTIVE:

The aim of the course is to introduce the students

- Various cryptographic algorithms and their applications in securing the networking environment
- Different authentication protocols and applications.
- The concepts of IP security and web security.
- The working nature of firewalls and their usage in different organizations.

SYLLABUS:

UNIT I: **(07 hrs)**

Introduction: Computer Security Concepts, The OSI Security Architecture, Security Attacks- DOS, DDOS, Session Hijacking, Spoofing, Phishing, Security Services, Security Mechanisms, and a Model for Network Security.
Classical Encryption: Symmetric Cipher Model, Substitution Techniques-Caesar Cipher, monoalphabetic, Playfait Cipher, Transportation Techniques-rail fence, Steganography. [T1]

UNIT II: **(07 hrs)**

Number Theory: Divisibility and the Division Algorithm, The Euclidean Algorithm, Prime and Relatively Prime Numbers, The Chinese Remainder Theorem. [T1]
Symmetric Encryption: Symmetric Encryption **Principles-**Cryptography, Cryptanalysis **Symmetric Block Encryption Algorithms-** Data Encryption Standard (DES), Strength of DES, Advanced Encryption Standard (AES). [T2]

UNIT III: **(16 hrs)**

Public Key Cryptography and Message Authentication: Approaches to message authentication- Authentication using Conventional Encryption, Message authentication without Message Encryption, Message Authentication Code, One way Hash Function, Secure Hash functions - Hash function requirements, Simple hash function, The SHA-1 Secure Hash Function, The RSA Algorithm Public Key Encryption Algorithm, Diffie-Hellman Key Exchange, Digital signature. [T2]

Authentication Applications: KerberosVersion-4, X.509-Format [T2]
Electronic Mail Security: PGP, S/MIME. [T2]

UNIT IV: **(08 hrs)**

IP Security: Overview, Applications of IPSec, Benefits of IPSec, IP Security Architecture-IPSec Services,Security Associations, Authentication Header, Encapsulating Security Payload, ISAKMP Header format.[T2]

Web Security: Web Security Considerations, Web Security Threats, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction. [T2]	
UNIT V:	**(07 hrs)**
System Security: Intruders- Techniques,Malicious Software – Viruses and Related Threats- Backdoor, Logic Bomb, Trojen Horses, Zombie,Types of Viruses,Virus Countermeasures- Anti Virus Approaches, Worms[T2]. **Firewalls:** Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration [T2]	

COURSE OUTCOMES:

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

CO1:	Compare different types of attacks and security mechanisms, and knowing the importance of network security,
CO2:	Apply symmetric and Asymmetric cryptographic algorithms with concepts of number theory for implementing various security protocols.
CO3:	Analyze the security considerations of IP layer and Transport layer to identify different authentication applications for secure transmission
CO4:	Understand various types of malicious software and the importance of Firewalls to prevent attacks.

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	2	3	3	3	-	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1.	Cryptography and Network Security: Principles and Practice, William Stallings, Pearson Education,5th edition, 2011
2.	Network Security Essentials : William Stallings, Pearson Education,3rd edition, 2011

REFERENCE BOOKS:

1.	Fundamentals of Network Security by Eric Maiwald, Dreamtech press.
2.	Principles of Information Security, Whitman, Thomson.
3.	Introduction to Cryptography, Buchmann, Springer. Applied Cryptography. 2nd Edition, Bruce Schneier, Johnwiley& Sons
4.	Cryptography and Network, Behrouz.A.Fourouzan and DebdeepMukhopadhyay, McGraw-Hill,2nd edition, 2010
5.	Fundamentals of Network Security by Eric Maiwald, Dreamtech press.

ONLINECOURSES:

1.	Asymmetric Cryptography and Key Management by University of Colorado System
2.	Number Theory and Cryptography by University of California San Diego

DEEP LEARNING

Subject Code: UGAI6T0122		L	T	P	C
III Year / II Semester		3	0	0	3

PRE-REQUISITES:

- The students should have basic knowledge in linear algebra, statistics, as well as programming in Python and Machine Learning.

COURSE OBJECTIVE:

- To Introduce major deep learning Algorithms, the problem setting and their application to solve real world problems.
- Identify the deep learning Algorithms which are more appropriate for varies types of learning tasks in various domains.

SYLLABUS:

UNIT I: **(7 hrs)**

Neural Networks: Biological Neuron, Linear Perceptron, Expressing Linear Perceptron's as Neurons, Perceptron Learning Algorithm, Sigmoid, Tanh and ReLu Neurons.

UNIT II: **(7 hrs)**

Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

UNIT III: **(15 hrs)**

Regularization for Deep Learning: Parameter Norm Penalties, Data set augmentation, Noise Robustness, Early stopping, Bagging and other Ensemble methods, Dropouts.

Convolution Neural Network: Convolution operation, Building Blocks of CNN, Pooling, Variants of basic convolution function.

UNIT IV: **(8 hrs)**

Recurrent and Recursive Networks: Recurrent Neural Networks, Bidirectional RNNs, Deep recurrent neural networks, Long Short-Term Memory Networks.

UNIT V: **(8 hrs)**

Deep Learning Frameworks: Introduction to Keras and TensorFlow, Deep Learning for computer vision –using CIFAR-10,LeNet Deep Learning for Text and Sequences: working with Text Data, Sequence processing with ConvNets, Text Generation with LSTM.

COURSE OUTCOMES:

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

CO1:	Make use of the Algorithms associated with Deep learning and Deep Network architectures for Machine Learning.
CO2:	Determine the deep learning algorithms which are more feasible for operations in various domains.
CO3:	Implement deep learning models using Python libraries and train them with real- world datasets.
CO4:	Evaluate the performance of different deep learning models with respect to the overfitting and underfitting, estimation of test error.

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2		3	-	-	-	-	-	-	-	-	-	-	-	3
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-	3
CO4	-	-	-	3	-	-	-	-	-	-	-	-	-	3

TEXT BOOKS:

1.	Nikhil Buduma, Fundamentals of Deep Learning, Released June 2017,Publisher(s):O'Reilly Media, Inc
2.	Goodfellow, I., Bengio,Y., and Courville,A., Deep Learning, MIT Press, 2016.
3.	Francois Chollet, Deep Learning with Python, Manning publisher

REFERENCE BOOKS:

1.	B. Yegnanarayana, Artificial Neural Networks, PHI Learning Ltd.
2.	Satish Kumar , Neural Networks: A Classroom Approach.

INFORMATION RETRIEVAL SYSTEMS
(PROFESSIONAL ELECTIVE-II)

Subject Code: UGAI6T1122		**L**	**T**	**P**	**C**
III Year / II Semester		**3**	**0**	**0**	**3**

PRE-REQUISITES:

- Basics of Database Management Systems, Data structures

COURSE OBJECTIVE:

- To learn the important concepts and algorithms in IRS
- To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

SYLLABUS:

UNIT I: **(08 hrs)**

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses **Information Retrieval System Capabilities:** Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT II: **(07 hrs)**

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction

Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models

UNIT III: **(08 hrs)**

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages

Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

UNIT IV: **(09 hrs)**

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext **Information Visualization:** Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies

UNIT V: **(14 hrs)**

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech

Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

COURSE OUTCOMES:

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

CO1:	Apply IR principles to locate relevant information large collections of data
CO2:	Design different document clustering algorithms
CO3:	Implement retrieval systems for web search tasks.
CO4:	Design an Information Retrieval System for web search tasks.

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	-	-	3	-	-	-	-	-	-	-	-	-	-	3
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	3
CO4	-	-	3	-	-	-	-	-	-	-	-	-	-	3

TEXT BOOKS:

1.	Gerald J. Kowalski, Mark T. Maybury, " Information Storage and Retrieval Systems – Theory and Implementation", Second Edition, , Springer
2.	Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.

REFERENCE BOOKS:

1.	Robert Korfhage, "Information Storage & Retrieval" , John Wiley & Sons.
2.	Yates and Neto, "Modern Information Retrieval" Pearson Education

RECOMMENDER SYSTEMS
(PROFESSIONAL ELECTIVE-II)

Subject Code: UGAI6T0322		**L**	**T**	**P**	**C**
III Year / II Semester		**3**	**0**	**0**	**3**

COURSE OBJECTIVE:	
➢ Familiarize with recommender systems and their applications ➢ Analyze the different approaches towards recommendation ➢ Evaluate the effectiveness of recommender system ➢ Design recommender system	
SYLLABUS:	
UNIT I:	**(10 hrs)**
Introduction: Recommender system functions, Linear Algebra notation: Matrix addition, Multiplication, transposition, and inverses; covariance matrices, Understanding ratings, Applications of recommendation systems, Issues with recommender system.	
UNIT II:	**(10 hrs)**
Collaborative Filtering: User-based nearest neighbour recommendation, Item-based nearest neighbour recommendation, Model based and pre-processing based approaches, Attacks on collaborative recommender systems	
UNIT III:	**(12 hrs)**
Content-based recommendation: High level architecture of content-based systems, Advantages and drawbacks of content based filtering, Item profiles, Discovering features of documents, Obtaining item features from tags, Representing item profiles, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.	
UNIT IV:	**(12 hrs)**
Knowledge based recommendation: Knowledge representation and reasoning, Constraint based recommenders, Case based recommenders. **Hybrid approaches:** Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade Meta-level, Limitations of hybridization strategies.	
UNIT V:	**(12 hrs)**
Evaluating Recommender System: Introduction, General properties of evaluation research, Evaluation designs, Evaluation on historical datasets, Error metrics, Decision-Support metrics, User-Centred metrics.	

COURSE OUTCOMES:

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

CO1:	To understand basic techniques and problems in the field of recommender systems. (L2)
CO2:	Evaluate Types of recommender systems: non-personalized, content based, collaborative filtering. (L3)
CO3:	Apply algorithms and techniques to develop Recommender Systems that are widely used in the Internet industry. (L3)
CO4:	To develop state-of-the-art recommender systems. (L3)

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	3	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	3	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-		-	-	-	-	-	-	-
CO4	-	3	-	-	-	-	3	-	-	-	-	-	3	3

TEXT BOOKS:

1.	Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press(2011), 1st ed. 2.
2.	Aggarwal, C. C. Recommender Systems: The Textbook. Springer 2016

REFERENCE BOOKS:

1.	Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed
2.	Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st ed.

COMPUTER VISION
(PROFESSIONAL ELECTIVE-II)

Subject Code: UGAI6T0422		**L**	**T**	**P**	**C**
III Year / II Semester		**3**	**0**	**0**	**3**

PRE-REQUISITES:

- Basics knowledge of linear algebra, calculus, and statistics
- Basic Knowledge on Python Programming.

COURSE OBJECTIVE:

- To introduce students the fundamentals of image formation;
- To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition;
- To develop an appreciation for various issues in the design of computer vision and object recognition systems; and To provide the student with programming experience from implementing computer vision and object recognition applications.

SYLLABUS:

UNIT I:	**(08 hrs)**

Introduction: Image Formation: Geometric Primitives and Transformation, Photometric Image Formation, Digital Camera, Image Processing: Point Operators, Linear Filtering, More Neighborhood Operators, Fourier Transforms, Pyramids and Wavelets, Geometric Transformations, Global Optimization.

UNIT II:	**(07 hrs)**

Feature Detection and Matching: Points and Patches, Edges, Lines, Segmentation: Active Contours, Split and Merge, Mean Shift and Mode Finding, Normalized Cuts, Feature-Based Alignment: 2D and 3D Feature-based Alignment, Pose Estimation, Geometric Intrinsic Calibration.

UNIT III:	**(08 hrs)**

Structure and Motion: Triangular, Two-frame Structure from Motion, Factorization, Bundle Adjustment, Constrained Structure and Motion, Dense Motion Estimation: Translation Alignment, Parametric Motion, Spline-based Motion, Optical Flow, Layered motion

UNIT IV:	**(09 hrs)**

Image Stitching: Motion Models, Global Alignment, Composing, Computational Photography: Photometric Calibration, High Dynamic Range Imaging, Super-Resolution and Blur Removal, image Matting and Compositing, Texture Analysis and Synthesis.

UNIT V:	**(12 hrs)**

3D Reconstruction: Shape From X, Active Range Finding, Surface Representation,

Point-based Representation, Volumetric Representation, Model-based Reconstruction, Recovering Texture Maps and Albedos **Image- based Rendering:** View Interpolation, Layered Depth Images, Light Fields and Lumigraphs, Environment Mattes, Video-based Rendering.

COURSE OUTCOMES:

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

CO1:	Identify basic concepts, terminology, theories, models and methods in the field of computer vision
CO2:	Describe known principles of feature detection and matching,
CO3:	Describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal.
CO4:	Suggest a design of a computer vision system for a 3D Reconstruction, Albedos, image based rendering views and depths.

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-	3
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	3
CO4	-	-	3	-	-	-	-	-	-	-	-	-	-	3

TEXT BOOKS:

1.	Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2011.
2.	Simon J.D Prince, Computer Vision: Models, Learning and Inference, 1st Edition, 2012.

REFERENCE BOOKS:

1.	Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2.	Haralick & Shapiro, "Computer and Robot Vision", Vol II
3.	G_erard Medioni and Sing Bing Kang "Emerging topics in computer vision"95

NPTEL LINK: https://onlinecourses.nptel.ac.in/noc22_ee48/preview

DESIGN PATTERN
(PROFESSIONAL ELECTIVE-II)

Subject Code: UGIT6T0520		**L**	**T**	**P**	**C**
III Year / II Semester		**3**	**0**	**0**	**3**

PRE-REQUISITES:

- Students must have knowledge on Object oriented analysis using UML.

COURSE OBJECTIVE:

- Infer the knowledge of design patterns through their organization and classification.
- Interpret underlying object oriented design Principles while implementing the pattern.
- Compare different patterns functionality in executing real time problems.
- Implement patterns based on their applicability for different problems

SYLLABUS:

UNIT I:	**(07 hrs)**

Introduction: What Is a Design Pattern? Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalogue of Design Patterns, Organizing the Catalogue, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern. [T1]

UNIT II:	**(09 hrs)**

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Double Checked Locking Pattern, Object Pool Pattern Management of Objects. [T1]

UNIT III:	**(09 hrs)**

Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy. [T1]

UNIT IV:	**(08 hrs)**

Behavioral Patterns - 1: Chain of Responsibility, Command, Interpreter, Iterator, Mediator. [T1]

Behavioral Patterns - 2: Memento, Observer, State, Strategy, Template Method, Visitor. [T1]

UNIT V:	**(07 hrs)**

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation.[T1]

COURSE OUTCOMES:

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

CO1:	Understand the need for proper implementation of the application design and resolve issues in application design tasks. [L2]
CO2:	Interpret the patterns usage based on their applicability and known uses. [L5]
CO3:	Utilize the design patterns to create object-oriented applications that are scalable and easily maintainable. [L3]
CO4:	Examine the patterns to ensure their reliability in solving design problems. [L4]

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3		-	-	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1.	Design Patterns, Erich Gamma, Pearson Education

REFERENCE BOOKS:

1.	Pattern's in JAVA Vol-I, Mark Grand, Wiley DreamTech.
2.	Pattern's in JAVA Vol-II, Mark Grand, Wiley DreamTech.
3.	JAVA Enterprise Design Patterns Vol-III, Mark Grand, WileyDreamTech.
4.	Design Patterns Explained, Alan Shalloway, Pearson Education.
5.	Head First Design Patterns, Eric Freeman-Oreilly-spd.

ONLINE COURCES AND REFERENCES:

1.	Design patterns offred by University of Alberta –coursera.

FULL STACK DEVELOPMENT
(JOB ORIENTED ELECTIVE-I)

Subject Code: UGAI6T0522		**L**	**T**	**P**	**C**
III Year / II Semester		**2**	**0**	**2**	**3**

PRE-REQUISITES:

- The students must have knowledge on the concepts of HTML, CSS and JavaScript.

COURSE OBJECTIVE:

- Full Stack Development Course covers complete breath of technologies & applications that are extensively used in the industry. This course not only make the students gain expertise in both front end & backend programming applications but also help them to get familiar with the latest web development technologies & also complete web development life cycle.

SYLLABUS:

UNIT I: **(07 hrs)**

React Basics: Introduction, Nesting elements, Creating component classes, Working with properties, Introduction to JSX, States, Component lifecycle events.

UNIT II: **(07 hrs)**

React Advanced Concepts: Handling events, Working with forms, Scaling React components, React routing, Working with data using Redux, Unit testing React with Jest.

UNIT III: **(16 hrs)**

Node.js: Introduction, Modules and npm, Node's Programming Model, Core Modules, Building the Node Server, Node's Debugger, node-inspector, Testing Node.

MongoDB: History of MongoDB, Installing MongoDB Locally, Cloud Hosting, MongoDB Shell, Inserting New Data, Retrieving Data, Updating Data, Deleting Data, Deleting Collections, Deleting Databases, Interacting with MongoDB Using Mongoose, Alternatives to MongoDB.

UNIT IV: **(07 hrs)**

Express.js : Building Blocks of Express, Router, Middleware, Routes, Generating an Express App, Jade, Architecture of an Express Application.

UNIT V: **(07 hrs)**

AngularJS: Single-page Applications, SPA Frameworks, Model-View-Controller Architecture, Getting Angular, Data Binding, Angular Directives, Controllers, Client-side Routing, Testing Angular.

Lab Experiments:

1. Create a react project using create-react-app and demonstrate the stateless class and functional components.

2. Demonstrate the app life cycle in ReactJS for class/functional components and the concept of error handling in react.
3. Demonstrate the mechanism of state management in class components.
   => Create a button with the title `Click`. On button click update a counter and display the number of times the button was clicked (use state management mechanism to update the counter).
4. Demonstrate the mechanism of state management in functional components(using hooks).
   => Create a button with the title `Click`. On button click update a counter and display the number of times the button was clicked (use useState() hook to update the counter).
5. Demonstrate the mechanism of passing props in class and functional components.
   => Create a component StudentList which has an array of Student objects (each object contains {studentId, studentName and favoriteSubject}), create another component StudentItem which takes the props of each item in studentList{studentName, studentId, favoriteSubject} and displays them in the tabular format.
6. Demonstrate how forms are handled in ReactJS.
   => Create a registration form with following fields: registration no., name, college, gender, hobbies (give users a list of options to select from).
7. Demonstrate how routing is done in ReactJS.
   => Create a login page (route `/login`) which has 2 fields: Username/email and Password. If the password is the same as username, allow the user to login and route the user to `/profile` where you display them a message Hello __username__.
8. Create a MongoDB collection of "books" with the following details: Title, ISBN(unique id), Authors, Publication ,Year of Publication and Price. Write commands for the following: a) Insert a new document with multiple authors. b) Update a document with change in price c) Remove documents with year of publication lesser than 1990
9. Write a MongoDB query to find the restaurants which do not prepare any cuisine of 'American ' and achieved a grade point 'A' not belongs to the borough Brooklyn. The document must be displayed according to the cuisine in descending order.
10. Demonstrate how to Submit Forms and Save Data into a database using React.js and Node.js
11. Demonstrate how to handle HTTP methods- Get data from REST API and return HTML content.
12. Write Server side programming with Node.js
13. Perform Email applications using Nodemailer Module
14. Write custom applications with Node.js and Mongo DB
15. Write a program to demonstrate Angular JS Directives

16. Write a program to demonstrate Angular JS Fillers
17. Using Angular JS, add names that are entered in textbox to the list and clear the textbox once the name is added to list.
18. Deploy applications to Docker Hub.

COURSE OUTCOMES:

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

CO1:	Understand the principles, working methodologies and operations of front end and back end programming applications.
CO2:	Demonstrate the design methodology of MEAN architecture frame works to support real time interactions.
CO3:	Apply the techniques of modern web methodologies for formulating solutions to real world problems.
CO4:	Analyze and Integrate all the components of for developing robust and dynamic web applications.
CO5:	Conduct experiments using modern tools like react, nodejs and angularjs

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	3	3	-	-	-	-	-	-	-	-	-
CO3	3	-	3	-	3	-	-	-	-	-	-	-	-	-
CO4	3	-	3	3	3	-	-	-	-	-	-	-	-	-
CO5	-	-	-	3	3	-	-	-	3	-	-	3	-	-

TEXT BOOKS:

1.	Azat Mardan, React Quickly, Manning Publications Co.
2.	Colin J. Ihrig and Adam Bretz, Full Stack JavaScript Development with MEAN, SitePoint Pty Ltd.

REFERENCE BOOKS:

1.	Kirupa Chinnathambi, Learning React, Pearson Education Inc.
2.	Cássio de Sousa Antonio, Pro React, Apress.
3.	Vasan Subramanian, Pro MERN Stack, Apress Publications.
4.	Simon Holmes, Clive Harber, Getting Mean with Mongo, Express, Angular and Node, Manning Publications Co.
5.	Amos Q. Haviv, MEAN Web Development, Packt Publishing.

DEVOPS
(JOB ORIENTED ELECTIVE-I)

Subject Code: UGAI6T0622		**L**	**T**	**P**	**C**
III Year / II Semester		**2**	**0**	**2**	**3**

PRE-REQUISITES:

- Good Exposure to Software Engineering concepts and Software Development Methodologies.

COURSE OBJECTIVE:

- To get an expertise on the culture of DevOps in Software Development Methodologies for finding ways to adapt and innovate social structure, culture, and technology together in order to work more effectively in the Enterprises

SYLLABUS:

UNIT I: **(08 hrs)**

Introduction to DevOps: What is DevOps, A History of DevOps, Fundamental Terminology and Concepts – Software Development Methodologies, Operations Methodologies, Systems Methodologies, Development Release and Deployment Concepts, Infrastructure Concepts, Cultural Concepts, DevOps Misconceptions and Anti-Patterns, the Four Pillars of Effective DevOps. **[T1]**

UNIT II: **(08 hrs)**

Collaboration: Defining Collaboration, Individual Differences and Backgrounds, Opportunities for Competitive Advantage, Mentorship, Introducing Mindsets, Mindsets and Learning Organizations, The Role of Feedback, Reviews and Rankings, Communication and Conflict Resolution Styles, Empathy and Trust, Humane Staffing and Resources Misconceptions and Troubleshooting of Collaboration.**[T1]**

UNIT III: **(15 hrs)**

Affinity: What Makes a Team, Teams and Organizational Structure, Finding Common Ground Between Teams, Benefits of Improved Affinity, Requirements for Affinity, Measuring Affinity, Misconceptions and Troubleshooting of Affinity. **[T1]**
Tools: Software Development, Automation, Monitoring, Evolution of the Ecosystem, The Value of Tools to People, The Right Tools for Real Problems, Embracing Open Source, Standardization of Tools, Consistent Processes for Tool Analysis, Exceptions to Standardization, Irrelevance of Tools, The Impacts of Tools on Culture, Selection of Tools. **[T1, T2]**

UNIT IV: **(08 hrs)**

Scaling: Understanding Scaling, Considering Enterprise DevOps, Organizational Structure, Team Flexibility, Organizational Life cycle, Complexity and Change, scaling for Teams, Team Scaling and Growth Strategies, scaling for Organizations, Misconceptions and Troubleshooting of Scaling. **[T1]**

UNIT V:	**(06 hrs)**
DevOps Practices: Implementing CI/CD and continuous deployment, Understanding IaC practices, DevOps Best Practices: Automating everything, Choosing the right tool, writing all your configuration in code, Designing the system architecture, building a good CI/CD pipeline, integrating tests, Applying security with DevSecOps, Monitoring your system, Evolving project management. **[T2]**	
Lab Experiments: 19. To Perform installation of Git and work on local and remote git repositories 20. To fetch and synchronize Git repository 21. To perform basic branching and merging in Git 22. To install and Jenkins build a job in Jenkins 23. To Create CI/CD pipe line in Jenkins 24. To install Docker and execute basic command in Docker 25. To build image from the Docker file 26. To deploy java application into Docker 27. To perform continuous testing of web applications using Selenium	

COURSE OUTCOMES:

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

CO1:	Make use the Influence of DevOps on Software Development Methodologies along with its Misconceptions and Anti-Patterns. **[L3]**
CO2:	Illustrate the Methodology of Four Pillars of DevOps and Troubleshoot common problems that can arise in the effective DevOps**. [L2]**
CO3:	Inference the culture of DevOps to the Enterprises for achieving agility and innovation in its business units**. [L4]**

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	3	-	-	-	-	-	-	-	-	3	-	-	-
CO2	-	-	-	3	-	-	-	-	-	-	3	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	3	-	-	-

TEXT BOOKS:

1.	Jennifer Davis, RynDaniels, Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale, O'Reilly.
2.	Mikael Krief, Learning DevOps, Packt Publications

REFERENCE BOOKS:

1.	Gene Kim, Jez Humble, Patrick Debois, John Willis, the DevOPS Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, IT Revolution Press
2.	Verona, Joakim. Practical DevOps. Packt Publishing Ltd.
3.	Jez Humble and David Farley, Continuous Delivery: Reliable Software Releases through Build, Test and Deployment Automation, Addison-Wesley Professional
4.	Mandi Walls, Building a DevOps Culture, O'Reilly publications.
5.	Sanjeev Sharma, "The DevOps Adoption Playbook – A Guide to Adopting DevOps in a Multi-Speed IT Enterprise", Wiley Publications.
6.	Gene Kim, Kevin Behr, George Spafford, The phoenix Project, 5th Anniversary Limited Edition

ONLINE COURSES:

1.	Devops Culture and Mindset: offered by University of VIRGINIA.
2.	Devops Culture and Mindset: offered by UCDAVIS

NATURAL LANGUAGE PROCESSING
(JOB ORIENTED ELECTIVE-II)

Subject Code: UGAI6T0722		**L**	**T**	**P**	**C**
III Year / II Semester		**2**	**0**	**2**	**3**

PRE-REQUISITES:

- Student must familiar with probability, linear algebra, and calculus
- Students must familiar with Python and Machine Learning

COURSE OBJECTIVE:

- Introduces fundamental concepts and techniques of NLP
- Provides in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Explore Machine Learning Techniques used in NLP
- Examine Deep Neural Architectures for Sequence Processing
- Understands Encoder-Decoder architectures and is able to build Machine Translation Models.

SYLLABUS:

UNIT I:	**(08 hrs)**

Introduction : Natural Language Processing Definition, Origins, applications, challenges, components of modern NLP – Regular Expressions, Words, Corpora, Tokenization, Text Normalization, Minimum Edit Distance.
Language Models: N-grams, Evaluating Language Models - Perplexity, Generalization and zeros, Smoothing – Laplace, Add-k, Interpolation and Backoff

UNIT II:	**(08 hrs)**

Naive Bayes: Naive Bayes Classifier - Training the NB Classifier - an example, Optimizing for Sentiment Analysis, NB for other text classification tasks, NB as a Language Model.

UNIT III:	**(12 hrs)**

Vector Semantics and Embeddings : Lexical Semantics, Vector Semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF: Weighing terms in the vector, Pointwise Mutual Information (PMI),
Applications of the tf-idf or PPMI vector models, Word2vec, Visualizing Embeddings, Semantic properties of embeddings, Bias and Embeddings.

UNIT IV:	**(10 hrs)**

Neural Networks and Neural Language Models : Feedforward networks for NLP : classification, Feedforward Neural Language Modelling, Training Neural Nets, Training the Neural Language the model.
Sequence Labelling for Parts of Speech and Named Entities : English word classes, Part-of-speech tagging, Named Entities and Named Entity Tagging.

UNIT V:	**(10 hrs)**

Deep Learning Architectures for Sequence Processing : Language Models, Recurrent Neural Networks, Managing Context in RNNs: LSTMs and GRUs, Potential Harms from Language Models

Machine Translation and Encoder-Decoder Models : The Encoder-Decoder Model, Encoder-Decoder with RNNs

Application of LLM: Generative AI, Prompt Engineering

Lab Experiments:

1. Solve the following by writing Regular Expressions in Python
    a. Replace all occurrences of **5** with '**five**' for the given string
    b. For the given list, filter all elements that do *not* contain '**e'**.
    c. For the given input string, display all lines not containing '**start'** irrespective of case.
    d. For the given input list, filter all elements that contains **42** surrounded by word characters.
    e. Validate the CVV number(It should have 3 or 4 digits, It should have a digit between 0-9, It should not have any alphabets and special characters)
    f. For the given input string, change whole word **mall** to **1234** only if it is at the start of a line
    g. Check whether the given email address is valid or not.
    h. Check whether the Aadhar number is valid or not (It should have 12 digits, It should not start with 0 and 1, It should not contain any alphabet and special characters, It should have white space after every 4 digits)
2. Write code snippets to
    a. Tokenize words and sentences.
    b. Perform stemming on the tokens present in the given sentence.
    c. Perform Lemmatization on the tokens present in the given sentence.
3. Write a program to implement the Minimum Edit Distance algorithm.
4. Design a function with the name ngram_converter() that takes in a **sentence** and '**n**' as an argument and converts it into N-grams.
5. Write a program to compute unsmoothed unigrams and bigrams.
6. Build a basic N-gram language model using trigrams of Reuters corpus. Reuters corpus is a collection of 10,788 news documents totaling 1.3 million words.
7. Run N-gram program on two different small corpora of your choice (you might use email textor newsgroups). Now compare the statistics of the two corpora. What are the differences in the most common unigrams between the two? How about interesting differences in bigrams?
8. Add an option to the above program to compute the perplexity of a test set.
9. Implement and Evaluate Naïve Bayes Model for Email Spam filtering task.
10. Implement and Evaluate Naïve Bayes Model for Sentiment Analysis task.
11. Write Python functions to calculate sigmoid, softmax, cross-entropy loss.
12. Create a sample value of Z (weighted sum as in logistic regression) and create the cross-entropy loss function plot showing plots for cost function output vs hypothesis function output (probability value).
13. Train a Text Classifier for E-mail spam detection using Logistic Regression.

14. Train a Text Classifier for Sentiment Analysis using Logistic Regression 15. Design a Sequence labelling task "Part-of-Speech tagging" using Hidden Markov Model. 16. Build a custom Named-Entity-Recognition model using any library (NLTK or spacy)

COURSE OUTCOMES:

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

CO1:	Understand the theoretical foundations of natural language processing in linguistics and formal language theory
CO2:	Analyse NLP tasks like text pre-processing, part-of-speech tagging, syntax parsing and semantic role labelling using existing algorithms and frameworks
CO3:	Apply existing mathematical models and machine learning algorithms to build NLP applications.
CO4:	Conduct experiments to implement building blocks of statistical NLP
CO5:	Evaluate language models designed to solve NLP problems

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	-	2	-	-	-	-	-	-	-	-	-	-	-	3
CO3	3	-	3	-	-	-	-	-	-	-	-	-	-	3
CO4	-	-	-	3	-	-	-	-	-	-	-	-	-	3
CO5	-	-	3	3	-	-	-	-	-	-	-	-	-	3

TEXT BOOKS:

1.	Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications

REFERENCE BOOKS:

1.	Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems, Oreilly Publishers - by Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, Harshit Surana
2.	Natural Language Processing with Python: Analysing Text with the Natural Language Toolkit. Oreilly Publishers - Stevem Bord. Ewam Klein, Edward Loper

CRYPTOGRAPHY & NETWORK SECURITY LAB

Subject Code: UGAI6P0822		L	T	P	C
III Year / II Semester		0	0	3	1.5

PRE-REQUISITES:	
➢ Familiarity with C or Java Programming	
COURSE OBJECTIVE:	
➢ The students will learn and implement the various Error correction, Detection Mechanisms, concepts of routing algorithms and implementation of various Data Link layer protocols	
Experiments	
Experiments of Cryptography:	
1	Perform encryption, decryption using the following substitution techniques • Ceaser cipher • Playfair cipher • Hill Cipher • Vigenere cipher
2.	Perform encryption and decryption using following transposition techniques • Rail fence • Row & Column Transformation
3.	Apply DES algorithm for practical applications.
4.	Apply AES algorithm for practical applications.
5.	Implement RSA Algorithm using HTML and JavaScript
6.	Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
7.	Calculate the message digest of a text using the SHA-1 algorithm.
8.	Implement the SIGNATURE SCHEME - Digital Signature Standard.
9.	Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.

COURSE OUTCOMES:

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

CO1:	Implement cryptography solution for given security problem by identifying strength and weaknesses of algorithms
CO2:	Demonstrate the generation of keys and execution of symmetric and public key algorithms from given data.
CO3:	Demonstrate the network security system using open source tools

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	-	-	3	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	3	-	-	-	-	-	-	-	-	-
CO3	3	-	-	3	3	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1.	Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, TMH, 2013.
2.	A.S. Tanenbaum, Computer Networks, 4th Edition, Pearson Education.
3.	Abraham Silberchatz, Peter B.Galcin,GregGagne,Operating System Concepts, 8th Edition, John Wiley.

REFERENCE BOOKS:

1.	Stallings, Operating systems-internals and design principles, sixth Edition, Pearson education -2009.
2.	S. Keshav, An Engineering Approach to Computer Networks- 2nd Edition, Pearson Education
3.	NeerajBhargava, Computer Network Simulation in Ns2: : Basic Concepts and Protocols Implementation, bpb publications

DEEP LEARNING LAB

Subject Code: UGAI6P0922		L	T	P	C
III Year / II Semester		0	0	3	1.5

PRE-REQUISITES:

- Understanding of programming concepts.
- Programming knowledge of python is mandatory

COURSE OBJECTIVE:

- Understand complexity of Deep Learning algorithms and their limitations
- Capable of performing experiments in Deep Learning using real-world data.
- Learn different packages or libraries of Python are used to perform Deep Learning on the dataset

Experiments

1.	Image processing Experiments. Write an application to implement Perception.
2.	Write an application to implement AND OR gates using Perception.
3.	Write an application to implement a simple neural network
4.	Write an application to implement a multi-layered neural network
5.	Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
6.	Design feed forward neural network for solving regression typeProblems. (Example: Predicting car purchase amount from car sales datasets)
7.	Design Convolution Neural Network for Image classification (use CIFAR-10 dataset for image classification)
8.	Design Convolution Neural Network for traffic sign classification (Use LeNet dataset for traffic sign images classification)
9.	Design Recurrent Neural Network with LSTM (Example: Stock price prediction)

Open Ended Experiments:

1. Implement a simple feed-forward neural network by completing the provided stub this includes:
    - I possibility to use 2-4 layers
    - I sigmoid/tanh and ReLU for the hidden layer
    - I softmax output layer
    - I optimization via gradient descent (gd)
    - I optimization via stochastic gradient descent (sgd)
    - I gradient checking code (!!!)
    - I weight initialization with random noise (!!!) (use normal distribution with changing std. deviation for now)
    - **testing some advanced ideas:**
        - I implement dropout, l2 regularization
        - I implement a different optimization scheme (rprop, rmsprop, adagrad)

COURSE OUTCOMES:

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

CO1:	Make use of the Algorithms associated with Deep learning and Deep Network architectures for Machine Learning. **[L3]**
CO2:	Determine the deep learning algorithms which are more feasible for operations in various domains. **[L4]**
CO3:	Implement deep learning models using Python libraries and train them with real- world datasets.
CO4:	Evaluate the performance of different deep learning models with respect to the overfitting and under fitting, estimation of test error. **[L5]**

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	3	-	-	-	-	-	-	-	-	3
CO2	-	3	-	-	3	-	-	-	-	-	-	-	-	3
CO3	2	2	3	-	3	-	-	-	-	-	-	3	-	3
CO4	-	-	-	2	3	-	-	-	-	-	-	3	3	3

TEXT BOOKS:

1.	Deep Learning with Python, François Chollet, Second Edition, Manning Publications,2018.
2.	Fundamentals of Deep Learning, by Nikhil Buduma ,Released June 2017, Publisher(s): O'Reilly Media, Inc.
3.	Deep Learning, Ian Goodfellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016.

Online Courses:

1.	NPTEL Course: Deep Learning for Computer Vision https://nptel.ac.in/courses/106/106/106106224/
2.	Coursera Course: Deep Learning Specialization https://www.coursera.org/specializations/deep-learning
3.	Udemy Course: Deep Learning A-Z™: Hands-On Artificial Neural Networks https://www.udemy.com/course/deeplearning/

DATA VISUALIZATION LAB

Subject Code: UGAI6P1022		L	T	P	C
III Year / I Semester		0	0	3	1.5

PRE-REQUISITES:	
➢ Basic knowledge in databases, graphs and statistics	
COURSE OBJECTIVE:	
All students will learn how to: ➢ Use all the basic functionality to visualize their data ➢ Connect to various data sources ➢ Build a variety of basic charts ➢ Combine insights into a useable dashboard ➢ Share and publish visualizations ➢ Create complex calculations and dynamic parameters ➢ Build a dashboard with powerful interactivity ➢ Produce complex chart types ➢ Real time log analysis and visualization using Splunk ➢ Apply advanced formatting and data visualization best practices	
Experiments	
1.	Installing Tableau visualization software in PC
2.	Connect to and Prepare data a. Connect to your data b. Modelling the data(Joins and Relationships) c. Setup data source d. Mange Data Sources
3.	Organize Data and Customize fields in the Data Pane
4.	Build data views from scratch a. Add visual details by dragging fields to the views b. Filter and sort data c. Showcase insights
5.	Add Interactivity using filters and actions for the visualization
6.	Build Common Chart types for the selected dataset a. Bar Chart b. Box Plot c. Area Chart d. Histogram e. Line Chart f. Scatter Plot g. Text Table h. Treemap i. Heat map

7.	Create Maps for the Geographic Data
8.	Analyize the data a. Create Groups b. Create Sets c. Create Calculated Fields d. Spot Trends e. Calculate Percentages f. Find Clusters in Data
9.	Creating a Dashboards for the selected data source a. Combining multiple views b. Linking the views c. Filtering based on one view
10.	Creating Story for the selected data source a. Steps b. Highlights c. Tell a story
11.	Create a visualization and publish in tableau public **Reporting and data visualization(Title)** OLAP Views Data warehousing (Mutli dimensional views)

COURSE OUTCOMES:

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

CO1:	Understand best practices in data visualization and storytelling to communicate accessible and meaningful insights.
CO2:	Create meaningful data visualizations, gaining experience with the iterative process of data storytelling.
CO3:	Gain experience with presenting data insights through visualizations

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	-	3	-	-	3	3	3	-	-	3	-
CO2	3	3	3	-	3	-	-	3	3	3	-	-	3	-
CO3	3	3	3	-	3	-	-	3	3	3	-	-	3	-

TEXT BOOKS:

1.	Dykes, Brent. "Data Storytelling: The Essential Data Science Skill Everyone Needs." Forbes.com. March 31, 2016.
2.	Ryan, Lindy. "Storyboarding Frame-by-Frame" in Visual Data Storytelling with Tableau. Boston, MA: Pearson Education, 2018.

REFERENCES:

1.	https://help.tableau.com/current/pro/desktop/en-us/default.htm
2.	https://www.datacamp.com/community/tutorials/data-visualisation-tableau
3.	http://Dear-Data.com
4.	http://Dear-Data-Two.com

ADVANCED COMMUNICATION SKILLS

Subject Code: UGBS6K0122		L	T	P	C
III Year / II Semester		1	0	2	2

PREREQUISITE:

- Basic competency skills in English for effective communication at work place.

COURSE OBJECTIVE:

- To expose students further to enhance their speaking skills.
- To prepare students to acquire correct body language for better oral communication.
- To prepare students to develop debatable skills, presentation as well as interview skills.

SYLLABUS:

UNIT-I :	Business E-mail Writing	(9 Hours)
UNIT-II :	Presentation skills	(9 Hours)
UNIT-III :	Group Discussion	(9 Hours)
UNIT-IV :	Resume Writing	(9 Hours)
UNIT-V :	Interviews	(9 Hours)

COURSE OUTCOMES:

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

CO1:	Develop the skill of writing business e-mails. (L3)
CO2:	Apply presentation skills for effective presentations. (L3)
CO3:	Employ various aspects of group discussion and apply in discussions. (L3)
CO4:	Develop the skill of writing resumes contextually and effectively. (L3)
CO5:	Discover techniques for various types of interview for facing career interviews. (L3)

MAPPING OF COs TO POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	-	-	-
CO5	-	-	-	-	-	-	-	-	3	3	-	-	-	-

TEXT BOOKS:

1.	Soft Skills – Key to Success in Workplace and Life – Meenakshi Raman & Shalini UpadhyayCengage publications
2.	Interact – Orient BlackSwan

REFERENCE BOOKS:

1.	Fluency Development Course – Kev Nair (Kerala)
2.	Speaking English Effectively – Krishna Mohan & N P Singh – Macmillan Indian Ltd. Group Discussion for Admissions & Jobs – Anand Ganguly – Pustak Mahal Publishers, New Delhi
3.	

INTERNET SOURCES:

1.	BBC Learning English at work: http://www.bbc.co.uk/learningenglish/features/english-at-work/18-writing-an-email
2.	Talkenglish.com: https://www.google.com/search?client=firefox-b-&q=talk+english.com Actual English – Jennifer (Video lessons)

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE
(Common to all branches)

Subject Code: UGBS6A0222	**L**	**T**	**P**	**C**
III Year / II Semester	**2**	**0**	**0**	**0**

Course Objectives:
This course offers an introduction to Indian philosophy, tradition of Indian Science and Mathematics, holistic approach to health and gender sensitization.

Syllabus:

UNIT-I: INDIAN PHILOSOPHY
Origin of Indian philosophy- philosophy of Charvaka, Samkhya, Nyaya, Mimensa, Buddist and Jaina.

UNIT-II: TRADITION OF INDIAN SCIENCE
Historical evolution of medical tradition in ancient India.
Ayurveda: Principles of Ayurvedic Healing -Treating diseases to restore health.
Environmental Knowledge: Nature, flora and fauna, Manusmriti.

UNIT-III: TRADITION OF INDIAN MATHS
Early Historical period, Classical period, Vedic mathematics, Baskaracharya, Lilavati Bijaganitha, Srinivasa Ramanujan - Magic squares.

UNIT-IV: HOLISTIC HEALTH
History, Holistic approach: Enhance living – Mind fullness skills- Spirituality and Healing, Stress Management - Food—Work and Life style.
Yoga –Healthy Body: Introduction to Yoga, - Pranayamam, Surya Namaskara and Personality Development.

UNIT-V: GENDER SENSITIZATION
Basic Gender concepts and terminology, Exploring attitudes towards Gender, Making Women, Making Men, Preparing for Womanhood.
Struggles with discrimination, Gender Roles and Relations, Gender and Human Rights, Types of Gender-based violence, Gender-based violence from a Human Rights perspective, Sexual Harassment, Gender and Media.

Course Outcomes:
Upon completion of this course, the students will be able to:
CO 1. Summarize the essence of Indian philosophy.
CO 2. Outline the tradition of Indian Science and Mathematics.
CO 3. Make use of holistic health practices, spirituality, stress management techniques for healthy life Style and Yoga practices to attain good personality.
CO 4. Develop awareness with regard to issues of gender.

Mapping of COs to POs:

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	-	3	-	-	-	-
CO2	-	-	-	-	-	3	-	-	-	-	-	3
CO3	-	-	-	-	-	3	-	-	-	-	-	3
CO4	-	-	-	-	-	3	-	3	-	-	-	-

TEXT BOOKS:

1. "Traditional Knowledge System in India" by Amit Jha, 2009.
2. "Traditional Knowledge System and Technology in India", Basanta Kumar Mohantra, Vipin Kumar Singh, Pratibha Prakashan publisher, 2012.
3. "Towards a World of Equals: A Bilingual Textbook on Gender" written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by Telugu Akademi.
4. "Gender Sensitization" by C. Rajya Lakshmi Kalyani, D.S. Vittal, published by Himalaya Publishing House Pvt. Ltd.

REFERENCES:

1. "Knowledge Traditions and Practices of India", Kapil Kapoor, Michel Danino.
2. S. Radhakrishna, Indian Philosophy, Vol. 1 (London: George Allen and Unwin,1962), 287.
3. J. P. Jain, Religion and Culture of the Jains (Delhi: Bhartiya Jnanpith, 1977) 168
4. D. P. Sen Gupta, Current Science, 78 (12), 1569 (2000)
5. C.N.Srinivasa Iyengar, History of Indian Mathematics, World Press, Calcutta, 1967.
6. G. H Hardy, Ramanujan (Cambridge, 1940).
7. Nutritive Value of Indian Foods, C.Gopalan, B.V.Raman Sastri & S.C. Balasubramanian.
8. George Feuerstein: The Yoga Tradition (Its history, literature, philosophy and practice)
9. Swami Sivananda, Practice of Karma Yoga (The Divine Life Society, Shivananda Nagar, P.O., U.P., Himalayas, India)
10. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
11. IGNOU : Gender Sensitization: Society, Culture and Change (2019) BGSE001, New Delhi IGNOU
12. Jane Pilcher and Imelda Whelehan (2005) : Fifty Key Concepts in Gender Studies