



SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)

UG Programmes CE, CSE, ECE, EEE, IT & ME are Accredited by NBA, Accredited by NAAC with A+

CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

Estd:1980

Regulation: R20		IV / IV - B.Tech. I - Semester							
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING									
SCHEME OF INSTRUCTION & EXAMINATION									
(With effect from 2021-22 admitted Batch onwards)									
Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20HS4101	Universal Human Values-2: Understanding Harmony	HS	3	3	0	0	30	70	100
#PE-III	Professional Elective -III	PE	3	3	0	0	30	70	100
#PE-IV	Professional Elective -IV	PE	3	3	0	0	30	70	100
#PE-V	Professional Elective -V	PE	3	3	0	0	30	70	100
#OE-III	Open Elective-III	OE	3	3	0	0	30	70	100
#OE-IV	Open Elective-IV	OE	3	3	0	0	30	70	100
#SOC-V	Skill Oriented Course - V	SOC	2	1	0	2	--	50	50
B20AM4117	Industrial/Research Internship 2 Months	PR	3	--	--	--	--	50	50
TOTAL			23	19	0	2	180	520	700

	Course Code	Course
#PE-III	B20AM4101	Robotic Process Automation
	B20CS4101	Cloud Computing
	B20AM4102	Big Data Analytics
	B20AM4103	NoSQL Databases
	B20AM4104	Natural Language Processing with Deep Learning Applications
#PE-IV	B20AM4105	Reinforcement Learning
	B20AM4106	Soft Computing
	B20AM4107	Cryptography and Network Security
	B20AM4108	Block Chain Technologies
	B20AM4109	Speech Processing
#PE-V	B20AM4110	Social Network Analysis
	B20AM4111	Recommender Systems
	B20AM4112	AI Chatbots
	B20AM4113	Object Oriented Analysis and Design
	B20AM4114	Video Analytics
#SOC-V	B20AM4115	Programming with Go
	B20AM4116	MEAN Stack Technologies-Module II - MongoDB, Node JS and Express JS
#OE-III & #OE-IV	Student has to study one Open Elective each from OE-III & IV offered by CE or ECE or EEE or ME or S&H from the list enclosed.	

Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS4101	HS	3	--	--	3	30	70	3 Hrs.

UNIVERSAL HUMAN VALUES-2: UNDERSTANDING HARMONY

(Common to AIDS, AIML, CSBS, CSG, CSE, IT & ME)

Course Objectives:

1.	To enable students appreciate the essential complementarity between 'Values' and 'Skills' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2.	To understand the harmony in the human being, family, society and nature/existence
3.	To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Value based living in a natural way.

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

S.No	Outcome	Knowledge Level
1.	Identify the importance of human values and skills for sustained happiness	K2
2.	Understand how to balance profession and personal happiness/ goals.	K2
3.	Express their commitment towards what they have understood (human values, human relationship and human society)	K2
4.	Explain the significance of trust, mutually satisfying human behavior and enriching interaction with nature.	K2
5.	Develop/ propose appropriate technologies and management patterns to create harmony in professional and personal life.	K3

SYLLABUS

UNIT-I (10 Hrs)	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Purpose and motivation for the course, recapitulation from Universal Human Values-I Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfil the above human aspirations: understanding and living in harmony at various levels.
UNIT-II (08 Hrs)	Understanding Harmony in the Human Being - Harmony in Myself! Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’ Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility Page 29 of 43 Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer) Understanding the characteristics and activities of ‘I’ and harmony in ‘I’ Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs,

	meaning of Prosperity in detail; Programs to ensure Sanyam and Health.
UNIT-III (08 Hrs)	Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship Understanding the meaning of Trust; Difference between intention and competence Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
UNIT-IV (08 Hrs)	Understanding Harmony in the Nature and Existence - Whole existence as Coexistence Understanding the harmony in the Nature Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature Understanding Existence as Co-existence of mutually interacting units in all pervasive space Holistic perception of harmony at all levels of existence.
UNIT-V (08 Hrs)	Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values Definitiveness of Ethical Human Conduct Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
Textbooks:	
1.	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
Reference Books:	
1.	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3.	The Story of Stuff (Book).
4.	The Story of My Experiments with Truth
5.	Small is Beautiful E. F Schumacher by Mohandas Karamchand Gandhi
6.	Slow is Beautiful Cecile Andrews
7.	Economy of Permanence J C Kumarappa
8.	Bharat Mein Angreji Raj Pandit Sunderlal

9.	Rediscovering India by Dharampal Hind Swaraj or Indian Home
10.	Rule by Mohandas K. Gandhi
11.	India Wins Freedom Vivekananda Maulana Abdul Kalam Azad 12Romain Rolland (English)



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4101	PE	3	--	--	3	30	70	3 Hrs.

ROBOTIC PROCESS AUTOMATION

(Common to AIML and CSD)

Course Objectives:

1. Understand the Fundamentals of Robotic Process Automation (RPA)
2. Expertise in utilizing UI Path and managing control flows
3. Get proficiency in Advanced Automation Techniques and Exception Handling.

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

S. No	Outcome	Knowledge Level
1.	Interpret concepts and applications of RPA	K2
2.	Use RPA tool to manipulate text data.	K3
3.	Apply Image, Text and Data Tables Automation techniques.	K3
4.	Illustrate handling of User Events & Assistant Bots and Exceptions	K2
5.	Demonstrate the deployment and maintenance of a bot	K3

SYLLABUS

UNIT-I (10Hrs)	<p>Introduction to Robotic Process Automation: Scope and techniques of automation, Robotic process automation, what is RPA, what can RPA do, Benefits of RPA, Components of RPA, RPA platforms, The future of automation.</p> <p>RPA Basics: RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads which can be automated, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, Process Design Document/Solution Design Document, Industries best suited for RPA, Risks & Challenges with RPA, RPA and emerging ecosystem.</p>
UNIT-II (12 Hrs)	<p>RPA Tool Introduction and Basics:</p> <p>Introduction to RPA Tool: The User Interface, Variables, Managing Variables, Naming Best Practices, The Variables Panel, Generic Value Variables, Text Variables, True or False Variables, Number Variables, Array Variables, Date and Time Variables, Data Table Variables, Managing Arguments, Naming Best Practices, The Arguments Panel, Using Arguments, About Imported Namespaces, Importing New Namespaces, Control Flow, Control Flow Introduction, If Else Statements, Loops, Advanced Control Flow, Sequences, Flowcharts, About Control Flow, Control Flow Activities, The Assign Activity, The Delay Activity, The Do While Activity, The If Activity, The Switch Activity, The While Activity, The For</p>

	Each Activity, The Break Activity. Data Manipulation: Introduction to Data Manipulation, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data.
UNIT-III (12 Hrs)	Advanced Automation Concepts & Techniques: Recording Introduction, Basic and Desktop Recording, Web Recording, Input/ Output Methods, Screen Scraping, Data Scraping, scraping advanced techniques, Selectors, Defining and Assessing Selectors, Customization, Debugging, Dynamic Selectors, Partial Selectors, RPA Challenge, Image. Introduction to Image & Text Automation: Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, using tab for Images, Starting Apps, Excel Data Tables & PDF, Data Tables in RPA, Excel and Data Table basics, Data Manipulation in excel, Extracting Data from PDF, Extracting a single piece of data, Anchors, Using anchors in PDF.
UNIT-IV (8 Hrs)	Handling User Events & Assistant Bots, Exception Handling: What are assistant bots, Monitoring system event triggers, Hotkey trigger, Mouse trigger, System trigger, an example of monitoring email. Exception Handling: Debugging and Exception Handling, Debugging Tools, Strategies for solving issues, Catching errors.
UNIT-V (8 Hrs)	Deploying and Maintaining the Bot: Publishing using publish utility, Creation of Server, Using Server to control the bots, Creating a provision Robot from the Server, Connecting a Robot to Server, Deploy the Robot to Server, Publishing and managing updates, Managing packages, Uploading packages, Deleting packages.
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Textbooks:	
1.	Alok Mani Tripathi, “Learning Robotic Process Automation”, Packt Publishing, 2018.
Reference Books:	
1.	RPA Design and Development V 4.0 Student Manual.
2.	Frank Casale, Rebecca Dilla, Heidi Jaynes, Lauren Livingston, “Introduction to Robotic Process Automation: a Primer”, Institute of Robotic Process Automation, 1st Edition 2015.
3.	Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant”, Independently Published, 1st Edition 2018.
4.	Lim Mei Ying, “Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes”, Packt Publishing, 1st Edition 2018.
e-Resources	
1.	What is Robotic Process Automation - RPA Software UiPath

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4101	PE	3	--	--	3	30	70	3 Hrs.

CLOUD COMPUTING

(Common to CSE, AIML and CSD)

Course Objectives:

1	Fundamentals of Cloud Computing, Concepts of Virtualization and the Cloud delivery and Deployment Models.
2	To introduce the various levels of services that can be achieved by cloud.
3	To motivate students to do programming and experiment with the various cloud computing environments.
4	Common types of persistent storage devices, Cloud computing software security objectives, design principles and development practices.
5	To motivate students to do programming and experiment with the various cloud computing environments.

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

S. No	OUTCOME	Knowledge Level
1	Summarize concepts for state-of-the-art cloud computing.	K2
2	Explain how virtualization technology enabling cloud computing.	K2
3	Use algorithms for cloud resource management and scheduling.	K3
4	Describe storage system architectures and security fundamentals for cloud applications.	K2
5	Determine suitable host provider for cloud applications development.	K3

SYLLABUS

UNIT-I (10 Hrs)	Introduction to Cloud Computing , Meaning of Cloud and History, Evolution of Cloud Computing, Cloud essential Characteristics, Cloud Computing Architecture: Cloud Service Models/Types (i.e., Public, Private, Hybrid, and Community), Cloud deployment models (i.e., IaaS, PaaS, SaaS, and PaaS), System models for Distributed and Cloud Computing, Service Oriented Architecture, Performance, Security and Energy Efficiency
UNIT-II (10 Hrs)	Cloud Enabling Technologies: Implementation Levels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.
UNIT-III (10 Hrs)	Cloud Resource Management and Scheduling: Policies and Mechanisms for Resource Management, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized

	Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.
UNIT-IV (10 Hrs)	Storage Systems: Evolution of storage technology, storage models, File systems and database, distributed file systems, general parallel file systems. Google file system. Cloud Computing Software Security Fundamentals: Cloud Information Security Objectives, Confidentiality, Integrity, Availability, Cloud Security Services, Secure Cloud Software Requirements.
UNIT-V (10 Hrs)	Cloud Technologies and Advancements: Hadoop: MapReduce, Programming on Amazon AWS and Microsoft Azure, Google App Engine and Programming Environment for Google App Engine, Federation in the Cloud: Four Levels of Federation Federated Services and Applications, Future of Federation.
TEXT BOOK:	
1.	Distributed and Cloud Computing, Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra MK Elsevier.
2.	Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
REFERENCE BOOKS:	
1.	Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
2.	Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
3.	Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH

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AUTONOMOUS

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4102	PE	3	--	--	3	30	70	3 Hrs.
BIG DATA ANALYTICS								
(For AIML)								
Course Objectives:								
1	Optimize business decisions and create competitive advantage with Big Data Analytics							
2	Analyze the big data using intelligent techniques.							
3	Introduce programming tools PIG & HIVE in the Hadoop ecosystem							
Course Outcomes: Upon completion of the course, the students will be able to								
S. No	Outcome							Knowledge Level
1	Explain the characteristics of big data and its application areas.							K2
2	Use HDFS and Map Reduce to store and process the big data.							K3
3	Apply Map reduce functions to analyze big data.							K3
4	Use Pig for efficient big data processing.							K3
5	Use HIVE for data querying and management with HIVEQL, HBase, and ZooKeeper							K3
SYLLABUS								
UNIT-I (08 Hrs)	<p>Introduction to Big Data: Big data definition, Characteristics of big data, Importance of big data, Patterns for big data development.</p> <p>Introduction Hadoop: What is Hadoop? Google File System, understanding distributed systems and Hadoop, Comparing SQL databases and Hadoop, Understanding MapReduce.</p>							
UNIT-II (10 Hrs)	<p>Starting Hadoop: The building blocks of Hadoop, Design of HDFS, Anatomy of a File Read, Anatomy of a File Write, Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), HDFS Basic file commands.</p> <p>MapReduce: Anatomy of a MapReduce program, Hadoop data types, Mapper, reducer, Partitioner, Combiner, Yarn.</p>							
UNIT-III (10 Hrs)	<p>Writing MapReduce Programs: Constructing the basic template of a MapReduce program, Hadoop API for MapReduce Framework (Old and New), Basic map reduce program (word count), MapReduce programs based on Patent data, weather data.</p> <p>Advance MapReduce: Chaining MapReduce jobs, joining data from different sources, Creating a Bloom filter.</p>							
UNIT-IV (08 Hrs)	<p>Pig: Introduction to Pig, Pig Architecture, installation of Pig, Running Pig, Data types and schemas, Expressions, and functions, Relational operators, user-defined functions, scripts.</p>							

UNIT-V (08 Hrs)	HIVE: Introduction to HIVE, HIVE Architecture, Installation of HIVE, HIVEQL, Example Quires Based on DDL, DML. Fundamentals of HBase and ZooKeeper.
Textbooks:	
1.	Hadoop in Action by Chuck Lam, MANNING Publ
2.	Tom White, “Hadoop: The Definitive Guide”, Third Edition, O’reilly Media, Fourth Edition, 2015.
3.	Understanding Big Data by Chris Eaton, Dirk Deroos, Tom Deutsch, George Lapis and Paul Zikopoulos
Reference Books:	
1.	Hadoop in Practice by Alex Holmes, MANNING Publ.
2.	Hadoop MapReduce Cookbook, SrinathPerera, ThilinaGunarathne
E-Resources:	
1.	Hadoop: http://hadoop.apache.org/
2.	Hive: https://cwiki.apache.org/confluence/display/Hive/Home
3.	Piglatin: http://pig.apache.org/docs/r0.7.0/tutorial.html



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4103	PE	3	--	--	3	30	70	3 Hrs.

NoSQL DATABASES

(Common to AIML and CSD)

Course Objectives:

1.	Define, compare and use the four types of NoSQL Databases (Document-oriented, Key-Value Pairs, Column-oriented and Graph).
2.	Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
3.	Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.

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

S.No	Outcome	Knowledge Level
1.	Explain Aggregate Data Models	K2
2.	Use distribution models for handling data replication and consistency	K3
3.	Apply key-value features for databases by considering suitable use cases	K3
4.	Use document and column-family features for databases	K3
5.	Model graph and schemaless databases	K3

SYLLABUS

UNIT-I (10Hrs)	Why NoSQL, The Value of Relational Databases, Impedance Mismatch, Application and Integration Databases, Aggregate Data Models; Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases.
UNIT-II (10 Hrs)	Distribution Models: Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication. Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums.
UNIT-III (10 Hrs)	What Is a Key-Value Store, Key-Value Store Features, Suitable Use Cases, Storing Session Information, User Profiles, Preference, Shopping Cart Data, When Not to Use, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets
UNIT-IV (10 Hrs)	Document Databases, What Is a Document Database, Features, Suitable Use Cases, When Not to Use, what is Column-Family Data Store, Features, Suitable use cases, when not to use

UNIT-V (10 Hrs)	Graph Databases, What Is a Graph Database, Features, Suitable Use Cases, Connected Data, Routing, Dispatch and Location-Based Services, Recommendation Engines, When Not to Use, Schema changes in RDBMS, Schema changes in a NOSQL Data Store
Textbooks:	
1.	Sadalage, P. & Fowler, No SQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addison Wesley, 2012
Reference Books:	
1.	Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN13: 978-9332557338)
2.	Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022)
3.	Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694)
e-Resources	
1.	https://www.coursera.org/learn/introduction-to-nosql-databases



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4104	PE	3	--	--	3	30	70	3 Hrs.
NATURAL LANGUAGE PROCESSING WITH DEEP LEARNING APPLICATIONS								
(For AIML)								
Course Objectives:								
1.	To introduce the fundamental techniques of text processing including regular expressions, text normalization, and edit distance algorithms.							
2.	To teach the principles and practices of building and evaluating n-gram language models and to develop skills in sequence labeling for part-of-speech tagging and named entity recognition.							
3.	To enable students to utilize state-of-the-art transformer and Large Language models for various NLP tasks							
4.	To explore the application of language models in improving the performance of QA systems and understanding classic QA models.							
Course Outcomes: Upon completion of the course, the students will be able to								
S.No	Outcome	Knowledge Level						
1.	Apply text Normalization and Edit Distance techniques for a given text.	K3						
2.	Apply n-gram language models for sampling sentences.	K3						
3.	Use sequence labeling techniques to perform part-of-speech tagging and named entity tagging.	K3						
4.	Illustrate word sense disambiguation techniques using contextual embeddings.	K2						
5.	Apply transformer and large language models to perform NLP tasks such as text generation.	K3						
6.	Use encoder-decoder models and information retrieval techniques to solve NLP applications.	K3						
SYLLABUS								
UNIT-I (8Hrs)	Introduction, Regular Expressions, Text Normalization, Edit Distance: Words, Corpora, Text Normalization, Word Normalization, Lemmatization and Stemming, Sentence Segmentation, The Minimum Edit Distance Algorithm.							
UNIT-II (10 Hrs)	N-gram Language Models: N-Grams, Evaluating Language Model, Sampling sentences from a language model, Sequence Labeling for Parts of Speech and Named Entities: Part-of-Speech Tagging, Named Entities and Named Entity Tagging							

UNIT-III (10 Hrs)	Word Senses and WordNet: Word Senses, Relations Between Senses, WordNet: A Database of Lexical Relations, Word Sense Disambiguation, WSD Algorithm: Contextual Embeddings
UNIT-IV (12 Hrs)	Transformers and Large Language Models: The Transformer: A Self-Attention Network, Multihead Attention, Transformer Blocks, The Residual Stream view of the Transformer Block, The input: embedding's for token and position, The Language Modeling Head, Large Language Models with Transformers
UNIT-V (10 Hrs)	NLP Applications: Machine Translation: Language Divergences and Typology, Machine Translation using Encoder-Decoder, Details of the Encoder-Decoder Model, Decoding in MT: Beam Search Question Answering and Information Retrieval: Information Retrieval, Information Retrieval with Dense Vectors
Textbooks:	
1.	Speech and Language Processing, Dan Jurafsky and James H. Martin (Stanford.edu), 3rd Edition, Pearson Publications
2.	Natural Language Processing in Action, Understanding, Analysing, and Generating Text with Python, Hobson Lane, Cole Howard, Hannes Max Hapke
Reference Books:	
1.	Natural Language Processing with Python, Analyzing Text with the Natural Language Toolkit, Steven Bird, Ewan Klein, and Edward Loper
2.	Practical Natural Language Processing: A Comprehensive Guide to Building RealWorld NLP Systems, Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, Harshit Surana
3.	Foundations of Statistical Natural Language Processing, Christopher Manning and Hinrich Schütze
4.	The Handbook of Computational Linguistics and Natural Language Processing, (Blackwell Handbooks in Linguistics), 1st Edition
e-Resources	
1.	https://nptel.ac.in/courses

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4105	PE	3	--	--	3	30	70	3 Hrs.

REINFORCEMENT LEARNING

(Common to AIML, CSD)

Course Objectives:

- Learn various approaches to solve decision problems with functional models and algorithms for task formulation, Tabular based solutions, Function approximation solutions, policy gradients and model based reinforcement learning.

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

S. No	Outcome	Knowledge Level
1.	Apply Reinforcement learning principles to solve the sequential decision-making problems and multi-armed bandit problems	K3
2.	Apply concepts of finite Markov decision processes and dynamic programming to evaluate and optimize decision-making policies	K3
3.	Use Monte Carlo and Temporal Difference learning methods for optimal decision-making in reinforcement learning tasks.	K3
4.	Apply n-step bootstrapping and eligibility traces techniques within the framework of temporal difference learning for reinforcement learning problems.	K3
5.	Explain policy approximation techniques and applications of reinforcement learning.	K2

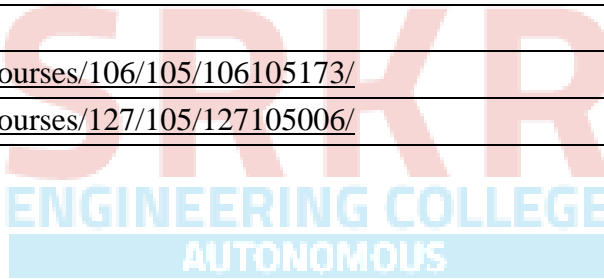
SYLLABUS

UNIT-I (10Hrs)	<p>Introduction: Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and Scope, An Extended Example: Tic-Tac-Toe</p> <p>Multi-armed Bandits: A k-armed Bandit Problem, Action-value methods, The 10-armed Testbed, Incremental Implementation, Tracking a Nonstationary Problem, Optimistic Initial Values, Upper Confidence-Bound Action Selection</p>
UNIT-II (12 Hrs)	<p>Finite Markov Decision Process: The Agent-Environment Interface, Goals and Rewards, Returns and Episodes, Unified Notation for Episodic and Continuing Tasks, Policies and Value Functions, Optimal Policies and Optimal Value Functions</p> <p>Dynamic Programming: Policy Evaluation, Policy Improvement, Policy Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiency of Dynamic Programming</p>
UNIT-III (12 Hrs)	<p>Monte Carlo Methods: Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Incremental Implementation, Off-policy Monte Carlo Control</p> <p>Temporal Difference Learning: TD Prediction, Advantages of TD Prediction Methods,</p>

	Optimality of TD(0), Sarsa: On-policy TD Control, Q-Learning: Off-policy TD Control, Expected Sarsa, Maximization Bias and Double Learning
UNIT-IV (8 Hrs)	n-step Bootstrapping: n-step TD Prediction, n-step Sarsa, n-step Off-policy Learning, Per-decision methods with Control Variables, The n-step Tree Backup Algorithm Eligibility Traces: The λ -return, TD(λ), n-step Truncated λ -return methods
UNIT-V (8 Hrs)	Policy Gradient Methods: Policy Approximation and its Advantages, The Policy Gradient Theorem, REINFORCE: Monte Carlo Policy Gradient, REINFORCE with Baseline, Actor-Critic Methods Applications and Case Studies: TD-Gammon, Samuel's Checkers Player, Optimizing Memory Control, Personalized Web Services
Textbooks:	
1.	R. S. Sutton and A. G. Bart., "Reinforcement Learning - An Introduction," Second Edition, MIT Press, 2020.
Reference Books:	
1.	Szepesvári, Csaba, "Algorithms for Reinforcement Learning," United States: Morgan & Claypool, 2010.
2.	Puterman, Martin L., "Markov Decision Processes: Discrete Stochastic Dynamic Programming," Germany: Wiley, 2014.
e-Resources	
1.	https://onlinecourses.nptel.ac.in/noc20_cs74/preview
2.	https://www.coursera.org/learn/fundamentals-of-reinforcement-learning

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4106	PE	3	--	--	3	30	70	3 Hrs.
SOFT COMPUTING								
(For AIML)								
Course Objectives:								
1.	In the course the student will Learn soft computing concepts and techniques and foster their abilities in designing and implementing soft computing-based solutions for real-world problems.							
Course Outcomes: Upon completion of the course, the students will be able to								
S.No	Outcome							Knowledge Level
1.	Apply fuzzy set theory and fuzzy inference systems to model and solve complex decision-making problems with uncertainty.							K3
2.	Explain derivative-based and derivative-free optimization techniques to solve complex optimization problems							K2
3.	Use knowledge representation and heuristic search techniques for effective reasoning and problem-solving							K3
4.	Apply adaptive neuro-fuzzy inference systems to integrate fuzzy logic and neural networks for enhanced pattern recognition and decision-making.							K3
5.	Apply computational intelligence to predict and solve diverse problems including character recognition, kinematics, automobile efficiency, and color recipe development							K3
SYLLABUS								
UNIT-I (10Hrs)	Fuzzy Set Theory: Introduction to Neuro – Fuzzy and Soft Computing, Fuzzy Sets, Basic Definition and Terminology, Set-theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations. Fuzzy Inference Systems, Mamdani Fuzzy Models, Sugeno Fuzzy Models.							
UNIT-II (10 Hrs)	Optimization: Derivative based Optimization, Descent Methods, The Method of Steepest Descent, Classical Newton’s Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms.							
UNIT-III (10 Hrs)	Artificial Intelligence: Introduction, Knowledge Representation, Reasoning, Issues and Acquisition: Propositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning, Heuristic Search: Techniques for Heuristic search Heuristic Classification.							

UNIT-IV (10 Hrs)	Neuro-Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems, Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN, Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum.
UNIT-V (10 Hrs)	Applications Of Computational Intelligence: Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction, Soft Computing for Color Recipe Prediction.
Textbooks:	
1.	J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004
2.	N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2006.
Reference Books:	
1.	Computational Intelligence: A Logical Approach" by David L. Poole and Alan K. Mackworth Published by Oxford University Press, New York 1998.
2.	"Fuzzy Logic with Engineering Applications" by Timothy J. Ross Copyright © 2010 John Wiley & Sons, Ltd
e-Resources	
1.	https://archive.nptel.ac.in/courses/106/105/106105173/
2.	https://archive.nptel.ac.in/courses/127/105/127105006/



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4107	PE	3	--	--	3	30	70	3 Hrs.

CRYPTOGRAPHY AND NETWORK SECURITY

(For AIML)

Course Objectives:

1.	A more comprehensive understanding of cryptography and its significance in Network Security.
2.	Working principles and utilities of various cryptographic algorithms including symmetric key Cryptography and public key cryptography algorithms.
3.	Design issues and working principles of hashing, message digest algorithms and various Authentication protocols.
4.	Various secure communication protocols standards and Concepts of firewalls.

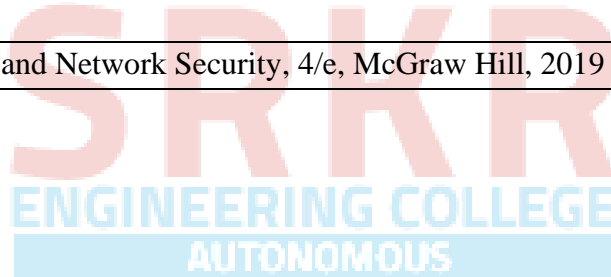
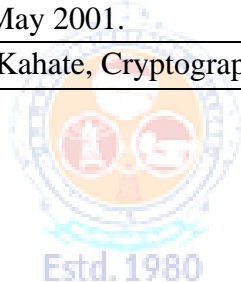
Course Outcomes: Upon completion of the course, the students will be able to

S. No	Outcome	Knowledge Level
1.	Explain Information Security goals, classical encryption techniques and principles of block ciphers.	K2
2.	Apply different encryption and decryption techniques to solve problems related to confidentiality.	K3
3.	Apply cryptographic hash functions and the message digest algorithms to verify integrity and authentication.	K3
4.	Describe various network security protocols.	K2
5.	Compare different system security firewalls.	K2

SYLLABUS

UNIT-I (10Hrs)	<p>Introduction to Cryptography: Security Attacks, Services & Mechanisms, Symmetric Cipher Model, Substitution and Transposition Techniques.</p> <p>Block Ciphers: Traditional Block Cipher Structure, Block Cipher Design Principles.</p>
UNIT-II (10 Hrs)	<p>Symmetric Cryptography: Block Cipher Design Principles, Data Encryption Standards, Advanced Encryption Standard, Triple DES, IDEA, Block Cipher Modes of Operation.</p> <p>Public Key Cryptography: Principles, Public Key Cryptography Algorithms, Euler's Theorem, RSA Algorithm, Diffie-Hellman Key Exchange.</p>
UNIT-III (10 Hrs)	<p>Cryptographic Hash Functions: Application of Cryptographic Hash Functions, SHA and MD5 Algorithms, Message Authentication Functions, HMAC & CMAC.</p> <p>Digital Signatures: DSS, DSS with RSA.</p> <p>Key Management: ISAKMP, Oakley Key management.</p>

UNIT-IV (10 Hrs)	User Authentication: Remote User Authentication Principles, Kerberos. Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME. Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS).
UNIT-V (10 Hrs)	IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload. Firewalls: Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration, Trusted Systems
Textbooks:	
1.	Cryptography and Network Security – Principles and Practice, William Stallings, 7/e. Pearson Education, 2017.
2.	Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyaya, McGrawHill, 3rd Edition, 2015.
Reference Books:	
1.	Neal Koblitz, A Course in Number Theory and Cryptography: Springer- Verlag, New York Inc. May 2001.
2.	Atul Kahate, Cryptography and Network Security, 4/e, McGraw Hill, 2019



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4108	PE	3	--	--	3	30	70	3 Hrs.
BLOCK CHAIN TECHNOLOGIES								
(Common to AIML and CSD)								
Course Objectives:								
1.	Understand how blockchain systems (mainly Bitcoin and Ethereum) work and to securely interact with them.							
2.	Design, build, and deploy smart contracts and distributed applications,							
3.	Integrate ideas from blockchain technology into their own projects.							
Course Outcomes Upon completion of the course, the students will be able to								
S. No	Outcome							Knowledge Level
1.	Explain the fundamental concepts of the block chain technology							K2
2.	Summarize Blockchain concepts and the risks involved in building its application							K2
3.	Determine various blockchain solutions for designing applications							K3
4.	Apply concepts of Ethereum for implementing Blockchain							K3
5.	Describe the concept of Hyperledger used for different usecases							K2
SYLLABUS								
UNIT-I (10Hrs)	Introduction, Scenarios, Challenges Articulated Block chain, Block chain Characteristics, Opportunities Using Block chain, History of Block chain, Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Block chain Evolution, Consortia, Forks, Public Block chain Environments, Type of Players in Block chain Ecosystem, Players in Market.							
UNIT-II (10 Hrs)	Block chain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on block chain data storage on block chain, wallets, coding on block chain: smart contracts, peer-to-peer network, types of block chain nodes, risk associated with block chain solutions, life cycle of block chain transaction.							
UNIT-III (10 Hrs)	Architecting Block chain solutions: Introduction, Obstacles for Use of Block chain, Block chain Relevance Evaluation Framework, Block chain Solutions Reference Architecture, Types of Block chain Applications, Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Block chain Solutions, Architecture Considerations, Architecture with Block chain Platforms, Approach for Designing Block chain Applications.							

UNIT-IV (10 Hrs)	Ethereum Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Infura, Ether scan, Ethereum Clients, Decentralized Application, Meta mask. Tuna Fish Use Case Implementation, Open Zeppelin Contracts
UNIT-V (10 Hrs)	Hyper ledger Block chain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyper ledger Fabric, Hyper ledger Fabric Transaction Flow, Fab Car Use Case Implementation, Invoking Chain, code Functions Using Client Application.
Textbooks:	
1.	Ambadas, Arshad Sarfarz Ariff, Sham “Block chain for Enterprise Application Developers”, Wiley, 2020
2.	Andreas M. Antonopoulos, “Mastering Bitcoin: Programming the Open Block chain” , O’Reilly, 2017
Reference Books:	
1.	Block chain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
2.	Block chain: Blueprint for a New Economy, Melanie Swan, O’Reilly
e-Resources	
1.	https://www.coursera.org/specializations/blockchain
2.	https://www.coursera.org/learn/blockchain-basics
3.	https://onlinecourses.nptel.ac.in/noc22_cs44/preview

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4109	PE	3	--	--	3	30	70	3 Hrs.

SPEECH PROCESSING

(For AIML)

Course Objectives:

1. To understand the basic principles of sound and speech production and perception, speech recognition, synthesis and dialogue systems
2. To understand how to expand a periodic function in a Fourier series.

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

S.No	Outcome	Knowledge Level
1.	Explain the Fundamentals of Digital Speech Processing	K2
2.	Apply speech signals in Time Domain and frequency domain for Speech Processing	K3
3.	Use Linear Predictive Coding for speech analysis	K3
4.	Use Machine Learning Models for speech processing	K3
5.	Apply Automatic Speech & Speaker Recognition models	K3

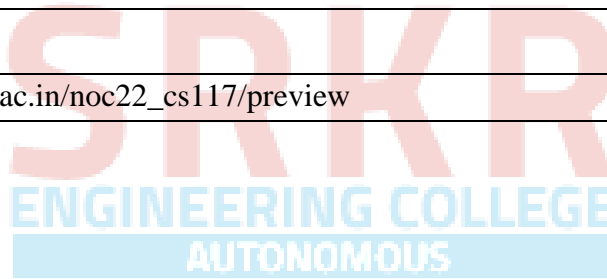
SYLLABUS

UNIT-I (8 Hrs)	Fundamentals of Digital Speech Processing: Anatomy & Physiology of Speech Organs, The process of Speech Production, Acoustic Phonetics, Articulatory Phonetics, The Acoustic Theory of Speech Production- Uniform lossless tube model, effect of losses in vocal tract.
UNIT-II (12 Hrs)	Time Domain & Frequency Domain Models for Speech Processing: Introduction-Window considerations, Short time energy and average magnitude Short time average zero crossing rate, Speech Vs Silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function. Review of DSP techniques, Time and frequency domain analysis, ztransform, Discrete Fourier transform, short-time analysis of speech, spectrograms, Segmental analysis of speech, Cepstral analysis, Mel frequency cepstral coefficients (MFCC).
UNIT-III (10 Hrs)	Linear Predictive Coding (LPC) Analysis: Basic principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

UNIT-IV (10 Hrs)	Machine learning models for speech processing: Traditional Approaches: Dynamic time warping (DTW), Gaussian mixture models (GMM), Neural network models, Support vector machines State of the Art Models: Deep Neural Networks, LSTM Recurrent neural networks, Convolutional neural networks, Reinforcement learning. Speech Enhancement: Nature of interfering sounds, Speech enhancement techniques: Single Microphone Approach : spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi microphone Approach.
UNIT-V (10 Hrs)	Automatic Speech & Speaker Recognition: Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated digit Recognition System, Continuous digit Recognition System. Hidden Markov Model (HMM) for Speech: Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS. Speaker Recognition: Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System.
Textbooks:	
1.	L.R. Rabiner and S. W. Schafer, “Digital Processing of Speech Signals”, Pearson Education.
2.	Douglas O’Shaughnessy, “Speech Communications: Human & Machine”, 2nd Ed., Wiley India, 2000.
3.	L.R Rabinar and R W Jhaung, “Digital Processing of Speech Signals”, 1978, Pearson Education.
Reference Books:	
1.	Thomas F. Quateri, “Discrete Time Speech Signal Processing: Principles and Practice”, 1st Edition., PE, 1980
2.	Ben Gold & Nelson Morgan, “Speech & Audio Signal Processing”, 1st Edition, Wiley
e-Resources	
1.	https://onlinecourses.nptel.ac.in/noc22_ee117/preview

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4110	PE	3	--	--	3	30	70	3 Hrs.
SOCIAL NETWORK ANALYSIS								
(Common to AIML and CSD)								
Course Objectives:								
1.	To understand the levels of SNA and network growth and rank models							
2.	To understand cascade behaviour in networks							
Course Outcomes Upon completion of the course, the students will be able to								
S.No	Outcome							Knowledge Level
1.	Describe the levels of SNA and Network measures							K2
2.	Illustrate various network growth models and rank models							K2
3.	Apply different community structures and link prediction models.							K3
4.	Illustrate cascade prediction and anomaly detection in social networks							K2
5.	Apply graph representation learning methods to address real-world problems							K3
SYLLABUS								
UNIT-I (10Hrs)	Introduction: Introduction, Applications, Preliminaries, Three Levels of Social Network Analysis, Historical Development, Graph Visualization Tools Network Measures: Network Basics, Node Centrality, Assortativity, Transitivity and Reciprocity, Similarity, Degeneracy							
UNIT-II (10 Hrs)	Network Growth Models: Properties of real world networks, Random network model, Ring lattice network model, Watts-Strogatz Model, Preferential Attachment Model, Price's Model, Local-world Network Growth Model Link Analysis: Applications, Signed Networks, Strong and Weak Ties, Link Analysis and Algorithms, Page Rank, Personalized Page Rank, DivRank, SimRank, PathSim							
UNIT-III (10 Hrs)	Community Structure in Networks: Applications, Types of Communities, Community Detection Methods, Disjoint Community Detection, Overlapping Community Detection, Local Community Detection, Community Detection vs Community Search, Evaluation of Community Detection Methods Link Prediction: Applications, Temporal Changes in a Network, Problem Definition Evaluating Link Prediction Methods, Heuristic Models, Probabilistic Models, Supervised Random Walk, Information-theoretic Model							

UNIT-IV (10 Hrs)	Cascade Behaviours and Network Effects: Preliminaries, Cascade Model, Case Study, Probabilistic Cascades, Epidemic Models, Independent Cascade Models, Cascade Prediction Anomaly Detection in Static Networks: Outliers vs. Network-based Anomalies, Challenges, Anomaly Detection in Static Networks
UNIT-V (10 Hrs)	Graph Representation Learning: Machine Learning Pipelines, Intuition behind Representation Learning, Benefits, Criterion of GRL, GRL Pipelines, Representation Learning Methods Applications and Case Studies: Malicious Activities on OSNs, Sockpuppets in OSNs, Modeling the Spread of COVID-19, Recommender System
Textbooks:	
1.	Social Network Analysis, Tanmoy Chakraborty, Wiley, 2021
Reference Books:	
1.	Network Science, Albert-Lazzlo Barabasi
2.	Social Network Analysis: methods and Applications, Stanley Wasserman, Katherine Faus
e-Resources	
1.	https://onlinecourses.nptel.ac.in/noc22_cs117/preview



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4111	PE	3	--	--	3	30	70	3 Hrs.

RECOMMENDER SYSTEMS

(Common to AIML & CSD)

Course Objectives:

To develop expertise in designing, implementing, and evaluating diverse recommender systems using collaborative filtering, supervised models, knowledge-based and content-based techniques.

Course Outcomes: On completion of the course the students will be able to:

S. No.	Outcome	Knowledge Level
1.	Interpret the types of recommender systems and their applications.	K2
2.	Use Neighbourhood-based collaborative filtering methods for building recommender systems.	K3
3.	Apply supervised models and Latent Factor Models for implementing recommender systems.	K3
4.	Illustrate content-based and knowledge-based techniques for building recommender systems.	K2
5.	Describe paradigms, goals, design issues and metrics for recommender system evaluation.	K2

SYLLABUS

UNIT-I (10Hrs)	An Introduction to Recommender Systems: Goals of Recommender Systems, Basic Models of Recommender Systems, Collaborative Filtering Models, Content-Based Recommender Systems, Knowledge-Based Recommender Systems, Domain-Specific Challenges in Recommender Systems, Advanced Topics and Applications.
UNIT-II (10 Hrs)	Neighborhood-based Collaborative Filtering: Key Properties of Ratings Matrices, Predicting Ratings with Neighborhood-Based Methods, Clustering and Neighborhood-Based Methods, Dimensionality Reduction and Neighborhood Methods, Graph Models for Neighborhood-Based Methods.
UNIT-III (10 Hrs)	Model-Based Collaborative Filtering: Decision and Regression Trees, Rule-Based Collaborative Filtering, Naïve Bayes Collaborative Filtering, Using an Arbitrary Classification Model as a Black-box, Latent Factor Models: Singular Value Decomposition, Non-negative Matrix Factorization

UNIT-IV (10 Hrs)	Content-Based Recommender Systems: Basic Components of Content-Based Systems, Preprocessing and Feature Extraction, Learning User Profiles and Filtering, Content-Based Versus Collaborative Recommendations. Knowledge-Based Recommender Systems: Introduction, Constraint-Based Recommender Systems
UNIT-V (10 Hrs)	Evaluating Recommender Systems: Evaluation Paradigms, General Goals of Evaluation Design, Design Issues in Offline Recommender Evaluation, Accuracy Metrics in Offline Evaluation, Limitations of Evaluation Measures
Textbooks:	
1.	Charu .C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.
Reference Books:	
1.	Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.
2.	Francesco Ricci, Lior Rokach, Bracha Shapira., Recommender Systems Handbook, Springer (2022), 3 rd ed.
	Akshay K., Adarsha Shivananda, Anoosh K., V Adithya Krishnan, Applied Recommender Systems with Python: Build Recommender Systems with Deep Learning, NLP and Graph-Based Techniques, Apress, 2023.
3.	Kim Faalk, Practical Recommender Systems, Manning publishers, 2019
3.	Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed.
e-Resources	
1.	http://pzs.dstu.dp.ua/DataMining/recom/bibl/1aggarwal_c_c_recommender_systems_the_textbook.pdf

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4112	PE	3	--	--	3	30	70	3 Hrs.
AI CHATBOTS								
(Common to AIML, CSD)								
Course Objectives:								
1.	Learn how artificial intelligence powers chatbots, get an overview of the bot ecosystem and bot anatomy, and study different types of bots and use cases.							
2.	Identify best practices for defining a chatbot use case and use a rapid prototyping framework to develop a use case for a personalized chatbot.							
3.								
Course Outcomes Upon completion of the course, the students will be able to								
S.No	Outcome							Knowledge Level
1.	Explain chatbot data sources, GDPR principles, and customer-centric chatbot solutions for financial services, integrating ethical considerations							K2
2.	Apply rules-based and AI-based chatbot development approaches, conversational flow components, and key chatbot terms to develop a customer service-centric chatbot for a 24x7 insurance agent use case.							K3
3.	Illustrate business considerations for chatbot solutions, chatbots, apps, success metrics including customer satisfaction index and completion rate, and generic solution architecture for private chatbots.							K2
4.	Develop chatbots using various natural language processing, understanding, and generation libraries							K3
5.	Use third-party APIs and modules to integrate chatbots, connect to an enterprise data store.							K3
SYLLABUS								
UNIT-I (10Hrs)	Introduction: Benefits from Chatbots for a Business, A Customer-Centric Approach in Financial Services, Chatbots in the Insurance Industry, Conversational Chatbot Landscape Identifying the Sources of Data: Chatbot Conversations, Training Chatbots for Conversations, Personal Data in Chatbots, Introduction to the General Data Protection Regulation (GDPR)							
UNIT-II (10 Hrs)	Chatbot Development Essentials: Customer Service-Centric Chatbots, Chatbot Development Approaches, Rules-Based Approach, AI-Based Approach, Conversational Flow, Key Terms in Chatbots, Utterance, Intent, Entity, Channel, Human Takeover, Use Case: 24x7 Insurance Agent							

UNIT-III (10 Hrs)	Building a Chatbot Solution: Business Considerations, Chatbots Vs Apps, Growth of Messenger Applications, Direct Contact Vs Chat, Business Benefits of Chatbots, Success Metrics, Customer Satisfaction Index, Completion Rate, Bounce Rate, Managing Risks in Chatbots Service, Generic Solution Architecture for Private Chatbots
UNIT-IV (10 Hrs)	Natural Language Processing, Understanding, and Generation: Chatbot Architecture, Popular Open Source NLP and NLU Tools, Natural Language Processing, Natural Language Understanding, Natural Language Generation, Applications.
UNIT-V (10 Hrs)	Introduction to Microsoft Bot, RASA, and Google Dialog flow: Microsoft Bot Framework, Introduction to QnA Maker, Introduction to LUIS, Introduction to RASA, RASA Core, RASA NLU, Introduction to Dialog flow Chatbot Integration Mechanism: Integration with Third-Party APIs, Connecting to an Enterprise Data Store, Integration Module
Textbooks:	
1.	Abhishek Singh, Karthik Ramasubramanian, Shrey Shivam, "Building an Enterprise Chatbot: Work with Protected Enterprise Data Using Open Source Frameworks", ISBN 978-1-4842-5034-1, Apress,2019
Reference Books:	
1.	Janarthanam and Srini, Hands-on chatbots and conversational UI development: Build chatbots and voice user interfaces with C (1 ed.), Packt Publishing Ltd, 2017. ISBN 978-1788294669.
2.	Galitsky, Boris., Developing Enterprise Chatbots (1 ed.), Springer International Publishing, 2019. ISBN 978-303004298
3.	Kelly III, John E. and Steve Hamm, Smart machines: IBM's Watson and the era of cognitive computing (1 ed.), Columbia University Press, 2013. ISBN 978- 0231168564.
4.	Abhishek Singh, Karthik Ramasubramanian and Shrey Shivam, Building an Enterprise Chatbot (1 ed.), Springer, 2019. ISBN 978-1484250334.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4113	PE	3	--	--	3	30	70	3 Hrs.
OBJECT ORIENTED ANALYSIS AND DESIGN								
(For AIML)								
Course Objectives:								
1.	Become familiar with all phases of OOAD.							
2.	Master the main features of UML.							
3.	Master the main concepts of Object Technologies and how to apply them at work and develop the ability to analyze and solve challenging problems in various domains.							
4.	Learn the Object design Principles and understand how to apply them towards Implementation							
Course Outcomes Upon completion of the course, the students will be able to								
S.No	Outcome							Knowledge Level
1.	Summarize the nature of complex system and its solutions.							K2
2.	Explain the conceptual and structural modelling techniques of UML							K2
3.	Apply basic and advanced structural modeling concepts for real time applications.							K3
4.	Model basic behavior of a software system with Use Case, Interaction and Activity Diagrams.							K3
5.	Model advanced behavioral aspects and Runtime environment of Software Systems.							K3
SYLLABUS								
UNIT-I (10Hrs)	Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems.							
UNIT-II (10 Hrs)	Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle. Basic Structural Modeling: Classes, Relationships, Common Mechanisms							
UNIT-III (10 Hrs)	Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.							
UNIT-IV (10 Hrs)	Basic Behavioral Modeling-I: Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams.							

UNIT-V (10 Hrs)	Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams Case Study: Weather Forecasting
Textbooks:	
1.	Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston , “Object- Oriented Analysis and Design with Applications”, 3rd edition, 2013, PEARSON.
2.	Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education
Reference Books:	
1.	Meilir Page-Jones: Fundamentals of Object-Oriented Design in UML, Pearson Education.
2.	Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.
3.	Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4.	Applying UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.
e-Resources	
1.	https://onlinecourses.nptel.ac.in/noc21_cs57/preview

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AUTONOMOUS

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4114	PE	3	--	--	3	30	70	3 Hrs.

VIDEO ANALYTICS

(For AIML)

Course Objectives:

1.	Make student understand the need for video Analytics, the basic configuration of video analytics.
2.	The functional blocks of a video analytic system and to get exposed to the various applications of video analytics
3.	Students understand the AI and Deep Learning Techniques to video analytics using real time scenarios.

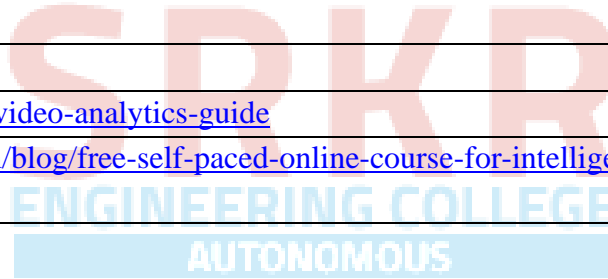
Course Outcomes Upon completion of the course, the students will be able to

S.No	Outcome	Knowledge Level
1.	Use advanced preprocessing techniques for feature extraction and classification in videos	K3
2.	Apply foreground extraction techniques and image segmentation on videos	K3
3.	Use machine learning and Deep Learning for video classification.	K3
4.	Apply video analytics for security applications	K3
5.	Find video-based insights for customer behavior analysis, traffic monitoring, and driver assistance	K3

SYLLABUS

UNIT-I (10Hrs)	Video Analytic Components: Need for Video Analytics, Overview of video Analytics, Foreground, extraction, Feature extraction, classifier, Preprocessing, edge detection, smoothening, Feature space-PCA-FLD-SIFT features
UNIT-II (10 Hrs)	Foreground Extraction: Background estimation, Averaging, Gaussian Mixture Model, Optical Flow based, Image Segmentation, Region growing, Region splitting, Morphological operations, erosion, Dilation, Tracking in a multiple camera environment.
UNIT-III (10 Hrs)	Classifiers: Neural networks (back propagation), Deep learning networks, Fuzzy Classifier, Bayesian classifier, HMM based classifier.
UNIT-IV (10 Hrs)	Video Analytics for Security: Abandoned object detection, human behavioral analysis, human action, recognition, perimeter security, crowd analysis and prediction of crowd congestion

UNIT-V (10 Hrs)	Video Analytics for Business Intelligence & Traffic Monitoring and Assistance: Customer behavior, analysis, people counting, Traffic rule violation detection, traffic congestion, identification for route, planning, driver assistance, lane change warning
Textbooks:	
1.	Dr. Lalit V Patil and Dr. Sunitha S. Dhotre, “Video Analytics”, Nirali Prakashan Publishers, 2023.
2.	Graeme A. Jones, Nikos Paragios, Carlo S. Regazzoni, “Video-Based Surveillance Systems: Computer Vision and Distributed Processing”, Kluwer academic publisher, 2001.
3.	Nilanjan Dey, Amira Ashour and Suvojit Acharjee, “Applied Video Processing in Surveillance and Monitoring Systems”, (IGI global) 2016.
Reference Books:	
1.	Zhihao Chen, Ye Yang, Jingyu Xue, Liping Ye, Feng Guo, “The Next Generation of Video Surveillance and Video Analytics: The Unified Intelligent Video Analytics Suite”, CreateSpace Independent Publishing Platform, 2014
2.	Caifeng Shan, Fatih Porikli, Tao Xiang, Shaogang Gong, “Video Analytics for Business Intelligence”, Springer, 2012.
e-Resources	
1.	https://tryolabs.com/guides/video-analytics-guide
2.	https://developer.nvidia.com/blog/free-self-paced-online-course-for-intelligent-video-analytics-now-available/



Code	Category	L	T	P	C	I.M	E.M.	Exam
B20AM4115	SOC	1	0	2	2	0	50	3 Hrs.
PROGRAMMING WITH Go								
(For AIML)								
Pre-requisites: Problem solving skills through any Programming Language								
Course Objectives:								
1.	Set up a Go development environment for solo developers or teams.							
2.	To learn how to use Go's advanced development tools for Machine Learning.							
Course Outcomes: Upon completion of the course, the students will be able to								
S. No.	Outcome							Knowledge Level
1.	Demonstrate problem solving skills through GO programming							K3
2.	Apply regression, classification, clustering and auto-regressive models to real world datasets using GO programming							K3
Syllabus								
LIST OF PROGRAMS								
1.	Part-A Go Programming Exercise - 1: Basics of Go Environment Configuration a) <u>Go environment configuration</u> b) <u>Installation</u> c) <u>\$GOPATH and workspace</u> d) <u>Go commands</u> e) <u>Go development tools</u>							
2.	Exercise – 2: Demonstrate CSV Handling, JSON Parsing, and SQL Database Connectivity Using Go such as a) Read CSV file and find the maximum value in a particular column b) To read iris dataset which is in csv format and handling of unexpected fields, types and manipulating CSV data. c) Parse JSON data using Go d) To connect and Query SQL like databases (Postgres MySQL, SQL Lite)							
3.	Exercise – 3: Demonstrate Control Statements and Data Structures in Go such as a) Write a program that prints the numbers from 1 to 100, but for multiples of three, print “Fizz” instead of the number, and for the multiples of five, print “Buzz.” For numbers that are multiples of both three and five, print “FizzBuzz.” b) Write a program to access the fourth element of an array or slice? c) Write a program to perform reading, writing, deleting, emptying operations on Maps							

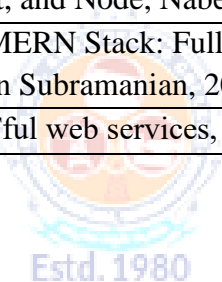
4.	<p>Exercise – 4: Demonstrate Functions using GO such as</p> <p>a) The simple calculator program doesn't handle one error case: division by zero. Change the function signature for the math operations to return both an int and an error. In the div function, if the divisor is 0, return errors.New("division by zero") for the error. In all other cases, return nil. Adjust the main function to check for this error</p> <p>b) Write a function with one variadic parameter that finds the greatest number in a list of numbers.</p>
5.	<p>Exercise – 5: Demonstrate the concept of Interface and packages</p> <p>a) Add a new perimeter method to the Shape interface to calculate the perimeter of a shape. Implement the method for Circle and Rectangle.</p> <p>b) Develop a program to create and access packages.</p>
6.	<p>Exercise – 6: Demonstrating Concurrency in Go: Using Goroutines, Channels, and Wait Groups such as</p> <p>a) Write a Go program that uses goroutines and channels to fetch several web pages simultaneously using the net/http package, and prints the URL of the biggest home page (defined as the most bytes in the response)</p>
7.	<p>Part-B Machine Learning with GO programming</p> <p>Exercise – 7: Develop Regression models using Go such as</p> <p>a) Demonstrate how to build a linear regression model using Go.</p> <p>b) Demonstrate how to build a multiple linear regression model using Go.</p> <p>c) Demonstrate how to build a logistic regression model using Go.</p>
8.	<p>Exercise – 8: Develop classification models using Go such as</p> <p>a) Apply k-nearest neighbor classifier on iris dataset using Go</p> <p>b) Build a decision tree on iris dataset using Go.</p>
9.	<p>Exercise – 9: Develop Clustering models using Go such as</p> <p>Demonstrate K-Means clustering method using Go</p>
10.	<p>Exercise – 10: Demonstrate auto regressive model using Go</p> <p>Build auto regressive models for time series data using Go</p>
Reference Books:	
1.	Introducing Go: Build Reliable, Scalable Programs Paperback – 5 February 2016 by Caleb Doxsey
2.	Learning Go: An Idiomatic Approach to Real-World Go Programming by Jon Bodner
3.	Machine Learning With Go by Daniel Whitenack, September 2017, Publisher(s): Packt Publishing, ISBN: 9781785882104
e-Resources:	
1.	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0130944292286873602383_shared/overview
2.	https://gobyexample.com/
3.	https://astaxie.gitbooks.io/build-web-application-with-golang/content/en/preface.html
4.	https://go.dev/tour/basics/1

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4116	SOC	1	--	2	2		50	3 Hrs.
MEAN STACK TECHNOLOGIES-MODULE II- MONGODB, NODE JS AND EXPRESS JS								
(For AIML)								
Course Objectives:								
1	Provide understanding about the core concepts of frontend programming for web application.							
2	Build strong foundation of JavaScript which will help developer to apply JavaScript concepts for responsive web frontend development							
Course Outcomes								
Upon completion of the course, the students will be able to								
S. No.	Outcome							Knowledge Level
1	Use Nodejs and Express Js to develop dynamic and responsive web pages							K3
2	Use MongoDB document database to develop web applications							K3
SYLLABUS								
1	MongoDB <ul style="list-style-type: none"> • SQL and NoSql Concepts • Create and Manage MongoDB • Migration of Data into MongoDB • MongoDB with PHP • MongoDB with NodeJS • Services Offered by MongoDB 							
2	Nodejs <ul style="list-style-type: none"> • Node js Overview • Node js - Basics and Setup • Node js Console • Node js Command Utilities • Node js Modules • Node js Concepts • Node js Events • Node js Database Access 							

3	<p>Express Js</p> <ul style="list-style-type: none"> • Introduction to Express.js • Routing in Express.js • Middleware in Express.js • Templating Engines with Express.js • Handling Static Files • Error Handling • RESTful API Development • Authentication and Authorization • Database Integration • Sessions and Cookies • Express.js Best Practices • Deployment and Security
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Reference Books:

1.	Beginning MERN Stack: Build and Deploy a Full Stack MongoDB, Express, React, Node.js App, Greg Lim, 2021
2.	MERN Projects for Beginners: Create Five Social Web Apps Using MongoDB, Express.js, React, and Node, Nabendu Biswas, 2021
3.	Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasam Subramanian, 2019
4	RESTful web services, 1st Edition, Leonard Richardson, Ruby, O'Reilly, 2007.





Estd:1980

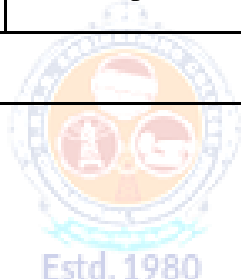
SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)

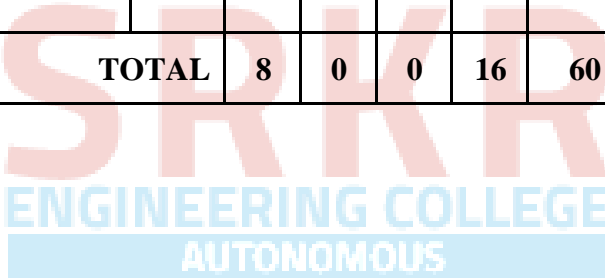
UG Programmes CE, CSE, ECE, EEE, IT & ME are Accredited by NBA, Accredited by NAAC with A+

CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

Regulation: R20		IV / IV - B.Tech. II - Semester							
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2021-22 admitted Batch onwards)									
Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20AM4201	Project Work (Project work, seminar and internship in industry)	PR	8	0	0	16	60	140	200
TOTAL			8	0	0	16	60	140	200



Estd. 1980



Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM4201	PR	--	--	16	8	60	140	3 Hrs.

PROJECT WORK

(For AIML)

Course Objectives:

1	To provide an opportunity to work in group on a topic / problem / experimentation
2	To encourage creative thinking process
3	To provide an opportunity to analyze and discuss the results to draw conclusions
4	To acquire and apply fundamental principles of planning and carrying out the work plan of the project through observations, discussions and decision-making process.

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

S.No.	Outcome	Knowledge Level
1	Identify a current problem through literature/field/case studies	K3
2	Identify the objectives and methodology for solving the problem	K3
3	Design and Develop technology/process for solving the problem	K4
4	Evaluate the technology/process	K5

*The object of Project Work is to enable the student to take up investigative study in the broad field of Artificial Intelligence and Machine Learning, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or a group of students, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work.

The assignment to normally include:

- a) Survey and study of published literature on the assigned topic.
- b) Working out a preliminary approach to the problem relating to the assigned topic.
- c) Conducting preliminary Analysis/Modeling/Simulation/Experiment/Design/ Feasibility.
- d) Preparing a written report on the study conducted for presentation to the department.
- e) Final Seminar, as oral Presentation before a departmental committee.