



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 & DATA SCIENCE									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2020-21 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
B20AD4116	Industrial/Research Internship 2 Months	PR	3	--	--	--	--	50	50
TOTAL			23	19	0	2	180	520	700

	Course Code	Course
#PE-III	B20AD4101	Reinforcement Learning
	B20AD4102	Nature Inspired Computing Techniques
	B20AD4103	Social Media Analytics
	B20AD4104	Block Chain Technologies
#PE-IV	B20AD4105	Computer Vision
	B20AD4106	Cloud Computing
	B20AD4107	Information Retrieval Systems
	B20AD4108	NOSQL Databases
#PE-V	B20AD4109	Social Network Analysis
	B20AD4110	Recommender Systems
	B20AD4111	AI Chatbots
	B20AD4112	Data Visualization
#SOC-V	B20AD4113	Machine Learning with Go (Infosys Springboard)
	B20AD4114	Mean Stack Technologies module -II- MongoDB, Express.js, Angular JS Node.js and AJAX
	B20AD4115	APSSDC offered Courses
#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, CSBS, 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

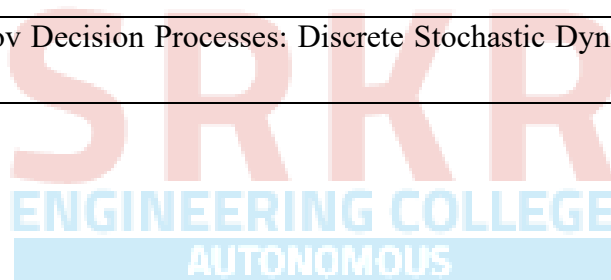
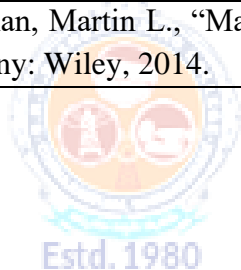
8.	Bharat Mein Angreji Raj Pandit Sunderlal
9.	Rediscovering India by Dharampal Hind Swaraj or Indian Home
10.	Rule by Mohandas K. Gandhi
11.	India Wins Freedom Vivekananda Maulana Abdul Kalam Azad 12Romain Rolland (English)



SRKR
ENGINEERING COLLEGE
AUTONOMOUS

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD4101	PE	3	--	--	3	30	70	3 Hrs.
REINFORCEMENT LEARNING								
(For AIDS)								
Course Objectives:								
1.	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: At the end of course, students will be able to:								
S.No	Outcome							Knowledge Level
1.	Understand the basic and advanced reinforcement learning techniques.							K2
2.	Identification of suitable learning tasks to which these learning techniques can be applied.							K3
3.	Understand and apply learning and prediction methods							K3
4.	Formulate the decision problems and evaluate the results.							K4
5.	Understand applications through case studies							K3
SYLLABUS								
UNIT-I (10Hrs)	Introduction: Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and Scope, An Extended Example: Tic-Tac-Toe 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, Gradient Bandit Algorithm							
UNIT-II (10 Hrs)	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, Dynamic Programming: Policy Evaluation, Policy Improvement, Policy Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiency of Dynamic Programming							
UNIT-III (10 Hrs)	Monte Carlo Methods: Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off-policy Prediction via Importance Sampling, Incremental Implementation, Discounting-aware Importance Sampling, Per-decision Importance Sampling n-step Bootstrapping: n-step TD Prediction, n-step Sarsa, n-step Off-policy Learning, Per-decision methods with Control Variables, A Unifying Algorithm: n-step Q(σ)							
UNIT-IV (10 Hrs)	Off-policy Methods with Approximation: Semi-gradient Methods, Examples of Off-policy Divergence, The Deadly Triad, Linear Value-function Geometry, Gradient Descent							

	<p>in the Bellman Error, The Bellman Error is not Learnable, Gradient-TD methods, Emphatic-TD methods, Reducing Variance</p> <p>Eligibility Traces: The λ-return, TD(λ), n-step Truncated λ-return methods, Online λ – return Algorithm, True Online TD(λ), Dutch Traces in Monte Carlo Learning, Sarsa(λ), Variable λ and γ, Off-policy Traces with Control Variables, Watkins’s Q(λ) to Tree-Backup(λ)</p>
UNIT-V (10 Hrs)	<p>Policy Gradient Methods: Policy Approximation and its Advantages, The Policy Gradient Theorem, REINFORCE: Monte Carlo Policy Gradient, REINFORCE with Baseline, Actor-Critic Methods, Policy Gradient for Continuing Problems, Policy Parameterization for Continuous Actions</p> <p>Applications and Case Studies: TD-Gammon, Samuel’s Checkers Player, Watson’s Daily Double Wagering, Optimizing Memory Control, Personalized Web Services</p>
Textbooks:	
1.	R. S. Sutton and A. G. Bart, “Reinforcement Learning - An Introduction,” MIT Press, 2018
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.



Code	Category	L	T	P	C	LM	E.M	Exam
B20AD4102	PE	3	--	--	3	30	70	3 Hrs.
NATURE INSPIRED COMPUTING TECHNIQUES								
(For AI&DS)								
Course Objectives:								
1.	Learn the theoretical foundations of Nature Inspired Computing techniques, how they can be used to solve problems, and in which areas are most useful and effective.							
Course Outcomes At the end of course, students will be able to:								
S.No	Outcome							Knowledge Level
1.	Understand importance of Nature-Inspired Optimization Algorithms							K2
2.	Demonstrate Genetic Algorithms (GA) and Particle Swarm Optimization (PSO) Algorithms							K2
3.	Illustrate Firefly and Cuckoo Search Algorithms and their applications							K3
4.	Explain Bat algorithms and their applications							K2
5.	Illustrate Single and Multi-Objective Optimization through Algorithms							K3
SYLLABUS								
UNIT-I (10Hrs)	Analysis of Algorithms: Analysis of Optimization Algorithms, Nature Inspired Algorithms, Parameter Tuning and Parameter Control: Parameter Tuning, Hyper optimization, Multi objective View, Parameter Control, Simulated Annealing: Algorithm, Basic Convergence Properties, Stochastic Tunneling							
UNIT-II (10 Hrs)	Genetic Algorithms: Introduction, Role of Genetic Operators, Choice of Parameters, GA Variants, Differential Evolution: Introduction, Differential Evolution, Variants, Choice of Parameters, Convergence Analysis, Particle Swarm Optimization: Swarm Intelligence, PSO Algorithm, Accelerated PSO, Binary PSO							
UNIT-III (10 Hrs)	Firefly Algorithms: Firefly Behavior, Standard Firefly Algorithm Variations of Light Intensity and Attractiveness, Controlling Randomization, Firefly Algorithms in Applications Cuckoo Search: Cuckoo Breeding Behavior, Levy Flights, Cuckoo Search: Special Cases of Cuckoo Search, Variants of Cuckoo Search, Global Convergence, Applications							
UNIT-IV (10 Hrs)	Bat Algorithms: Echolocation of Bats: Behavior of Microbats, Acoustics of Echolocation, Bat Algorithms: Movement of Virtual Bats, Loudness and Pulse Emission, Binary Bat Algorithm, Variants of the Bat Algorithm, Convergence Analysis, Applications: Continuous Optimization, Combinatorial Optimization and Scheduling, Inverse Problems and Parameter Estimation, Classifications, Clustering and Data Mining, Image Processing, Fuzzy Logic and Other Applications							

UNIT-V (10 Hrs)	Flower Pollination Algorithms: Introduction, Characteristics of Flower Pollination, Flower Pollination Algorithms, Multi-Objective Flower Pollination Algorithms, Validation and Numerical Experiments: Single-Objective Test Functions, Multi-Objective Test Functions, Applications: Single-Objective Design Benchmarks, Multi-Objective Design Benchmarks
Textbooks:	
1.	“Nature-Inspired Optimization Algorithms”, Yang, Xin-She, Elsevier Science, 2014.
Reference Books:	
1.	“Nature-Inspired Computing and Optimization: Theory and Applications,” Germany: Springer International Publishing, 2017.



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD4103	PE	3	--	--	3	30	70	3 Hrs.

SOCIAL MEDIA ANALYTICS

(For AIDS)

Course Objectives:

1.	To Understand & deal with Data Sources and Analytics in any Social Media Networks, strategy, or campaign.
2.	To learn Analytics & Analytical Process in Social Media Networks
3.	To Understand the dedicated & Hybrid tools in Social Media Platforms

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

S.No	Outcome	Knowledge Level
1.	Understand data sources and data gathering in social media categories and types of social media analytics	K2
2.	Identify the Data to Insights & Data Analysis for various applications. Illustrate Social Media & big data challenges in different domains.	K3
3.	Understand various types of Analytical techniques in Social Media such as analytics, listening, publishing, or ads.	K2
4.	Illustrate the dedicated & Hybrid tools in Social Media Platforms	K3
5.	Understand the impact of social media analytics integration with and affects other areas of business.	K2

SYLLABUS

UNIT-I (10Hrs)	Introduction: Foundation for Analytics, Evolution of Data and the Digital Gap, Social Media Data Sources: Offline and Online, Definition of Social Media, Data Sources in Social Media Channels, Estimated vs. Factual Data Sources, Public and Private Data, Data Gathering in Social Media Analytics, Social Media Network Support of Data Collection, API: Application Programming Interface, Web Crawling or Scraping.
UNIT-II (10 Hrs)	From Data to Insights: Example of a Single Metric Giving Actionable Insight, An Example of a Metric Leading to New Questions, Creating a Plan to Shape Data into Insights, The Planning Stage: Projecting Possible Insights, Analysis of a Social Media Post, The process of Comparison, Data Aggregation, Calculations and Display, Data Display, Social Media and Big Data, Potential Challenges
UNIT-III (10 Hrs)	Analytics in Social Media: Types of Analytics in Social Media, Analytics or Channel Analytics, Social Media Listening: Keyword and Mention-Based Analysis, Demographics, Interests and Sentiment, Advertising Analytics: Focus on Conversions and ROI of Paid Social Media Campaigns, Conversions: The Key to Digital and Social Advertising, CMS Analytics: Measuring the Performance of the Content Management Team, CRM Analytics:

	Customer Support and Sales via Social Media
UNIT-IV (10 Hrs)	Dedicated vs. Hybrid Tools: Common to all Tools, Dedicated Tools, Advantages of Dedicated Tools, Disadvantages of Dedicated tools, Hybrid Tools, Dedicated Tools with Hybrid Features, Advantages of Hybrid Tools, Disadvantages of Hybrid Tools, Data Integration Tools, Advantages of Data Integration Tools, Disadvantages of Data Integration Tools
UNIT-V (10 Hrs)	Social Network Landscape: Concept and UX on Social Networks, Features and Their Strategic Value, Interactivity: How Social is the Network, Content Flow on Social Network The Analytics Process: Analysis is Comparison, Investigation beyond Social Analytics, Shaping a Method: The End Game for an Analyst, The Analysis Circle, Dynamic Cycles, The Analyst Mindset: Making the Right Questions and Running the Right Experiments
Textbooks:	
1.	Alex Goncalves, "Social Media Analytics Strategy-Using Data to Optimize Business Performance," Apress, 2017.
Reference Books:	
1.	Qiu, Liangfei., Kumar, Subodha, "Social Media Analytics and Practical Applications: The Change to the Competition Landscape," United States: CRC Press, 2021.
2.	Sponder, Marshall, "Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics," United Kingdom: McGraw-Hill Education, 2011.
e-Resources	
1.	https://www.coursera.org/learn/social-media-analytics-introduction

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AUTONOMOUS

Code	Category	L	T	P	C	LM	E.M	Exam
B20AD4104	PE	3	--	--	3	30	70	3 Hrs.

BLOCK CHAIN TECHNOLOGIES

(For AIDS)

Course Objectives:

1.	Understand block chain technology and Cryptocurrency works
2.	Explore the functionalities and applications of crypto currency
3.	Gain knowledge of advanced block chain concepts and applications
4.	Understand the working of specific block chain platforms and technologies
5.	Evaluate the challenges, regulations and real-world applications of bock chain

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

S.No	Outcome	Knowledge Level
1.	Demonstrate the block chain basics, Crypto currency	K2
2.	Compare and Contrast the use of different private vs. public block chain and use cases	K3
3.	Design an innovative Bit coin Block chain and scripts, Block chain Science on various coins	K4
4.	Classify Permission Block chain and use cases – Hyper ledger, Corda	K3
5.	Apply Block-chain technology in E-Governance, Land Registration, Medical Information Systems and others	K3

SYLLABUS

UNIT-I (10Hrs)	Introduction: Introduction, basic ideas behind block chain, how it is changing the landscape Of digitalization, introduction to cryptographic concepts required, Block chain or distributed trust, Currency, Cryptocurrency, How a Cryptocurrency works, Financial services, Bitcoin prediction markets.
UNIT-II (10 Hrs)	Hashing, public key cryptosystems, private vs public block chain and use cases, Hash Puzzles, Extensibility of Block chain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Block chain Environment
UNIT-III (10 Hrs)	Introduction to Bitcoin: Bitcoin Block chain and scripts, Use cases of Bitcoin Blockchain scripting language in micropayment, escrow etc Downside of Bit coin mining, Block chain Science: Grid coin, Folding coin, Block chain Genomics, Bit coin MOOCs.
UNIT-IV (10 Hrs)	Ethereum continued, IOTA, the real need for mining, consensus, Byzantine Generals Problem, and Consensus as a distributed coordination problem, Coming to private or permissioned block chains, Introduction to Hyper ledger, Currency, Token, Campus coin, Coin drop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

UNIT-V (10 Hrs)	Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations, Uses of Block chain in E-Governance, Land Registration, Medical Information Systems.
Textbooks:	
1.	Blockchain Blue print for Economy by Melanie Swan
Reference Books:	
1.	Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, by Daniel Drescher



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD4105	PE	3	--	--	3	30	70	3 Hrs.
COMPUTER VISION								
(For AIDS)								
Course Objectives:								
1.	To introduce students the fundamentals of image formation							
2.	To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition							
3.	To develop an appreciation for various issues in the design of computer vision and object recognition systems							
4.	To provide the student with programming experience from implementing computer vision and object recognition applications.							
Course Outcomes : At the end of course, students will be able to:								
S.No	Outcome							Knowledge Level
1.	Understand and apply basic mathematical background for computer vision.							K3
2.	Apply known principles of feature detection and matching.							K3
3.	Demonstrate basic types of Motion and Factorization							K3
4.	Identify basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal.							K2
5.	Demonstrate methods for 3D Reconstruction, Albedos, image based rendering views and depths.							K3
SYLLABUS								
UNIT-I (10Hrs)	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 (10 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 (10 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 (10 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 (10 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. .
Textbooks:	
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_erardMedioni and Sing Bing Kang “Emerging topics in computer vision”161
e-Resources	
1.	NPTEL LINK: https://onlinecourses.nptel.ac.in/noc22_ee48/preview



Code	Category	L	T	P	C	I.M	E.M.	Exam
B20AD4106	PE	3	--	--	3	30	70	3 Hrs.
CLOUD COMPUTING								
(For AIDS)								
Course Objectives: Students are expected to learn								
1	The implementation of Virtualization Concepts							
2	The implementation of Task Scheduling algorithms							
3	Apply Map-Reduce concept to applications							
4	How to build Private Cloud							
5	the impact of engineering on legal and societal issues involved							
Course Outcomes: After completion of the course, the student will be able to								
S.No	Outcome							Knowledge Level
1	Interpret the key dimensions of the challenge of Cloud Computing							K4
2	Examine the economics, financial, and technological implications for selecting cloud computing for own organization							K3
3	Assess the virtualization concepts and resource management for initiating and installing cloud-based applications							K4
4	Evaluate own organizations needs for capacity building and security risks in cloud computing related IT areas							K3
5	Apply real time cloud application development through AWS, Google and Microsoft.							K3
SYLLABUS								
UNIT-I (10 Hrs)	<p>Introduction: Network centric computing, Network centric content, peer-to –peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing.</p> <p>Parallel and Distributed Systems: introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency.</p>							
UNIT-II (10 Hrs)	<p>Cloud Infrastructure: At Amazon, The Google Perspective, Microsoft Windows Azure, Open-Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing.</p> <p>Cloud Computing Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, HPC on cloud.</p>							
UNIT-III (12 Hrs)	<p>Cloud Resource virtualization: Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and</p>							

	<p>security isolation, hardware support for virtualization,</p> <p>Resource Management and Scheduling: Policies and Mechanisms, Stability of a two-level resource allocation architecture, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines.</p>
UNIT-IV (12 Hrs)	<p>Storage Systems: Storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Big Table, Megastore (text book 1), Amazon Simple Storage Service(S3) (Text book 2),</p> <p>Cloud Security: Cloud security risks, security – a top concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks.</p>
UNIT-V (10Hrs)	<p>Cloud Application Development: Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Cloud based simulation of a Distributed trust algorithm(Text Book 1)</p> <p>Google: Google App Engine, Google Web Toolkit (Text Book 2),</p> <p>Microsoft: Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2)</p>
Text Books:	
1.	Cloud Computing, Theory and Practice, 1st Edition, Dan C Marinescu, MK Elsevier publisher, 2013
2.	Cloud Computing, A Practical Approach, 1st Edition, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH, 2017
Reference Books:	
1.	Mastering Cloud Computing, Foundations and Application Programming, 1st Edition, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH, 2013
2.	Essential of Cloud Computing, 1st Edition, K Chandrasekharan, CRC Press, 2014.
3.	Cloud Computing, A Hands on Approach, ArshdeepBahga, Vijay Madiseti, Universities Press, 2014.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD4107	PE	3	--	--	3	30	70	3 Hrs.

INFORMATION RETRIVAL SYSTEMS

(For AIDS)

Course Objectives:

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

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

S.No	Outcome	Knowledge Level
1.	Apply IR principles to locate relevant information large collections of data	K3
2.	Illustrate basics of indexing, data structures and models required for IR	K3
3.	Design different document clustering algorithms	K4
4.	Illustrate the basics search techniques and visualization.	K3
5.	Design an Information Retrieval System for web search tasks.	K4

SYLLABUS

UNIT-I (10Hrs)	<p>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</p> <p>Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities</p>
UNIT-II (10 Hrs)	<p>Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction</p> <p>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</p>
UNIT-III (10 Hrs)	<p>Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages</p> <p>Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters</p>
UNIT-IV (10 Hrs)	<p>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</p>

	Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies
UNIT-V (10 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
Textbooks:	
1.	Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer
Reference Books:	
1	Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992..
e-Resources	
1	https://www.math.unipd.it/~aiolli/corsi/0910/IR/irbookprint.pdf
2	https://nlp.stanford.edu/IR-book/pdf/irbookonlinereading.pdf



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD4108	PE	3	--	--	3	30	70	3 Hrs.
NoSQL Databases								
(For AIDS)								
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, defining 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: At the end of course, students will be able to:								
S.No	Outcome							Knowledge Level
1.	Describe about Aggregate Data Models							K2
2.	Explain about data distribution across multiple nodes.							K2
3.	Describe Map-Reduce concepts and features of Key-Value Databases.							K2
4.	Describe about features and use cases of document databases and column-family stores.							K2
5.	Describe about features and use cases of graph databases and schema changes.							K2
SYLLABUS								
UNIT-I (10Hrs)	Why NoSQL, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, 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. More Details on Data Models; Relationships, Graph Databases, Schema less Databases, Materialized Views, Modelling for Data Access,							
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. Version Stamps, Business and System Transactions, Version Stamps on Multiple Nodes							
UNIT-III (10 Hrs)	Map-Reduce: Basic Map-Reduce, Partitioning and Combining, Composing Map-Reduce Calculations. What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, 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, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, Ecommerce Applications, When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure. Column-Family Stores: 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, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch and Location-Based Services, Recommendation Engines, When Not to Use. Schema Migrations: Schema Changes, Schema Changes in RDBMS, Schema Changes in NoSQL data store.
Textbooks:	
1.	Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addison Wesley, 2012
Reference Books:	
1.	Dan Sullivan, "NoSQLFor 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)

Estd. 1980

AUTONOMOUS

Code	Category	L	T	P	C	LM	E.M	Exam
B20AD4109	PE	3	--	--	3	30	70	3 Hrs.

SOCIAL NETWORK ANALYSIS

(For AIDS)

Course Objectives:

1.	Formalize different types of entities and relationships as nodes and edges and represent this information as relational data.
2.	Plan and execute network analytical computations.
3.	Use advanced network analysis software to generate visualizations and perform empirical investigations of network data.
4.	Interpret and synthesize the meaning of the results with respect to a question, goal or task.
5.	Collect network data in different ways and from different sources while adhering to legal standards and ethics standards.

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

S.No	Outcome	Knowledge Level
1.	Explain basic notation and terminology used in network science	K2
2.	Visualize, summarize and compare networks	K3
3.	Illustrate basic principles behind network analysis algorithms	K3
4.	Develop practical skills of network analysis in R programming language	K2
5.	Analyze real work networks	K3

SYLLABUS

UNIT-I (10Hrs)	Social Network Analysis: Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily.
UNIT-II (10 Hrs)	Random graph models: Random graphs and alternative models, Models of network growth, Navigation in social Networks, Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions.
UNIT-III (10 Hrs)	Network topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited.
UNIT-IV (10 Hrs)	Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The ErdosRenyi Model, Clustering Models.
UNIT-V (10 Hrs)	Network structure -Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory, Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioral experiments, Spatial and agent-based models.

Textbooks:	
1.	S. Wasserman and K. Faust. "Social Network Analysis: Methods and Applications", Cambridge University Press
2.	D. Easley and J. Kleinberg, "Networks, Crowds and Markets: Reasoning about a highly connected world", Cambridge University Press, 1st edition,2010
Reference Books:	
1.	Maarten van Steen. "Graph Theory and Complex Networks. An Introduction", 2010
2.	Reza Zafarani, Mohammed Ali Abbasi, Huan Liu. "Social Media Mining: An Introduction". Cambridge University Press 2014.
3.	Maksim Tsvetov and Alexander Kouznetsov. "Social Network Analysis for Startups". O'Reilly Media, 2011.
e-Resources	
1.	https://www.classcentral.com/course/edx-social-network-analysis-sna-9134
2.	https://www.coursera.org/learn/social-network-analysis



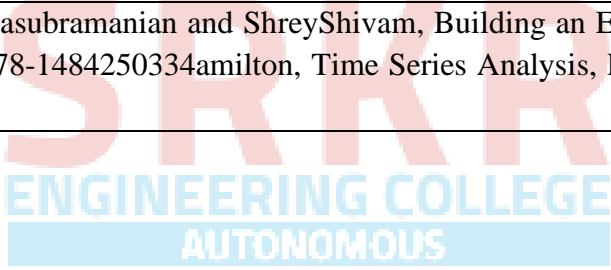
Code	Category	L	T	P	C	LM	E.M	Exam
B20AD4110	PE	3	--	--	3	30	70	3 Hrs.
RECOMMENDER SYSTEMS								
(For AIDS)								
Course Objectives:								
1.	To develop state-of-the-art recommender systems that automates a variety of choice-making strategies with the goal of providing affordable, personal, and high-quality recommendations.							
Course Outcomes: At the end of course, students will be able to:								
S.No	Outcome							Knowledge Level
1.	Understand the basic concepts of recommender systems							K2
2.	Carry out performance evaluation of recommender systems based on various metrics.							K2
3.	Implement machine-learning and data-mining algorithms in recommender systems data sets.							K4
4.	Design and implement a simple recommender system should aware of all the characteristics of time series and measures of dependencies.							K4
5.	Understand paradigms for evaluating Recommender system							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, A Regression Modeling View of 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, Latent Factor Models, Integrating Factorization and Neighborhood Models							
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: Constraint-Based Recommender Systems, Case-Based Recommenders, Persistent Personalization in Knowledge-Based Systems							

UNIT-V (10 Hrs)	Evaluating Recommender Systems: Evaluation Paradigms, General Goals of Evaluation Design, Design Issues in Online 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.	James D. HaJannach D., Zanker M. andFelFering A., Recommender Systems: An Introduction, Cambridge University Press(2011), 1st ed.
2.	Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st ed..
3.	Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed.
4.	J. Leskovec, A. Rajaraman and J. Ullman, Mining of massive datasets, 2nd Ed., Cambridge, 2012 milton, Time Series Analysis, Princeton University Press, 2004.. Time Series: Applications to Finance. 2002, New York: Wiley.



Code	Category	L	T	P	C	LM	E.M	Exam
B20AD4111	PE	3	--	--	3	30	70	3 Hrs.
AI CHATBOTS								
(For AIDS)								
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.							
Course Outcomes : At the end of course, students will be able to:								
S.No	Outcome							Knowledge Level
1.	Understand in-depth of conversation design, including on boarding, flows, utterances, entities, and personality.							K2
2.	Illustrate different approaches used to develop Chatbots							K3
3.	Learn how to demonstrate, test, and iterate a fully-functional, interactive Chatbot using a commercial platform.							K3
4.	Demonstrate how NLP is used in developing Chatbots							K3
5.	Design a chatbot for public use and interaction.							K4
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 Rama subramanian, 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.	James D. HJanarthanam and Srini, Hands-on chatbots and conversational UI development: Build chatbots and voice user interfaces with C (1 ed.), Packt Publishing Ltd, 2017. ISBN 978-17882946693
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, KarthikRamasubramanian and ShreyShivam, Building an Enterprise Chatbot (1 ed.), Springer, 2019. ISBN 978-1484250334amilton, Time Series Analysis, Princeton University Press, 2004.



Code	Category	L	T	P	C	LM	E.M	Exam
B20AD4112	PE	3	--	--	3	30	70	3 Hrs.
DATA VISUALIZATION								
(For AIDS)								
Course Objectives:								
1.	The main objective of this course is to make it easier to identify patterns, trends and outliers in large data sets							
Course Outcomes: At the end of course, students will be able to:								
S.No	Outcome							Knowledge Level
1.	Understand basics of Data Visualization							K2
2.	Implement visualization of distributions							K3
3.	Write programs on visualization of time series, proportions & association							K3
4.	Apply visualization on Trends and uncertainty							K3
5.	Explain principles of proportions							K2
SYLLABUS								
UNIT-I (10Hrs)	INTRODUCTION TO VISUALIZATION: Visualizing Data-Mapping Data onto Aesthetics, Aesthetics and Types of Data, Scales Map Data Values onto Aesthetics, Coordinate Systems and Axes- Cartesian Coordinates, Nonlinear Axes, Coordinate Systems with Curved Axes, Color Scales-Color as a Tool to Distinguish, Color to Represent Data Values, Color as a Tool to Highlight, Directory of Visualization Amounts, Distributions, Proportions, x-y relationships, Geospatial Data							
UNIT-II (10 Hrs)	VISUALIZING DISTRIBUTIONS: Visualizing Amounts-Bar Plots, Grouped and Stacked Bars, Dot Plots and Heat-maps, Visualizing Distributions: Histograms and Density Plots- Visualizing a Single Distribution, Visualizing Multiple Distributions at the Same Time, Visualizing Distributions: Empirical Cumulative Distribution Functions and Q-Q Plots-Empirical Cumulative Distribution Functions, Highly Skewed Distributions, Quantile Plots, Visualizing Many Distributions at Once-Visualizing Distributions Along the Vertical Axis, Visualizing Distributions Along the Horizontal Axis							
UNIT-III (10 Hrs)	VISUALIZING ASSOCIATIONS: Visualizing Proportions- A Case for Pie Charts, A Case for Side-by-Side Bars, A Case for Stacked Bars and Stacked Densities, Visualizing Proportions Separately as Parts of the Total, Visualizing Nested Proportions- Nested Proportions Gone Wrong, Mosaic Plots and Tree-maps, Nested Pies ,Parallel Sets. Visualizing Associations Among Two or More Quantitative Variables-Scatter plots, Correlograms, Dimension Reduction, Paired Data.							

UNIT-IV (10 Hrs)	VISUALIZING TIME SERIES & UNCERTAINTY: Visualizing Time Series and Other Functions of an Independent Variable-Individual Time Series, Multiple Time Series and Dose– Response Curves, Time Series of Two or More Response Variables, Visualizing Uncertainty-Framing Probabilities as Frequencies, Visualizing the Uncertainty of Point Estimates, Visualizing the Uncertainty of Curve Fits, Hypothetical Outcome Plots
UNIT-V (10 Hrs)	PRINCIPLE OF PROPORTIONAL INK: The Principle of Proportional Ink- Visualizations Along Linear Axes, Visualizations Along Logarithmic Axes, Direct Area Visualizations, Handling Overlapping Points Partial Transparency and Jittering, 2DHistograms, Contour Lines.
Textbooks:	
1.	Claus Wilke, “Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures”, 1st edition, O’Reilly Media Inc, 2019.
2.	Ossama Embarak, Data Analysis and Visualization Using Python: Analyze Data to Create Visualizations for BI Systems, Apress, 2018
Reference Books:	
1.	Tony Fischetti, Brett Lantz, R: Data Analysis and Visualization, O’Reilly, 2016



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD4113	SOC	1	--	2	2	0	50	3 Hrs.
MACHINE LEARNING WITH GO (Infosys Springboard)								
(For AIDS)								
Course Objectives:								
1	To turn the students into a productive, innovative data analyst who can leverage Goto build robust and valuable applications.							
2	To introduce the technical aspects of building predictive models in Go, but also helps you understand how machine learning workflows are applied in real-world scenarios.							
3	To understand how to gather, organize, and parse real – work data from a variety of sources.							
4	To develop a solid statistical toolkit that will allow you to quickly understand gain in tuition about the content of a dataset.							
5	To implement essential machine learning techniques (regression, classification, clustering, and soon) with the relevant Go packages.							
Course Outcomes: At the end of course, students will be able to:								
S.No	Outcome	Knowledge Level						
1	Solve fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.	K3						
2	Apply popular machine learning approaches to real life problems with an understanding of the strengths and weaknesses of the approaches.	K3						
3	Apply Machine Learning algorithms and the paradigms of supervised and unsupervised learning and perform Hyper parameter tuning by appreciating the underlying mathematical relationships.	K3						
SYLLABUS								
1	a) Write a Go program to read CSV file and find the maximum value in a particular column. b) Write a Go program to read iris data set which is in csv format and demonstrate handling of unexpected fields, types and manipulating CSV data.							
2	a) Demonstrate how JSON data can be parsed using Go. b) Demonstrate how to connect and Querying SQL like databases (Postgres MySQL, SQLite) using Go.							
3	Demonstrate how to cache data in memory using Go.							
4	a) Demonstrate how to represent matrices and vectors in Go b) Write a Go program to get statistical measures like mean, median, standard deviation and so on for any dataset. c) Write a Go program to visualize data distributions using Histogram, BoxPlots.							

5	a) Write a Go program to demonstrate Mean Squared Error (MSE), Mean Absolute Error (MAE), R^2 (R Squared). b) Write a Go program to compute Accuracy, Precision, Recall, AUC (Area Under Cover)
6	a) Demonstrate how to build a linear regression model using Go. b) Demonstrate how to build a multiple linear regression model using Go.
7	Demonstrate how to build alogistic regression model using Go
8	Apply k-nearest neighbor classifier on iris dataset using Go
9	Build a decision tree on iris data set using Go.
10	Demonstrate K-Means clustering method using Go.
11	Build auto regressive models for time series data using Go
12	Demonstrate how to build a simple neural network using Go
Reference Books:	
1	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0130944292286873602383_shared/overview



Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD4114	SOC	1	0	2	2	0	50	
MEAN STACK TECHNOLOGIES MODULE -II- MongoDB, Express.js, Angular JS Node.js and AJAX (Skill Oriented Course)								
(For AIDS)								
Course Objectives:								
1.	Learn the latest trends in Web Technologies client-side scripting							
2.	Learn NoSql systems and their features in MongoDB Atlas							
Course Outcomes: At the end of course, students will be able to:								
S.No	Outcome							Knowledge Level
1	Build a component-based application using Angular components and enhance their functionality using directives							K4
2	Utilize data binding for developing Angular forms and bind them with model data.							K3
3	Apply Angular built-in or custom pipes to format the rendered data.							K3
4	Develop a single page application by using synchronous or asynchronous Angular routing.							K4
5	Make use of MongoDB queries to perform CRUD operations on document database.							K3
SYLLABUS								
1.a	Course Name: Angular JS							
	Module Name: Angular Application Setup							
	Observe the link http://localhost:4200/welcome on which the mCart application is running. Perform the below activities to understand the features of the application.							
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24049616594198490000_shared?collectionId=lex_208585155432546000_00_shared&collectionType=Course							
1.b	Course Name: Angular JS							
	Module Name: Components and Modules							
	Create a new component called hello and render Hello Angular on the page							
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28217843279641040000_shared?collectionId=lex_208585155432546000_00_shared&collectionType=Course							
1.c	Course Name: Angular JS							
	Module Name: Elements of Template							
	Add an event to the hello component template and when it is clicked, it should change the courseName.							

	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19226434057992030000_shared?collectionId=lex_208585155432546000_00_shared&collectionType=Course
1.d	Course Name: Angular JS
	Module Name: Change Detection
	progressively building the PoolCarz application
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2560981637120771000_shared?collectionId=lex_2085851554325460000_0_shared&collectionType=Course
2.a	Course Name: Angular JS
	Module Name: Structural Directives - ngIf
	Create a login form with username and password fields. If the user enters the correct credentials, it should render a "Welcome <<username>>" message otherwise it should render "Invalid Login!!! Please try again..." message
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_0127637402260439042595_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
2.b	Course Name: Angular JS
	Module Name: ngFor
	Create a courses array and rendering it in the template using ngFor directive in a list format.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32795774277593590000_shared?collectionId=lex_2085851554325460000_00_shared&collectionType=Course
2.c	Course Name: Angular JS
	Module Name: ngSwitch
	Display the correct option based on the value passed to ngSwitch directive.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_23388127475984175000_shared?collectionId=lex_2085851554325460000_00_shared&collectionType=Course
2.d	Course Name: Angular JS
	Module Name: Custom Structural Directive
	Create a custom structural directive called 'repeat' which should repeat the element given a number of times.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24073319904331424000_shared?collectionId=lex_2085851554325460000_00_shared&collectionType=Course
3.a	Course Name: Angular JS
	Module Name: Attribute Directives - ngStyle
	Apply multiple CSS properties to a paragraph in a component using ngStyle.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24037156998765367000_shared?collectionId=lex_2085851554325460000_00_shared&collectionType=Course

3.b	Course Name: Angular JS
	Module Name: ngClass
	Apply multiple CSS classes to the text using ngClass directive.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3459610297074182000_shared?collectionId=lex_2085851554325460000_0_shared&collectionType=Course
3.c	Course Name: Angular JS
	Module Name: Custom Attribute Directive
	Create an attribute directive called 'showMessage' which should display the given message in a paragraph when a user clicks on it and should change the text color to red.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14783742359773809000_shared?collectionId=lex_2085851554325460000_00_shared&collectionType=Course
4.a	Course Name: Angular JS
	Module Name: Property Binding
	Binding image with class property using property binding.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_8951964709153619000_shared?collectionId=lex_2085851554325460000_0_shared&collectionType=Course
4.b	Course Name: Angular JS
	Module Name: Attribute Binding
	Binding colspan attribute of a table element to the class property.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_7154252883180625000_shared?collectionId=lex_2085851554325460000_0_shared&collectionType=Course
4.c	Course Name: Angular JS
	Module Name: Style and Event Binding
	Binding an element using inline style and user actions like entering text in input fields.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_7417401021103822000_shared?collectionId=lex_2085851554325460000_0_shared&collectionType=Course
5.a	Course Name: Angular JS
	Module Name: Built in Pipes
	Display the product code in lowercase and product name in uppercase using built-in pipes.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_11810543990912035000_shared?collectionId=lex_2085851554325460000_00_shared&collectionType=Course
5.b	Course Name: Angular JS
	Module Name: Passing Parameters to Pipes
	Apply built-in pipes with parameters to display product details.

	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_21187073707540988000_shared?collectionId=lex_208585155432546000_00_shared&collectionType=Course
5.c	Course Name: Angular JS
	Module Name: Nested Components Basics
	Load CoursesListComponent in the root component when a user clicks on the View courses list button.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24231999287700136000_shared?collectionId=lex_208585155432546000_00_shared&collectionType=Course
6.a	Course Name: Angular JS
	Module Name: Passing data from Container Component to Child Component
	Create an AppComponent that displays a dropdown with a list of courses as values in it. Create another component called the CoursesList component and load it in AppComponent which should display the course details. When the user selects a course from the list, the details should be updated.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15758356947336235000_shared?collectionId=lex_208585155432546000_00_shared&collectionType=Course
6.b	Course Name: Angular JS
	Module Name: Passing data from Child Component to ContainerComponent
	Create an AppComponent that loads another component called the CoursesList component. Create another component called CoursesListComponent which should display the courses list in a table along with a register button in each row. When a user clicks on the register button it should say you are registered for this course
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2494980689916818400_shared?collectionId=lex_2085851554325460000_0_shared&collectionType=Course
6.c	Course Name: Angular JS
	Module Name: Shadow DOM
	Apply ShadowDOM and None encapsulation modes to components.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10312243404892470000_shared?collectionId=lex_208585155432546000_00_shared&collectionType=Course
6.d	Course Name: Angular JS
	Module Name: Component Life Cycle
	Override component life-cycle hooks and logging the corresponding messages to understand the flow.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10818939635948007000_shared?collectionId=lex_208585155432546000_00_shared&collectionType=Course
7.a	Course Name: Angular JS
	Module Name: Template Driven Forms

	<p>Create a course registration form as a template-driven form.</p> <p>https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2810668513603024400_shared?collectionId=lex_2085851554325460000_shared&collectionType=Course</p>
7.b	Course Name: Angular JS
	Module Name: Model Driven Forms or Reactive Forms
	Create an employee registration form as a reactive form.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33704702617536004000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
7.c	Course Name: Angular JS
	Module Name: Custom Validators in Reactive Forms
	Create a custom validator for an email field in the employee registration form (reactive form)
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33728128192769250000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
8.a	Course Name: Angular JS
	Module Name: Custom Validators in Template Driven forms
	Create a custom validator for the email field in the course registration form.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_27688491925133280000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
8.b	Course Name: Angular JS
	Module Name: Services Basics
	Create a Book Component which fetches book details like id, name and displays them on the page in a list format. Store the book details in an array and fetch the data using a custom service.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32584403823635940000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
8.c	Course Name: Angular JS
	Module Name: RxJS Observables
	Create and use an observable in Angular.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_62096093639052560000_shared?collectionId=lex_208585155432546000000_shared&collectionType=Course
9.a	Course Name: Angular JS
	Module Name: Server Communication using HttpClient
	Create an application for Server Communication using HttpClient
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_0127637395317063682615_shared?collectionId=lex_208585155432546000000_shared&collectionType=Course

9.b	Course Name: Angular JS
	Module Name: Communicating with different backend services using Angular HttpClient
	Create a custom service called ProductService in which Http class is used to fetch data stored in the JSON files.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_4266333361795059700_shared?collectionId=lex_2085851554325460000_0_shared&collectionType=Course
10.a	Course Name: Angular JS
	Module Name: Routing Basics, Router Links
	Create multiple components and add routing to provide navigation between them.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3782024852517635000_shared?collectionId=lex_2085851554325460000_0_shared&collectionType=Course
10.b	Course Name: Angular JS
	Module Name: Route Guards
	Considering the same example used for routing, add route guard to BooksComponent. Only after logging in, the user should be able to access BooksComponent. If the user tries to give the URL of Bookscomponent in another tab or window, or if the user tries
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_30303325731876470000_shared?collectionId=lex_2085851554325460000_00_shared&collectionType=Course
10.c	Course Name: Angular JS
	Module Name: Asynchronous Routing
	Apply lazy loading to BookComponent. If lazy loading is not added to the demo, it has loaded in 1.14 s. Observe the load time at the bottom of the browser console. Press F12 in the browser and click the Network tab and check the Load time
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9878739890118246000_shared?collectionId=lex_2085851554325460000_0_shared&collectionType=Course
10.d	Course Name: Angular JS
	Module Name: Nested Routes
	Implement Child Routes to a submodule.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012768043900444672140_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
11.a	Course Name: MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Installing MongoDB on the local computer, Create MongoDB Atlas Cluster
	Install MongoDB and configure ATLAS
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821437313024030083_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course

11.b	Course Name: MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Introduction to the CRUD Operations
	Write MongoDB queries to perform CRUD operations on document using insert(), find(), update(), remove()
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821874166169630118_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course
12.a	Course Name: MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Create and Delete Databases and Collections
	Write MongoDB queries to Create and drop databases and collections.
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821654119219230121_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course
12.b	Course Name: MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Introduction to MongoDB Queries
	Write MongoDB queries to work with records using find(), limit(), sort(), createIndex(), aggregate().
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_0132890816264519682505_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course
Text Books:	
1	Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson.
2.	Pro Mean Stack Development, 1st Edition, Elad Elrom, Apress O'Reilly.
3.	Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
4.	MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow, O'Reilly
Software configuration and installation:	
1.	Angular Setup details: Angular Application Setup - Internal - Viewer Page Infosys Springboard(onwingspan.com)
2.	MongoDB TOC - MongoDB Essentials - A Complete MongoDB Guide Infosys Springboard (onwingspan.com)
Web Links:	
1.	https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview (Angular JS)
2.	https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview (MongoDB)



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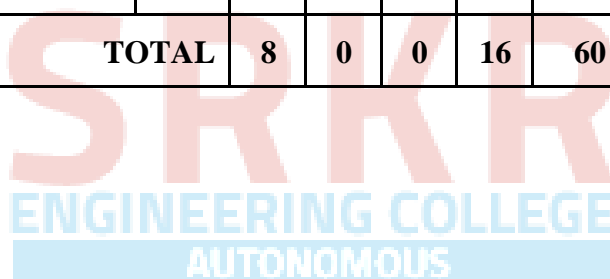
SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(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 & DATA SCIENCE									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2020-21 admitted Batch onwards)									
Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20AD4201	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



Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20AD4201	PR	--	--	16	8	60	140	3 Hrs.

PROJECT WORK

(For AIDS)

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 & Data Science 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.