RVR & JC College of Engineering

CSE (AI & ML)

Semester V (Third Year)

S. No.	Course Code	Course Title	Hours Per Week	Scheme of Examination			Category Code
			L – T – P	INT	EXT	Credits	
1	CM 311	Automata Theory & Formal Languages	3 – 0 – 0	30	70	3	PC
2	CM 312	Computer Networks	3 – 0 – 0	30	70	3	PC
3	CM 313	Data and Visual Analytics in AI	3 – 0 – 0	30	70	3	PC
4	CM 314	Professional Elective – I	3 – 0 – 0	30	70	3	PE
5	CM 315	Open/Job-Oriented Elective – I	3 – 0 – 0	30	70	3	OE
6	CM 351	Data and Visual Analytics in AI Lab	0 – 0 – 3	30	70	1.5	PC
7	CM 352	Professional Elective Lab	0 – 0 – 3	30	70	1.5	PE
8	CM 353	Summer Internship	0 – 0 – 0	100	-	1.5	PR
9	CM SL3	Skill Oriented Course – III	1 – 0 – 2	100	-	2	SC
		Total	**16 – 0 – 8**	**410**	**490**	**21.5**	

CM 311	AUTOMATA THEORY & FORMAL LANGUAGES	L	T	P	Int.	Ext.	C
		3	-	-	30	70	3

Course Objectives:

The main objectives of this course are to:

1. Introduce the types of Finite Automata and properties of Regular Expressions.
2. Explain Context-Free Grammars and Push Down Automata
3. Introduce the Turing Machine and explain undecidability concept.

Course Outcomes:

After successful completion of the course, students will be able to:

CO 1. Explain the fundamental concepts of Automata and Formal languages. L2
CO 2. Apply the knowledge of Automata Theory, Formal languages, Grammars & Regular Expressions for solving various problems. L3
CO 3. Design PDAs for various languages. L4
CO 4. Design Turing machines to solve problems. L4

Course Content:

UNIT – I	CO1, CO2	12 Periods

Automata: Introduction to Automata, The central concepts of automata theory Alphabets, Strings, Languages.

Finite Automata: An Informal picture of finite automata, Deterministic finite automata (DFA) - Definition of DFA, DFA processing strings, Notations for DFA, Extended transition function, the language of DFA, Non deterministic finite automata (NFA) – Definition of NFA, Extended transition function, the language of NFA, Equivalence of DFA and NFA Finite.

Automata with ∈ transitions: Use of ∈ - transition, notation for an ∈ - NFA, Epsilon closures, extended transitions and languages, Applications.

UNIT – II	CO1, CO2	12 Periods

Regular Expressions and Languages: Regular expressions, finite automata and regular expressions, Algebraic laws of regular expressions.

Properties of Regular Languages: Proving languages are not regular – Pumping lemma for regular languages, Applications of the pumping lemma, Closure Properties of Regular Languages, Equivalence and minimization of automata – Minimization of DFA.

UNIT – III	CO1, CO2, & CO3	12 Periods

(Construction based treatment & proofs are excluded)

Context Free Grammars: Context Free Grammars, Parse Trees, Constructing parse trees, derivations and parse trees, ambiguous grammars.

Pushdown Automata: Definition of the Pushdown automata, the languages of PDA, Equivalences of PDA's and CFG's.

Context free languages: Normal form's for context- Free grammars, the pumping lemma for context free languages.

UNIT – IV	CO1, CO2, & CO4	12 Periods
Properties of Context free languages: closure properties for context free languages, Decision properties for CFL's. **Introduction to Turing Machines:** The Turing Machine, programming techniques for Turing machines. **Undecidability:** A language that is not recursively enumerable, an undecidable problem that is RE, Undecidability problems about TM, Post's Correspondence problem.		

Learning Resources:

Text Book:

1. John. E. Hopcroft, R. Motwani, & Jeffery. D. Ullman, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2003

Reference Books:

1. Daniel I.A.Cohen, 'Computer Theory',
2. KLP Mishra & N. Chandrasekharan, 'Theory of Computation', PHI.
3. MichealSipser, "Introduction of the Theory and Computation", Thomson Brokecole,1997.
4. R.K.Ragade, "Automata and Theoretical Computer Science", First Edition, PearsonEducation, 2004.
5. John E Hopcroft& Jeffery D Ullman' 'Introduction to Automata Theory & Languagesand Computation', Narosa Publishing House.

CM 312	COMPUTER NETWORKS	L	T	P	Int.	Ext.	C
		3	-	-	30	70	3

Course Objectives:

The main objectives of this course are to:

1. Introduce the fundamental concepts and layered architectures of networks.
2. Impart knowledge on functionalities, design issues, protocols and mechanisms used in different layers of network stack.

Course Outcomes:

After successful completion of the course, students will be able to:

CO 1. Describe the layered architectures of computer networks.
CO 2. Explain the fundamental concepts of data communications.
CO 3. Illustrate the data link layer protocols and the mechanisms used for accessing a channel.
CO 4. Exemplify optimal routing algorithms and QoS mechanisms used for networks.
CO 5. Explain reliable and unreliable protocols used for end to end connectivity.
CO 6. Discuss the application layer protocols.

Course Content:

UNIT – I		**12 Periods**
Introduction: Network Hardware, Network Software, Reference Models. **Physical Layer:** The theoretical basis for data communication, Guided media, digital modulation and multiplexing, switching.		
UNIT – II		**12 Periods**
The Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols. **The Medium Access Control Sub-layer:** Multiple Access Protocols- ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Ethernet, Data Link Layer Switching.		
UNIT – III		**12 Periods**
The Network Layer: Network Layer Design Issues, Routing Algorithms-Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast routing, multicast routing, Congestion control algorithms, Quality of Service- Application Requirements, Traffic Shaping, Packet Scheduling, Admission Control, Internetworking, The Network Layer in the Internet-The IP version 4.0 protocol, IP Addresses, IP Version 6.0, Internet Control Protocols.		
UNIT – IV		**12 Periods**
The Transport Layer: The Transport Service: Services Provided to the Upper Layers, Transport Service Primitives, Elements of Transport Protocols – addressing: Connection Establishment, Connection Release, Error Control and Flow Control, Congestion control-Desirable Bandwidth allocation, Regulating the sending rate, The Internet Transport Protocols: Introduction to UDP, Remote procedure call, Real-Time transport protocols, Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release. **The Application Layer:** DNS- The Domain Name System, Electronic mail.		

Learning Resources:

Text Book:

1. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Fifth Edition, Pearson Education.

Reference Books:

1. James F. Kurose, Keith W. Ross, Computer Networking, Third Edition, Pearson Education.
2. Behrouz A Forouzan, Data Communications and Networking, Fourth Edition, TMH (2007).
3. Kurose & Ross, COMPUTER NETWORKS, A Top-down approach featuring the Internet, Pearson Education, Alberto Leon, Garciak.

CM 313	Data and Visual Analytics in AI	L	T	P	Int.	Ext.	C
		3	-	-	30	70	3

Course Objectives:

The main objectives of this course are to:

1. This course introduces the visualization techniques of data.
2. To enable students to make more effective use of data.
3. To utilize various levels and types of summarization of data

Course Outcomes:

After successful completion of the course, students will be able to:

CO 1. Use basic data types and preprocessing techniques of data according to needs.
CO 2. Apply the data visualization through various graphs to analyse the data.
CO 3. Apply the visual distribution of data.
CO 4. Understand the multiple visual distribution of data.

Course Content:

UNIT – I		**12 Periods**
Data Warehouse: Data Warehouse: Basic Concepts, Data Warehouse Modelling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation. **Getting to know Data:** Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity.		
UNIT – II		**12 Periods**
Data Mining: What is Data Mining, Kinds of Data, Kinds of Patterns, Technologies Used, Major Issues in Data Mining. **Data Pre-processing:** Data cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.		
UNIT – III		**12 Periods**
Visualizing Data: Mapping data onto aesthetics, aesthetics and types of data, scales map data values onto aesthetics, visualizing amounts: bar plots, grouped and stacked bars, dot plots and heat maps, exploration of visualization tools. **Visualizing Distributions:** Histograms and density plots - visualizing a single distribution, visualizing multiple distributions at the same time. Empirical cumulative distribution functions and q-q plots - empirical cumulative distribution functions, highly skewed distributions, quantile-quantile plots.		
UNIT – IV		**12 Periods**
Visualizing Multiple Distributions: Visualizing distributions along the vertical axis, visualizing distributions along the horizontal axis. Visualizing associations among two or more quantitative variables - scatter plots, scatter plot matrix, ggplots, correlograms, dimension reduction, paired data.		

Learning Resources:

Text Book:

1. Jiawei Han and Micheline Kamber, Data Mining- Concepts and Techniques, Morgan Kaufmann Publishers, Elsevier, 3rd Edition.
2. Claus O. Wilke, Fundamentals of Data Visualization, Oreilly publication, 1st Edition .

erence Books:

1. Arun K Pujari, Data Mining Techniques, 3rdEdition, Universities Press.
2. Kieran Healy, Data Visualization: A Practical Introduction 1stEdition, Princeton university press