B.Tech. ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (AM)
III/IV B. Tech SEMESTER-I

S. No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	CS/CY/AM/DS 311	COMPUTER NETWORKS	PC	3	0	0	30	70	3
2	AM/DS 312	DATABASE MANAGEMENT SYSTEMS	PC	3	0	0	30	70	3
3	AM 313	MACHINE LEARNING	PC	3	0	0	30	70	3
4	AM 314	Elective I [Select in set-1 from respective specialization]	PC	3	0	0	30	70	3
5	AM 315	Elective II [Select in set-1 from respective specialization]	PC	3	0	0	30	70	3
6	CS/AM 316	INTELLECTUAL PROPERTY RIGHTS	MC	3	0	0	30	70	0
7	AM 351	MACHINE LEARNING LAB	PC	0	0	2	30	70	1.5
8	AM/DS 352	DATABASE MANAGEMENT SYSTEMS LAB	PC	0	0	2	30	70	1.5
9	AM 353	SKILL COURSE	SC	1	0	2	30	70	2
10	AM 354	INTENSHIP/ MINI PROJECT	SC	0	0	3	30	70	1.5
Total Credits									**21.5**
Industrial/Research Internship (2 Months) after 2nd Year during summer vacation									
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)									**4**

Elective-I(set-1)		**Elective-II(set-1)**	
A	COMPUTER ORGANIZATION AND ARCHITECTURE	E	EMBEDDED SYSTEMS
B	DIGITAL IMAGE PROCESSING	F	INFORMATION RETRIEVEL
C	KNOWLEDGE REPRESENTATION & REASONING	G	DISTRIBUTED COMPUTING
D	SOFTWARE ENGINEERING	H	DESIGN ANALYSIS AND ALGORTHIMS

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AM/CS/CY/DS 311	Computer Networks	L	T	P	M	C
		3	0	0	100	3

Course Objectives

1. To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
2. To study data link layer concepts, design issues, and protocols.
3. To study MAC layer Random Access Protocols, LAN.
4. To gain knowledge on Network layer and Routing Algorithms.
5. To learn Transport layer services, and protocols.
6. To acquire knowledge of Application layer protocols.

Course Outcomes

1. Illustrate the OSI reference model, TCP/IP, and Digital transmission techniques
2. Demonstrate Data Link Layer protocols
3. Compare and contrast MAC protocols, various types of LANs
4. Summarize various network layer services and Routing algorithms
5. Implement Transport layer and application layer protocols

SYLLABUS

UNIT-I

Introduction: Introduction to Computer Networks, Network Models (protocols): OSI reference model, TCP/IP reference model. Network topologies, types of networks (LAN, MAN, WAN).

Physical layer: Data and Signals, Digital signals, Digital transmission (Digital-to-Digital, Analog-to-Digital), multiplexing (FDM, TDM), Transmission media.

UNIT-II

Data Link Layer: Error Detection & Correction: types of errors, Error Detection (Parity, CRC, Check Sum), Error Correction (Using hamming code), Data Link Layer services: framing, flow control, error control. Error & Flow control mechanisms: stop and wait, Go back N and selective repeat, High Level Data Link Control (HDLC).

UNIT-III

Medium access control: Random access: Aloha, Slotted Aloha, CSMA, CSMA/CD, and CSMA/CA, Local area networks: Ethernet, Types of ethernet (Token Ring, Fast Ethernet, Gigabit Ethernet), Personal Area Network: Bluetooth (Architecture), Wireless LANS: IEEE 802.11(Architecture, MAC sub layer).

UNIT-IV

Network layer: Network Layer Services, IPV4 Address, Subnetting, Super-netting, Classless addressing, Internet Protocol (IP, ARP, DHCP, ICMP), IPV6 Address format, Routing algorithms: Distance vector, Link state, Network Address Translation (NAT).

UNIT-V

Transport layer: UDP (User Datagram, Services, Applications), TCP (TCP Services, features, Segment, Connection establishment and termination, sliding window protocol, flow control and congestion control)

Application Layer: Application Layer services and protocols including WWW, DNS, SMTP, POP, FTP, Telnet, HTTP, Firewalls.

Textbook:

1. Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill, 5th Edition, 2017.

Reference Books:

1. Data and Computer Communications, William Stallings,Pearson, 10th Edition, 2013.
2. Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, Pearson Education India; 5th edition,

AM/DS 312	Database Management Systems	L	T	P	M	C
		3	0	0	100	3

COURSE OBJECTIVES:

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
- To understand and use data manipulation language to query, update, and manage a database
- To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency &Client/Server (Database Server).
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.

COURSE OUTCOMES:

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

1. Understand the basic concepts of database management systems
2. Apply SQL or Relational Algebra operations to find solutions for a given application
3. Apply normalization techniques to improve database design
4. Analyze a real time scenario to use Conceptual and Relational data models for designing the database

UNIT - I

Introduction to Databases: Characteristics of the Database Approach, Advantages of using the DBMS Approach, A Brief History of Database Applications, Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System environment, Centralized and Client-Server Architecture for DBMSs.

UNIT - II

Conceptual Data Modeling: High-Level Conceptual Data Models for Database Design, A Sample Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, Relationship Types of Degree Higher Than Two. Relational Database Design Using ER-to- Relational Mapping.

UNIT - III

Relational Model: The Relational Model Concepts, Relational Model Constraints and Relational Database Schemas. Basic SQL: SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic retrieval Queries in SQL ,INSERT, DELETE AND UPDATE Statements in SQL More SQL: More complex SQL retrieval queries Advanced Queries, Specifying constraints on Actions as Triggers, procedures, functions, cursors, Views in SQL

Relational Algebra: Unary Relational Operations: Select and Project, Relational Algebra Operations from SetTheory, Binary Relational Operations: Join and Division, Examples of Queries in Relational Algebra.

UNIT - IV

Database Design Theory and Normalization: Functional Dependencies, Normal forms based on Primary Keys, General definitions of Second and Third Normal Forms , Boyce-Codd Normal Form, Multi valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

UNIT - V

Transaction Processing: Introduction, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability & Serializability, Transaction Support in SQL.

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Introduction to Concurrency Control: Two-Phase Locking Techniques for concurrency control: Types of Locks and System Lock Tables, Guaranteeing Serializability by Two-Phase Locking.

Introduction to Recovery Protocols: Recovery Concepts, No- UNDO/REDO Recovery Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging.

TEXT BOOK:

1. Fundamentals of Database Systems, Ramez Elmasri,ShamkantB. Navathe, Seventh edition, Pearson.

REFERENCE BOOKS:

1. Data base System Concepts, Abraham Silberschatz, Henry F Korth, S. Sudarshan, FifthEdition,McGraw Hill.
2. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, Third Edition,TMH.
3. Introduction to Database Systems, C.J.Date, Eigth Edition , Pearson

e-Resources and other Digital Material:

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://onlinecourses.nptel.ac.in/noc21_cs04/
3. https://nptel.ac.in/courses/106/106/106106093/

MAPPING OF CO's &PO's:

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2													2	
CO3	2													
CO4		2				1			1	1				

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AM-313	Machine Learning	L	T	P	M	C
		3	0	0	100	3

Prerequisites:

1. Mastery of introduction-level algebra , statistics and probability theory
2. Data Modeling and Evaluation

Course Objectives:

1. Recognize the basic terminology and fundamental concepts of machine learning.
2. Understand the concepts of Supervised Learning models with a focus on recent advancements.
3. Relate the Concepts of Neural Networks Models of supervised Learning
4. Discover Unsupervised learning paradigms of machine learning
5. Understand the concepts of Reinforcement learning and Ensemble methods

Course Outcomes:

1. Explain the concepts and able to prepare the dataset for different Machine learning models.
2. Identify and Apply appropriate Supervised Learning models.
3. Design Neural Network models for the given data.
4. Perform Evaluation of Machine Learning algorithms and Model Selection.
5. Devise un-supervised and Reinforcement learning models.

UNIT-I:

Introduction: Introduction to Machine learning, Goals and applications of Machine learning, Issues in machine learning, Types of machine learning. Supervised learning, Unsupervised learning,Reinforcement learning.

Feature Selection: Filter, Wrapper, Embedded methods.

Feature Normalization:- min-max normalization, z-score normalization, and constant factor normalization

Introduction to Dimensionality Reduction: Principal Component Analysis(PCA), Linear Discriminant Analysis(LDA)

UNIT-II:

Supervised Learning – I (Regression/Classification)

Regression models: Simple Linear Regression, multiple linear Regression, Logistic Regression. **Performance Metrics**: Mean Absolute Error (MAE), Mean Squared Error (MSE),R-Squared error, Adjusted R Square.

Classification models: Decision Trees-ID3, CART, Naive Bayes, K-Nearest-Neighbours (KNN) Support Vector Machines (SVM)

UNIT-III:

Supervised Learning – II (Neural Networks)

Neural Network Representation : Perceptrons, Activation Functions, ArtificialNeural Networks (ANN) , Back Propagation Algorithm. Convolutional Neural Networks - Convolution and Pooling layers, , Recurrent NeuralNetworks (RNN).

Classification Metrics: Confusion matrix, Precision, Recall, Accuracy, F-Score.

UNIT-IV:

Model Validation in Classification : Cross Validation - Holdout Method, K-Fold, Regularization.

Ensemble Methods: Boosting, Bagging, Random Forest.

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UNIT-V:

Unsupervised Learning : Clustering-K-means, Hierarchical clustering.

Reinforcement Learning: Overview, Example, Markov Decision Process,Uses of Reinforcement Learning

Text Books:

1. Machine Learning – Tom M. Mitchell, -MGH
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press,2012
3. R. S. Sutton and A. G. Barto. Reinforcement Learning - An Introduction.MIT Press.1998.

References:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer2009
2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer,2007.
3. Machine Learning Yearning, AndrewNg.
4. Data Mining–Concepts and Techniques -Jiawei Han and MichelineKamber,Morgan Kaufmann

MAPPING OF CO&PO:

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

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AM/CS/CY/DS 314-A	Computer Organization and Architecture (ELECTIVE -1)	L	T	P	M	C
		3	0	0	100	3

Course Objectives:

1. Study of the basic structure and operation of a digital computer system.
2. Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations.
3. Implementation of control unit techniques and the concept of Pipelining
4. Understanding the hierarchical memory system, cache memories and virtual memory
5. Understanding the different ways of communicating with I/O devices and standard I/O interfaces

UNIT-1

Introduction: Functional units of digital system and their interconnections, buses, bus architecture,types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes.

UNIT-2

Arithmetic and logic unit: Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers

Unit-3

Control Unit: Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming.

Unit-4

Memory: Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.

Unit-5

Input / Output: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.

Text books:

1. Computer System Architecture - M. Morris Mano
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012
3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998. Reference books
4. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventhedition, 2006.
5. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression, 2011.

6. David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier, a division ofreed India Private Limited, Fifth edition, 2012 Structured Computer Organization, Tannenbaum(PHI)

MAPPING OF CO&PO:

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

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AM/CS/DS 314-B	Digital Image Processing (ELECTIVE -I)	L	T	P	M	C
		3	0	0	100	3

Course Objectives:

Students undergoing this course are expected to:

1. Familiarize with basic concepts of digital image processing and different image transforms
2. Learn various image processing techniques like image enhancement, restoration, segmentation and compression
3. Understand color fundamentals and different color models
4. Understand wavelets and morphological image processing

Course Outcomes:

After undergoing the course students will be able to

1. Perform image manipulations and different digital image processing techniques
2. Perform basic operations like – Enhancement, segmentation, compression,Image transforms and restoration techniques on image.
3. Analyze pseudo and fullcolor image processing techniques.
4. Apply various morphological operators on images

UNIT-1

Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing.

Image Transforms: Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms.

UNIT-2

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, Combining spatial enhancement methods

Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering.

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UNIT-3

Image Restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering ,geometric mean filter .

UNIT-4

Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding .

Wavelets and Multiresolution Processing: Image pyramids, subband coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

UNIT-5

Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation.

Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.

Text Books

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.

2. Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", Tata McGraw-Hill Education,

2011.

Reference Books

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.

2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009

MAPPING OF CO&PO:

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CO1	1	1	1	-	2	1	-	-	-	-	-	1
CO2		1		-	1	1	-	-	-	-	-	1
CO3	1	2	2	-	1	1	-	-	-	-	-	1
CO4	1	1	1	-	1	1	-	-	-	-	-	1

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AM/CS 314-C	Knowledge Representation & Reasoning (ELECTIVE -I)	L	T	P	M	C
		3	0	0	100	3

Course Objectives:

1. To investigate the key concepts of knowledge representation (KR) techniques and different notations.
2. To integrate the KR view as a knowledge engineering approach to model organizational Knowledge.
3. To introduce the study of ontologies as a KR paradigm and applications of ontologies.
4. To understand various KR techniques.
5. To understand process, knowledge acquisition and sharing of ontology.

Course Outcomes:

- Analyze and design knowledge based systems intended for computer implementation.
- Acquire theoretical knowledge about principles for logic-based representation and reasoning.
- Ability to understand knowledge-engineering process
- Ability to implement production systems, frames, inheritance systems and approaches to handle uncertain or incomplete knowledge..

UNIT - I:

The Key Concepts: Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic

Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity

UNIT - II:

Ontology: Ontological categories, Philosophical background, Top-level categories, Describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time

UNIT - III:

Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation

UNIT - IV:

Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction,

Change Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.

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UNIT - V:

Knowledge Soup: Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Nonmonotonic Logic, Theories, Models and the world, Semiotics Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, Accommodating multiple paradigms, Relating different knowledge representations, Language patterns,

TEXT BOOKS:

1. Knowledge Representation logical, Philosophical, and Computational Foundations by John F. Sowa, Thomson Learning.
2. Knowledge Representation and Reasoning by Ronald J. Brachman, Hector J. Levesque, Elsevier.

Reference books

- Schank, Roger C., Robert P. Abelson: Scripts, Plans, Goals, and Understanding: An Inquiry into Human Knowledge Structures. Hillsdale, NJ: Lawrence Erlbaum, 1977.
- R. C. Schank and C. K. Riesbeck: Inside Computer Understanding: Five Programs Plus Miniatures, Lawrence Erlbaum, 1981.
- Murray Shanahan: A Circumscriptive Calculus of Events. Artif. Intell. 77(2), pp. 249-284, 1995.

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

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AM/CS/DS-314-D	Software Engineering (ELECTIVE -I)	L	T	P	M	C
		3	0	0	100	3

Course Objectives

1. The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
2. Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

Course Outcomes

1. Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
2. Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
3. Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

UNIT-I

Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths.

A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models.

Process models: The waterfall model, incremental process models, evolutionary process models, the unified process.

UNIT-II

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, Interface specification, the software requirements document.

System models: Context models, behavioral models, data models, object models, structured methods.

UNIT-III

Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT-IV

Testing Strategies: black-box and white-box testing, validation testing, system testing, the art of debugging.

Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

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UNIT-V

Metrics for Process and Products: Software measurement, metrics for software quality. **Risk management:** Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

Quality Management: software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

TEXTBOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
   The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

REFERENCEBOOKS:

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The McGraw- Hill Companies.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

Mapping of CO &PO:

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

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AM/CS 315-E	Embedded Systems (ELECTIVE -1I)	L	T	P	M	C
		3	0	0	100	3

Course Objectives:

1. To provide an overview of principles of Embedded System
2. To provide a clear understanding of role of firmware, operating systems in correlation with hardware systems.

Course Outcomes:

1. Expected to understand the selection procedure of processors in the embedded domain.
2. Design procedure of embedded firm ware.
3. Expected to visualize the role of realtime operating systems in embedded systems.
4. Expected to evaluate the correlation between task synchronization and latency issues

UNIT - I

Introduction to Embedded Systems: Processor embedded into a system, Embedded Hardware units and devices in a system, Embedded software in a system, Design process of an embedded system, classification of embedded systems, application areas of embedded systems , characteristics and quality attributes of an embedded systems

UNIT - II

Introduction to processor/microcontroller: Architecture, Real world interfacing, processor and memory organization, memory types, memory maps and addresses, interrupt sources and interrupt service mechanism.

UNIT - III

On board Communication Basics: serial communication devices, Parallel devices, Wireless devices, Real time clock, Serial bus communication Protocols - I2C, SPI; Parallel buss communication - ISA, PCI.

UNIT - IV

Embedded Firmware Development: Overview of programming concepts - in assembly language and in high level language 'C', C Program elements- Heads, Source files, Processor Directives, Macros, Functions, Data types and Data Structures

UNIT - V

OS Based Embedded Systems: OS services - Process/Task Management, Memory Management, I/O subsystem manager, Inter Process/Task communications - Tasks, Task states, Shared data, Signals, Message Queues, Mailbox, Pipes and concepts of Semaphores.

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TEXT BOOK:

1. Embedded Systems, Raj Kamal, 2nd edition, Tata Mc Graw Hill
2. Shibu K V, "Introduction to Embedded Systems", Second Edition, Mc Graw Hill

REFERENCE BOOKS:

1. Rajkamal, Embedded Systems Architecture, Programming and Design, Tata McGraw-Hill
2. Frank Vahid and Tony Givargis, "Embedded Systems Design" - A Unified Hardware/Software Introduction, John Wiley
3. Lyla, "Embedded Systems" –Pearson
4. David E. Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1		1		1							1	2	3
CO2		1	1		1							1	2	3
CO3				1	1								2	3
CO4						1								3

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AM/CS/DS 315-F	Information Retrieval (ELECTIVE -II)	L	T	P	M	C
		3	0	0	100	3

COURSE OBJECTIVES:

1. To understand the concepts of information Retreival.
2. To Implement the Concept of Indexing and Natural language.
3. To Understand & Implement the Data Structures for retrieval .
4. To Implement Search Techniques.

COURSE OUTCOMES:

1. Describe the objectives of information retrieval systems.
2. Implement concepts of Indexing.
3. Understand & Implement the Data Structures for retrieval
4. Implement Search Techniques.

UNIT – I:

Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses. **Information Retrieval System Capabilities:** Search, Browse, Miscellaneous

UNIT – II:

Cataloging and Indexing:

Objectives, Indexing Process, Automatic Indexing, Information Extraction.

Automatic Indexing:

Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages

UNIT – III:

Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure.

UNIT – IV:

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.

UNIT – V:

Text Search Algorithms:

Introduction , Software text search algorithms, Hardware text search systems.

Information System Evaluation:

Introduction, Measures used in system evaluation, Measurement example

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TEXT BOOKS:

1. Kowalski, Gerald, Mark T Maybury: Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.
2. Gerald J Kowalski, Mark T Maybury Information Storage and Retrieval Systems: Theory and Implementation, Springer, 2004.

REFERENCE BOOKS:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms,Prentice Hall, 1992.
2. SoumenChakrabarti, Mining the Web : Discovering Knowledge from Hypertext Data, Morgan – Kaufmann Publishers, 2002.
3. Christopher D Manning, PrabhakarRaghavan, HinrichSchutze, An Introduction to Information Retrieval By Cambridge University Press, England, 2009.
4. Modern Information Retrival By Yates Pearson Education.
5. Information Storage & Retieval By Robert Korfhage

MAPPING OF CO&PO:

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

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CS-315-G	Distributed Computing (ELECTIVE -1I)	L	T	P	M	C
		3	0	0	100	3

COURSE OBJECTIVES

The course should enable the students to:

1. Distributed systems concepts, protocols and mechanisms.
2. State-of-the-art developments in distributed systems.
3. Interplay of emerging technologies and paradigms and distributed systems.
4. Practical experience with implementing distributed computing techniques.

COURSE OUTCOMES

After completing this course the students will learn

1. Learning about the fundamental principles of distributed computing, how to design and develop distributed systems, and how to analyze the performance of cloud computing They will also familiar with the research area of Game AI.
2. To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
3. To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
4. To improve the efficiency and performance of computing tasks.

UNIT-I

INTRODUCTION:

Definition: Relation to Computer System Components ,Motivation , Message, Passing Systems versus Shared Memory Systems , Primitives for Distributed Communication, Synchronous versus Asynchronous Executions, Design Issues and Challenges, A Model of Distributed Computations, A Distributed Program, A Model of Distributed Executions, Models of Communication Networks, Global State of a Distributed System.

UNIT-II

LOGICAL TIME AND GLOBAL STATE :

Logical Time, Physical Clock Synchronization, NTP, A Framework for a System of Logical Clocks, Scalar Time, Vector Time, Message Ordering and Group Communication, Message Ordering Paradigms, Asynchronous Execution with Synchronous Communication, Synchronous Program Order on Asynchronous System, Group Communication, Causal Order, Total Order, Global State and Snapshot Recording Algorithms, Introduction, System Model and Definitions, Snapshot Algorithms for FIFO Channels.

UNIT-III

DISTRIBUTED MUTEX AND DEADLOCK:

Distributed Mutual exclusion Algorithms: Introduction, Preliminaries, Lamport's algorithm, RicartAgrawala's Algorithm, Token-Based Algorithms, Suzuki-Kasami's Broadcast Algorithm Deadlock Detection in Distributed Systems.

Introduction: System Model, Preliminaries, Models of Deadlocks, Chandy-Misra-Haas Algorithm for the AND model and OR Model

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UNIT-IV

CONSENSUS AND RECOVERY :

Consensus and Agreement Algorithms: Problem Definition, Overview of Results, Agreement in a Failure-Free System(Synchronous and Asynchronous) , Agreement in Synchronous Systems with Failures, Check pointing and Rollback Recovery.

Introduction: Background and Definitions, Issues in Failure Recovery, Checkpoint-based Recovery, Coordinated Check pointing Algorithm, Algorithm for Asynchronous Check pointing and Recovery.

UNIT-V

CLOUD COMPUTING :

Definition of Cloud Computing: Characteristics of Cloud, Cloud Deployment Models, Cloud Service Models, Driving Factors and Challenges of Cloud, Virtualization, Load Balancing, Scalability and Elasticity, Replication, Monitoring, Cloud Services and Platforms, Computer Services, Storage Services, Application Services

TEXT BOOKS

1. Kshemkalyani Ajay D, Mukesh Singhal, "Distributed Computing: Principles, Algorithms and Systems", Cambridge Press, 2011.
2. Mukesh Singhal, Niranjan G Shivaratri, "Advanced Concepts in Operating systems", McGraw Hill Publishers, 1994.

REFERENCE BOOKS:

1. George Coulouris, Jean Dollimore, Time Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.
2. Pradeep L Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
3. Tanenbaum A S, Van Steen M, "Distributed Systems: Principles and Paradigms", Pearson Education, 2007.
4. Liu M L, "Distributed Computing: Principles and Applications", Pearson Education, 2004.
5. Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, 2003.
6. Arshdeep Bagga, Vijay Madisetti, " Cloud Computing: A Hands-On Approach", Universities Press, 2014

MAPPING OF CO&PO:

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

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AM/DS 315-H	Design & Analysis of Algorithms(ELECTIVE -I1)	L	T	P	M	C
		3	0	0	100	3

COURSE OBJECTIVES:

- Analyse the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

COURSE OUTCOMES:

1. Analyse time efficiency of algorithms using Divide and Conquer Strategy.
2. solve Optimization problems using Greedy strategy.
3. Distinguish Dynamic Programming and Greedy Strategies.
4. Test the efficient algorithms using Back Tracking, Branch & Bound for solving problems.
5. Examine computational problems into P, NP, NP-Hard and NP-complete.

Syllabus

Unit I

Background: Introduction, algorithms specification, time and space complexity, performance analysis.

Divide and Conquer: Binary search, merge sort, quick sort, Strassen's matrix multiplication, maximum and minimum problem.

Unit II

Greedy Methods: General method, Activity Selection Problem, optimal merge patterns,Knapsack problem, job scheduling problem, single source shortest path problem.

Unit III

Dynamic Programming: General method, multistage graphs, 0/1 Knapsack problem, longest common subsequence, string editing,travelling salesman problem, optimal binary search trees.

Unit IV

Back Tracking: General method, N-queen problem, sum of subset problem, graph colouring, Hamiltonian cycles.

Unit V

Branch and Bound: General method, 0/1 knapsack problem, travelling salesman problem.

NP Hard and NP Complete: deterministic and nondeterministic algorithms, NP Hard and NP complete, Example NP-complete Problems.

Text Books:

1. Cormen T. H, Leiserson C. E, Rivest R. L, and Stein C., Introduction to Algorithms, Prentice-Hall of India, 2nd Ed., 2001.
2. Horowitz E., Computer Algorithms, Galgotia Publications, 1998.

Reference Books:

1. Cormen T. H, Leiserson C. E, Rivest R. L, and Stein C., Introduction to Algorithms, Prentice-Hall of India, 2nd Ed., 2001.
2. Brassard G., Fundamentals of Algorithmics, Prentice-Hall of India, 2003.
3. Aho A. V., Design and Analysis of Algorithms, Addison Wesley, 2001.

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CO PO-PSO Articulation Matrix:

CO\PO-PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	0	0	0	0	0	0	3	3	2	1
CO2	3	3	3	2	2	0	0	0	0	1	0	2	2	3	2
CO3	2	3	2	3	2	0	0	1	0	1	0	2	2	2	3
CO4	3	3	3	3	3	1	1	1	1	2	2	3	3	3	2

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AM/CS 316 **INTELLECTUAL PROPERTY RIGHTS** L T P M C
3 0 0 100 0

Course Objectives:

1. To explain the art of interpretation and documentation of research work
2. To explain various forms of intellectual property rights
3. To discuss leading International regulations regarding Intellectual Property Rights

Course Outcomes: Upon the Successful Completion of the Course, the Students would be able to:

1. Understand types of Intellectual Property
2. Analyze trademarks and its functionality
3. Illustrate law of copy rights and law of patents

UNIT- I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT - II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT - III

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT - IV

Trade Secrets: Trade secret law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

UNIT - V

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT BOOKS & REFERENCES:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

CO-PO/PSO Mapping Matrix:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	3	-	-	-	-	-	-
CO3	3	-	3	-	-	3	-	3	-	-	-	-	-	-

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AM 351	MACHINE LEARNING Lab	L	T	P	M	C
		0	0	2	100	1.5

COURSE OBJECTIVES:

This course will enable students to

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.

COURSE OUTCOMES:

The students should be able to:

1. Understand the implementation procedures for the machine learning algorithms.
2. Design Java/Python programs for various Learning algorithms.
3. Apply appropriate data sets to the Machine Learning algorithms.
4. Identify and apply Machine Learning algorithms to solve real world problems.

Lab Experiments:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

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AM/DS 352 DATABASE MANAGEMENT SYSTEMS LAB

L	T	P	M	C
0	0	2	100	1.5

Course Objectives:

- The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively information from a DBMS.
- This lab enables the students to practice the concepts learnt in the subject DBMS by developing a database.
- The student is expected to practice the designing, developing and querying a database.

Course Outcomes:

- Understand, appreciate and effectively explain the underlying concepts of database technologies
- Design and implement a database schema for a given problem-domain Normaliz a database
- Populate and query a database using SQL DML/DDL commands.
- Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS
- Programming PL/SQL including stored procedures, stored functions, cursors, packages

List of Experiments

2. Learn the Data Definition Language (DDL) commands in RDBMS, Data Manipulation Language (DML) and Data Control Language (DCL)
3. Create table and insert sample data in tables.
4. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions
5. Queries using Partial Matching operators (LIKE, %, _, *, ?) ,ASC-DESC ordering combinations Checking for Nulls and aggregate functions in SQL
6. Perform queries involving predicates LIKE, BETWEEN, IN etc.
7. Queries to Retrieve and Change Data: Select, Insert, Delete, and Update
8. Queries on Controlling Data: Commit, Rollback, and Save point
9. Queries for Creating, Dropping, and Altering Tables, Views, and Constraints
10. To apply the concept of Aggregating Data using Group functions
11. Queries using Group By, Order By, and Having Clauses
12. Queries on Multi-table queries (JOIN OPERATIONS) ,Simple joins (no INNER JOIN) Aliasing tables Full/Partial name qualification ,Inner-joins (two and more (different) tables) ,Inner-recursive-joins (joining to itself) , Outer-joins (restrictions as part of the WHERE and ON clauses) ,Using where & having clauses and Correlated Sub-Queries
13. Nested queries: In, Not In Exists, Not Exists Dynamic relations (as part of SELECT, FROM, and WHERE clauses)
14. Set Oriented Operations: Union, Difference, Intersection, Division
15. PL/SQL Programming I: Programs using named and unnamed blocks, using SQL and Control Structures in PL/SQL, Programs using Cursors
16. PL/SQL Programming II: Creating stored procedures, functions and packages
17. Triggers and auditing triggers

TEXT BOOK/ REFERENCE BOOKS:

- Oracle: The Complete Reference by Oracle Press
- Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.
- Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007.

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MAPPING OF CO's &PO's:

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength ofcorrelations (3:Substantial, 2: Moderate, 1:Slight)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1					1		1						
CO2	1					1		1						
CO3	1					1		1						
CO4														
CO5														

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AM 353-C	Python for AI Lab	L T P M C 1 0 2 100 2

1. Write a Program to Implement Breadth First Search using Python.
2. Write a Program to Implement Depth First Search using Python.
3. Write a Program to Implement Tic-Tac-Toe game using Python.
4. Write a Program to Implement 8-Puzzle problem using Python.
5. Write a Program to Implement Water-Jug problem using Python.
6. Write a Program to Implement Travelling Salesman Problem using Python.
7. Write a Program to Implement Tower of Hanoi using Python
8. Write a Program to Implement Monkey Banana Problem using Python.
9. Write a Program to Implement Alpha-Beta Pruning using Python.
10. Write a Program to Implement 8-Queens Problem using Python.

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Dr. BALAJI VICHARAPU
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Head
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Dr. YSR ANU College of Engineering & Technology
Acharya Nagarjuna University, Nagarjuna Naga

AM 353-D	Mobile Application Development Lab	L	T	P	M	C
		1	0	2	100	2

OBJECTIVES:

• To understand the components and structure of mobile application development frameworks for Android and windows OS-based mobiles.

• To understand how to work with various mobile application development frameworks.

• To learn the basic and important design concepts and issues of development of mobile applications.

• To understand the capabilities and limitations of mobile devices.

LIST OF EXPERIMENTS:

1. Develop an application that uses GUI components, Font and Colours.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop an application that makes use of databases.
4. Develop an application that makes use of Notification Manager.
5. Develop a Simple Android Application to display different shapes..
6. Develop a native application that uses GPS location information.
7. Implement an application that for basic calculator.
8. Implement an application that creates an alert upon receiving a message.
9. Write a mobile application that makes use of RSS feed.
10. Develop a mobile application for Creating an Alarm.
11. Develop a mobile application to send an email.
12. Develop a Mobile application for simple needs (Mini Project).

OUTCOMES:

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

• Develop mobile applications using GUI and Layouts.

• Develop mobile applications using Event Listener.

• Develop mobile applications using Databases.

• Develop mobile applications using RSS Feed, Internal/External Storage, SMS and GPS.

• Analyse and discover own mobile app for simple needs.

REFERENCES:

1. Build Your Own Security Lab, Michael Gregg, Wiley India

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GUNTUR - 522

AM 353-F	Tableau Lab	L	T	P	M	C
		1	0	2	100	2

1. Introduction to Tableau and Installation
2. Connecting to Data and preparing data for visualization in Tableau
3. Data Aggregation and Statistical functions in Tableau.
4. Creating common visualizations (bar charts, line charts etc.)
5. Data Storytelling
    - Intro to data storytelling
    - Creating a data story in Tableau.
6. Transform the data
    - Creating simple calculations in Tableau
    - Using table calculations
7. Basic Dashboards in Tableau.

REFERENCES BOOKS:

1. Interactive Data Visualization for the Web by Scott Murray 2nd Edition (2017)
2. D3.js in Action by Elijah Meeks 2nd Edition (2017)
3. Semiology of Graphics by Jacques Bertin (2010)
4. Data visualization with python: create an impact with meaningful data insights using interactive and engaging visuals, Mario Dobler, Tim Grobmann, Packt Publications, 2019
5. Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master, Ryan Sleeper, Oreilly Publications, 2018 .

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ACHARYA NAGARJUNA UNIVERSITY

SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2022

DEPARTMENT OF ARTIFICIAL INTELLIGENCE&MACHINE LEARNING (AM)

III/IV B.Tech II-SEMESTER

S. No.	CourseDetails		Category	Scheme of Instruction			Scheme of Examination		
				Hours in a Week			Marks		
	Code	SubjectName		L	T	P	Internal	External	Credits
1	AM/CS/ CY/DS321	Automata Theory and Compiler Design	PC	3	0	0	30	70	3
2	AM/CS322	Cryptography & Network Security	PC	3	0	0	30	70	3
3	AM323	DeepLearning	PC	3	0	0	30	70	3
4	AM324	Elective III	PC	3	0	0	30	70	3
5	AM 325	Open Elective [Moocs]	PC	3	0	0	30	70	3
6	AM/CS 326	Constitution of India	MC	3	0	0	30	70	0
7	AM361	Deep Learning Lab	PC	0	0	2	30	70	1.5
8	AM362	Elective-III Lab	PC	0	0	2	30	70	1.5
9	AM/CS/ CY/DS363	Soft Skills Lab	SC	1	0	2	30	70	2
10	AM/CS/ CY/DS364	Mini Project/Internship	PC	0	0	3	100	0	1.5
TotalCredits									**21.5**
Honors/Minorcourses(Thehoursdistributioncanbe3-0-2or3-1-0also)									**4**

Elective-III and Lab (AM 362)	
AM/CS 324-A	Network Programming
AM/CS 324-B	Cloud Computing Architecture &Its Applications
AM 324-C	Internet Of Things
AM/CS 324-D	Artificial Neural Networks

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AM/CS/CY/DS 321 Automata Theory & Compiler Design **L T P M C**
3 0 0 100 3

Course Objectives:

- Illustrating finite state machines to solve problems in computing.
- Understanding deterministic and non-deterministic machines.
- To familiarize regular grammars, context frees grammar.
- To understand the differences between decidability and undecidability.
- To explain the hierarchy of problems arising in the computer sciences.

Course Outcomes:

1. Understand the basic properties of formal languages and grammars.
2. Differentiate regular, context-free and recursively enumerable languages.
3. Make grammars to produce strings from a specific language.
4. Including decidability and intractability.

UNIT-I

Finite Automata & Regular Languages: Fundamentals & Finite Automata: Alphabet, Strings, Language, Operations, Finite state machine, definitions, finite automaton model, deterministic finite automaton and non-deterministic finite automaton, Finite Automata with output- Moore and Mealy machines.

Regular Languages: Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets.

UNIT-II

Grammars & Context-free Languages (CFLs)

Regular grammars: right linear and left linear grammars, Context free grammar, derivation trees, and sentential forms. Rightmost and leftmost derivation of strings.

Context-free Languages: Ambiguity in context free grammars. Chomsky normal form, Pumping Lemma for Context Free Languages. Pushdown Automata (PDA).

UNIT-III

Turing Machines & Computability - Introduction to Turing Machines, definition, model, design of TM, Multi-tape Turing machines. Recursive and Recursively enumerable languages.

Computability Theory: Chomsky hierarchy of languages, decidability of problems, Undecidability of Halting Problem..

UNIT-IV

Introduction to Compiler - Phases and passes, Bootstrapping, Finite state machines and regular Expressions and their applications to lexical analysis, Implementation of lexical analysis. Basic Parsing Techniques- Parsers, top-down parsing, bottom-up parsing, LRparsing.

UNIT-V

Syntax-directed Translation - Syntax-directed Translation schemes, Implementation of Syntax directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples. Symbol Tables: Data structure for symbols tables.

Introduction to code optimization- Loop optimization, the DAG representation of basic blocks, Global Data-Flow analysis.

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Text Books:

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, MonicaS. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson.
2. "Introduction to Automata Theory Languages and Computation". Hopcroft H.E. and Ullman J. D.Pearson Education.
3. "Theory of Computer Science – Automata languages and computation". Mishra and Chandra shekaran, 2nd edition, PHI.

Reference Books:

1. Automata and Computability, Dexter C. Kozen, Springer Publishers, 2007.
2. Introduction to Automata Theory, Languages and Computation, Hopcroft, Motwani, and Ullman, Pearson Publishers, Third Edition, 2006.
3. Elements of the Theory of Computation, H. R. Lewis and C.H. Papadimitriou, Prentice Hall Publishers, 1981
4. Introduction to Languages and the Theory of Computation, John. C. Martin, Tata McGraw-Hill, 2003.
5. Formal Languages and Automata Theory, E.Srinivasa Reddy, B.S. Publications.
6. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffry D. Ullman, Pearson.
7. Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning.
8. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
9. Introduction to compiler design, Torben Egdius Mogensen, Pearson Education 2011.

E-resources:

https://archive.nptel.ac.in/courses/106/105/106105190/

CO-PO mapping Matrix

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	2	2	3	2	2					1	2	1
CO2	3	1	3	1	2		1			1	2	1
CO3	2	2	3	1	2					2	2	2
CO4	2	2	1		2					2	1	1
CO5	3		2	3	2	2		1	1	1	1	1

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AM/CS 322	Cryptography and Network Security	L T P M C 3 0 0 100 3

Course Objectives:

- Learn the basic categories of threats to computers and networks.
- Understand various cryptographic algorithms and be familiar with public-key cryptography.
- Apply authentication functions for providing effective security.
- Analyze the application protocols to provide web security.
- Discuss the place of ethics in the information security area.

Course Outcomes:

1. Understand the basic concepts on attacks of computer, computer security.
2. Understand the concepts of symmetric key ciphers.
3. To describe about the message authentication algorithm and hash functions.
4. Understand the concepts of e-mail security.
5. Understand the concepts of web security.

UNIT I:

Attacks on computers and computer security: Introduction, the need for security, security approaches, principles of security, types of security attacks, security services, security mechanism, a model for network security.

Cryptography concepts and techniques: Introduction, plain text and cipher text, encryption and decryption, symmetric and asymmetric key cryptography, substitution techniques, transposition techniques steganography, key range and key size, Fermat's and Euler's theorem.

UNIT-II

Symmetric key ciphers: Block cipher principles and algorithms (DES, AES, Blowfish), differential and linear cryptanalysis, block cipher modes of operation, stream ciphers, RC4 location, and placement of encryption function, key distribution;

Asymmetric key ciphers: Principles of public key cryptosystems, algorithms (RSA Diffie – Hellman,ElGamal), key distribution.

UNIT III

Message authentication algorithm and hash functions: Authentication requirements, functions, message, MD5 message digest algorithm, authentication codes, hash functions, secure hash algorithm, HMAC, CMAC, digital signatures, Elgamal based digital signatures, knapsack algorithm.

Authentication application: Kerberos, X.509 authentication service, public key infrastructure.

UNIT IV

E-mail Security: Pretty Good Privacy; S/MIME IP Security: IP security overview, IP security architecture, authentication header, encapsulating security payload,combining security associations.

UNIT V

Web security: Web security considerations, secure socket layer and transport layer security,

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secure electronic transaction protocol.

Intruders, Virus and firewalls: Intruders, intrusion detection password management, virus and related threats, countermeasures, firewall design principles; Types of firewalls

Text Books:

1. William Stallings, Cryptography and Network Security, Pearson Education, 2006
2. AtulKahate, "Cryptography and Network Security", McGraw-Hill, 2nd Edition, 2009.
3. C K Shymala, N Harini, Dr. T R Padmanabhan, "Cryptography and Network Security", Wiley India, 1st Edition, 2016.

Reference Books:

1. Behrouz A. ForouzanDedeep Mukhopadhyay, "Cryptography and Network Security", McGraw Hill, 2nd Edition, 2010.
2. Eric Cole, Dr. Ronald Kurtz and James W. Conley, Network Security Bible, Wiley Publishers, 2009
3. Jason Albanese and Wes Sonnenreich, Network Security Illustrated, MGH Publishers, 2003

CO-PO Mapping Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	1	-	-	-	2	-	-	-
CO2	2	1	2	2	2	-	1	-	1	-	-	-
CO3	3	2	-	2	1	-	-	-	-	-	-	-
CO4	-	2	1	-	-	-	-	-	2	-	-	-
CO5	3	-	-	3	2	2	-	1	-	-	-	-

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AM323	Deep Learning	L T P M C
		3 0 0 100 3

Course Objectives:

- Understand the context of neural networks and deep learning
- Introduces convolutional, recurrent, and other neural network architectures for deep learning.
- Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.

Course Outcomes:

1. Describe the feed-forward and deep networks.
2. Design single and multi-layer feed-forward deep networks and tune various hyper-parameters.
3. Implement deep neural networks to solve a problem
4. Analyze performance of deep networks.

UNIT I

Challenges in Machine Learning, Curse of dimensionality, local consistency, smoothing regularization, manifold learning, Deep feed forward networks, Architectural design of deep learning networks

UNIT II

Gradient based learning. hidden units, computational graphs, chine rule, forward propagation and backward propagation, back propagation and other differentiation algorithms.

UNIT III

Regularization for deep learning, data set augmentation, semi-supervised learning, multitask learning, early stopping, parameter sharing, bagging, dropout, adversal training.

UNIT IV

Optimization of Deep Learning, Learning Vs Optimization, ANN optimization, Activation Functions: Sigmoid, ReLU, Hyperbolic Fns, Soft max, parameter initialization strategies, adaptive learning, convolution operation, CNN variants, Capsule neural networks.

UNIT V

Sequence Modelling, Unfolding Graphs, Recurrent Neural Networks, Teacher forcing for RNN, RNN gradients, RNN-PGM, bidirectional RNN, Recursive Neural Networks, LSTM.

Text Books:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville.
2. Deep Learning – A Practical Approach (using Python) by Dr Rajiv Chopra.
3. Beginning with Deep Learning with TensorFlowby Mohan kumarSilaparasetty.
4. Fundamentals of Deep Learning by Nikhil Buduma.
5. Deep Learning illustrated by Jon Krohn.

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CO-PO Mapping Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	2	-	-	-	1	-	-	2
CO2	3	3	2	2	2	-	1	-	1	-	-	2
CO3	3	3	3	2	2	-	-	-	-	-	-	2
CO4	3	3	2	-	3	-	-	-	1	-	-	2
CO5	3	3	2	2	3	-	-	-	1	-	-	2

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ELECTIVE-III

AM/CS 324 -A	Network Programming	L T P M C
		3 0 0 100 3

Course Objectives:

- Demonstrate mastery of main protocols comprising the Internet.
- Develop skills in network programming techniques.
- Implement network services that communicate through the Internet.
- Apply the client- server model in networking applications.
- Practice networking commands available through the operating systems.

Course Outcomes:

1. Understand the key protocols which support the Internet
2. Create applications using techniques such as multiplexing, forking, multithreading
3. Apply knowledge of Unix/Linux operating systems to build robust client and server software for this environment;
4. Learn advanced programming techniques such as IPv6 Socket Programming, Broadcasting and Multicasting.

UNIT-I

Introduction to Network Programming: OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.

Sockets: Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

UNIT-II

TCP Client Server: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.

Elementary UDP Sockets: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP.

I/O Multiplexing and socket options: I/O Models, select function, Batch input, shutdown function, poll function.

UNIT-III

Socket options: getsockopt and setsockopt functions. Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options.

Advanced I/O Functions:Introduction, Socket Timeouts, recv and send Functions,readv and writev Functions, recvmsg and sendmsg Functions, Ancillary Data, How Much Data Is Queued?, Sockets and Standard I/O, T/TCP: TCP for Transactions.

UNIT-IV

Elementary name and Address conversions: DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function, other networking information.

Daemon Processes and inetdSuperserver – Introduction, syslogd Daemon, syslog Function, daemon_init Function, inetd Daemon, daemon_inetd Function.

Broadcasting: Introduction, Broadcast Addresses, Unicast versus Broadcast, dg_cli Function

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Using Broadcasting, Race Conditions.

UNIT-V

Remote Login: Terminal line disciplines, Pseudo-Terminals, Terminal modes, Control Terminals, rlogin Overview, RPC Transparency Issues.

Text Books:

1. UNIX Network Programming, W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Third Edition, Pearson Education,2015
2. UNIX Network Programming, W. Richard Stevens. Second Edition Pearson,2015
3. UNIX Network Programming, Vol. I, Sockets API, 2nd Edition. - W.Richard Stevens, Pearson Edn. Asia.
4. UNIX Network Programming, 1st Edition, - W.Richard Stevens. PHI.
5. UNIX Systems Programming using C++ T CHAN, PHI.
6. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education.

Reference Books:

1. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education .
2. Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education.

CO-PO Mapping Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	1	-	-	-	2	-	-	-
CO2	2	1	2	2	2	-	1	-	1	-	-	—
CO3	3	2	-	2	1	-	-	-	-	-	-	-
CO4	2	1	-	-	-	-	-	-	2	-	-	-

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ELECTIVE-III

AM/CS 324-B Cloud Computing Architecture And Its Application **L T P M C**
3 0 0 100 3

Course Objectives:

- Students will be able to learn about cloud environment.
- Students will be able to learn about the key dimensions of the challenges of cloud computing.
- Student encounters with building software systems and components which scale millions of users in modern internet.
- Students will be able to deal with various cloud service models such as Iaas, Paas, Saas
- Students will be able to learn about the storage and management of resources concepts in the cloud.
- Students will learn about the components that scale to millions of users in modern internet, cloud concepts capabilities across the various cloud service models including Iaas, Paas, Saas, and developing cloud-based software applications on top of cloud platforms.

Course Outcomes:

1. Summarize the key dimensions of the challenge of Cloud Computing (Understanding –L1)
2. Assessment of the economics, financial, and technological implications for selecting cloud computing for own organization (Evaluating – L3)
3. Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications. (Evaluating – L2)
4. Assessment of own organizations' needs for capacity building and training in cloud computing related IT areas. (Evaluating – L3)

UNIT-I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

UNIT –II

Cloud models: Introduction, Collaboration to cloud, Cloud Models, Cloud Applications and Architecture, Cloud Computing Architecture, Cloud Infrastructure Models, Cloud Infrastructure Self Service, Scaling a cloud infrastructure. Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Trust Management. Service Oriented Architecture, Message Oriented Middleware.

UNIT-III

Cloud Service Models: Infrastructure as a Service: Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers. Platform as a Service:

Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers. Software as a Service: Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

UNIT-IV

Concurrent and Data Intensive Computing: Thread Programming, Programming Applications with Threads, What is a Thread?, Thread APIs, Techniques for Parallel Computation with Threads, Multithreading with Aneka, Introducing the Thread Programming Model, Aneka Thread vs. Common Threads, Programming Applications with Aneka Threads, Aneka Threads Application Model.

High-Throughput Computing: Task Programming, Task Computing, Characterizing a Task, Computing Categories, Frameworks for Task Computing, Task-based Application Models, MPI Applications, Workflow Applications with Task Dependencies,

UNIT-V

Data Intensive Computing and Cloud Platforms in Industry: Map-Reduce Programming, What is Data-Intensive Computing?, Characterizing Data-Intensive Computations, Challenges Ahead, Historical Perspective, Technologies for Data-Intensive Computing.

Cloud Platforms in Industry, Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google AppEngine, Architecture and Core Concepts, Application Life-Cycle, Cost Model.

Text Books:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
2. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
3. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
4. Cloud Computing, A Hands-on approach, ArshadeepBahga, Vijay Madisetti, University Press

Reference Book:

1. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
2. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi.

Online Resource:

1. https://nptel.ac.in/courses/106/105/106105167/
2. https://cloudacademy.com/courses/
3. www.slideshare.net

CO-PO mapping Matrix:

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1		2	2		2					1	2	1	1	2
CO2		2	2		2					1	2	1	1	2
CO3		2	2		2					1	2	1	1	2
CO4		2	2		2					1	2	1	1	2
CO5		2	2		2					1	2	1	1	2

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ELECTIVE-III

AM 324-C	Internet Of Things	L T P M C 3 0 0 100 3

Course Objectives:

- To learn the fundamentals of Internet of Things
- To understand IoT Reference Architecture
- To learn about the basics of IoT protocols
- To understand the basics of python with IoT.
- To build a small low cost IoT system and to apply the concept to Internet of Things in the real-world scenario.

Course Outcomes:

1. Explain IoT Architecture describe the architecture, components, and working principles of IoT systems.
2. Implement IoT Communication Utilize various communication protocols for data transfer between IoT devices and networks.
3. Develop IoT Applications Design and prototype real-world IoT applications using hardware and software tools.
4. Analyze IoT Security Risks Identify security vulnerabilities in IoT systems and propose countermeasures to mitigate risks.
5. IoT and AI Integration and cloud computing techniques to enhance IoT functionalities and real-time decision-making.

UNIT-I

Introduction and Applications:

Introduction to IoT–Definition, Characteristics, functional requirements, motivation, Physical design-things in IoT, IoT protocols, Logical Design- functional blocks, communication models, Communication APIs, Applications–Home Automation, Cities, Environment, Energy, Agriculture, Health,Industry.

UNIT-II

M2m And System Management:

Introduction-M2M, Difference between M2M and IoT, SDN and NFV for IoT, SystemManagement–need,SNMP,NETCONF,YANG.

UNIT-III

Developing Internet Of Things:

IoT Methodology-Purpose & Requirements specification, process specification, domain model specification, information model specification, service specification, IoT level specifications.

UNIT-IV

Usage of python:

IoT systems logical design using python-python datatypes & datastructures, controlflow, functions or modules, remote access enablement using cloud.

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UNIT-V

Case Study On Iot System:

case studies illustrating iot design, introduction, home automation, cities, environment, agriculture, productivity applications.

Data Analytics for IOT:introduction , apache hadoop, using hadoop mapreduce for batch data analysis , apache oozie , apache spark , apache storm , using apache storm for real-time data analysis , structural health monitoring case study , tools for IOT, chef case studies, NETCONF-YANG case studies.

Text books:

1. Dr.OvidiuVermesanandDr.PeterFriess,InternetofThings:Fromresearch and innovation to market deployment,RiverPublishers2014.
2. Honbo Zhou,"The Internet of Things in the Cloud:A Middle ware Perspective"-CRCPress2012.
3. Arshdeep Bahgaand Vijay Madisetti, Internet of Things A Hand-on Approach, Universities press, 2015.

References:

1. Dieter Uckelmannet.al, Architecting the Internet of Things,Springer,2011
2. Pethuru Raj and Anupama C.Raman,"The Internet of Things: Enabling Technologies and UseCases,CRCPress

Web References:

1. https://onlinecourses.nptel.ac.in/noc19_cs65
2. The Internet of Things in the Cloud | A Middleware Perspective | Honbo(taylorfrancis.com).

CO–PO Mapping Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	-	1	2	3
CO2	3	3	2	-	-	-	-	-	-	-	-	2	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	2	3	3
CO4	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO5	3	1	1	-	-	-	-	-	-	-	-	3	3	3
CO6	3	1	1	-	-	-	-	-	-	-	-	3	2	3

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AM/CS 324-D

ELECTIVE-III
Artificial Neural Networks

L	T	P	M	C
3	0	0	100	3

Course Objectives:

On completion of this course the students will be able to expose themselves towards intelligence systems and knowledge based systems. It also provides knowledge of learning networks.

Course Outcomes:

1. Understand the difference between biological neuron and artificial neuron
2. Understand the application areas of neural networks
3. Understand building blocks of Neural Networks.
4. Develop neural network models
5. Design and develop applications using neural networks.

UNIT -I

Introduction to Artificial Neural Networks : Introduction, Artificial Neural Networks, , Biological Neural Networks, Comparison Between them and the Computer, Comparison Between Artificial and Biological Neural Network ,

Activation Functions: ReLU, Sigmoid. Tanh. Softmax. etc.,Basic Building Blocks of Artificial Neural Networks, Artificial Neural Network (ANN) terminologies.

UNIT – II

Fundamental Models of Artificial Neural Networks : Introduction, mcculloch - pitts neuron model.

Learning Rules: Hebbian learning rule perceptron learning rule, delta learning rule (widrow-hoff rule or least mean square(lms)rule, competitive learning rule, unsupervised learning, supervised learning, reinforcement learning.

UNIT III

Perceptron Networks : Introduction, single layer perceptron, brief introduction to multilayer perceptron networks.

Adaline and Madaline Networks: Introduction, adaline, madaline

Associative Memory Networks: Introduction, algorithms for pattern association, hetero associative memory neural networks, auto associative memory network, bi- directional associative memory.

UNIT – IV

Feedback Networks: Introduction, discrete hopfiled net, continuous hopfiled net, relation between bam and hopfiled nets.

Feed Forward Networks: Introduction, back propagation network (bpn), radial basis function network (RBFN).

UNIT – V

Self Organizing Feature Map : Introduction, methods used for determining the winner, kohonen self organizing feature maps, learning vector quantization (lvq),max net, maxican hat, hamming net

Adaptive Resonance Theory : Introduction, ART fundamentals, ART 1, ART2

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Text Books:

1. Sivanandam, S Sumathi, S N Deepa; "Introduction to Neural Networks", 2nd ed.,TATA McGraw HILL : 2005.
2. Neural Networks A Classroom Approach— Satish Kumar, McGraw HillEducation (India) Pvt. Ltd, Second Edition.
3. Artificial neural nretworks :B.yegnanarayana prentice hall publications

References Books:

1. Simon Haykin, "Neural networks A comprehensive foundations", 2nd ed., Pearson Education, 2004.
2. B Yegnanarayana, "Artificial neural networks", 1st ed., Prentice Hall of India P Ltd, 2005.
3. Li Min Fu, "Neural networks in Computer intelligence", 1st ed., TMH, 2003

CO-PO Mapping Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			1					1				-
CO2	3	2			2					1				2
CO3	3	3	2	3	3	2			3	2				2
CO4	3	3	2	3	3	2			3	2				2

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AM325	**OPEN ELECTIVE [MOOCS]**	**L T P M C** **3 0 0 100 3**

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AM/CS326	Constitution Of India	LT P M C 3 0 0 100 3

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high courtcontroller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative.

Course Outcomes:

At the end of the semester/course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and Pachayati Raj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on roles and functioning of Election Commission

UNIT-I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship

President:Role,powerandposition,PMandCouncilofministers,CabinetandCentral Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT-IV

A.Local Administration - District's Administration Head - Role and Importance, MunicipalitiesMayorandroleofElectedRepresentative-CEOofMunicipalCorporationPachayatiRaj:Functions

PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

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UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election.

Commissionerate State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women

References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. SubashKashyap, IndianConstitution,NationalBookTrust
3. J.A.Siwach,DynamicsofIndianGovernment &Politics
4. D.C.Gupta, IndianGovernmentandPolitics
5. H.M.Sreevai,Constitutional Law of India,4theditionin3volumes(Universal Law Publication)
6. J.C.Johari, Indian Governmentand Politics Hans
7. J.RajIndian GovernmentandPolitics
8. M.V.Pylee, IndianConstitutionDurgaDasBasu,HumanRightsinConstitutionalLaw,Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani,A.G.,(SouthAsiaHumanRightsDocumentationCentre), ChallengestoCivilRight), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-Resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

CO-PO/PSOMappingMatrix:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	3	-	-	-	-	-	-
CO3	3	-	3	-	-	3	-	3	-	-	-	-	-	-

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AM361	Deep Learning Lab	L T P M C 0 0 2 100 1.5

List of Practical Experiments:

1. Installation and working on python, Juypter, and its different libraries for deep learning (Tensor Flow, NumPy, Kera, Pandas, Matplotlib, etc.)
2. ToimplementaMultilayerPerceptron(MLP)usingKeraswithTensorFlow,andfine-tune neural network hyperparameters for regression problem (house price prediction).
3. ToimplementaMLPusingkeraswithTensorFlowforclassificationproblem(heart disease predication).
4. To implement a Convolution Neural Network (CNN) for dog/cat classification problem using keras.
5. ToImplementaCNNforobjectdetection inthegiven image.
6. ToimplementaRecurrentNeuralNetwork(RNN)forpredicatingtimeseriesdata.
7. ToimplementaLongShort-TermMemory(LSTM)forpredicatingtimeseriesdata.
8. ToimplementaSeq2SeqModel forNeuralMachineTranslationin Keras.
9. To implement an Encoder-Decoder Recurrent neural network model for Neural Machine Translation.
10. ToimplementMultimodalemotionrecognitionusingTransformers.

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ELECTIVE-III-LAB

AM/CS 362-A **Network Programming Lab** **L T P M C**
0 0 2 100 1.5

Course Objectives:

1. Understand the fundamentals of computer networking and protocols like TCP, UDP, and IP.
2. Develop Socket Programming Skills for Gain hands-on experience in creating client-server applications using socket programming in C, Java, or Python.
3. Implement Network Protocols to design and implement key networking protocols and services.
4. Develop network applications using multi-threading and synchronization techniques.
5. Analyze Network Performance Using network monitoring tools to analyze and optimize network performance.

Course Outcomes:

1. Demonstrate a clear understanding of network architecture, models, and protocols.
2. Implement socket-based communication using TCP and UDP protocols.
3. Design and deploy networking solutions such as chat applications and file transfer systems.
4. Network Debugging Tools for Employ debugging and testing tools like Wireshark to analyze network traffic.
5. Optimize Network Applications to improve the performance and security of networked applications through efficient coding and best practices.

List of Experiments:

1. Write example script to connect to Google using socket.
2. Design Socket Programming for TCP Socket.
3. Design Socket Programming for UDP Socket .
4. Design TCP iterative Client and server application to reverse the given input sentence.
5. Design TCP client and server application to transfer file.
6. Design a TCP concurrent server to convert a given text into upper case using multiplexing system call "select"
7. Design a TCP concurrent server to echo given set of sentences using poll functions
8. Design UDP Client and server application to reverse the given input sentence
9. Design UDP Client server to transfer a file
10. Design using poll client server application to multiplex TCP and UDP requests for converting a given text into upper case.

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Elective-III-Lab

AM/CS362-B Cloud Computing Architecture its Applications Lab **L T P M C**
0 0 2 100 1.5

Course Objectives:
The student should be made to:

- Be exposed to tool kits for grid and cloud environment.
- Be familiar with developing web services/Applications in grid framework
- Learn to run virtual machines of different configuration.
- Learn to use Hadoop

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

1. Configure various virtualization tools such as Virtual Box, VMware workstation.
2. Design and deploy a web application in a PaaS environment.
3. Learn how to simulate a cloud environment to implement new schedulers.
4. Install and use a generic cloud environment that can be used as a private cloud.
5. Manipulate large data sets in a parallel environment.

List of Experiments:

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top ofwindows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not presentinCloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Install Hadoop single node cluster and run simple applications like wordcount.

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Elective-III-Lab

AM/CS 362 -C **Internet of Things Lab** **L T P M C**
0 0 2 100 1.5

Course Objective:

The objective of this course, to give a comprehensive view of the - Internet of Things (Applications / Potentials / Challenges). To analyze enabling technologies to make it happen (Embedded Devices and communication protocols) and to conduct Hands on activities (Guidelines on how to operate —things in the —Internet of Things).

Course Outcomes:

After the completion of this course, the student will be able to:

1. Understand the programming environment of IOT.
2. Develop IOT applications using sensors.
3. Develop IOT applications using web/mobile services
4. Improveindividual/teamworkskills,communication&reportwritingskillswith ethical values.

List of Experiments:

DIGITALSENSORS:

1) Write an Arduino/python program for LEDRED, GREEN and BLUE sensors
2) Write an Arduino/python program for touch sensor
3) Write an Arduino/python program for push button sensor
4) Write an Arduino/python program for motion sensor
5) Write an Arduino/python program for buzzerring based on the input

ANALOGSENSORS:

1) Write an arduino/python program for temperature sensor
2) Write an arduino/python program for gas sensor
3) Write an arduino/python program for rotation sensor
4) Write an arduino/python program for light sensor
5) Write an arduino/python program for ultrasonic sensor
6) Write an arduino/python program for moisture sensor
7) Write an arduino/python program for sound sensor
8) Write an arduino/python program for magnetic sensor
9) Write an arduino/python program for sending message to the mobile

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