ANIL NEERUKONDA INSTITUTE OF TEHCNOLOGY AND SCIENCES (A)

(UGC Autonomous)

Approved by AICTE , Affiliated to Andhra University , Accredited by N.B.A & NAAC with A+ Grade

(Estd: 2001)

2023-2024

Academic Regulations (R23)

III Year B.Tech Syllabi

Department of Computer Science & Engineering

III Year Course structure – CSE										
Semester –II										
CODE	SUBJECT NAME	Category	Periods				Sessional Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Total				
23DP6121	Open Elective - II	OE	3	0	0	3	40	60	100	3
23CS5121	Professional Elective-II	PE	3	0	0	3	40	60	100	3
23CS5131	Professional Elective-III	PE	3	0	0	3	40	60	100	3
23CS4122	Machine Learning	PC	3	0	0	3	40	60	100	3
23CS4123	Cryptography and network security	PC	3	0	0	3	40	60	100	3
23CS5221	Professional Elective - II Lab	PE	0	0	3	3	50	50	100	1.5
23CS4222	Machine Learning Lab	PC	0	0	3	3	50	50	100	1.5
23CS4223	Cryptography and network security Lab	PC	0	0	3	3	50	50	100	1.5
23CS9214	Cloud Technologies	SC	0	0	2	2	50	50	100	1
23CR9104	High Level Reasoning and Employability Skills	HS	0	0	2	2	50	50	100	1
Total			15	0	13	28	450	550	1000	21.5

DATABASE MANAGEMENT SYSTEM USING MySQL (Open Elective – II)	
23DP6121(A)	**Credits: 3**
Instruction: 3 Periods / Week	Sessional Marks: 40
End Exam: 3 hours	End Exam Marks: 60

Prerequisites:

- Computer Basics & File Concepts
- Fundamental of Set Theory and Boolean Algebra

Course Objectives:

1. Summarize the fundamental concepts of Database Management Systems (DBMS).
2. Learn various data models and relational database design.
3. Apply data retrieval and manipulation using MySQL
4. Apply database normalization and integrity constraints.
5. Interpret transaction management, concurrency control, and database recovery.

Course Outcomes:

1. Outline core principles of database management systems.
2. Design relational databases using the E-R model.
3. Apply MySQL queries for data manipulation
4. Apply normalization techniques to enhance database efficiency.
5. Summarize insight into transaction management, concurrency control, and recovery mechanisms.

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	1	3	-	-	-	-	-	-	-	1	-	-	-	-	-
	2	1	3	2	1	-	-	-	-	2	-	-	-	1	1
	3	-	-	3	1	-	-	-	-	1	-	-	1	3	2
	4	2	2	-	2	-	-	-	-	1	-	-	-	1	-
	5	-	-	3	2	-	-	-	-	2	-	-	-	2	-

COURSE CONTENTS

UNIT-I: **12 periods**

Introduction to Database Systems: Data, Information, and Databases, File-Based System vs. Database Management System, Advantages of DBMS, Components of DBMS: Storage Manager, Query Processor, Transaction Manager, Users of DBMS (Administrators, Designers, End Users), DBMS Architecture (1-Tier, 2-Tier, 3-Tier)

Learning Outcomes:

1. Differentiate between data, information, and databases and explain how databases store and manage structured data.
2. Discuss the key benefits of DBMS, including data integrity, security, consistency, and reduced redundancy and recognize how DBMS improves data retrieval and sharing across multiple users.

UNIT-II: **12 periods**

Data Models and Database Design: Introduction to Data Models (Hierarchical Model, Network Model, Relational Model, Object-Oriented Model) Entity-Relationship (E-R) Model (Entities, Attributes, Relationships, E-R Diagrams and Mapping Cardinalities, Conversion of E-R Model to Relational Model) Relational Model and Constraints (Tables, Tuples, Attributes, Keys: Primary Key, Foreign Key, Candidate Key, Integrity Constraints (Domain, Referential, Key Constraints))

Learning Outcomes:

1. Explain various data models (Hierarchical, Network, Relational, Object-Oriented), Identify the significance of the Relational Model in modern database design.
2. Develop E-R diagrams to represent real-world scenarios, Map E-R models to relational schemas by converting entities and relationships into tables.

UNIT-III: **12 periods**

Installation of MySQL, Retrieve Data from single Table and Multiple Tables, Using Functions, Insert , Update, Delete Data in Tables, Summary Queries and Aggregate Functions, Working with Sub Queries, SQL Views, SQL Indexes

Learning Outcomes:

1. Explain the purpose and significance of SQL in database management, Differentiate between DDL, DML, DQL, DCL, and TCL commands.
2. Construct optimized queries for business intelligence

UNIT-IV: **12 periods**

Database Normalization and Indexing: Functional Dependencies, Normalization (1st Normal Form (1NF), 2nd Normal Form (2NF), 3rd Normal Form (3NF), Boyce-Codd Normal Form (BCNF).

Learning Outcomes:

1. Define functional dependencies and their role in database design and identify determinants and dependent attributes in a relation.
2. Examine how normalization helps minimize redundancy and prevent anomalies.
3. Evaluate a database schema and suggest normalization improvements.

UNIT V: **12 periods**

Transaction Management and Concurrency Control: ACID Properties (Atomicity, Consistency, Isolation, Durability), Transactions and States of a Transaction, Concurrency Issues (Lost Update, Dirty Read, Inconsistent Read), Concurrency Control Techniques (Lock-Based Protocols (Shared & Exclusive Locks), Timestamp-Based Protocols, Deadlocks and Deadlock Prevention), Database Recovery (Log-Based, Checkpoints, Shadow Paging)

Learning Outcomes:

1. Define a transaction and identify different states of a transaction (Active, Partially Committed, Failed, Aborted, Committed).
2. Understand and apply the ACID properties (Atomicity, Consistency, Isolation, Durability) to ensure data reliability.
3. Apply deadlock prevention and detection techniques.
4. Apply concurrency techniques to prevent data anomalies while maintaining efficiency.

TEXTBOOKS:

1. Raghu Ramakrishnan, Johannes *Gehrke" Database Management Systems*", 4th Edition, McGraw- Hill 2003 (UNIT-I,2,4,5)
2. Mat Miles Learning MYSQL By Example, 2021 (UNIT – 3)
3. Steve Suehring, MySQL Bible, Wiley Publications, ISBN - 0-7645-4932-4 (UNIT – 3)

RECOMMENDED BOOKS:

1. Ramez Elmasri & Shamkant B. Navathe – Fundamentals of Database Systems , 6th Edition , Pearson Publication
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan – Database System Concepts, 7th Edition , McGraw-Hill
3. C.J. Date – An Introduction to Database Systems , 8th Edition ,Addison - Welsey

WEB RESOURCES:

1. https://edtechbooks.org/learning_mysql

DATA MINING (Open Elective – II)	
23DP6121(B)	Credits: 3
Instruction: 3 Periods / Week	Sessional Marks: 40
End Exam: 3 hours	End Exam Marks: 60

Prerequisites:

- Basic database concepts

Course Objectives:

1. The basics and challenges issues in Data Mining
2. The concepts of data warehouse and data mining
3. The tools and techniques used for Knowledge Discovery in Databases
4. The Potential and Current research issues in Data Mining

Course Outcomes:

1. Able to learn the basics and challenging issues in Data Mining
2. To familiarize the student with the concepts of data warehouse
3. To make the student acquaint with the tools and techniques used for Knowledge
4. Discovery in Databases
5. To familiarize the student with the concepts of data mining.

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	1	1	3	3	-	-	-	-	-	-	-	-	-	2	1
	2	-	2	2	2	-	-	-	-	-	-	-	-	2	-
	3	-	3	3	-	2	-	-	-	-	-	-	-	1	-
	4	-	-	-	2	2	-	-	-	-	-	-	-	1	-
	5	-	3	3	-	3	-	-	-	-	-	-	-	1	1

COURSE CONTENTS

UNIT-1: **12 Periods**

Introduction to Data Mining: Motivation and importance, what is Data Mining, Relational Databases, Data Warehouses, Transactional Databases, Advanced Database Systems and Advanced Database Applications, Data Mining Functionalities, Interestingness of a pattern Classification of Data Mining Systems, Major issues in Data Mining. **Data Warehouse and OLAP Technology for Data Mining:** What is a Data Warehouse? Multi-Dimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Development of Data Cube Technology, Data Warehousing to Data Mining.

UNIT-II: **12 Periods**

Data Pre-processing: Why Pre-process the Data? Data Cleaning, Data Integration and Transformation Data Reduction, Discretization and Concept Hierarchy Generation. **Data Mining Primitives, Languages and system Architectures, Data Mining Primitives:** Data Mining Task, A Data Mining query language, Designing Graphical User Interfaces Based on a Data Mining Query language, Architectures of Data Mining Systems.

UNIT-III: **14 Periods**

Concept Description: Characterization and comparison, what is Concept Description? Data Generalization and summarization-based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between different Classes, Mining Descriptive Statistical Measures in large Databases. **Mining Association rule in large Databases:** Association Rule Mining, Mining Single- Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining

UNIT-IV: **12 Periods**

Classification and prediction: Concepts and Issues regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back-propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods like k-Nearest Neighbour Classifiers, Case- Based Reasoning, Generic Algorithms, Rough Set Approach, Fuzzy Set Approaches, Prediction, Classifier Accuracy

UNIT-V: **10 Periods**

Cluster Analysis: What is Cluster Analysis? Types of Data in Cluster Analysis, a Categorization of Major Clustering Methods

TEXT BOOK:

1. Data Mining Concepts and Techniques, Jiawei Han and MichelineKamber, Morgan Kaufman Publications

REFERENCE BOOKS:

1. Introduction to Data Mining, Adriaan, Addison Wesley Publication, 2nd Edition , Peason Publication
2. Data Mining Techniques, A.K.Pujari, University Press , 4th Edition

WEB RESOURCES:

1. http://nptel.ac.in/syllabus/106106046/

SOFT COMPUTING (Open Elective – II)	
23DP6121(A)	**Credits: 3**
Instruction**:** 4 Periods	Sessional Marks: 40
End Exam: 3 Hours	End Exam Marks: 60

Prerequisites:

- Basic Knowledge of Programming Fundamentals and Problem Solving

Course Objectives:

1.Analyze fundamental concepts of soft computing and machine learning
2.Perform operations on fuzzy sets
3.Analyze neural networks algorithms in machine learning
4.Apply genetic algorithms in machine learning
5.Implement artificial neural networks and fuzzy logic through matlab/Python.

Course Outcomes:

Students will be able to.

1.Illustrate the evolution and basics of soft computing and machine learning. (L1)
2.Experiment with fuzzy sets, operations, fuzzy inference and expert systems. (L5)
3.analyzet various forms of neural networks and their learning. (L1)
4.apply genetic algorithms and their applications. (L3)
5.Experiment with Matlab/Python to understand the implementation of artificial neural network and fuzzy logic. (L5)

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	2	1	2	1	-	-	-	-	-	-	-	2	-	1
	2	2	2	2	2	-	-	-	-	1	-	1	2	1	2
	3	2	2	3	2	-	-	-	-	1	-	1	2	2	2
	4	2	2	3	2	-	-	-	-	1	-	1	2	1	2
	5	2	2	3	2	-	-	-	-	1	-	1	2	2	2

COURSE CONTENTS

UNIT-I: **12 periods**

Introduction: Introduction to Soft Computing and Neural Networks Number of hours Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

Learning Outcomes:

1. Define soft computing and neural network(L1)
2. Illustrate the evolution of the field of soft computing(L1)
3. Explain the basics of machine learning(L2)
4. Explain conventional AI.
5. Illustrate Computational Intelligence.

UNIT-II: **12 periods**

Stacks: Fuzzy Logic: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

Learning Outcomes:

1.Name what are fuzzy sets, fuzzy operations and relations(L1)
2.Define fuzzy reasoning and fuzzy inference systems(L1)
. 3. Illustrate fuzzy expert systems and decision making using fuzzy logic (L2)
4. Explain fuzzy expert system
5.Elaborate fuzzy decision making

UNIT-III: **12 periods**

Neural Networks: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures

Learning Outcomes:

1.List various forms of neural networks(L1)
2.Define different types of learning a neural network (L1)
3.Odentify how autonomous agents choose optimal decisions in their environments(L3)
4.Illustrate reinforcement learning(L2)
5.Explain difference between supervised and unsupervised neural networks (L1)

UNIT-IV: **12 periods**

Basics of Genetic Algorithms : Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning: Machine Learning Approach to Knowledge Acquisition.

Learning Outcomes:

After completion of this unit, the student will be able to:
1.Model genetic learning method by an analogy to biological evolution(L3)
2.Experiment with hypothesis space search in genetic learning(L3)
3.Apply the concepts of genetic programming(L4)
4.Illustrate structure of genetic algorithm
5. Machine Learning Approach to Knowledge Acquisition

UNIT-V: **Introduction to Matlab/Python** **12 periods**

Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic

Learning Outcomes:

1. Arrays and array operations
2.experiment with toolboxes of neural network and fuzzy logic(L3)
3.inspect a simple implementation of artificial neural network and fuzzy logic(L4)
4.illustrate the functions and files
5..identify various fundamental concepts of Matlab/Python(L3)

TEXT BOOKS :

1.Jyh-Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro:Fuzzy and Soft Computing®, Prentice Hall of India, 2003 [UNIT-2]
2.George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, PrenticeHall, 1995. [UNIT-2]
3. MATLAB ToolkitManual [UNIT-5]
4.Saroj Kaushik, Sunita Tiwari, Soft computing: Fundamentals, Techniques and applications, Mc Graw Hill Education, 2018 [UNIT1,3,4]

REFERENCE BOOKS :

1.Snehashish Chakraverty, Deepti Moyi Sahoo, Nisha Rani Mahato, Concepts of Soft Computing: Fuzzy and ANN with Programming, Springer, 2019.
2.Samir Roy, Udit Chakraborty, Introduction to Soft Computing: Neuro-Fuzzy and Genetic Algorithms, Pearson, 2013

INTERNET OF THINGS (Professional Elective – II)	
23CS5121	**Credits: 3**
Instruction: 3 Periods / Week	Sessional Marks: 40
End Exam: 3 hours	End Exam Marks: 60

Prerequisites

- Basic understanding of computer networks & embedded systems
- Knowledge of programming
- Awareness of Cloud Computing & Data Analytics

Course Objectives

students will be able to:

1. Analyse the fundamentals of IoT architecture, protocols, and models.
2. Analyse the IoT hardware components, including sensors, actuators, and microcontrollers.
3. Explore IoT communication technologies such as Wi-Fi, Bluetooth, Zigbee.
4. Develop IoT applications using embedded programming and cloud integration.
5. Implement IoT security mechanisms to protect devices and data from vulnerabilities**.**

Course Outcomes

1. Explain IoT architecture, components, and protocols
2. Develop basic IoT applications using microcontrollers and sensors
3. Analyse and select appropriate communication protocols for IoT.
4. Integrate IoT devices with cloud platforms for real-time monitoring.
5. Implement security measures in IoT applications to prevent cyber threats

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	3	2	1	-	3	-	-	-	-	-	-	-	3	-
	2	-	-	3	-	3	-	-	-	2	-	-	-	3	-
	3	-	3	-	3	-	2	-	-	-	-	-	-	-	3
	4	-	-	3	-	3	-	-	-	-	-	2	-	3	2
	5	-	-	-	-	-	3	2	3	-	-	-	-	-	3

COURSE CONTENTS

UNIT-I **12 Periods**

Introduction to IoT & Architecture : Introduction to IoT: Definition, Evolution, IoT Applications. IoT Architecture: 3-layer and 5-layer architecture, IoT Protocol Stack. IoT Components: Sensors, Actuators, Edge Devices, Gateways, Cloud. IoT Communication Models: Device-to-Device (D2D), Device-to-Cloud (D2C).

Learning Outcomes:

1. Analyse the fundamental building blocks of IoT and its significance in real-world applications.
2. Analyse the architecture and different communication models used in IoT.

UNIT-II **12 Periods**

IoT Hardware & Embedded Systems: Microcontrollers & IoT Hardware: Arduino, ESP32, Raspberry Pi. IoT Sensors & Actuators: Temperature, Humidity, PIR, Ultrasonic, Soil Moisture, Servo Motors, Stepped Motor. Output Devices: LED, Buzzer, LCD display. Interfacing Sensors: Analog & Digital sensors.

Learning Outcomes:

1. Design, and integrate microcontrollers and hardware components to develop IoT-based solutions
2. Implement sensor interfacing and basic embedded programming for IoT devices.

UNIT-III **12 Periods**

IoT Communication & Networking: IoT Communication Protocols: MQTT, CoAP, HTTP, WebSocket's. Wireless Communication Technologies: Wi-Fi, Bluetooth, Zigbee, Lora WAN. IoT Network Layers: Physical, MAC, Transport, Application. Hands-on: Setting up MQTT broker (Mosquitto), Sending sensor data using MQTT.

Learning Outcomes:

1. Compare and contrast different IoT communication protocols and their use cases.
2. Develop an MQTT-based data transmission system for IoT applications.

UNIT-IV **12 Periods**

IoT Cloud & Data Management: IoT Cloud Platforms: Google Cloud IoT. Data Storage & Processing in IoT: Things Board. IoT Analytics: Streaming Data, Real-time Analysis. Visualization Tools: Thing speak. Hands-on: Sending IoT data to the cloud.

Learning Outcomes:

1. Integrate IoT devices with cloud platforms for remote data storage and visualization.
2. Implement real-time monitoring dashboards for IoT applications.

UNIT-V: **12 Periods**

IoT Security & Applications: IoT Security Challenges: Cyber Threats, Data Privacy. Security Mechanisms: Encryption (AES, RSA), Authentication. IoT Case Studies: Smart Home, Smart Healthcare. Hands-on: Implementing basic encryption in IoT communication**.**

Learning Outcomes:

1. Analyse IoT security risks and how to mitigate them using encryption and authentication.
2. Apply security measures to protect IoT systems from cyber threats**.**

TEXT BOOKS:

1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017.

REFERENCE BOOKS:

1. Bahga A, Madisetti V. Internet of Things: A hands-on approach; 2014.
2. Hang Song, "Internet of Everything: Key technologies, Practical applications, and Security
3. of IOT", Copyright © 2023 by World Scientific Publishing Co. Pte. Ltd
4. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education;2017.
5. Vijay Madisetti and Arshdeep Bahga, "Internet of Things, 1St Edition, VPT, 2014.

BLOCKCHAIN AND SMART CONTRACTS (Professional Elective – II)	
23CS5122	**Credits: 3**
Instruction: 3 Periods / Week	Sessional Marks: 40
End Exam: 3 hours	End Exam Marks: 60

Prerequisites:

- Knowledge of Data structures.
- Students must have knowledge of some programming languages (such as C, C++, and Java).

Course Objectives:

1. Gain the concepts of working principles of blockchain systems, including Bitcoin and Ethereum
2. Design, build, and deploy smart contracts and distributed applications.
3. Integrate ideas from blockchain technology into their own projects.

Course Outcomes:

Students will be able to:

1. Explain the basic concepts and technology used for blockchain
2. Describe the primitives of the distributed computing and cryptography related to blockchain.
3. Illustrate the concepts of Bitcoin and their usage
4. Analyze the working of Ethereum and Smart Contracts
5. Design and build Smart Contracts.

Mapping of course outcomes with program outcomes:

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	1	2	3	2	-	2	-	-	-	-	1	-	-	-	-
	2	2	3	3	-	2	-	-	-	-	1	-	-	2	1
	3	2	3	2	-	2	-	-	-	-	2	-	-	2	-
	4	3	3	2	2	2	-	-	-	-	2	-	2	2	2
	5	3	3	3	2	2	-	-	-	-	2	-	2	2	2

COURSE CONTENTS

UNIT-I: **12 Periods**

Introduction of Blockchain: Basics of Cryptography, Symmetric Key and Asymmetric key Cryptography, MAC and HMAC, Back-story of Blockchain, Centralized Vs Decentralized Systems, Layers of Blockchain, Significance of Blockchain, Blockchain uses and use cases, Public Vs Private Blockchains.

Learning Outcomes: At the end of this unit, Students are able to

1. Explain the need of Blockchain
2. Describe the benefits of Blockchain

UNIT-II **12 Periods**

How Blockchain Works: Laying the Blockchain foundation, Game Theory: Nash Equilibrium, Prisoner's Dilemma, Byzantine Generals Problem, Blockchain data structure, Merkle Trees, Properties of Blockchain Solutions, Distributed Consensus Mechanisms, Blockchain Applications in real world

Learning Outcomes: At the end of this unit, Students are able to

1. Describe the Blockchain working.
2. Explain the different Cryptographic Concepts used in Blockchain

UNIT-III: **12 Periods**

How Bitcoin Works: The History of Money, Dawn of Bitcoin, Working with Bitcoins, The Bitcoin Blockchain, Block Structure, The Genesis Block, The Bitcoin Network, Network Discovery for a New Node, Bitcoin Transactions, Consensus and Block Mining, Block Propagation, Bitcoin Scripts, Full Nodes Vs SPVs, Bitcoin Wallets.

Learning Outcomes: At the end of this unit, Students are able to

1. Illustrate the concept of Bitcoin
2. Explain different primitive concepts related to Bitcoin

UNIT-IV: **12 Periods**

How Ethereum Works: From Bitcoin to Ethereum: Ethereum as a Next-Gen Blockchain, Design Philosophy of Ethereum, **Enter the Ethereum Blockchain**: Ethereum Blockchain, Ethereum Accounts, Trie Usage, Merkle Patricia Tree, RLP Encoding, Ethereum Transaction and Message Structure, Ethereum State Transaction Function, Gas and Transaction Cost.
Ethereum Smart Contracts.

Learning Outcomes: At the end of this unit, Students are able to

1. Describe How Ethereum works
2. Analyze how Smart Contracts are used in Ethereum

UNIT-V: **12 Periods**

Blockchain Application Development:
Interacting with the Bitcoin Blockchain, Setup and Initialize the bitcoin js Library in a node.js Application, Interacting Programmatically with Ethereum—Sending Transactions, Interacting Programmatically with Ethereum—Creating a Smart Contract, Interacting Programmatically with Ethereum—Executing Smart Contract Functions.

Learning Outcomes: At the end of this unit, Students are able to

1. Design programs to interact with Blockchain
2. Build Smart Contracts

TEXT BOOKS:

1. Bikramaditya Singhal, Gautam Dhameja and Priyansu Sekhar Panda, "Beginning Blockchain:A Beginner's Guide to Building Blockchain Solutions" 2018, Apress
2. Antonopoulos and G. Wood, "Mastering Ethereum" 1st Edition,2018, O'Reilly Publications

REFERENCE BOOKS:

1. Antonopoulos, "Mastering Bitcoin" 1st Edition, 2014, O'Reilly Publications

WEB RESOURCES:

1. https://solidity-by-example.org/
2. https://www.coursera.org/learn/blockchain-basics
3. https://cs251.stanford.edu/syllabus.html

DIGITAL IMAGE PROCESSING (Professional Elective – II)	
23CS5123	**Credits:3**
Instruction: 3Periods / Week	SessionalMarks:40
End Exam: 3 Periods	EndExamMarks:60

Prerequisites:

- Knowledge of linear algebra, basic probability and statistics, introductory knowledge of basic programming language C is preferred.

Course Objectives:

1. To make the students to be familiar with basic image processing techniques for solving real problems,
2. To make the students have a general overview on digital image processing concept along with its uses and applications.
3. To make the students gain knowledge about representation of a digital image in different domains and the transformations between those domains,
4. To make the students learn about various morphological operations on a digital image.

Course Outcomes:

Students will be able to:

1. Apply the basic concepts of 2D image acquisition, sampling, quantization, relationships Between pixels and components of image.
2. Apply the fundamentals of image transformation techniques and understand the principles of color.
3. Analyze the filtering techniques in spatial domain for face reorganization, pattern Reorganization and segmentation
4. Analyze and apply the filtering techniques in frequency domain for classify the images
5. Apply the image Segmentation techniques on Edge detection and Region-Based Segmentation, image morphological techniques for manipulating digital images

Mapping of course outcomes with program outcomes:

Mapping		**PO**												**PSO**	
	1	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	2	3	2	1	2	2		1	1				1	1	3
	3	3	3	2	2	2							1	1	3
	4	3	3	2	2	2							1	1	3
	5	3	2	3	3	3	2	1	1				2	2	3

COURSE CONTENTS

UNIT-I: **12 Periods**

INTRODUCTION: Examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system.

DIGITAL IMAGE FUNDAMENTALS: Image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, Introduction to the basic mathematical tools used in digital image processing

Learning outcomes:

1. Review the fundamental concepts of a digital image processing system.
2. Describe and explain basic principles of digital image processing

UNIT-II: **12 Periods**

INTENSITY TRANSFORMATIONS AND SPATIALFILTERING: Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, basic smoothing and sharpening spatial filters.

Learning outcomes:

1. Examine various types of images, intensity transformations and color images.

UNIT-III: **12 Periods**

IMAGE RESTORATION: A model of the image degradation/ restoration process, noise models, restoration in the presence of noise– only spatial filtering, periodic noise reduction using frequency domain filtering.

Learning outcomes:

1. Analyze images in the spatial domain using various transforms.
2. Develop Fourier transform for image processing in spatial domain.

UNIT-IV: **12 Periods**

IMAGE COMPRESSION: Fundamentals, Huffman coding, Golomb coding, arithmetic coding, LZW coding, run-length coding, symbol-based coding, bit-plane coding

Learning outcomes:

1. Evaluate the techniques for image enhancement and image restoration.
2. Apply image processing algorithms in practical applications.

UNIT-V: **12 Periods**

IMAGE SEGMENTATION: Fundamentals, Point, Line, And Edge Detection, Thresholding, Segmentation By Region Growing and by Region Splitting And Merging, Region Segmentation using Clustering and Super pixels, Region Segmentation using Graph Cuts.

Learning outcomes:

1. Interpret image segmentation and representation techniques.
2. Evaluate the methodologies for image segmentation, restoration etc.

TEXT BOOKS:

1. Gonzalez Rafael Cand Woods Richard E," Digital Image Processing", 3rd Edition, Prentice Hall, 2008. (Unit I to Unit V)

REFERENCE BOOKS:

1. Pratt William K,"Digital Image Processing: PIKS Scientific Inside",4th Edition, John Wiley, 2007. (TA1632.P917 2007)
2. Pitas Ioannis, Digital Image Processing Algorithms and Applications, John Wiley, 2000. (TA1637.P681)
3. Anil K. Jain, PHI. Pattern Recognition and Image Analysis, Earl Gose and Richard John son baugh Steve Jost, PHI," Fundamentals of Digital Image Processing".

WEB RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105032/
2. https://www.coursera.org/courses?languages=en&query=digital%20image%20processing

MULTIMEDIA ANIMATION AND DESIGN (Professional Elective – II)	
23CS5124	Credits: 3
Instruction: 3 Periods / Week	Sessional Marks: 40
End Exam: 3 hours	End Exam Marks: 60

Prerequisites:

- Basic knowledge of computers and graphics tools (optional).

Course Objectives (COs):

1. Gain the knowledge of fundamentals on multimedia and its components.
2. Learn the basics of 2D animation and design principles.
3. Explore 3D modelling and animation concepts.
4. Gain knowledge about video editing and post-production techniques.
5. Work on real-world multimedia projects and UI design concepts.

Course Outcomes

Students will be able to

1. Explore the fundamental concepts of multimedia and its components.
2. Apply 2D animation techniques and design principles to create simple animations.
3. Develop 3D models and animations using basic tools and techniques.
4. Perform video editing and post-production using industry-standard tools.
5. Design user interfaces and integrate multimedia elements into real-world applications.

Mapping of Course Outcomes with Program Outcomes

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	1	3	2	1	-	-	-	-	-	-	-	-	-	3	2
	2	3	3	2	2	2	-	-	-	-	-	-	-	3	3
	3	3	3	3	2	2	-	-	-	-	-	-	-	3	3
	4	3	2	2	3	3	-	-	-	-	-	-	-	2	3
	5	3	3	3	3	3	2	2	-	2	3	3	2	3	3

COURSE CONTENTS

UNIT-I: **12 Periods**

Introduction to Multimedia Definition of Multimedia, Elements of Multimedia (Text, Image, Audio, Video, Animation), Multimedia Applications (Entertainment, Education, Advertisement), Multimedia File Formats (JPEG, PNG, GIF, MP3, MP4, AVI), Basic Tools for Multimedia Creation.

Learning Outcomes: At the end of this unit the students will be able to

1. Discuss gain knowledge on multimedia and different colour models.
2. Learn action script programming skills required for development of multimedia applications.

UNIT-II: **12 Periods**

2D Animation and Design Basics of Animation (Frame-by-Frame, Tweening), Principles of Animation (Squash & Stretch, Anticipation, Timing), Creating Simple 2D Animations using Adobe Animate / OpenToonz, Digital Drawing Basics (Layers, Brushes, Colours), Storyboarding and Character Design.

Learning Outcomes: At the end of this unit the students will be able to

1. Discuss the 2D Animation and Design techniques.
2. Apply the techniques for 2D Animation concepts

UNIT-III: **12 Periods**

3D Modelling and Animation: Introduction to 3D Modelling (Mesh, Polygons, Textures), Basics of Blender / Autodesk Maya, 3D Animation Techniques (Key frames, Rigging, Rendering), Lighting and Camera in 3D Scenes, Exporting 3D Models for Animation.

Learning Outcomes: At the end of this unit the students will be able to

1. Identify different 3D techniques and explore them.
2. Apply the video compression techniques and explore it.

UNIT-IV: **12 Periods**

Video Editing and Post-Production: Introduction to Video Editing (Timeline, Cutting, Transitions), Working with Premiere Pro / DaVinci Resolve, Adding Effects, Filters, and Text Overlays, Audio Editing and Background Music, Exporting and Optimizing Video for Web.

Learning Outcomes: At the end of this unit the students will be able to

1. Explain the basics of video & audio editing technique.

UNIT-V: **12 Periods**

UI Design and Real-World Applications: Introduction to UI/UX Design, Basics of Figma / Adobe XD for UI Design, Designing Simple Web Interfaces, Multimedia in Web Development (Embedding Animation & Videos)

Learning Outcomes: At the end of this unit the students will be able to

1. Identify different techniques in UI/UX design.
2. Apply the animation techniques to create animation &videos

TEXT BOOKS:

1. Ze-Nian Li, Mark S. Drew, *Fundamentals of Multimedia*, 2nd Edition, Springer, 2014.
2. Pakhira Malay., *Computer Graphics, Multimedia and Animation*, 2nd Edition, 2010.

REFERENCE BOOKS:

1. Tay Vaughan, Multimedia: Making It Work, 9th Edition, McGraw-Hill, 2014.
2. John F. Koegel Buford, Multimedia Systems, Pearson Education, 2000.

WEB REFERENCES:

1. https://itsfoss.com/
2. https://www.ucl.ac.uk/slade/know/3396
3. https://handbrake.fr/
4. https://opensource.com/article/18/2/open-source-audio-visual-production-tools
   https://camstudio.org/
5. https://developer.android.com/training/animation/overview

No SQL DATABASES (Professional Elective – II)	
23CS5125	**Credits:3**
Instruction: 3 Periods / Week	Sessional Marks : 40
End Exam: 3 hours	End Exam Marks : 60

Prerequisites:

- Knowledge on Relational Database management systems.

Course Objectives:

1. Distinguish and describing how NoSQL databases differ from relational databases from theoretical perspective.
2. Explore the origins of NoSQL databases and the characteristics.
3. Demonstrate competency in selecting a particular NoSQL database for specific use cases.
4. Demonstrate Document databases with MongoDB.

Course Outcomes:

student will be able to:

1. Compare and contrast the uses of relational RDBMSs and NoSQL systems for different types of data and applications.
2. Differentiate various data models.
3. Recognize Key value Databases and document databases.
4. Create a sample database using NoSQL.
5. Apply the Query concepts in MongoDB database.

Mapping of course outcomes with program outcomes:

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	1	2	2	1	-	2	-	-	-	-	-	-	-	1	2
	2	1	2	1	-	2	-	-	-	-	-	-	-	1	2
	3	1	2	1	2	2	-	-	-	-	-	-	-	1	2
	4	2	2	1	2	2	-	-	-	-	-	-	2	2	2
	5	2	2	2	2	2	-	-	-	-	-	-	2	2	2

COURSE CONTENTS

UNIT- I: **12 Periods**

Why NoSQL?
The value of relational database, Impedance mismatch, Application and integration databases, Attack of the clusters.

Learning Outcomes: The student will be able to

1. Recall Relational databases and security aspects in Real time
2. Identify working with multiple databases.

UNIT-II: **12 Periods**

Aggregate Data Models:
Aggregates - Example of Relations and Aggregates - Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores.

More Details on Data Models:
Relationships, Graph Databases, Schema less Databases, Materialized Views, Modeling for Data Access.

Learning Outcomes: The student will be able to

1. Explain internal operations on Database.
2. Analyze how to view data from database in different ways.

UNIT –III: **12 Periods**

Distribution Models:
Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication

Consistency:
Update Consistency, Read Consistency, Relaxing Consistency - The CAP Theorem, Relaxing Durability.

Learning Outcomes: The student will be able to

1. Analyze how multiple clients can interact with database server.
2. Apply updating values dynamically in database.

UNIT-IV: **12 Periods**

Key-Value Databases:
What Is a Key-Value Store, Key-Value Store Features – Consistency – Transactions - Query Features - Structure of Data – Scaling, Suitable Use Cases - Storing Session Information - User Profiles, Preferences, Shopping Cart Data, When Not to Use - Relationships among Data – Multi operation Transactions - Query by Data - Operations by Sets.

Learning Outcomes: The student will be able to

1. Use the way how Operations used in Real-time applications.
2. Solve working with the database transactions.

UNIT-V: **12 Periods**

Document Databases:
What Is a Document Database? Features – Consistency – Transactions – Availability - Query Features – Scaling, Suitable Use Cases - Event Logging - Content Management Systems, Blogging Platforms - Web Analytics or Real-Time Analytics - E-Commerce Applications, When Not to Use - Complex Transactions Spanning Different Operations - Queries against Varying Aggregate Structure.
Introduction to MongoDB: Introduction to MongoDB, The Data Model, Working with Data, GridFS.

Learning Outcomes: The student will be able to

1. Integrate database server like MongoDB to cloud apps.
2. Test Cloud data storage.

TEXT BOOKS:

1. Pramod J.Sadalag and Martin Fowler," NoSQL Distilled, A Brief Guide to the Emerging World of Polyglot Persistence" ,1st Edition, Addison Wesley
2. David Hows, Eelco Plugge, Peter Membrey , and Tim Hawkins, "The definitive guide to MongoDB", "A complete guide to dealing with big data using MongoDB". 1st Edition, Apress

REFERENCE BOOKS:

1. Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN: 978-0-470-94224-6
2. Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.

WEB RESOURCES:

1. http://allvideolectures.com/courses/course/96uv57kBOZ.
2. https://university.mongodb.com/

SOFT COMPUTING (Professional Elective – III)	
23CS5131	**Credits: 3**
Instruction**:** 4 Periods	Sessional Marks: 40
End Exam: 3 Hours	End Exam Marks: 60

Prerequisites:

- Basic Knowledge of Programming Fundamentals and Problem Solving

Course Objectives:

1.Analyze fundamental concepts of soft computing and machine learning
2.Perform operations on fuzzy sets
3.Analyze neural networks algorithms in machine learning
4.Apply genetic algorithms in machine learning
5.Implement artificial neural networks and fuzzy logic through matlab/Python.

Course Outcomes:

Students will be able to.

1.Illustrate the evolution and basics of soft computing and machine learning. (L1)
2.Experiment with fuzzy sets, operations, fuzzy inference and expert systems. (L5)
3.analyzet various forms of neural networks and their learning. (L1)
4.apply genetic algorithms and their applications. (L3)
5.Experiment with Matlab/Python to understand the implementation of artificial neural network and fuzzy logic. (L5)

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	2	1	2	1	-	-	-	-	-	-	-	2	-	1
	2	2	2	2	2	-	-	-	-	1	-	1	2	1	2
	3	2	2	3	2	-	-	-	-	1	-	1	2	2	2
	4	2	2	3	2	-	-	-	-	1	-	1	2	1	2
	5	2	2	3	2	-	-	-	-	1	-	1	2	2	2

COURSE CONTENTS

UNIT-I: **12 periods**

Introduction: Introduction to Soft Computing and Neural Networks Number of hours Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

Learning Outcomes:

6. Define soft computing and neural network(L1)
7. Illustrate the evolution of the field of soft computing(L1)
8. Explain the basics of machine learning(L2)
9. Explain conventional AI.
10. Illustrate Computational Intelligence.

UNIT-II: **12 periods**

Stacks: Fuzzy Logic: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

Learning Outcomes:

1.Name what are fuzzy sets, fuzzy operations and relations(L1)
2.Define fuzzy reasoning and fuzzy inference systems(L1)
. 3. Illustrate fuzzy expert systems and decision making using fuzzy logic (L2)
4. Explain fuzzy expert system
5.Elaborate fuzzy decision making

UNIT-III: **12 periods**

Neural Networks: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures

Learning Outcomes:

1.List various forms of neural networks(L1)
2.Define different types of learning a neural network (L1)
3.Odentify how autonomous agents choose optimal decisions in their environments(L3)
4.Illustrate reinforcement learning(L2)
5.Explain difference between supervised and unsupervised neural networks (L1)

UNIT-IV: **12 periods**

Basics of Genetic Algorithms : Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning: Machine Learning Approach to Knowledge Acquisition.

Learning Outcomes:

After completion of this unit, the student will be able to:
1.Model genetic learning method by an analogy to biological evolution(L3)
2.Experiment with hypothesis space search in genetic learning(L3)
3.Apply the concepts of genetic programming(L4)
4.Illustrate structure of genetic algorithm
5. Machine Learning Approach to Knowledge Acquisition

UNIT-V: **Introduction to Matlab/Python** **12 periods**

Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic

Learning Outcomes:

1. Arrays and array operations
2.experiment with toolboxes of neural network and fuzzy logic(L3)
3.inspect a simple implementation of artificial neural network and fuzzy logic(L4)
4.illustrate the functions and files
5..identify various fundamental concepts of Matlab/Python(L3)

TEXT BOOKS :

1.Jyh-Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro:Fuzzy and Soft Computing®, Prentice Hall of India, 2003 [UNIT-2]
2.George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, PrenticeHall, 1995. [UNIT-2]
3. MATLAB ToolkitManual [UNIT-5]
4.Saroj Kaushik, Sunita Tiwari, Soft computing: Fundamentals, Techniques and applications, Mc Graw Hill Education, 2018 [UNIT1,3,4]

REFERENCE BOOKS :

1.Snehashish Chakraverty, Deepti Moyi Sahoo, Nisha Rani Mahato, Concepts of Soft Computing: Fuzzy and ANN with Programming, Springer, 2019.
2.Samir Roy, Udit Chakraborty, Introduction to Soft Computing: Neuro-Fuzzy and Genetic Algorithms, Pearson, 2013

NATURAL LANGUAGE PROCESSING (Professional Elective – III)	
23CS5132	**Credits: 3**
Instruction**:** 3 Periods / Week	Sessional Marks: 40
End Exam: 3 hours	End Exam Marks: 60

Prerequisites:

- Programming Skills – Python, Mathematics & Statistics, Machine Learning Basics, Deep learning concepts, data structures & algorithms.

Course Objectives:

The course should enable the students:

1. To introduce students to the fundamentals of Natural Language Processing (NLP) and its real-world applications.
2. To understand and implement language models, including statistical and deep learning-based approaches.
3. To explore machine learning and deep learning techniques for text classification and sentiment analysis.
4. To develop hands-on experience with sequence models and transformer architectures in NLP tasks.
5. To analyse advanced NLP applications like machine translation, text summarization, and ethical considerations in NLP.

Course Outcomes:

Students will be able to.

1. Identify the fundamental concepts, challenges, and syntactic structures in NLP.
2. Apply N-gram models and deep learning-based language models for NLP applications.
3. Implement machine learning and deep learning techniques for text classification and sentiment analysis.
4. Develop and apply sequence models (RNNs, LSTMs, GRUs) and transformers for various NLP tasks.
5. Evaluate and implement advanced NLP applications like machine translation, and question-answering systems while considering ethical implications.

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	3	3	3	3	-	-	-	-	1	1	-	-	3	2
	2	3	3	3	3	-	-	-	-	1	1	1	-	3	3
	3	3	3	3	3	-	-	-	-	3	2	2	-	3	3
	4	3	3	3	3	-	-	-	-	3	3	3	-	3	3
	5	3	3	3	3		3	3	3	3	3	3	-	3	3

COURSE CONTENTS

UNIT-I: Regular Expression, Tokenization, Edit Distance **10 Periods**

Regular Expression, Words, Corpora, Word and Sub word Tokenization, Word Normalization, Lemmatization and Stemming, Sentence Segmentation, Minimum Edit Distance.

Learning Outcomes:

At the end of this unit, the students will be able to

1. Apply Text Preprocessing Techniques.
2. Analyze and Implement Text Segmentation and Similarity Measures.

UNIT-II: N-gram Language Models **10 Periods**

N-Grams, Evaluating Language Model: Training and Tests, Sampling sentences from a language model, Smoothing, Interpolation and backoff : Laplace Smoothing, Add K-Smoothing, Language Model Interpolation, Stupid backoff, Advanced: Perplexity's Relation to Entropy.

Learning Outcomes:

At the end of this unit, the students will be able to

1. Find the probability distribution over word sequences.
2. Explore N- Gram Evaluating Language Models.

UNIT-III: Vector Semantics **10 Periods**

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

Learning Outcomes:

At the end of this unit, the students will be able to

1. Apply similarity measures for language processing
2. Illustrate similarity measures like cosine similarity and evaluate their effectiveness in various NLP applications.

UNIT-IV: Sequence Labeling for Parts of Speech and Named Entities **10 Periods**

English Word Classes, Part-of-Speech Tagging, Named Entities and Named Entity Tagging, HMM Part-of-Speech Tagging, Conditional Random Fields (CRFs), Evaluation of Named Entity Recognition.

Learning Outcomes:

At the end of this unit, the students will be able to

1. Construct Sequence labeling for POS Tagging
2. Evaluate Named Entity Recognition for text classification

UNIT-V: Chatbots & Dialogue Systems **10 Periods**

Properties of Human Conversation, Frame Based Dialogue Systems, Dialogue Acts and Dialogue State, Chatbots, Dialogue System Design.

CASE STUDY: Sentiment Classification, Dialog Systems and Chatbots

Learning Outcomes:

At the end of this unit, the students will be able to

1.Study about sentiment classification.
2.Implement Dialog Systems and chatbots.

Textbooks:

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Third Edition, 2025.

Reference Books:

1. Manning, Christopher D., and Hinrich Schütze, “Foundations of Statistical Natural Language Processing.” Cambridge, MA: MIT Press, 1999. ISBN: 0262133601.
2. Nitin Indurkhya and Fred J.Damerau, ”Handbook of Natural Language Processing”, Second Edition, CRC Press,2010.

Web Resources:

- https://nptel.ac.in/courses/106105158
- https://www.mit.edu/~jda/teaching/6.864/sp21

CYBER SECURITY (Professional Elective – III)	
23CS5133	**Credits: 3**
Instruction**:** 3 Periods / Week	Sessional Marks: 40
End Exam: 3 hours	End Exam Marks: 60

Prerequisites:

- Knowledge of Computer Networks would be beneficial.

Course Objectives:

1. To gain the knowledge on various Cybercrimes.
2. To analyze and to identify, classify, estimate the criminal plans of the attackers.
3. To acquire knowledge on global perspective of Cybercrimes, Cyber stalking, key loggers and cyber crimes
4. To predict the web threats and attacks.
5. To implement various frameworks to analyze the cyber-crimes.
6. To audit the regulatory compliance management systems.

Course Outcomes:

Students will be able to.

1. Illustrate the fundamentals of various cyber threats and attacks.
2. Acquaint with the knowledge on various security tools.
3. Discuss and implement IT Security Processes and technologies.
4. Gain the Awareness on cyber security industry standards.
5. Interpret the Perception of securing devices and Internet security perimeter.

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	2	2	1	-	-	-	-	-	-	-	-	-	-	-
	2	2	2	2	2	-	-	-	-	-	-	-	-	-	1
	3	2	2	2	1	-	-	-	-	-	-	-	-	-	-
	4	2	1	2	1	-	1	0	1	-	-	-	-	-	1
	5	2	1	2	2	-	1	0	1	-	-	-	-	-	1

COURSE CONTENTS

UNIT-I: **12 periods**

Introduction to Cybersecurity: Cybersecurity Definition, Key Terms, Security Threats, Vulnerability Assessments, Roles in Security, Cybersecurity Today, Critical Thinking in Cybersecurity. **Overview of actors and their motives**: Hacking organizations, Major types of cyber-attacks, Network Security Model, Security services, Security Mechanisms, Threat Examples, Malware and Ransomware, Threat Protection, Internet Security Threats, Security Threat, The Cyber Kill Chain, Social Engineering, Cyberwarfare.

Learning Outcomes: At the end of this unit, Student will be able to:

1. Gain the knowledge on Cyber Threats and Attacks.
2. Assess the type of Cyber Threat.

UNIT-II: **12 periods**

Overview of Key Security Concepts: CIA Triad, Non - Repudiation - How does it apply to CIA? Access Management, Key Concepts – Incident Response, Incident Response Process, Introduction to Frameworks and Best Practices, IT Governance Process, Cybersecurity Compliance and Audit Overview.
Overview of key security tools: Introduction to Firewalls, Firewalls - Packet Filtering, Firewalls, Application Gateway, Firewalls - XML Gateway, Firewalls - Stateless and Stateful, Anti-virus/Anti malware.

Learning Outcomes: At the end of this unit, Student will be able to:

1. Gain the knowledge of security concepts, IT Governance, Compliance and Audit process.
2. Gain the knowledge of Firewalls and Anti malware.

UNIT-III: **12 periods**

Overview of People, Process and Technologies: Frameworks and their purpose, Roles in Security, Introduction to Process, Overview Business Process Management.
Overview of Information Technology Infrastructure Library (ITIL), Key ITIL Processes, identification and AAA, Access Control Methods, Access Control - Physical and Logical, Open Web Application Security Project (OWASP).

Learning Outcomes: At the end of this unit, Student will be able to:

1. Interpret the knowledge of Frameworks.
2. Apply various Access Control Methods.

UNIT-IV: **12 periods**

Compliance Frameworks and Industry Standards: What Cybersecurity Challenges do Organizations Face? Compliance Basics, Overview of US Cybersecurity Federal Law, National Institute of Standards and Technology (NIST) Overview, General Data Protection Regulation (GDPR) Overview, International Organization for Standardization (ISO) 2700x, SOC Reports, SOC Reports - Auditor Process Overview, Health Insurance Portability and Accountability Act (HIPAA), Payment Card Industry-Data Security Standard (PCI DSS), Center for Internet Security (CIS) Critical Security Controls.

Learning Outcomes:

1. Gain the knowledge of Compliance Management and Frameworks.
2. Gain the knowledge of Industry Standards.

UNIT-V: **12 periods**

Security the Perimeter: Perimeter Security in the Real World, Security Challenges, the Basics of Internet Security, Understanding the Environment, Hiding the Private Network, Understanding Private Networks, Protecting the Perimeter, Understanding the Perimeter, Network Appliances, Proxy Servers, Demilitarized Zones (DMZs), Honeypots, Extranets.

Learning Outcomes:

1. Gain the knowledge of Perimeter Security.
2. Interpret the knowledge of Perimeter Security using tools.

TEXTBOOKS:

1. Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, Cyber Security Essentials 1/e, Sybex Wiley, 2019.

REFERENCE BOOKS:

1. James Graham, Richard Howard and Ryan Otson, Cyber Security Essentials, 1/e, CRC Press, 2011.
2. Chwan-Hwa(John) Wu, J. David Irwin, Introduction to Cyber Security, 1/e, CRC Press T&F Group, 2013
3. Nina Godbole and Sunil Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, 1/e, Wiley INDIA.

SOFTWARE AGILE METHODOLOGIES (Professional Elective – III)	
23CS5134	**Credits: 3**
Instruction: 3 Periods / Week	Sessional Marks: 40
End Exam: 3 hours	End Exam Marks: 60

Prerequisites:

- Basic Knowledge of Software Development Process.

Course Objectives:

1. To familiarize the students with the features of agile development.
2. Acquire knowledge on Lean Software Development, Scrum and Extreme Programming.
3. To facilitate students in understanding the Tracking Agile Projects.
4. Analyse the principles and benefits of Continuous Integration and Test-Driven Development

Course Outcomes:

Students will be able to

1. Explain the fundamental principles of Agile methodologies and various development frameworks.
2. Analyze and apply different Agile frameworks such as Scrum, Extreme Programming (XP) in software development projects.
3. Demonstrate Agile project management techniques like planning, estimation, tracking, and risk management.
4. Apply Feature-Driven Development (FDD) principles for incremental software development and demonstrate release management through version control and continuous integration.
5. Demonstrate an understanding of Agile testing methodologies by applying Test-Driven Development (TDD).

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	2	2	2	-	-	-	-	-	-	2	2	3	-
	2	3	3	2	3	-	2	-	-	2	-	3	2	2	-
	3	2	3	2	2	-	2	-	-	3	2	3	2	3	-
	4	2	3	2	2	-	2	-	-	3	3	2	2	2	-
	5	2	3	2	3	-	2	-	2	2	3	2	2	3	-

COURSE CONTENTS

UNIT-I: **12 periods**

Introduction to Agile Methodologies: The Origin of Agile, Introduction and background, Comparison between traditional models and agile approaches, Agile Manifesto and Methods, Lean Software Development. DSDM, feature-Driven Development, modelling misconceptions, agile modelling, tools of misconceptions, updating agile models, Advantages of agility in software development and obstacles in implementation.

Learning Outcomes:

1. Summarize the need for Agile over traditional software development approaches.
2. Describe the Agile Manifesto and principles.
3. Explain the Agile frameworks.

UNIT-II: **12 periods**

Agile Frameworks and Practices:

Extreme Programming (XP): Twelve Practices of XP, Test first coding, Pair Programming, Test-Driven Development, Continuous Integration, Refactoring, XP objections to agile modelling.
Scrum: Sprints, Requirements and User Stories, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Product backlogs, Sprint backlog, Estimation and Velocity, Planning, Roles, Ceremonies, Artifacts, Agile and Scrum Principles.

Learning Outcomes:

1. Explain and apply the core principles and twelve practices of Extreme Programming (XP).
2. Analyze and implement key Scrum concepts and Scrum principles.

UNIT-III: **12 periods**

Agile Project Management: Agile Project Initiation, Planning: Defining Product Vision and Scope, Identifying Stakeholders and Setting up Agile Teams, Creation and Prioritization of user stories, Agile Estimation & Planning.
Tracking Agile Projects: Time tracking agile projects, tracking agile development project progress. Handling Changes and Continuous Improvement, Agile Risk management.

Learning Outcomes:

1. Demonstrate Agile estimation and planning techniques.
2. Utilize Agile tracking methods to monitor project progress and apply Agile risk management strategies

UNIT-IV: **12 periods**

Agile Software Design: Design Principles: Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles.
Feature-Driven Development: Introduction, incremental software development, Regaining Control, motivation behind FDD, planning an iterative project, architecture centric, FDD and XP.
Release Management: Version Control, Continuous Integration.

Learning Outcomes:

1. Apply Agile design practices and fundamental design principles
2. Explain the concepts of Feature-Driven Development and Release Management.

UNIT-V: **12 periods**

Agile Testing: The Agile lifecycle and its impact on testing, Test Driven Development: Unit Tests, Integration Tests, End-to-End Tests, customer Tests. Testing user stories - acceptance tests and scenarios, planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Tools to support the Agile tester.

Learning Outcomes:

1. Interpret the Agile lifecycle and its impact on testing Test-Driven Development (TDD) practices.
2. Demonstrate the ability to test user stories.
3. Utilize Agile testing tools to support continuous testing.

TEXT BOOKS:

1. Agile Software Construction, John Hunt ,1st Edition, Springer,2005
2. Agile and Iterative Development: A Manager's Guide, Craig Larman, Addison-Wesley, Pearson Education – 2004.
3. The Art of Agile Development, Pearson, Robert C. Martin, Juli, James Shore, Chromatic 2013, O'Reilly Media.

REFERENCE BOOKS:

1. Agile Software Development – The Cooperative Game (2nd Edition), Alistair Cockburn, 2007
2. Succeeding With Agile, Software Development Using Scrum, Mike Cohn, Addison Wesley, 2010.

WEB RESOURCES:

1. https://www.atlassian.com/agile
2. https://www.extremeprogramming.org
3. https://scrumguides.org
4. https://www.mountaingoatsoftware.com/agile/user-stories
5. https://www.jenkins.io/doc/book/pipeline/
6. https://www.forbes.com/sites/stevedenning/2018/08/13/the-age-of-agile

BIO-INFORMATICS (Professional Elective – III)	
23CS5135	**Credits: 3**
Instruction: 3 Periods / Week	Sessional Marks: 40
End Exam: 3hours	End Exam Marks: 60

Prerequisites:

- Basic Knowledge of Computing
- Fundamentals of Biology

Course Objectives:

The course should enable the students:

1. Exemplifying the fundamental concepts of Bio-informatics, and types of Nucleotides.
2. Assessing the Major Bio-informatic Data Resources.
3. To Determining and Designing Algorithms for Bio-Informatics
4. Articulate various Simulation Models of System Biology
5. To Design the Computer aided Drugs.

Course Outcomes:

students will be able to:

1. Annotating the basic ideas of Basic biomolecular concepts
2. To explore the students to applied areas of Bioinformatics like drug design, metabolic pathway engineering the Major Bioinformatics Databases.
3. Composing the Algorithms for Bio-informatics
4. Identify simulation models of Bio-logical Systems
5. Gain the Practical exploration of tools in bioinformatics

Mapping of course outcomes with program outcomes:

mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	2	2	1	2	-	-	-	-	-	-	-	1	3	1
	2	2	2	2	3	-	-	1	-	2	2	-	2	3	1
	3	2	2	3	2	-	-	1	-	3	2	-	2	3	-
	4	2	3	3	2	-	-	-	-	2	2	-	2	3	2
	5	2	3	3	2	-	-	1	-	3	1	-	2	3	2

COURSE CONTENTS

UNIT-I: **12 Periods**

Introduction: Aim and branches of Bioinformatics, Application of Bioinformatics, Role of internet and www in bioinformatics. Basic biomolecular concepts: Protein and amino acid, DNA & RNA, Sequence, structure and function. Forms of biological information, Types of Nucleotide Sequence: Genomic DNA, Complementary DNA (cDNA), Recombinant DNA (rDNA), Expressed sequence tags (ESTs), Genomic survey sequences (GSSs). DNA sequencing methods: Basic and Automated DNA sequencing, DNA sequencing by capillary array and electrophoresis, Gene expression data**.**

Learning Outcomes: At the end of this unit the students will be able to

1. Interpreting the Fundamentals of Bio-informatics
2. Extending the Different types of DNAS.

UNIT-II: **12 Periods**

Bioinformatics Resources – Major Bioinformatics Databases: NCBI, EBI, ExPASy, RCSB, DDBJ, organization of databases: data contents, purpose and utility. Open Access Bibliographic Resources and Literature Databases: PubMed BioMed Central, Public Library of Science (PLOS), CiteXplore (EBI)

Learning Outcomes: At the end of this unit the students will be able to

1. Detecting the basic Bio-informatics Databases
2. Executing the Bio-informatic tools

UNIT-III: **12 Periods**

Algorithms for Bioinformatics: Introduction to Algorithms, Dynamic Programming, Sequence Alignment: Edit distance, LCS. PAM and BLOSUM Scoring Matrices. Global alignments: Needleman Wunsch Algorithm, Local Alignments: Smith Waterman Algorithm, Gap Penalties.

Learning Outcomes: At the end of this unit the Students will be able to

1. Comprehend the Dynamic Programming.
2. Implementing the various Bio-informatic Algorithms.

UNIT-IV: **12 Periods**

Systems biology: Basics of enzyme kinetics, Kinetic Laws. Modeling Biological System, Simulation, sensitivity analysis, parameter estimation using symbiology. Pharmacokinetic modeling- simulation, population study. Model of the Yeast Heterotrimeric G Protein Cycle and glycolysis.

Learning Outcomes: At the end of this unit the students will be able to

1. Preparing the various simulation models of biological systems.
2. Explore the various models of Glycolysis.

Unit V: **12 Periods**

Computer aided drug designing: Definition and Overview of CADD Role of Computational Methods in Drug Discovery Advantages of CADD over Traditional Drug Discovery Methods. Protein Function Prediction Metabolic Pathway analysis, Pharmacogenomics and Pharmacogenetics Applications of Artificial Intelligence (AI) and Machine Learning (ML),AI in Drug Repurposing, Predictive Models for Drug Efficacy and Toxicity.

Learning Outcomes: At the end of this unit the students will be able to

1. Explore the applied areas of Bioinformatics like drug design, metabolic pathway engineering
2. Utilizing AI in Drug Repurposing

TEXT BOOKS:

1. Bioinformatics: Sequence and Genome Analysis by Mount D., Cold Spring Harbor Laboratory Press, New York. 2004 (Unit I ,Unit II)
2. Neil C. Jones and Pavel A. Pevzner, "An Introduction to Bioinformatics Algorithms", MIT Press, 2005 (Unit III)
3. Parag Rastogi, "Bioinformatics Methods And Applications: Genomics Proteomics And Drug Discovery", PHI Learning Pvt. Ltd., 3rdedition, 2008 (Unit IV ,Unit V)

REFERENCE BOOKS:

1. Introduction to bioinformatics by Teresa K. Attwood, David J. Parry-Smith, Pearson Education. 1999
2. Hoppensteadt, Peskin, "Modeling and Simulation in Medicine and Life Sciences", Springer, 2010.
3. Bioinformatics for Dummies by Jean-michel Claverie Cedric Notredame. Publisher: Dummies (Jan 2007)

WEB RESOURCES:

1. https://www.tutorialspoint.com/course/basics-of-bioinformatics/index.asp
2. https://onlinecourses.nptel.ac.in/noc21_bt06/preview

MACHINE LEARNING (Professional Core)	
23CS4122	**Credits: 3**
Instruction**:** 3 Periods / Week	Sessional Marks: 40
End Exam: 3 hours	End Exam Marks: 60

Prerequisites:

- Basics of Probability, Statistics, and Artificial Intelligence.

Course Objectives:

1. To be able to apply machine learning algorithms to solve problems of moderate complexity.
2. To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

Course Outcomes:

Students will be able to.

1. Analyze the concept learning task and the general-to-specific ordering.
2. Examine how hypothesis space search impacts model learning and generalization
3. Apply the concepts to Utilize Genetic Algorithms for optimization problems.
4. Design and implement Temporal Difference Learning methods and environments.
5. Analyze strategies for handling imbalanced datasets in sampling.

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	3	2	-	-	-	-	-	-	-	-	-	-	-	2
	2	3	3	2	2	2	-	-	-	-	-	-	-	-	2
	3	3	3	3	3	2	-	-	-	-	-	-	-	-	2
	4	3	3	3	3	3	-	-	-	-	-	-	-	-	2
	5	3	3	3	3	3	2	2	2	2	2	2	2	-	3

COURSE CONTENTS

UNIT- I **12 Periods**

Introduction : Definition and scope of Machine Learning, Types of learning, Designing a Learning System, Concept Learning and the General to Specific Ordering: Concept Learning Task, Concept Learning as Search, Find S, Candidate-Elimination Learning Algorithm.

Learning Outcomes:

1. Explore the fundamental concepts and definitions of Machine Learning.
2. Identify various learning task in concept learning
3. Comprehend the stages involved in a typical Machine Learning process

UNIT-II **12 Periods**

Supervised Learning: Decision Tree Learning: Decision Tree (DT) Representation, Hypothesis space search in Decision Tree Learning, Inductive bias in DT Learning, Locally weighed Regression, Bayesian Learning: Bayes optimal classifier, Naïve-Bayes Classifier.

Learning Outcomes:

1. Explore the process of hypothesis space search in decision tree learning.
2. Recognize the inductive biases inherent in Decision Tree Learning.
3. Apply the Naïve Bayes classifier to various classification problems, understanding its assumptions and limitation.

UNIT-III **12 Periods**

Unsupervised Learning : Clustering techniques: K-Means, Hierarchical Clustering, DBSCAN clustering, Genetic Algorithm: Motivation, Genetic Algorithms, Dimensionality Reduction: Principal Component Analysis (PCA)

Learning Outcomes:

1.Ensure that students can effectively implement and analyze clustering algorithms,
2. Utilize genetic algorithms for optimization, and apply dimensionality reduction techniques to manage complex datasets.

UNIT-IV **12 Periods**

Reinforcement Learning: Introduction, The learning task, Q-Learning: Q- function, Algorithm of learning-Q, Convergence, non-deterministic Rewards and Actions, Temporal difference learning.

Learning Outcomes:

1. Evaluate the convergence behaviour of Q-Learning under uncertain conditions
2.Assess the effectiveness of Q-Learning and Temporal Difference Learning in various reinforcement learning scenarios.

UNIT-V **12 Periods**

Ensemble Methods And Boosting AdaBoost: Boosting technique, weak learners, and iterative weight adjustment, Gradient Boosting (XGBoost): Gradient boosting algorithm, Regularization, Evaluation and fine-tuning of ensemble models: Cross-validation, grid search, and model selection.

Learning Outcomes:

1. Design and develop ensemble models that effectively combine multiple weak learners to improve predictive performance.
2. Analyze the effects of oversampling and under sampling on model accuracy and generalization.

TEXT BOOKS:

1. Machine Learning by Tom M. Mitchell: A foundational text that covers a broad range of Machine Learning topics with clear explanations, McGraw Hill (UNIT-I,2,3,4) MGH,1997
2. Pattern Recognition and Machine Learning by Christopher M. Bishop Provides a comprehensive introduction to the fields of pattern recognition and Machine Learning. (UNIT-III)

REFERENCE BOOKS:

1. Ensemble Methods: Foundations and Algorithms by Zhi-Hua Zhou, Publisher: Chapman & Hall/CRC. (UNIT-V)
2. Boosting: Foundations and Algorithms by Robert E. Schapire and Yoav Freund, Edition: Illustrated Edition, Publisher: The MIT Press. (Unit-5)
3. Ensemble Methods for Machine Learning by Gautam Kunapuli, Publication Year: 2023, Publisher: O'Reilly Media. (UNIT-V)

CRYPTOGRAPHY & NETWORK SECURITY (Professional Core)	
23CS4123	**Credits:3**
Instruction:3Periods / Week	Sessional Marks:40
End Exam: 3 hours	End Exam Marks:60

Prerequisite:

- Basic knowledge of Computer Networks.
- Exposure to network routing and secure communication techniques.

Course Objectives:

1. Introducing different tools related to Network Security.
2. Introducing how to implement cryptographic algorithms in C/C++/Java/Python.
3. To illustrate various methods of secure communication over the internet.
4. To get familiarized with IDS and IPS.

Course Outcomes:

Students will be able to:

1. Memorize the foundational concepts of Cryptographic systems
2. Develop the applications of cryptographic algorithms in Network Security
3. Demonstrate the algorithms to achieve the security goals of Confidentiality, Authenticationand Integrity to a given application
4. Synthesize the different algorithms to determine protocol implementation and achieveAuthentication.
5. Examine the techniques of Intrusion Detection systems and classify the types of Firewalls.

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	2	2	3	-	3	-	3	3	3	-	-	-	-	-
	2	2	2	3	2	3	-	3	3	3	-	-	-	-	-
	3	2	2	3	2	3	-	3	3	3	-	-	-	1	1
	4	2	2	3	2	3	-	3	3	3	-	-	-	1	1
	5	2	2	3	-	3	-	3	3	3	-	-	-	-	1

SYLLABUS

UNIT 1: INTRODUCTION TO CRYPTOLOGY 12 Periods

Cryptography, Need for Security, Security Goals, Security attacks, Security services; Security mechanisms, fundamental security principles, A Model for Network Security, Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, steganography. Basic Concepts of Cryptography, Algorithm Types Key Range and Key Size, Principles of Public-Key Cryptography.

Learning Outcomes:

1. Analyze the importance of cryptographic algorithm.
2. Demonstrate a systematic and critical understanding of the principles and practices of Cryptography and network security.

UNIT 2: CONFIDENTIALITY 12 Periods

Symmetric Key Cryptographic techniques: Feistel Structure, DES-AES-RC4. **Asymmetric Key Cryptography Techniques:** Encryption/Decryption using RSA, RSA Key Exchange, Encryption/Decryption using Elliptic Curve Cryptography, Digital Envelope.

Learning Outcomes:

1. Implement Symmetric Cryptographic and Asymmetric algorithms.
2. Analyze fundamentals of symmetric cryptographic algorithms like DES, AES etc.

UNIT 3: KEY MANAGEMENT AND INTEGRITY 12 Periods

Key Distribution and Management: Public-key infrastructure, Diffie-Hellman Key Exchange, Digital Certificates (public key), Private Key Management. **Hashing:** Cryptographic Hash Function Definition, HMAC, Applications of Cryptographic Hash Functions, MD5, SHA-512,SHA-256.

Learning Outcomes:

1. Interpret key distribution and management.
2. Apply Hash Functions to achieve security goals.

UNIT 4: AUTHENTICATION 12 Periods

Authentication Using Asymmetric Cryptography (Digital Signatures): Digital Signatures, RSA Digital Signature Scheme, Digital Signature Standard, Kerberos.

Learning Outcomes:

1. Authenticate using Digital Signature implementation.
2. Interpret RSA Digital signatures for achieving Authentication.

UNIT 5: NETWORK SECURITY **12 Periods**

Application Layer Security: PGP, S/MIME, Transport Layer: TLS, SSL, Network Layer: IP Security Intrusion Detection Systems (IDS): Types of IDS Technologies, False Positives and Negatives, Intrusion Detection Techniques, Firewalls: Definition, Packet Filters, Circuit Level filters, Application Layer Filters.

Learning Outcomes:

1. Analyze various Intrusion Detection Techniques.
2. Formulate rules for providing security.

TEXTBOOKS:

1. Cryptography and Network Security, Forouzan and Mukhopadhyay, 2nd edition, TMH.
2. Cryptography and Network Security: Principles and Practice, William Stallings, 5thedition, Pearson.

REFERENCES:

1. Cryptography and Network security, Atul Kahate, TataMcGraw- Hill Pub company Ltd., New Delhi
2. Network Security: The Complete Reference, Robert Bregga, Mark Rhodes-Ousley,Keith Strassberg, TMH.

INTERNET OF THINGS LAB (Professional Elective – II Lab)	
23CS5221	**Credits: 1.5**
Instruction: 3 Periods / Week	Sessional Marks: 50
End Exam: 3 hours	End Exam Marks: 50

Prerequisites:

- Basic understanding of computer networks & embedded systems
- Knowledge of programming (C/Python/JavaScript)
- Awareness of cloud computing & data analytics

Course Objectives:

1. Develop Embedded IoT Applications – Gain experience in sensor interfacing with microcontrollers (ESP32, Arduino) and programming using C/Python.
2. Explore various IoT data transmission methods, including MQTT, HTTP to analyse their performance in different scenarios.
3. Implement data encryption, authentication, and access control to ensure secure IoT communication and prevent cyber threats.

Course Outcomes:

students will be able to:

1. Interface and integrate various sensors with microcontrollers for real-time data.
2. Establish communication between microcontrollers and web applications to send and receive real-time sensor data.
3. Utilize cloud platforms (Thing speak) for storing, visualizing IoT sensor data.
4. Design and implement IoT-based smart systems with security features.

Mapping of Course Outcomes with Program Outcomes

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	1	-	-	3	-	3	-	-	-	2	-	-	-	3	-
	2	-	3	-	3	3	2	-	-	-	-	-	-	-	3
	3	-	-	3	-	3	-	-	-	-	-	2	-	3	2
	4	-	-	-	-	-	3	2	3	-	-	-	-	-	3

SNO	LIST OF EXPERIMENTS	CO
1	Write a program to blink an LED using Arduino or ESP32.	1
2	Use a DHT11 temperature & humidity sensor with ESP32 to display data on the serial monitor.	1
3	Interfacing a Water Level Sensor with Arduino/ESP32	2
4	Interfacing an Ultrasonic Sensor (HC-SR04) with Arduino/ESP32	2
5	Write a program to control a servo motor using Arduino/ESP32 based on sensor input (e.g., temperature threshold).	2
6	Send real-time sensor data to a webpage hosted on ESP32	3
7	Store temperature readings on Firebase and access them via a mobile app.	4
8	Upload sensor data to Thingspeak for real-time visualization	4
9	Control an LED using a password-protected API request.	4
10	Design a smart agriculture system with soil moisture, temperature, and humidity sensors. Send data to the cloud, visualize it on a dashboard, and control a water pump (actuator) based on soil moisture levels.	1,2, 3,4.

Hardware Requirements:

1. Microcontrollers: ESP32 / ESP8266 / NodeMCU, Arduino Uno / Mega
2. Sensors & Actuators: DHT11 / DHT22, HC-SR04 Ultrasonic Sensor, PIR Motion Sensor, LDR, Servo Motor (SG90/MG995) , DC Motor with L298N Motor Driver.
3. Communication Modules:Wi-Fi (Built-in ESP32/ESP8266),RFID Module (RC522),Bluetooth Module (HC-05/HC-06)
4. Cloud & Networking Components: IoT Cloud Accounts (Firebase, Thingspeak, AWS IoT, Azure IoT Hub).
5. Power Components: 5V/3.3V Power Supply or Li-ion Batteries, LED / LCD Display (16x2, I2C-based, Resistors, LEDs, Breadboard, Jump Wires.

TEXT BOOKS:

1. Vijay Madisetti and ArshdeepBahga, “Internet of Things, 1St Edition, VPT, 2014.
2. Raj Kamal, “Internet of Things: Architecture and Design Principles”, 1st Edition, McGraw Hill Education, 2017.

REFERENCE BOOKS :

1. Bahga A, Madisetti V. Internet of Things: A hands-on approach; 2014.
2. Hang Song, “Internet of Everything: Key technologies, Practical applications, and Security of IOT”, Copyright © 2023 by World Scientific Publishing Co. Pte. Ltd

BLOCKCHAIN AND SMART CONTRACTS LAB (Professional Elective – II Lab)	
23CS5222	**Credits: 1.5**
Instruction: 3 Periods / week	Sessional Marks: 50
End Exam: 3 hours	End Exam Marks: 50

Prerequisites:

- Basic knowledge about Cryptography and Network Security.

Course objectives:

1. Investigate how transactions are validated and added to the blockchain
2. Able to Develop Block chain Applications in a structured manner
3. It enables them to gain knowledge in practical applications of blockchain.

Course Outcomes:

Student will be able to:

1. Implement Knowledge of Blockchain Concepts
2. Creating basic blocks
3. Apply the Knowledge of crypto currency and creating a basic form of it.
4. Evaluation , Analysis and usage of Blockchain Systems.

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	1	2	3	2	-	2	-	-	-	-	1	-	-	-	1
	2	2	3	3	-	2	-	-	-	-	1	-	-	-	1
	3	2	3	2	-	2	-	-	-	-	2	-	-	-	2
	4	3	3	2	2	2	-	-	-	-	2	-	1	-	2

LIST OF EXPERIMENTS

SNO	EXPERIMENT NAME	CO
1	**Creating Merkle tree** a. Implement a Merkle Tree using a cryptographic hash function (SHA-256). b. Construct a tree from a set of transactions and compute the Merkle root. c. Verify transaction integrity using Merkle proofs.	CO 1
2	**Creation of Block** Implement the creation of a block	CO 2
3	**Blockchain implementation** a. Develop a simple blockchain class. b. Implement methods for adding blocks, verifying integrity, and preventing tampering	CO 2
4	**Blockchain implementation using Merkle Trees** a. Defines a Merkle Tree for hashing transactions. b. Creates a blockchain with blocks containing transactions. c. Verifies the integrity of transactions using Merkle Roots.	CO 3
5	**Mining in Blockchain** Create Proof-of-Work mechanism to mine blocks	CO 4
6	**Peer-to-Peer implementation using Blockchain**	CO 4
7	**Creating Crypto-currency Wallet**	CO 4

TEXT BOOKS:

1. Bikram aditya Singhal, Gautam Dhameja and Priyansu Sekhar Panda, "Beginning Blockchain:A Beginner's Guide to Building Blockchain Solutions" 2018, Apress
2. Antonopoulos and G. Wood, "Mastering Ethereum" 1st Edition,2018, O'Reilly Publications

REFERENCE BOOKS:

1. Antonopoulos, "Mastering Bitcoin" 1st Edition, 2014, O'Reilly Publications

WEB RESOURCES:

1. https://solidity-by-example.org/
2. https://www.coursera.org/learn/blockchain-basics
3. https://cs251.stanford.edu/syllabus.html

DIGITAL IMAGE PROCESSING LAB (Professional Elective – II Lab)	
23CS5223	**Credits: 1.5**
Instruction**:** 3 Periods / Week	Sessional Marks: 50
End Exam: 3 hours	End Exam Marks: 50

Course Objectives:

1. Identify key attributes of digital images, such as aspect ratio and dynamic range
2. To Apply Image Enhancement Techniques
3. To Implement Image Transformation Techniques.
4. To know Morphological Operations

Course Outcomes (CO):

Students will be able to:

1. Apply the basic concepts of 2D image acquisition, sampling, quantization, relationships Between pixels and components of image.
2. Analyze the filtering techniques in spatial domain for face reorganization, pattern Reorganization and segmentation.
3. Analyze and apply the filtering techniques in frequency domain for classify the images.
4. Apply morphological and Segmentation techniques for manipulating digital images Edge detection and Region-Based Segmentation.

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	3	2	1	2	2	-	1	1	-	-	-	1	1	3
	2	3	3	2	2	2	-	-	–	-	-	-	1	1	3
	3	3	3	2	2	2	-	-	-	-	-	-	1	1	3
	4	3	2	3	3	3	2	1	1	-	-	-	2	2	3

List of Experiments

S. NO	NAME OF THE EXPERIMENT	CO
1	Introduction to MATLAB and perform basic operations.	
2	Simulation and Display of an Image, Negative of an Image (Binary & Gray Scale).	CO1
3	Image sampling and quantization.	CO1
4	Implementation of Relationships between Pixels.	CO1
5	Intensity transformation of images	CO1
6	Analysis of spatial and intensity resolution of images.	CO2
7	Contrast stretching of a low contrast image, Histogram, and Histogram Equalization.	CO2
8	Image Enhancement-Spatial filtering.	CO2
9	Implementation of Image Smoothening Filters (Mean and Median filtering of an Image).	CO2
10	Display of bit planes of an Image	CO3
11	Computation of Mean, Standard Deviation, Correlation coefficient of the given Image.	CO3
12	Implementation of image restoring techniques.	CO3
13	Apply Geometric transformations - image rotation, scaling, and translation, cropping.	CO3
14	Apply different types of noise on images.	CO3
15	Basic Morphological operations.	CO4
16	Region based segmentation.	CO4
17	Image compression techniques.	CO4
18	Analysis of images with different color models.	CO4
19	Canny edge detection Algorithm.	CO4
20	Image segmentation _ edge detection, line detection and point detection.	CO4

TEXT BOOKS:

1. Gonzalez Rafael Cand Woods Richard E," *DigitalImageProcessing*",3rdEdition, Prentice Hall, 2008.
2. Jain Anil K," Fundamentals of Digital Image Processing", PrenticeHall,1989.(TA1632.J25)

REFERENCE BOOKS:

1. Pratt William K,"Digital Image Processing: PIKS Scientific Inside",4th Edition, John Wiley, 2007. (TA1632.P917 2007)
2. 2.Pitas Ioannis, Digital Image Processing Algorithms and Applications,John Wiley, 2000. (TA1637.P681)
3. Anil K. Jain, PHI. Pattern Recognition and Image Analysis, Earl Gose and Richard Johnson baugh Steve Jost, PHI," Fundamentals of Digital Image Processing

WEB RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105032/
2. https://www.coursera.org/courses?languages=en&query=digital%20image%20processing

Multimedia Animation and Design Lab (Professional Elective – II)	
23CS5224	Credits: 1.5
Instruction: 3 Periods / Week	Sessional Marks: 50
End Exam: 3 hours	End Exam Marks: 50

Prerequisites

1. Basic knowledge of computers and digital media.
2. Familiarity with graphics tools (optional).

Course Objectives

By the end of this course, students will be able to:

1. Introduce students to multimedia tools for image, audio, and video editing.
2. Develop skills in 2D animation techniques.
3. Provide hands-on experience in 3D modelling and animation.
4. Familiarize students with video editing and post-production techniques.
5. Enable students to apply multimedia concepts to UI design and web applications.

Course Outcomes (COs):

students will be able to:

1. Perform basic multimedia operations like image conversion and slideshows.
2. Create simple 2D animations using animation tools.
3. Model and animate basic 3D objects in Blender/Maya.
4. Edit and enhance video content using video editing tools.

Mapping of Course Outcomes with Program Outcomes

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	1	3	2	1	-	-	-	-	-	-	-	-	-	3	2
	2	3	3	2	2	2	-	-	-	-	-	-	-	3	3
	3	3	3	3	2	2	-	-	-	-	-	-	-	3	3
	4	3	2	2	3	3	-	-	-	-	-	-	-	2	3

LIST OF EXPERIMENTS

SNO	Lab Description	CO
1	Convert an image format (JPEG to PNG, PNG to GIF).	CO1
2	Create a multimedia slideshow using PowerPoint/Canva.	CO1
3	Resize and compress an image without losing quality.	CO1
4	Apply basic image editing techniques (crop, filter, adjust brightness/contrast) using GIMP/Photoshop.	CO1
5	Create a bouncing ball animation using Adobe Animate.	CO2
6	Design a simple 2D character and animate its movement.	CO2
7	Create a basic 3D object (cube, sphere) in Blender/Maya.	CO3
8	Animate a 3D character's simple movement (walk/jump).	CO3
9	Edit a short video clip with transitions and text overlays.	CO4
10	Add background music and effects to a video project.	CO4

TEXT BOOKS:

1. Ze-Nian Li, Mark S. Drew, *Fundamentals of Multimedia*, 2nd Edition, Springer, 2014.
2. Pakhira Malay., *Computer Graphics, Multimedia and Animation*, 2nd Edition, 2010.

REFERENCE BOOKS:

1. Tay Vaughan, *Multimedia: Making It Work*, 9th Edition, McGraw-Hill, 2014.
2. John F. Koegel Buford, *Multimedia Systems*, Pearson Education, 2000.

WEB REFERENCES:

1. https://itsfoss.com/
2. https://www.ucl.ac.uk/slade/know/3396
3. https://handbrake.fr/
4. https://opensource.com/article/18/2/open-source-audio-visual-production-tools
   https://camstudio.org/
5. https://developer.android.com/training/animation/overview

No SQL DATABASES LAB (Professional Elective – II Lab)	
23CS5225	**Credits: 1.5**
Instruction**: 3** Periods / Week	Sessional Marks: 50
End Exam: 3hours	End Exam Marks: 50

Pre-requisites:

- Basic knowledge of databases and SQL
- Understanding of JSON format
- Basic programming in Python/JavaScript

Course Objectives:

By the end of this course, students will be able to:

1. Learn NoSQL databases and their differences from RDBMS.
2. Develop Key-Value stores, Document databases, and Graph databases.
3. Implement CRUD operations and apply database replication, sharding, and consistency models in MongoDB.
4. Integrate MongoDB with real-time applications.

Course Outcomes (CO):

By the end of the course, the student will be able to:	
CO1	Demonstrate the working of NoSQL databases.
CO2	Perform CRUD operations, replication and sharding using MongoDB.
CO3	Analyze the consistency and CAP theorem in databases.
CO4	Develop a cloud-based application with NoSQL integration.

Mapping of Course Outcomes with Program Outcomes:

CO	**PO**												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	2	3	-	-	-	-	-	-	2	3	2
2	3	3	3	3	3	-	-	-	-	-	-	2	3	3
3	3	3	3	3	2	-	-	-	-	-	-	2	3	3
4	3	3	3	3	3	-	-	-	-	-	-	2	3	3

List of Experiments:

SNO	NAME OF THE EXPERIMENT	Mapping
1	Basic CRUD Operations in MongoDB	CO2
2	Working with Key-Value Databases	CO1, CO2
3	Aggregate Data Model Operations	CO2
4	Modeling Relationships using Document Databases	CO2
5	Implementing Sharding in MongoDB	CO2
6	Implementing Replication in MongoDB	CO2
7	CAP Theorem Demonstration	CO3
8	Query Optimization and Indexing	CO2
9	Integrating MongoDB with a Web Application	CO4
10	GridFS - Handling Large Files in MongoDB	CO4

Tools & Technologies Required:

- MongoDB Community Edition
- MongoDB Compass (GUI)
- Python/Node.js for API interactions
- Cloud setup for NoSQL experimentation (Optional)

TEXT BOOKS:

1. MongoDB: The Definitive Guide by Shannon Bradshaw, Eoin Brazil, Kristina Chodorow, O'Reilly Media, Inc- 3rd Edition, 2019
2. Practical MongoDB: Architecting, Developing, and Administering MongoDB – Shakuntala Gupta Edward, Navin Sabharwal

WEB REFERENCES:

1. https://www.mongodb.com/developer/products/mongodb,cheatsheet/
2. https://www.mongodb.com/resources/products/fundamentals/crud.
3. https://www.mongodb.com/developer/products/mongodb/aggregation-framework/

MACHINE LEARNING LAB (Professional Core)	
23CS4222	**Credits : 1.5**
Instruction: 3 Periods / Week	Sessional Marks : 50
End Exam: 3 hours	End Exam Marks: 50

Prerequisites:

- Basic knowledge about Probability and Statistics.

Course objectives:

1. The course is designed to develop skills and analyze simple linear and non- linear data set.
2. It strengthens the ability of the students to understand the given real-world problem.
3. It enables them to gain knowledge in practical applications of Machine Learning.

Course Outcomes:

Student will be able to:

1. Involve implementing fundamental machine learning algorithms, contributing significantly to the development of engineering knowledge.
2. Focus on applying the Naïve Bayesian Classifier, enhancing the ability to design and develop solutions for complex engineering problems.
3. Contributing to the application of engineering knowledge to solve complex problems (PO1) and the ability to design and develop solutions.
4. focused on reinforcement learning algorithms, enhancing the ability to design and develop solutions for complex engineering problems.

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	3	2	1	-	-	-	-	-	-	-	-	-	1	2
	2	3	2	1	-	-	-	-	-	-	-	-	-	1	2
	3	3	2	1	-	-	-	-	-	-	-	-	-	-	2
	4	3	2	1	-	-	-	-	-	-	-	-	-	1	2

S.No	LIST OF PROGRAMS	CO's
1	Write A Program To Implement and Demonstrate The "Find-S" Algorithm.	**CO1**
2	Write A Program To Implement and Demonstrate The Candidate-Elimination Algorithm	**CO1**
3	Write A Program To Implement the Naïve Bayesian Classifier.	**CO2**
4	Write A Program To Implement a Set Of Documents That Need To Be Classified, Use The Naïve Bayesian Classifier Model To Perform This Task.	**CO2**
5	Write A Program To Implement Partition data into K distinct clusters based on feature similarity.	**CO3**
6	Write A Program To Implement and Identify clusters based on density, effectively handling noise and outliers.	**CO3**
7	Write A Program To Implement the Learn the value of state-action pairs to derive an optimal policy	**CO3**
8	Write a program for Q-Learning applied to a simple grid world environment:	**CO4**
9	Write a program to implement Gradient Boosting in dataset.	**CO4**
10	Write A Program To Implement the Reduce variance by training multiple models on different subsets of the training data and averaging their predictions.	**CO4**

Note : Utilizing these resources, students can access a wide variety of open-source datasets to practice and enhance the skills in machine learning .

TEXT BOOKS:

1. Machine Learning by Tom M. Mitchell: A foundational text that covers a broad range of Machine Learning topics with clear explanations, McGraw Hill MGH,1997
2. Pattern Recognition and Machine Learning by Christopher M. Bishop Provides a comprehensive introduction to the fields of pattern recognition and Machine Learning.

REFERENCE BOOKS:

1. Ensemble Methods: Foundations and Algorithms by Zhi-Hua Zhou, Publisher: Chapman & Hall/CRC.
2. Boosting: Foundations and Algorithms by Robert E. Schapire and Yoav Freund, Edition: Illustrated Edition, Publisher: The MIT Press.
3. Ensemble Methods for Machine Learning by Gautam Kunapuli, Publication Year: 2023, Publisher: O'Reilly Media.

CRYPTOGRAPHY & NETWORK SECURITY LAB (Professional Core)	
23CS4223	**Credits : 1.5**
Instruction: 3 periods / Week	Sessional Marks : 50
End Exam: 3 hours	End Exam Marks : 50

Prerequisites:

- Basic knowledge of Computer Networks
- Exposure to network routing and secure communication techniques.

Course Objectives:

5. Introducing different tools related to Network Security.
6. Introducing how to implement cryptographic algorithms in C/C++/Java/Python.
7. To illustrate various methods of secure communication over the internet.
8. To get familiarized with IDS and IPS.

Course Outcomes:

Students will be able to:

1. Gain the knowledge of capturing Network traffic using IDS tools and cryptographic algorithms.
2. Setup secure web server and browser communication channels and IP Tables.
3. Demonstrate Buffer over Flow attacks and Authentication Systems.
4. Implement SQL Injection Vulnerability attacks and IPS.

Mapping of course outcomes with program outcomes:

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	1	2	1	2	-	3	-	-	3	2	-	-	3	2	3
	2	2	1	2	-	3	-	-	3	2	-	-	3	1	3
	3	2	1	3	3	3	-	-	3	3	-	-	3	2	3
	4	3	2	3	3	3	-	-	3	2	-	2	3	2	3

SNO	LIST OF EXPERIMENTS	COURSE OUTCOMES
1	Working with Sniffers for monitoring network communication using a)Wireshark b) Tcpdump	**CO1,CO3**
2	Implementation and Performance evaluation of DES Key generation for single round and RSA.	**CO1**
3	Using IP TABLES on Linux and setting the filtering rules.	**CO2**
4	Using open SSL for web server - browser communication.	**CO2**
5	Implement Diffie Hellman key exchange Mechanism using HTML and Java Script. Consider the end users as one of the parties and JavaScript application as another party.	**CO3**
6	Prevention of buffer overflows and format string attacks.	**CO3**
7	Using NMAP for ports monitoring.	**CO4**
8	Testing a website for SQL Injection Vulnerability	**CO4**
9	Demonstrate Intrusion Prevention Systems using Snort.	**CO4**

Text Books :

1. The Complete Reference Network Security By Robert Bragg,Mark Rhodes-Ousley,Keith Strassberg, 1st Edition,Mc Graw Hill India (2004) Publication
2. The Unofficial Guide to Ethical Hacking by by Ankit Fadia, Second edition (2006), Laxmi Publications.

Reference Books:

1. Network Security Tools Writing, Hacking, and Modifying Security Tools By Nitesh Dhanjani, Justin Clarke,2nd Edition, Publisher: O'Reilly Media

CLOUD TECHNOLOGIES (Skill Course)	
23CS9214	**Credits: 1**
Instruction: 2 Periods / Week	Sessional Marks: 50
End Exam: 3 hours	End Exam Marks: 50

1. http://nptel.ac.in/courses/106106093/35

Prerequisites

- Basic knowledge of networking, storage, and databases
- Basic programming skills
- Familiarity with cloud concepts and technologies.

Course Objectives

The course should enable the students to:

- Understand various service types, delivery models and technologies of a cloud computing environment.
- Learn about the use of virtualization platforms
- Comprehend AWS networking and content delivery services: Amazon Virtual Private Cloud (Amazon VPC), Amazon Route 53, and Amazon CloudFront.
- Learn most commonly used AWS database services

Course Outcomes

By the end of this course, students will be able to:

1. Explain fundamental concepts of cloud computing, including service and deployment models.
2. Analyse the role of virtualization platforms
3. Develop and deploy applications using AWS Cloud and Usage of cloud service providers.
4. Apply the concept of virtual machines in various applications
5. AWS Certified Cloud Practitioner certification

CO-PO-PSO Mapping Matrix

Mapping		**PO**												**PSO**	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	1	1	1	-	-	-	-	-	-	-	-	-	1	1
	2	2	3	2	2	2	-	-	-	-	-	2	1	2	1
	3	3	3	2	2	1	-	-	-	-	-	2	1	2	1
	4	2	3	3	2	1	-	-	-	-	-	2	1	2	1

LIST OF EXPERIMENTS

SNO	EXPERIMENT NAME	CO
1	Cloud Concepts overview	CO1
2	Cloud Economics and Billing	CO1
3	AWS Global Infrastructure overview	CO1
4	Introduction to AWS IAM	CO2
5	Build your VPC and Launch a Webserver	CO2
6	Introduction to Amazon EC2	CO3
7	Working with EBS	CO3
8	Build a Database Server	CO4
9	Scale and Load balance your Architecture	CO4
10	Evaluation of all Modules	CO5
11	AWS Certified Cloud Practitioner Certification Exam	CO5

TEXT BOOK:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

REFERENCE BOOKS:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010