DEPARTMENT OF COMPUTER SCIENCE (PG)

CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOME BASED CURRICULAR FRAMEWORK (LOCF)

MASTER OF SCIENCE (COMPUTER SCIENCE)
2023 - 2025 BATCH

M.Sc Computer Science

Programme Outcomes

After completion of the programme, the student will be able to

PO1 : Demonstrate broad knowledge in core areas of computer science, current and emerging technologies in IT

PO2: Apply higher degree of technical skills in problem solving and application development

PO3 : Gain analytical and managerial skills to enhance employment potential

PO4 : Acquire holistic development with strong emphasis on values and ethics

Programme Specific Outcomes

The students at the time of graduation will

PSO1: Identify and formulate complex problems to achieve solutions using concepts of algorithms, advanced networks, database management systems, artificial intelligence and machine learning

PSO2 : Design solutions for complex problems and design processes that meet the specific needs of the society.

PSO3 : Create and apply appropriate techniques, resources and tools including prediction and modeling to multifaceted activities

PSO4 : Apply programming and technical skills to solve real life complex problems and hence enhance employability

PSO5: Analyse research methods including interpretation of data and synthesis of the information to provide valid conclusions.

PSO6: Demonstrate skills as an individual and as a member or leader in diverse teams

PSO7: Recognize the need for life-long learning and pursue career as a researcher or software engineer.

PSO8: Apply ethical principles and contribute effectively to the welfare of the society

Programme &Branch : M.Sc. Computer Science
Curriculum and Scheme of Examination (2023 - 2025 Batch onwards)
Semester

Semester	Part	Subject Code	Title of Paper	Instruction hours/week	Contact hours	Tutorial hours	Duration of Examination	Examination Marks			Credits
								CIA	ESE	Total	
I	III	MCS2301	Paper 1: Design and Analysis of Algorithms	4	58	2	3	25	75	100	4
I	III	MCS2302	Paper 2 : Network Security	4	58	2	3	25	75	100	4
I	III	MCS2303	Paper 3: Modern Operating Systems	4	58	2	3	25	75	100	4
I	III	MCS2304	Paper 4 : Data Mining Techniques and Tools	4	58	2	3	25	75	100	4
I	III	MCS2305	Paper 5 : Digital Image Processing	4	58	2	3	25	75	100	4
I	III	MCS23P1	Lab 1 : Data Mining Techniques and Tools Lab	5	75	-	3	25	75	100	3
I	III	MCS23P2	Lab 2: Full Stack Development Lab	5	75	-	3	25	75	100	3
I	III		Online course	-	-	-	-	-	-	-	-
II / III	III	MCS23CE	Paper6:Python Programming**	3	45	-	-	100	-	100	3
		MCS2306	Paper 6 /10: Artificial Intelligence	3	43	2	3	25	75	100	3
II	III	MCS2307	Paper7: Internet of Things	5	73	2	3	25	75	100	5
II	III	MCS2308	Paper8:Software Process Management	4	58	2	3	25	75	100	4

II	III	MCS23E1/ MCS23E2/ MCS23E5/ MCS23E8	Elective–I Machine Learning / Internet Protocol / Information Retrieval / Soft Computing	4	58	2	3	25	75	100	4
II	III	MCS23P3	Lab3:ADBMS Lab	5	75	-	3	25	75	100	3
II	III	MCS23P4	Lab4: Big Data Analytics Lab	5	75	-	3	25	75	100	3
II	III	MTH19A5	Interdisciplinary Course: Statistical Techniques in Practice	4	60	-	3	-	100	100	4
II	III	MCS23P3	Lab3:ADBMS Lab	5	75	-	3	25	75	100	3
II	III	MCS23P4	Lab4: Big Data Analytics Lab	5	75	-	3	25	75	100	3
II	III	MTH19A5	Interdisciplinary Course: Statistical Techniques in Practice	4	60	-	3	-	100	100	4
II	III		Online Course	-	-	-	-	-	-		-
III	III	MCS2309	Paper 9 : Advanced Java Programming	5	73	2	3	25	75	100	5
II/ III	III	MCS23CE/ MCS2310	Paper6:Python Programming**/ Paper 6 /10: Artificial Intelligence	3	45	-	-	100	-	100	3
III	III	MCS2311	Paper 11: Robotic Process Automation	4	58	2	3	25	75	100	4
III	III	MCS23E3/ MCS23E4/ MCS23E6/ MCS23E7/ MCS23E9/ MCS23E10	Elective–II Deep Learning / Cyber Security and Forensics / Natural Language Processing / Social Media Analytics/ Virtual Reality/ Quantum Computing	4	58	2	3	25	75	100	4
III	III	MCS22S1	Special Course: Research Methodology	4	60	-	3	-	100	100	4
III	III	MCS23P5	Lab5: Advanced Java Programming Lab	5	75	-	3	25	75	100	3
III	III	MCS23P6	Lab6: Robotic Process Automation Lab	5	75	-	3	25	75	100	3
III	III	MCS23COM	Comprehensive Exam – Online	-	-	-	1	-	-	100	Grade
III	III	MCS23IST	Summer Internship	-	-	-	-	-	-	100	Grade

III	III		Job Oriented Course	-	-	-	-	-	-	-	-
III	III	MNM22CS2	Cyber Security II	-	-	-	-	-	-	100	Grade
III	III	17MONL	Online Course	-	-	-	-	-	-	-	-
IV	III	MCS21PW	Project Work and Viva- Voce	30	5	-	-	50	50	100	12
IV	III	MCS2014	Advanced Learner Course1 - Block Chain	-	-	-	3	25	75	100	5**
IV	III	MCS2313	Advanced Learner Course 2 – Augmented Reality	-	-	-	3	25	75	100	5**

QUESTION PAPER PATTERN

Core Papers

CA Pattern

Section A – 3 x 2 = 6

Section B – 3 x 5 = 15 (either or – same CLO Level)

Section C – 3 x 8 = 24(either or – same CLO Level)

Total   45

ESE Pattern

Section A – 5 x 2 = 10

Section B – 5 x 5 = 25 (either or – same CLO Level)

Section C – 5 x 8 = 40(either or – same CLO Level)

Total   75

CIA Pattern

CIA Test	-	5	Conducted for 45 marks after 50 days
Model Exam	-	7	Conducted for 75 marks
			(Q.P. Pattern (2,5,8) Each Unit 15 Marks)
Sem/Ass/Quiz	-	5	
Class Participation	-	5	
Attendance	-	3	

25   + ESE 75 Marks

Open book exam
    CIA Test Pattern: 4 (4 out of 6) x 15 Marks = 60 Marks

Cyber Security II:
    Quiz: 60 Marks
        Case Study: 20 Marks
        Poster: 20 Marks

PG-IDC and Special Course:

    Section A: 5 questions (Internal choice): 25 marks
    Section B: 5 questions (Internal choice): 75 marks
                    Total: 100 marks

From the academic year 2024-25 and onwards marks allotted for attendance component in CA is modified as

91-100% attendance : 3 Marks
81-90% attendance   : 2 Marks
75-80% attendance   : 1 Marks

Advanced Learners Course (ALC)
Continuous Internal Assessment: 25 Marks

Section	Marks	Total
A- 4/6 X 4 Marks	16	25
B – 1/2 X 9 Marks	9	

End Semester Examination: 75 Marks

Section	Marks	Total
A- 5/8 X 5 Marks	25	75
B – 5/8 X 10 Marks	50	

MCS2301	DESIGN AND ANALYSIS OF ALGORITHMS	Category	L	T	P	Credit
		III	58	2	-	4

Preamble

This course covers the fundamental techniques for designing and analyzing algorithms, including asymptotic analysis, Trees, graphs, divide and conquer algorithms and recurrences. It also presents effective search methods, graph algorithms and randomized algorithms

Prerequisite

- Data structures and algorithms

Course Learning Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the performance of algorithms using analysis techniques.	**K2**
CLO2	Apply appropriate algorithms and data structures for various applications.	**K3**
CLO3	Analyze the computational complexity of various and estimate their worst-case and average-case behavior.	**K4**
CLO4	Evaluate the analysis of algorithm efficiency using different notations.	**K5**
CLO5	Design, implement, and evaluate an algorithm to meet desired needs.	**K6**

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	M	S	S
CLO2	S	S	S	M
CLO3	S	S	M	S
CLO4	M	S	S	S
CLO5	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I   (11 Hrs)

Basic concepts in Algorithmic Analysis:Introduction- Historical Background - **Binary Search- Merging Two Sorted -Selection Sort - Insertion Sort**-Bottom-up Merge Sorting- **Time Complexity- Space Complexity**-How to Estimate the Running Time of an Algorithm Worst-Case and Average-**Case Analysis- Amortized Analysis.**

UNIT II   (11 Hrs)

Data Structures: Introduction- **Linked Lists- Trees**- **Binary Trees**. Heaps data structures: Introduction-Heaps- Divide and Conquer: Introduction- Binary Search-**Merge sort-** The Divide-and-Conquer Paradigm-Selection: Finding the Median and the kth Smallest- **Quick sort.**

UNIT III   (12 Hrs)

AVL trees: Definition – Height – searching – insertion and deletion of elements-**AVL rotations – Analysis.** Red black trees: Definition – searching – **insertion and deletion of elements** – Algorithms and their time complexities. Splay trees: Definition – **Steps in Splaying** – Analysis -Multi-way search trees: Indexed Sequential Access – m-way search trees – B-Tree – searching, **insertion and deletion - B**+ **trees**.

UNIT IV   (12 Hrs)

Dynamic Programming: Introduction- The Longest Common Subsequence Problem- The Dynamic Programming Paradigm- The All-Pairs Shortest Path Problem- **Travelling sales Person problem** -The Knapsack Problem**.** Greedy Approach: Introduction- The Shortest Path Problem- **Minimum Cost Spanning Trees (Kruskal's Algorithm)- Minimum Cost Spanning Trees (Prim's Algorithm)**

UNIT V   (12 Hrs)

Graph Traversal : Introduction-Depth First search-**Applications of DFS**-Breadth-First search-**Applications of BFS**-Complexity of Problems: NP-complete Problems:- Introduction-The Class P-The Class NP-**NP-complete Problems**.Backtracking: Introduction-**The 8-Queens Problem- Sum of Subset Problem – Graph Coloring – Hamiltonian Cycles.**

Text Books

M. H. Alsuwaiyel (2016), "Algorithms Design Techniques and Analysis", Revised Edition, World Scientific Publishing Co. Pvt. Ltd.

Reference Books

1. Ellis Horowitz, Sartaj Sahni and SanguthevarRajasekaran (2019). Fundamentals of Computer Algorithms, 2/e, Universities Press Private Limited, India.
2. Priya Sen, "Design and Analysis of Algorithm" (2017), Tutorial Point(I) Pvt. Ltd.

Pedagogy: Lectures, Group Discussions, Case studies

Course Designers

1. Dr. S. Poongodi
2. Dr. S. Sasikala

Blended Learning Video Links:

Unit I

https://youtu.be/xayNr-QWmi0

https://youtu.be/81QLBCW94Oo

https://youtu.be/9DK8w7U43lI

https://www.simplilearn.com/tutorials/data-structure-tutorial/time-and-space-complexity

https://www.geeksforgeeks.org/understanding-time-complexity-simple-examples/

https://youtu.be/T7W5E-5mljc

Unit II

https://youtu.be/iKnynvncBps

https://youtu.be/H5JubkIy_p8
https://youtu.be/0nlPxaC2lTw
https://youtu.be/eGO_FMca7mk
https://youtu.be/N8lzcGiQo9A

Unit III
https://youtu.be/vRwi_UcZGjU
https://youtu.be/jDM6_TnYIqE
https://youtu.be/w5cvkTXY0vQ
https://youtu.be/qA02XWRTBdw
https://youtu.be/7cRNSnpMbQE
https://youtu.be/IBY4NtxmGg8
https://youtu.be/DqcZLulVJ0M
https://youtu.be/pGOdeCpuwpI

Unit IV
https://youtu.be/3rrNH_AizMA
https://youtu.be/ZtZaR7EcI5Y

Unit V
https://youtu.be/Ia6AgDENsf0
https://youtu.be/gq4K5hhiISE
https://youtu.be/XOna_Xpi8ZI
https://youtu.be/ykDVdQ5_QHk
https://youtu.be/ykDVdQ5_QHk
https://youtu.be/v3s0DjRqhKA

MCS2302	NETWORK SECURITY	Category	L	T	P	Credit
		III	58	2	-	4

Preamble

This course presents the fundamental concepts of cryptography and network security. It focuses on web security, IP security and system security. It also deals with the practical applications of network security.

Prerequisite

- Number Theory
- Computer Networks

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basics of Cryptography and Network Security	K2
CLO2	Apply Cryptography Theories, Algorithms and Techniques to Build Protection Mechanisms	K3
CLO3	Analyze Cryptographic methods and algorithms for a secure storage and movement of data	K4
CLO4	Evaluate the security of the in-built cryptosystems and threats in network security	K5
CLO5	Develop cryptographic algorithms and authentication schemes for information security and authorization.	K6

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CLO1	S	S	M	M
CLO2	S	S	M	S
CLO3	S	S	M	S
CLO4	S	S	S	S
CLO5	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs)

Computer and Network Security Concepts: Computer Security Concepts, **OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms,** Fundamental Security Design Principles, Attack Surfaces and Attack Trees, Model for Network Security. Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, **Steganography**.

UNIT II (11 Hrs)

Block Ciphers and the DES: Traditional Block Cipher Structure, DES, DES Example**, Strength of DES, Block Cipher Design Principles**. Random Bit Generation and Stream Ciphers: Principles of Pseudorandom Number Generation, Pseudorandom Number Generation Using a Block Cipher, **Stream Ciphers**, RC4. Public Key cryptography and RSA: Principles of Public–Key Cryptosystems, RSA Algorithm.

UNIT III (12 Hrs)

Other Public–Key Cryptosystems: Diffie-Hellman Key exchange, Elliptic Curve Cryptography. **Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Secure Hash Algorithm (SHA).** Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MACs.

UNIT IV (12 Hrs)

Digital Signatures: Introduction, Elgamal and Schnorr Digital Signature Scheme. Transport-Level Security: Web Security Considerations, Transport Layer Security, HTTPS, Secure Shell (SSH). **Electronic Mail Security: Internet Mail Architecture, Email Formats, S/MIME, Pretty Good Privacy**

UNIT V (12 Hrs)

IP Security: Overview, Policy, Encapsulating Security Payload. Intruders: Intruders, Intrusion Detection, Password Management. Malicious Software: Types, Viruses, Virus Countermeasures, Distributed Denial of Service Attacks. **Firewalls: The Need for Firewalls, Firewall Characteristics, Types of Firewalls.**

Text Book

William Stallings (2017). Cryptography and Network Security - Principles and Practices, Seventh Edition, Pearson India Education.

Reference Books
1. AtulKahate (2019). Cryptography and Network Security, 4E,McGraw-Hill
2. BruiceSchneier (2008). Applied Cryptography – Principles, Algorithm and Source in C, 2/e, Wiley India Pvt. Ltd, New Delhi.

Pedagogy: Lectures, Demonstrations, Case Studies

Course Designers
1. Dr. R. Kowsalya
2. Dr. M. Sasikala

Blended Mode Video Links:
UNIT-I
https://www.youtube.com/watch?v=1ngKETgWq2I
https://www.youtube.com/watch?v=xepNoHgNj0w

UNIT-II
https://www.youtube.com/watch?v=vX0W0yUhgUE
https://www.youtube.com/watch?v=3gDQNPagXDo
https://www.youtube.com/watch?v=DKN8w9Zibzg

UNIT-III
https://www.youtube.com/watch?v=fj2zINhlT-I
https://www.youtube.com/watch?v=JViXozmJnSk

UNIT-IV

https://www.youtube.com/watch?v=6-u5PHNplmo
https://www.youtube.com/watch?v=QzUThXGRFBU
https://www.youtube.com/watch?v=efabYp3Jhxo
https://www.youtube.com/watch?v=cvJ0jY6xbMI

UNIT-V

https://www.youtube.com/watch?v=9GZlVOafYTg
https://www.youtube.com/watch?v=uGaERP4Npys

MCS2303	MODERN OPERATING SYSTEMS	Category	L	T	P	Credit
		III	58	2	-	4

Preamble

This course introduces the architecture of various modern operating systems. It also includes the techniques such as virtualization, scheduling, memory management and distributed system. The course provides case studies in Linux and Android.

Prerequisite

- Operating System
- Data Structure

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of distributed operating system.	K2
CLO2	Apply the concepts of distributed operating system in various models	K3
CLO3	Analyze the controlling access techniques in distributed operating system in various environments	K4
CLO4	Evaluate file system structure tools used in modern operating systems	K5
CLO5	Perform administrative tasks on Linux Servers and compare iOS and Android Operating Systems.	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	M	M	S
CLO2	S	S	M	M
CLO3	S	M	M	S
CLO4	M	S	L	S
CLO5	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs)

Distributed Systems – Network Hardware - Network Services and Protocols-Document Based Middleware – File system based middleware - Object based middleware- Co-ordination based middleware – **Multi computers : User level Communication software** – Remote Procedure call -Distributed shared memory – Multicomputer scheduling – Load Balancing.

UNIT II (11Hrs)

Processes and Threads: Process model- Process Creation-Process Termination-Process Hierarchies-Process State. **Threads**: Thread usage -Classical Thread Model-Implementing Threads in user space and kernel.

Interprocess communication-semaphores- Message Passing-**Scheduling-Scheduling in Batch systems-Interactive Systems- Real time Systems-Thread scheduling.**

UNIT III   (12 Hrs)
Security Environment: Threats – Attackers - Controlling Access to Resources - Protection Domains - Access control lists – Capabilities - Formal Models of Secure Systems - Multilevel security – Covert Channels - Authentication using a Physical object - Authentication using Biometrics – **Defenses – Code signing – Jailing – Model based intrusion detection – encapsulating mobile code**

UNIT IV   (12 Hrs)
Case Study : Linux Overview – Processes in Linux : Process Management system calls in Linux – Implementation of processes and threads – Scheduling – Memory Management System calls- Paging – **Input – output system calls - Linux file system: Fundamental concepts – File system calls in Linux**

UNIT V   (12 Hrs)
Case Study**:** Android and Google - History of Android - Design Goals - Android Architecture - Linux Extensions – Dalvik - Binder IPC – Android Applications - Intents – Security - Process Model. Mobile OS - IOS and **Android - Architecture and SDK Framework,** Media Layer, Services Layer, Core OS Layer, File System.

Text Book
1. Andrew S. Tanenbaum Herbert Bos (2015). Modern Operating Systems, 4/e, Pearson Education.

Reference Books
1. Andrew S.Tanenbaum (2011). MaartenVan Steen, Distributed System – Principles and Paradigms, 2/e, Prentice Hall of India Pvt. Ltd.
2. Shubra Garg(2013). Fundamentals of Distributed Operating Systems, S.K. Kataria& Sons, 2013.
3. YakupPaker et al (2012). Distributed Operating Systems: Theory and Practice, Springer.
4. S SKudate A P Kale et al(2012). Distributed Operating Systems, NiraliPrakashan.
5. Andrew S.Tanenbaum (2011). Distributed Operating System, 10/e, Pearson Education.
6. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ―Operating System Concepts‖, 9th Edition, John Wiley and Sons Inc., 2012.
7. Daniel P Bovet and Marco Cesati, ―Understanding the Linux kernel‖, 3rd edition, O‘Reilly, 2005.
8. Neil Smyth, ―iPhone iOS 4 Development Essentials – Xcode‖, Fourth Edition, Payload media, 2011.

Pedagogy : Lectures, Demonstrations, Group Discussions

Course Designers:
1. Dr. S. Sasikala
2. Dr. R. Kowsalya

Blended Learning Video Links

UNIT I

https://www.youtube.com/watch?v=NlpyDBgPj7Q

UNIT II
https://www.youtube.com/watch?v=eHcuLvkduNM
https://www.youtube.com/watch?v=2tr5gcKo3tE
https://www.youtube.com/watch?v=sRg35FnlFwg
https://www.youtube.com/watch?v=VbQwCEYtWZM

UNIT III
https://www.youtube.com/watch?v=KM2hIBtDGT0
https://www.youtube.com/watch?v=TVucoTvNAc8

UNIT IV
https://www.youtube.com/watch?v=CHs9WwvEKdg
https://www.youtube.com/watch?v=CHs9WwvEKdg

UNIT V

https://www.youtube.com/watch?v=TwXuY2w7Zv0
https://www.youtube.com/watch?v=RleVSNhofKs

MCS2304	DATA MINING TECHNIQUES AND TOOLS	Category	L	T	P	Credit
		III	58	2	-	4

Preamble

This course presents the basic concepts of data mining and various data mining techniques like classification, clustering, association rule mining. The course also introduces various applications of data mining such as text mining, web mining, multimedia mining, image mining, spatial mining and data visualization.

Prerequisite

- Database Management Systems
- Probability and Statistics

Course Learning Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand data mining techniques, algorithms and data visualization	K2
CLO2	Apply data mining techniques to carry out simple data mining tasks	K3
CLO3	Analyze data mining algorithms appropriate for different data mining applications	K4
CLO4	Evaluate data mining models for solving real world problems	K5
CLO5	Develop predictive models using advanced data mining techniques for various application domains	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	S	M	L
CLO2	S	S	M	L
CLO3	S	S	M	L
CLO4	S	S	M	L
CLO5	S	S	M	L

S- Strong; M-Medium; L-Low

Syllabus

UNITI (11Hrs)

Introduction: Need for data mining - Kinds of data - Patterns for mining: Characterization and Discrimination Associations - Classification and Regression - Cluster Analysis - Outlier Analysis -

Technologies - Applications - Major issues in Data Mining. Data Preprocessing: Overview - Data cleaning - Data integration - Data reduction - Data Transformation and Discretization.

UNIT II   (12Hrs)

Association rule mining : Apriori algorithm, Mining Frequent Patterns–Associations and correlations – Mining Methods– Mining Various kinds of Association Rules– Correlation Analysis– **Constraint based Association mining. Graph Pattern Mining, SPM.**

UNIT III   (12Hrs)

Classification - Decision trees - Support Vector Machine - K Nearest neighbor - Bayesian classification-NaiveBayes, Rule–based classification, Lazy learner. Clustering: Cluster Analysis - Partitioning Methods: K-Means, K-Medoids - Hierarchical Methods: BIRCH, Probabilistic Hierarchical clustering - **Density based methods: DBSCAN, OPTICS**

UNIT IV   (12Hrs)

Advanced Concepts: Basic concepts in Mining data streams–Mining Time–series data––Mining sequence patterns in Transactional databases– Mining Object– Spatial– Multimedia–Text and Web data – Spatial Data mining– Multimedia Data mining–Text Mining– Mining the World Wide Web.**Data Visualization: Foundations for building visualizations - Visualizing data -Working with Data in Tableau - Moving from Foundational to Advanced Visualizations.**

UNIT V   (11Hrs)

Data Mining Trends and Research Frontiers: Mining Sequence data: Time-series, Symbolic sequences and Biological sequences Mining graphs and networks Visual and audio data mining. **Data mining applications: Financial data analysis Retail and telecommunication-Science and engineering Intrusion detection Recommender systems.**

Text Books

1. Jaiwei Han, MichelineKamber (2012). Data Mining-concepts and techniques, 3/e, Morgan
Kaufmann Publishers, San Francisco.
2. Joshua N.Milligan (2017). Learning Tableau, PACKT publishing.
3. Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA

Reference Books
1. Jaiwei Han, MichelineKamber (2022). Data Mining-concepts and techniques, 4/e, Morgan
Kaufmann Publishers, San Francisco.
2. Mark A. Hall, Ian H. Witten, Eibe Frank (2011). Data Mining: Practical Machine Learning Tools and
Techniques, 4/e, Morgan Kaufmann Publishers, San Francisco
3 David Hand, HeikkiMannila and Padhraic Smyth (2001). Principles of Data Mining, Prentice Hall of India, New Delhi.
4. Arun K. Pujari (2001). Data Mining Techniques; Universities Press, Hyderabad
5 Soman KP (2005). Data mining from theory to practice, 2/e, PHI Learning Pvt. Ltd., New Delhi.

Pedagogy: Lectures, Group Discussions, Case studies

Course Designers
1. Dr. R. Kowsalya
2. Dr. S. Poongodi

Blended Learning Video Links:

UNIT I
https://www.youtube.com/watch?v=I0DanOCgcjE
https://www.youtube.com/watch?v=8PRxBZggg_I
https://www.youtube.com/watch?v=5yeqDbagzs0

UNIT II
https://www.youtube.com/watch?v=guVvtZ7ZClw
https://www.youtube.com/watch?v=NT6beZBYbmU

UNIT III
https://www.youtube.com/watch?v=SNo1616WElc
https://www.youtube.com/watch?v=aWAnNHXIKww
https://www.youtube.com/watch?v=ENwPrrVf9qY

UNIT IV
https://www.youtube.com/watch?v=OiK7dhfB670
https://www.youtube.com/watch?v=qQ9Wu1IxsYw
https://www.youtube.com/watch?v=8qQRD0Z0CH4
https://www.youtube.com/watch?v=LI15e-H-wXg

UNIT V
https://www.youtube.com/watch?v=kSGLqOKlfFM
https://www.youtube.com/watch?v=l9_zMuSYwJo
https://www.youtube.com/watch?v=yMWf5ENo2xM

MCS2305	DIGITAL IMAGE PROCESSING	Category	L	T	P	Credit
		III	58	2	-	4

Preamble

This course covers the fundamental techniques to expose simple image enhancement techniques, image segmentation and representation techniques with image compression and recognition methods

Prerequisite

- Basic Mathematics, Programming Skills

Course Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.	K2
CLO2	Apply appropriate methods on images using the techniques of smoothing, sharpening and enhancement	K3
CLO3	Analyze the restoration concepts and filtering techniques.	K4
CLO4	Evaluate the basics of segmentation, features extraction, compression and recognition methods for color models	K5
CLO5	Design and implement image compression recognition methods	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	M	S	S	S
CLO2	M	S	S	M
CLO3	S	M	S	S
CLO4	S	M	S	S
CLO5	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs)

Digital Image Fundamentals Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - **RGB**, HSI models, Two-dimensional mathematical preliminaries, **2D transforms**.

UNIT II   **(11 Hrs)**

Image Enhancement Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering – Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters - **Homomorphic filtering - Color image enhancement.**

UNIT III   **(12 Hrs)**

Image segmentation Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, **Segmentation by morphological watersheds** – basic concepts – **Dam construction – Watershed segmentation algorithm**

UNIT IV   **(12 Hrs)**

Image compression and Recognition Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - **Patterns and Pattern classes - Recognition based on matching.**

UNIT V   **(12 Hrs)**

Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – **Inverse Filtering – Wiener filtering.**

Text Books
   1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing ', Pearson, Third Edition,2010.
   2. Anil K. Jain, Fundamentals of Digital Image Processing ', Pearson, 2002

Reference Books
   1. Kenneth R. Castleman, Digital Image Processing ', Pearson, 2006.
   2. Rafael C Gonzalez, Richard E. Woods, Steven Eddings, Digital Image Processing using MATLAB ', Pearson Education, Inc., 2011.

Pedagogy

Lectures, Group Discussions, Case studies

Course Designers
1. Dr. S. Lakshmi Priya
2. Dr. S. Sasikala

Blended Learning Video Links

UNIT I
https://youtu.be/xlFc0HFh_Wg
https://youtu.be/39Te-Q9Grjg

UNIT II
https://youtu.be/PL46EDPPzaQ
https://youtu.be/7ImSbCj8bRI

UNIT III
https://youtu.be/yiVipqzdOs0
https://youtu.be/LXGxK2b1mv4
https://youtu.be/EI1z6fIQFSE

UNIT IV
https://youtu.be/g_91DdPLOoc
https://youtu.be/cEZ-I7jlmSc

UNIT V
https://youtu.be/vcc73bl9_Fw
https://youtu.be/WQpXS9gBEu8

MCS23P1	DATA MINING TECHNIQUES AND TOOLS LAB	Category	L	T	P	Credit
		III	-	-	75	3

Preamble

This course provides exercises to implement data mining techniques such as classification, clustering, association rule mining, and regression using data mining tools like R, Python. This course also includes exercise to visualize the data using Tableau and PowerBI.

Prerequisite

- SQL, Oracle

Course Learning Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Implement the association rule mining, classification, clustering, prediction algorithm and implement data visualization using Tableau and PowerBI.	K3
CLO2	Apply data mining techniques to real world problem	K3
CLO3	Analyze the performance of various classification, clustering and prediction algorithm.	K4
CLO4	Evaluate the features of data mining tools.	K5
CLO5	Build models using classification, clustering and prediction to solve real world problems using Python.	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	S	S	M
CLO2	S	S	S	M
CLO3	S	S	S	M
CLO4	S	S	S	M
CLO5	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

- Exercises to implement visualization techniques in R
- Exercises to implement correlation, linear regression in R
- Exercises to perform classification in R
- Exercises to perform clustering using Python
- Exercises to perform association rules using Python
- Exercises to perform text mining using Python

- Exercise to perform visualization using Tableau
- Exercise to perform visualization using PowerBI

Pedagogy: Demonstrations

Course Designers

1. Dr. S. Poongodi

2.Dr. M. Sasikala

MCS23P2	FULL STACK DEVELOPMENT LAB	Category	L	T	P	Credit
		III	-	-	75	4

Preamble

This course provides exercises to create dynamic web application in both client and server side using CSS3, AJAX, Javascript, jQuery, PHP/ MySQL, Angular and ReactJS. It enables students to equip themselves as a full stack developer.

Prerequisite

HTML

Course Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of Client side /Server side web programming	K2
CLO2	Implement validation concepts using jQuery and angular JS	K3
CLO3	Analyze the requirements to implement the principles of web page development	K4
CLO4	Design applications using connectivity with MySQL database	K5
CLO5	Develop dynamic web pages using client side and server side scripting	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	S	S	M
CLO2	M	S	S	M
CLO3	M	S	S	M
CLO4	M	S	S	M
CLO5	M	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

- Exercise to pass information between web pages using GET and POST methods.
- Exercise to apply string functions to manipulate strings.
- Exercise to implement file operations.
- Exercise to implement the date and time functions.
- Exercise to create menus, styles, Animation using CSS using AJAX
- Exercise to manipulating JSP and SQL.
- Exercise to validate the HTML form fields using Javascript object,scope and Events.
- Exercise using jQuery and CSS.
- Exercise to handle events and special effects using jQuery and jQuery Traversing.
- Exercise to implement explode and implode functions
- Exercise to create data base connectivity using PHP and MySQL
- Exercise using Angular
- Exercise using ReactJS.

Pedagogy: Demonstrations

Course Designers
1. Dr. R. Kowsalya
2.Dr. S. Lakshmi Priya

MCS23CE	PYTHON PROGRAMMING	Category	L	T	P	Credit
		III	45	-	-	3

Preamble

This course introduces the core concepts of programming in Python. It also provides knowledge in concepts like regular expressions, text processing, multithreading, internet programming, GUI programming and database programming. It also explores Web Development using Python.

Prerequisite

● Basic concepts of Programming Language
● Database concepts

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the programming constructs of Python	K2
CLO2	Apply the concepts of Python in simple tasks	K3
CLO3	Analyze python packages suitable to develop solutions for real time problems	K4
CLO4	Evaluate the complex problems and solve using python modules	K5
CLO5	Create python projects for real time applications	K6

Mapping with Program Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	S	M	M
CLO2	S	S	S	M
CLO3	S	S	M	M
CLO4	S	S	S	M
CLO5	S	S	S	M

S- Strong; M-Medium; L-Low

Sl.No.	Coursera Courses	Coursera Link	No. of Hours
1	Crash Course on Python	https://www.coursera.org/programs/psgr-faculty-learning-program-1luew/skills/python-programming-language?collectionId=skill~python-programming-language&productId=8D3R5HiaEeioIg7r4jw_PA&productType=course&showMiniModal=true	22
2	Capstone: RetrievingProcessing, and Visualizing Data with Python	https://www.coursera.org/programs/psgr-faculty-learning-program-1luew/learn/python-data-visualization?specialization=python	**9**
3	Using Python to Access Web Data	https://www.coursera.org/programs/psgr-faculty-learning-program-1luew/learn/python-network-data?specialization=python	14

MCS2306	ARTIFICIAL INTELLIGENCE (SEMESTER II / III)	Category	L	T	P	Credit
		III	43	2	-	3

Preamble

This course introduces the concepts of Artificial Intelligence and the various methods of solving problems using Artificial Intelligence. It also provides insights on machine learning techniques and its applications.

Prerequisite

Probability and Statistics
Discrete Structures

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the techniques of knowledge representation and problem solving in the field of artificial intelligence	K2
CLO2	Apply appropriate AI techniques for real time scenarios	K3
CLO3	Analyze suitable Artificial Intelligence principles to solve a given problem	K4
CLO4	Evaluate different AI algorithms appropriate for solving a given problem	K5
CLO5	Design and develop models for predictive tasks in various domains	K6

Mapping with Program Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	S	M	M
CLO2	M	M	M	M
CLO3	M	M	M	M
CLO4	S	M	M	M
CLO5	S	S	M	M

S- Strong; M-Medium; L-Low

UNIT I   **(9 hrs)**

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem   Solving Agents Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth- First, DepthFirst Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

UNIT II   **(9hrs)**
Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning. Randomized Search: Genetic Algorithm - Ant Colony Optimization.
 Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

UNIT III   **(9hrs)**
 Knowledge representation issues: Representations and mappings – Approaches to Knowledge representations – Issues in Knowledge representations – Frame Problem.
Using Predicate Logic: Representing simple facts in logic – Representing Instance and Is a relationship – Computable functions and predicates – Resolution

UNIT IV   **(8hrs)**
Representing knowledge using rules: Procedural Vs Declarative knowledge – Logic programming – Forward Vs Backward reasoning – Matching – Control knowledge

UNIT V   **(8hrs)**
 Expert Systems: Representing and Using Domain Knowledge- Expert Knowledge Shell- Knowledge Acquisition- Perception. **Case Studies:** AI in Environmental Management (Smart Pollution Control, Water Management, Farming) - AI in Retail (Alibaba, Walmart) - AI in Medical Imaging (MRI, US, Mammography)

Reference Books
 1.Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Publishing, 2020, Fourth edition.
2.G. Luger, "Artificial Intelligence: Structures and Strategies for complex problemsolving", Fourth Edition, Pearson Education
3.Lavika Goel," Artificial intelligence: Concepts and applications", First edition, Wiley Publications

Pedagogy: Lectures, Demonstrations, Case Studies

Course Designers:
1. Dr. R. Kowsalya
2. Ms. A. Sheela Rini

BLENDED LEARNING VIDEO LINK:

Unit I
https://www.youtube.com/watch?v=M6V-TvwqwnU

Unit II
https://www.youtube.com/watch?v=kXlr6ydiPAQ

Unit III
https://www.youtube.com/watch?v=UIM-7213nyM

Unit IV
https://www.youtube.com/watch?v=zT0sGjOSPt8&list=PLyqSpQzTE6M-t-Qr2Z0Gf_KP5RC97uOKC

Unit V
https://www.youtube.com/watch?v=nEahhnk3VvM

MCS2307	INTERNET OF THINGS	Category	L	T	P	Credit
		III	73	2	-	5

Preamble

This course aims to cover the basics of Internet of Things and protocols, Internet evolving to connect people to physical things and also physical things to other physical things all in real It helps us to learn about the middleware for Internet of Things

Prerequisite

Basic knowledge of hardware and networking technology for IoT projects**.**

Course Learning Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basics of Internet of things and protocols	**K2**
CLO2	Implementing IoT architecture and IoT design constraints	**K3**
CLO3	Analyze the basics of IOT protocols and M2M	**K4**
CLO4	Evaluate the low-cost embedded system using IoT	**K5**
CLO5	Designing IoT solutions using sensors, actuators and Devices in Arduino or Raspberry Pi	**K6**

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	M	S	M	S
CLO2	S	M	M	M
CLO3	S	S	S	M
CLO4	S	M	M	S
CLO5	M	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (15 hrs)

Introduction to Internet of Things: Elements of an IoT - Technology drivers, Business drivers, Trends and implications, Machine-to-Machine Communications. Characteristics IoT – Physical Design of IoT - Logical Design of IoT- Functional Blocks - IoT Communication Models and APIs - IoT enabled

Technologies- M2M and WSN – Cloud Computing. IoT and M2M: M2M -**Difference between IoT and M2M - Software defined networks- Network functions virtualization**. Communication Protocols– Issues with IoT Standardization – Unified Data Standards. IoT system Management and its protocol: Needs for IoT Management – Simple Network Management Protocol (SNMP) - Limitations of SNMP – Network operation Requirements – IoT system with NETCONF-YANG. Application Protocols for IoT: UPnP, CoAP, MQTT, XMPP, DDS, AMQP SCADA, WebSocket; IP-based protocols: 6LoWPAN, RPL, Authentication Protocols.

UNIT II (15 hrs)

Architecture for IoT: Domain model specification, Information Model Specification, Service specification, IoT Level specification, Functional view specification, Operational view specification, Device and Component Integration, User centered design, Open-source development, End user programming, Tools for IoT. IoT Platform Design Methodology: Design Methods - Connectivity Technologies (6L) 6LoWPAN- **RFID- Zigbee Bluetooth- NFC-Piconets.** M2M value chains- IoT value chains – Emerging Industrial structure of IoT. Network & Communication aspects in IoT: Wireless Medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination

UNIT III (15 hrs)

Devices a Gateway: Device types – Deployment scenarios for devices-Gateways – Data management – Local Application – Device Management – Need of Networks (LAN / WAN) - Advanced Devices- IoT analytics – Analytical architecture – Methodology – Knowledge management – Reference model of IoT and architecture – IoT reference model – IoT domain model – Information model - Functional model – Communication model – Security and Privacy. Introduction to Arduino: Structuring an Arduino Program- Simple Primitive Types- Floating-Point Numbers –Working with groups of values- Arduino String Functionality – C character Strings- Converting Number to String – Structuring the Code into Function Block- **Serial communication - Input from Sensor - Input from visual output- Audio Output.**

UNIT IV (14 hrs)

Introduction on RaspberryPi: About the Board – Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming Raspberry Pi with Python. IoT Design using Raspberry Pi: IoT Applications based on Pi-, LAMP Web-server- GPIO Control over Web Browser- Creating Custom Web Page for LAMP-Communicating data using on-board module- Home automation using Pi -Node-RED-MQTT Protocol, Using Node-RED Visual Editor on Rpi Configuring- Wi-Fi on Raspberry Pi-MQTT (Message Queuing Telemetry Transport) protocol-**Establishing communication between IoT devices- Analyzing and processing IoT data on Raspberry Pi-Implementing security measures for IoT devices.**

UNIT V (14 hrs)

Introduction to Cloud Storage Models: Overview of cloud-based IoT platforms- Cloud Deployment Models-**Cloud service Models: PaaS, SaaS, IaaS**- IoT Platform- Cloud IoT Architecture-IoT cloud services- Comparison of Google, AWS and Azure IoT Core Services- AWS IoT Core -Connecting a web application to AWS IoT using MQTT-. Security Concerns, Risk Issues, and Legal Aspects of Cloud Computing- **Cloud Data Security.** Data analytics for IoT: MapReduce Programming model, Ozie workflow for IoT data analysis, Setting up a Strong, Cluster, REST - based approach, Web Socket - based approach. **Broad categories of IoT applications: Consumer IoT, Commercial IoT, Industrial IoT, Infrastructure IoT, Military Things (IoMT). Case Study: Automotive Applications, home automation, smart cards**

Text Books

1. Arshdeep Bahga and Vijay Madisetti Internet of Things - A Hands-on Approach, Universities Press, 2015, ISBN: 9788173719547
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press,2014
3. Monika Mangla, Suneeta Satpathy, Bhagirathi Nayak, Sachi Nandan Mohanty" Integration of Cloud Computing with Internet of Things: Foundations, Analytics, and Applications", 2021 Scrivener Publishing LLC

Reference Books

1. Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat "Industrial Internet of Things: Cyber manufacturing Systems" (Springer), 2017.
2. Zaigham Mahmood, "The Internet of Things in the Industrial Sector: Security and Device connectivity, smart environments and Industry 4.0 (Springer), 2019.
3. Bassi, Alessandro, et al, "Enabling things to talk", Springer-Verlag Berlin An, 2016.
4. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017
5. Olivier Hersent,DavidBoswarthick, Omar Elloumi"The Internet of Things key applications and protocols", willey

Pedagogy: Lectures, Group Discussions, Case studies

Course Designers

1. Dr. S. Lakshmi Priya
2. Dr. R. Kowsalya

BLENDED LEARNING VIDEO LINKS

UNIT I
https://www.youtube.com/watch?v=_LYXlYG0K0A
https://www.youtube.com/watch?v=yjeN9JIZHzg&t=4s

UNIT II
https://www.youtube.com/watch?v=9cEz6Bjdfpk&t=7s
https://www.youtube.com/watch?v=Isd8zTQlAK8&t=4s

UNIT III
https://www.youtube.com/watch?v=Isd8zTQlAK8&t=5s

UNIT IV
https://www.youtube.com/watch?v=LlhmzVL5bm8
https://www.youtube.com/watch?v=_w2g_fWEQP0&t=2s
https://www.youtube.com/watch?v=7zWVxrjjIpE&t=1s

UNIT V
https://www.youtube.com/watch?v=boY2i6qhPr8
https://www.youtube.com/watch?v=b66FPsTniNY&t=5s

MCS2308	SOFTWARE PROCESS MANAGEMENT	Category	L	T	P	Credit
		III	58	2	-	4

Preamble

This course presents the concepts of software product life cycle models, and Agile project management using Scrum and Lean. The course also introduces DevOps tools and technologies.

Prerequisite

- Software Engineering

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand Agile Methodologies and DevOps tools	K2
CLO2	Apply software process management concepts in real-time applications	K3
CLO3	Analyze various Agile Methodologies.	K4
CLO4	Evaluate the various software models which suitable for real-time application.	K5
CLO5	Design a plan for delivering a quality product	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1.	S	S	S	M
CLO2.	S	S	S	M
CLO3.	S	S	S	M
CLO4.	S	S	S	M
CLO5.	S	S	S	M

S- Strong; M-Medium; L-Low

UNIT I (12 Hrs)

Foundations: Background – The Software Process Ecosystem – Historical Overview – Terminology and Basic Concepts. Software Process in the Software Product Life Cycle: Introduction – **Basic Software Development Life Cycle Models** – Methodology – **Driven Cycle and Process Models – Detailed combined Software Life Cycle and Process Models**

UNIT II (12 Hrs)

Agile: Introduction – Core Attitudes of Agile – Learning through Example - The need for Agile Methodologies – Principles of Agile Project Management – Introduction to Scrum – Scrum Principles – **Sprint Planning, Execution and Reviewing – Becoming a better Scrum Master - Introduction to kanban – The work in progress.**

UNIT III (12 Hrs)

Scrum: Agile Principles and Values - Scrum: Development Teams, Scrum Master, Planning, Sprint Review, Sprint Retrospective - Three Scrum Artifacts – Sprint Cycle – **Scrum Estimation – Scrum Planning and Roadmaps – The daily Scrum –Scrum case studies.**

UNIT IV (11 Hrs)

DevOps Concepts, Tools, and Technologies: Understanding the DevOps movement - The DevOps lifecycle - Tools and technologies: Code Repositories – **GIT, Build Tools – Maven, Continuous Integration Tools – Jenkins, Configuration Management tools** – Chef, Container Technology – Docker – Monitoring Tools - Installing and Configuring Docker.

UNIT V (11 Hrs)

Introduction to Lean - Lean Thinking Tools - Design Thinking, Lean and Agile: Introduction – Actionable Strategy – Act to Learn – Leading teams to win- **Delivery: DevOps and Continuous Delivery – Evolutionary Architecture and Emergent Design.**

Reference Books

1. Ralf Kneuper (2018), Software Processes and Life Cycle Models , Springer. (Unit – I)
2. James Edge, Agile(2018) – An Essential Guide to Agile Project Management, The Kanban Process and Lean Thinking, CreateSpace Independent Publishing. (Unit – II & III)
3. Mitesh Soni(2016), Devops for Web Development, , Packt Publishing. (Unit – IV)
4. Jonny Schneider(2017), Understanding Design thinking, Lean and Agile,O'Reilly Publishing. (Unit – V)

Pedagogy: Lectures, Demonstrations, Case Studies

Course Designers:

3. Dr. R. Kowsalya
4. Ms. A. Sheela Rini

BLENDED LEARNING VIDEO LINKS:

Unit I
https://www.youtube.com/watch?v=U0CvH9pygsk
https://www.youtube.com/watch?v=_OsvmhsondU
https://www.youtube.com/watch?v=Fi3_BjVzpqk

Unit II
https://www.youtube.com/watch?v=TxUzyDIVjL8
https://www.youtube.com/watch?v=XmXnHNgMQK4
https://www.youtube.com/watch?v=mH48_b9G4t4

Unit III
https://www.youtube.com/watch?v=inntEmVaM8k
https://www.youtube.com/watch?v=tMBvg8Cgegk
https://www.youtube.com/watch?v=oTZd2vo3FQU

Unit IV
https://www.youtube.com/watch?v=-5tA3hZTVfA
https://www.youtube.com/watch?v=1er2cjUq1UI
https://www.youtube.com/watch?v=0zQJ_AH5TvU

Unit V
https://www.youtube.com/watch?v=93raARQl8PE
https://www.youtube.com/watch?v=940OINOmTJU
https://www.youtube.com/watch?v=2TTU5BB-k9U

MCS23P3	ADBMS LAB	Category	L	T	P	Credit
		III	-	-	75	3

Preamble

This course provides implementation of object oriented, parallel and partitioning concepts in RDBMS packages. This course also covers various queries in advanced databases like Neo4j and MongoDB

Prerequisite

- RDBMS
- SQL
- Oracle & MS-Access

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of integrity constraints with some exampleQueries	K2
CLO2	Implementing object oriented, parallel and partitioning queries and queries in MongoDB	K3
CLO3	Analyze the concepts of different databases	K4
CLO4	Design simple applications using VB with MS-ACCESS, Oracle and SQL	K5
CLO5	Develop real time applications using advanced databases like GraphDatabases	K6

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4
CO1.	S	M	M	M
CO2.	S	M	M	M
CO3.	S	S	M	M
CO4.	S	M	S	M
CO5.	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

- Exercises to implement DDL and DML Commands.
- Exercises to implement the concepts of null constraint, unique constraint, integrity constraints, check constraints.

- Exercises to implement parallel queries.
- Exercises to implement the concepts of partitioning queries.
- Exercises to implement object-oriented concepts.
- Exercises to implement the various queries for CRUD operations in MongoDB.
- Exercises to implement Replication, Backup and Restore of database in MongoDB.
- Exercises to implement aggregate functions in MongoDB.
- Exercises to implement the various queries for CRUD operations in Neo4j.
- Exercises to implement various clauses like order by, read, write and where clause in neo4j.
- Exercises to implement string functions in neo4j.
- Exercises to implement aggregate functions in neo4j.
- Develop a simple application using ADODC with front end as VB and MS-ACCESS as back-end.
- Develop a simple application using ADODC with front-end as VB and Oracle as back-end.
- Develop a simple application using ADODC with front-end as VB and SQL. as back-endconnectivity.

Pedagogy: Demonstrations

Course Designers

1. Mrs.A.Sheela Rini
2. Dr. M. Sasikala

MCS23P4	BIG DATA ANALYTICS LAB	Category	L	T	P	Credit
		III	-	-	75	3

Preamble

This course provides sound introduction to implement the Hadoop framework and also various exercises to implement in the distributed environment through map reduce programming. This course provides implementation of the Hadoop components like Pig and Spark.

Prerequisite

Big data framework

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand Hadoop components for big data processing and building a Hadoop cluster.	K2
CLO2	Apply simple processing operations in Pig.	K3
CLO3	Analyze simple processing operations in Spark and Scala.	K4
CLO4	Explore specific Mapper and reducer functions for different situations	K5
CLO5	Develop Spark, Hive, Cassandra and Zepplin for data processing	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	S	M	M
CLO2	S	S	M	M
CLO3	S	S	M	M
CLO4	S	S	S	M
CLO5	S	S	S	M

S- Strong, M-Medium, L-Low

Syllabus

1. Setting up a Hadoop environment
2. Exercises to implement file management tasks using Hadoop
3. Exercises to implement Map Reduce program that mines patient data
4. Exercises to implement Pig Latin scripts to sort, group, join, project, and filter data.
5. Exercises to implement simple processing tasks in Spark & Scala.
6. Exercises to implement basic operations in Spark SQL.
7. Exercise to implement Spark RDD actions.
8. Exercise to implement Hive, Cassandra and Zepplin.

Pedagogy: Demonstrations

Course Designers
1. Dr. S. Poongodi
2. Dr. M. Sasikala

ELECTIVES

MCS23E1	MACHINE LEARNING	Category	L	T	P	Credit
		III	58	2	-	4

Preamble

This course introduces the fundamentals of Machine Learning and its algorithms. It also covers various supervised and unsupervised learning algorithms for classification, prediction and clustering.

Prerequisite

- Linear Algebra
- Data Mining

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand supervised, unsupervised and semi-supervised learning	K2
CLO2	Apply supervised and unsupervised learning algorithms for classification, prediction and clustering	K3
CLO3	Analyze the efficiency of machine learning algorithms suitable for applications.	K4
CLO4	Evaluate various machine learning models.	K5
CLO5	Design an appropriate model for any given application	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	M	S	M	M
CLO2	S	M	S	M
CLO3	S	M	S	M
CLO4	S	S	M	S
CLO5	S	M	S	S

S- Strong; M-Medium; L-Low.

UNIT I   **(11 Hrs.)**

Introduction: Machine learning Basics – **Examples of machine Learning Applications.** Supervised Learning: Learning a class from Examples - Vapnik- Chervonenkis Dimension - Probably Approximately Correct Learning – Noise - Learning Multiple Classes – Regression - **Model Selection and Generalization** - Dimensions of a Supervised Machine Learning Algorithm.

UNIT II   **(12 Hrs.)**

Bayesian Decision Theory: Classification - Losses and Risks - Discriminant Functions - Association Rules. Parametric Methods: Maximum Likelihood Estimation - Evaluating an Estimator: Bias and Variance - The Bayes' Estimator - Parametric Classification – Regression - **Tuning Model Complexity: Bias/Variance Dilemma - Model Selection Procedures.**

UNIT III   **(12 Hrs.)**

Multivariate Methods: Multivariate Data - Parameter Estimation - Estimation of Missing Values - Multivariate Normal Distribution - Multivariate Classification - Tuning Complexity - Discrete Features - Multivariate Regression. Nonparametric Methods: Nonparametric Density Estimation - Generalization to Multivariate Data - **Nonparametric Classification - Condensed Nearest Neighbor - Distance-Based Classification - Outlier Detection - Nonparametric Regression: Smoothing Models.**

UNIT IV   **(12 Hrs.)**

Decision Trees: Univariate Trees – Pruning - Rule Extraction from Trees - **Learning Rules from Data - Multivariate Trees**. Clustering: Mixture Densities - k-Means Clustering - Expectation-Maximization Algorithm - Mixtures of Latent Variable Models - Supervised Learning after Clustering - Spectral Clustering - Hierarchical Clustering - **Choosing the Number of Clusters.**

UNIT V   **(11 Hrs.)**

Multilayer Perceptrons: Introduction – Perceptron - Training a Perceptron - **Learning Boolean Functions - Multilayer Perceptrons**- MLP as a Universal Approximator - Back propagation Algorithm - Training Procedures - **Tuning the Network Size** - Bayesian View of Learning - Dimensionality Reduction - Learning Time. **WEKA Implementations.**

Text Book:

Ethem Alpaydm, "Introduction to Machine Learning", PHI Learning Pvt. Ltd.; Third edition, 2015

Reference Books:

1. Ian Witten, Data mining: Practical Machine Learning Tools and Techniques, Fourth edition, Morgan Kaufmann Publishers, 2016
2. Tom M. Mitchell (1997). Machine Learning, Tata McGraw-Hill, New Delhi

Pedagogy:

Lectures, Group Discussions, Demonstrations.

Course Designers:

1.Dr. M. Sasikala
2.Dr. S. Poongodi

BLENDED LEARNING VIDEO LINKS:

UNIT I

https://youtu.be/T3PsRW6wZSY
https://youtu.be/jUHi1aPcrFg

UNIT II

https://youtu.be/_YPScrckx28
https://youtu.be/TtKF996oEl8

UNIT III

https://youtu.be/EItlUEPCIzM
https://youtu.be/1XqG0kaJVHY
https://youtu.be/4b5d3muPQmA

UNIT IV

https://youtu.be/Hm2H97aHTJE
https://youtu.be/9g32v7bK3Co

UNIT V

https://youtu.be/jGwO_UgTS7I
https://youtu.be/ukzFI9rgwfU

MCS23E2	INTERNET PROTOCOLS	Category	L	T	P	Credits
		III	58	2	-	4

Preamble

This course presents the concept of protocols in the TCP/IP suite (IP, UDP & TCP), Layering Concepts, and Routing Architectures. It also includes Internet Addressing, Mobile IP Addressing, Network Virtualization and Client Server model of interaction.

Prerequisite

● Computer Networks
● Basic Concept of Networking

Course Outcomes

On successful completion of the course, the students will be able to,

CLO Number	CLO Statement	Knowledge Level
CO1	Understand the concept of protocols in the TCP/IP suite, protocol Layering, Routing Architecture.	K2
CO2	Apply TCP/IP in the Mobiles.	K3
CO3	Analyze the relation between the various internet protocols.	K4
CO4	Evaluate the suitability of an internet protocol for supporting a given application type.	K5
CO5	Construct the alternate protocol.	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CO1	S	M	M	S
CO2	S	M	M	S
CO3	S	S	S	S
CO4	S	S	S	S
CO5	S	S	S	S

S – Strong; M – Medium; L - Low

Syllabus

UNIT I (11 Hrs)

Introduction and Overview: The TCP/IP Internet – Internet services – History and Scope of the Internet –Internet Architecture Board - Transition to IPv6 - Relationship between IPv4 and IPv6 - IPv6 Migration, Overview of Underlying Network Technologies: Two Approaches to Network Communication – WAN and LAN – Ethernet – Wi-Fi - ZigBee – OC and POS - Bridging – Congestion and Packet Loss, Internetworking Concept and Architectural Model: **Application Level Interconnection – Network Level Interconnection – Internet Architecture – Interconnection of Multiple Networks with IP Routers**, Protocol Layering: Reference Model - **ISO 7 Layer - TCP/IP 5 Layer.**

UNIT II   (11 Hrs)

Internet Addressing: IPv4 - Classful Addressing Scheme - Subnet Addressing - Classless Addressing Scheme - Classless Addressing Example - IPv6 Addressing Scheme - Embedding IPv4 Addresses In IPv6 For Transition - Special Addresses - Weaknesses In Internet Addressing, Mapping InternetAddresses of Physical Addresses (ARP), Internet Protocol: Connectionless Datagram Delivery: **Connectionless Delivery System Characteristics – IP Datagram – Datagram Encapsulation – Fragmentation – Reassembly**.

UNIT III   (12 Hrs)

Internet protocol: Forwarding IP Datagrams, Error and Control Messages: Internet Control Message Protocol - Error Reporting Vs. Error Correction - ICMP Message Delivery - ICMP Message Format – Example ICMP Message Types Used with IPv4 & IPv6, User Datagram Protocol, Reliable Stream Transport Service (TCP): Properties of the Reliable Delivery Service – **Sliding Window Paradigm - Transmission Control Protocol - Layering, Ports, Connections, and Endpoints - Segment Format - Checksum Computation**.

UNIT IV   (12 Hrs)

Routing Architecture: Origin of Forwarding Tables - Forwarding With Partial Information - Internet Architecture and Cores – Distance Vector (Bellman-Ford) Routing – Link State (SPF) Routing, Routing Among Autonomous Systems : Scope Of A Routing Update Protocol - Autonomous System Concept - Exterior Gateway Protocols And Reachability – BGP, Routing Within an Autonomous System : **Static Vs. Dynamic Interior Routes - Routing Information Protocol (RIP) - Open SPF Protocol (OSPF) - IS-IS Route Propagation Protocol**.

UNIT V   (12 Hrs)

Mobility And Mobile IP : Mobility, Addressing, and Routing - Mobility Via Host Address Change - Mobility Via Changes In Datagram Forwarding - Mobile IP Technology - Mobile IP Operation - Mobile IPv4 Addressing - IPv6 Mobility Support - Datagram Transmission, Reception, and Tunnelling - Assessment Of IP Mobility And Unsolved Problems , Network Virtualization: Virtual Private Networks (VPNs) - VPN tunnelling and IP-in-IP Encapsulation- **VPN Addressing And Forwarding - Network Address Translation (NAT) - Example Of NAT Translation - Overlay Networks - Multiple Simultaneous Overlays, Client-Server Model of Interaction.**

Text Book

Douglas E.Comer (2014), Internetworking with TCP/IP Vol I: Principles, Protocols and Architecture, 6/e, New Delhi, Pearson Publications.

Reference Books

1. Behrouz A.Forouzan (2006), TCP/IP protocol Suite 1, Tata McGraw Hill, New Delhi.
2. Richard Stevens (2003), TCP/IP Illustrated Volume 2, Prentice Hall of India, New Delhi.
3. Julie C. Gaffin (2007) Internet Protocol 6, Nova Science Publisher Inc., Newyork.

Pedagogy

Lectures, Case Studies, Group Discussions.

Course Designers

1.Mrs.A. Sheela Rini

2.Dr. M.Sasikala

BLENDED LEARNING VIDEO LINKS:

Unit I
https://www.youtube.com/watch?v=NyZWSvSj8ek
https://www.youtube.com/watch?v=HLziLmaYsO0&pp=ygUJIEV0aGVybmV0
https://www.youtube.com/watch?v=p4vZb-rIto&pp=ygUPV2ktRmkgLSAgWmlnQmVl
https://www.youtube.com/watch?v=aEPdRVc2IDc
https://www.youtube.com/watch?v=r3HaqRb24ME
https://www.youtube.com/watch?v=vv4y_uOneC0
https://www.youtube.com/watch?v=2QGgEk20RXM

Unit II
https://www.youtube.com/watch?v=8npT9AALbrI&t=6s
https://www.youtube.com/watch?v=k8rJFgeuZRw
https://www.youtube.com/watch?v=VHXZnFimCHs
https://www.youtube.com/watch?v=v50UVJ10_po

Unit III
https://www.youtube.com/watch?v=fuuuRj5JM20
https://www.youtube.com/watch?v=LnbvhoxHn8M
https://www.youtube.com/watch?v=2QGgEk20RXM

Unit IV
https://www.youtube.com/watch?v=qvBpF2qkK_Y
https://www.youtube.com/watch?v=K4prZSnOUTQ
https://www.youtube.com/watch?v=nMqUkVi_j_4
https://www.youtube.com/watch?v=WP7R3GtKc7o

Unit V
https://www.youtube.com/watch?v=6TPt8m4-0-M
https://www.youtube.com/watch?v=gv8Qru9WcCo
https://www.youtube.com/watch?v=H2QfGs-Qnl0

MCS23E3	DEEP LEARNING	Category	L	T	P	Credits
		III	58	2	-	4

Preamble

This course covers the context of deep learning, know how to use a neural network, understand the data needs of deep learning, have a working knowledge of deep learning, and explore the parameters for deep learning

Prerequisite

- Artificial Intelligence
- Machine Learning

Course Learning Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basics of deep learning	K2
CLO2	Apply the concept of optimization and generalization in deep learning.	K3
CLO3	Explore the deep learning applications.	K4
CLO4	Evaluate the analysis of algorithm efficiency using different notations.	K5
CLO5	Implement various deep learning models.	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	M	S	S
CLO2	S	S	S	M
CLO3	S	S	M	S
CLO4	M	S	S	S
CLO5	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I   (11 Hrs.)
Introduction to Machine learning: Linear models (SVMs and Perceptions and logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates.

UNIT II   (11 Hrs.)
History of Deep Learning: A Probabilistic Theory of Deep Learning- Back propagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks, Convolution Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning.

UNIT III   (12 Hrs.)
Linear (PCA, LDA) and manifolds, metric learning: Auto encoders and dimensionality reduction in networks - Introduction to Convent - Architectures – Alex Net, VGG, Inception, Res Net - Training a Convent: weights initialization, batch normalization, hyper parameter optimization.

UNIT IV   (12 Hrs.)
Optimization in deep learning: Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience.

UNIT V   (12 Hrs.)
Applications of Deep Learning: Images segmentation – Object Detection – Automatic Image Captioning – Image generation with Generative adversarial networks – Video to Text with LSTM models – Attention models for Computer Vision – Case Study: Named Entity Recognition – Opinion Mining using Recurrent Neural Networks – Parsing and Sentiment Analysis using Recursive Neural Networks – Sentence Classification using Convolutional Neural Networks – Dialogue Generation with LSTMs.

Text Books

Ian Good fellow, Yoshua Bengio, Aaron Courville, (2017) Deep Learning, MIT Press.

Reference Books
1. Francois Chollet, "Deep Learning with Python", Manning Publications, 2018
2. Phil Kim, "Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence", Apress, 2017.

Pedagogy: Lectures, Group Discussions, Case studies

Course Designers
1. Dr. M. Sasikala
2. Dr. S. Poongodi

BLENDED LEARNING VIDEO LINKS:

UNIT I:
https://www.youtube.com/watch?v=Ijqkc7OLenI
https://www.youtube.com/watch?v=Ln8pV1AXAgQ
https://www.youtube.com/watch?v=CeIS2L86ppU
https://www.youtube.com/watch?v=15bmcav7ynE

UNIT II:
https://www.youtube.com/watch?v=MZmNxvLDdV0
https://www.youtube.com/watch?v=5g1eXmQtl0E
https://www.youtube.com/watch?v=7GTAw4GYYdg
https://www.youtube.com/watch?v=b-yhKUINb7o
https://www.youtube.com/watch?v=g5y9dwXRprg

UNIT III:
https://www.youtube.com/watch?v=DtEq44FTPM4
https://www.youtube.com/watch?v=GVB2ALC1T8g
https://www.youtube.com/watch?v=dXB-KQYkzNU
https://www.youtube.com/watch?v=cyIINCqyi5g
https://www.youtube.com/watch?v=ttE0F7fghfk

UNIT IV:
https://www.youtube.com/watch?v=lDkEC7H88_A
https://www.youtube.com/watch?v=SEnXr6v2ifU
https://www.youtube.com/watch?v=43T8QXyJZsE
https://www.youtube.com/watch?v=QZXP1g42CIY

UNIT V:
https://www.youtube.com/watch?v=wp1bgd8reDk
https://www.youtube.com/watch?v=AqEF2HIMjYA
https://www.youtube.com/watch?v=IFfFwUwEOqE
https://www.youtube.com/watch?v=eMPQw7Xbjd0

MCS23E4	CYBER SECURITY AND FORENSICS	Category	L	T	P	Credits
		III	58	2	-	4

Preamble

This course covers the fundamental techniques security aspects like threats, attacks and authentication procedures. It also presents effective security systems and investigate security incidents.

Prerequisite

- Computer Security

Course Learning Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of various security aspects like threats, attacks and authentication procedures	K2
CLO2	Apply various type security attacks by inspecting their characteristics.	K3
CLO3	Analyze security issues in network and computer systems	K4
CLO4	Evaluate and communicate the human role in security systems	K5
CLO5	Interpret and forensically investigate security incidents	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	M	S	S
CLO2	S	S	S	M
CLO3	S	S	M	S
CLO4	M	S	S	S
CLO5	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs.)

Introduction to Cybercrime: Cybercrime and Information Security - Classifications of Cybercrimes – Legal Perspectives of Cybercrimes - Indian Perspectives of Cybercrimes –Cybercrime and the Indian ITA 2000 – Global Perspective on Cybercrimes. Cyber offenses: Categories of Cybercrime – **How Criminal Plan the Attacks** – **Social Engineering** – **Cyberstalking** – **Cybercafé and cybercrimes-Botnets**.

UNIT II (11 Hrs.)

Cybercrime in Mobile and Wireless Devices: Introduction – proliferation of Mobile and Wireless Devices – Trends in mobility – **Credit card Frauds in Mobile and Wireless Computing Era** – Security Challenges posed by Mobile Devices – Registry settings for Mobile Devices –Authentication Service Security – **Attacks on Mobile/Cell Phones** – Mobile Devices Security Implications for Organizations – Organizational Measures for Handling Mobile Devices – Organizational Security Policies and Measures in Mobile Computing Era. Phishing and Identity Theft: – Introduction – Phishing – **Identity Theft.**

UNIT III (12 Hrs.)

Cyber Crime and Cyber Laws: Cybercrime and the legal landscape around the World – Need for Cyber Laws – Indian IT Act – **Challenges in Indian law and Cybercrime Scenario in India – Consequences of Not Addressing the weakness in IT Act** - Digital Signatures and the Indian IT Act – Amendments to the Indian IT Act – Cybercrime and Punishment.

UNIT IV (12 Hrs.)

Understanding Computer Forensics: Historical Background – Need for Computer Forensics – Cyber forensics and Digital Evidence – Forensics Analysis of Email – Digital Forensics Life Cycle- Chain of Custody Concept – Network forensics – Approaching a Computer Forensics Investigation – **Forensics and Social Networking Sites – Computer forensics from Compliance perspectives- Challenges in Computer Forensics.**

UNIT V (12 Hrs.)

Digital Forensics: Overview - Preparing for Digital Investigations – Maintaining Professional Conduct – Preparing a Digital Forensics Investigation – Procedures for Private Sector High Tech Investigations – **Understanding Data Recovery Workstations and Software – Conducting an Investigation.** Data Acquisition: Understanding Storage Formats for Digital Evidence – Determining the Best Acquisition Method – Contingency planning for Image Acquisitions - Using Acquisition Tools – **Validating Data Acquisitions – Using Other Forensics Acquisitions Tools.**

Text Books
1. Nina Godbole and Sunit Bela pore; "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publications,2011.
2. Bill Nelson, Amelia Phillips and Christopher Steuart; "Guide to Computer Forensics and Investigations" – 6th Edition, Cengage, 2019

Reference Books
1. LNJN National Institute of Criminology and Forensic Science, "A Forensic Guide for Crime Investigators – Standard Operating Procedures", LNJNNICFS, 2016.
2. Harlan Carvey; "Windows Forensic Analysis Toolkit", Syngress, 2012.

Pedagogy: Lectures, Group Discussions, Case studies

Course Designers
1. Dr. M. Sasikala
2. Dr. S. Poongodi

BLENDED LEARNING VIDEO LINKS:

Unit I
https://www.youtube.com/watch?v=z2ilqLn_qjc
https://www.youtube.com/watch?v=dJBD_MAK_HI
https://www.youtube.com/watch?v=NbvBQRXL7WQ

Unit II
https://www.youtube.com/watch?v=NcsvwyZQt5E
https://www.youtube.com/watch?v=VIH03887UfA
https://www.youtube.com/watch?v=NAEb_vPxN_w
https://www.youtube.com/watch?v=etSXASmJAzE

Unit III
https://www.youtube.com/watch?v=S48gRv3_I6E
https://www.youtube.com/watch?v=0Hm5mla2c0o
https://www.youtube.com/watch?v=vEXoUOtI8lQ
https://www.youtube.com/watch?v=c-1nT5IGpe8

Unit IV
https://www.youtube.com/watch?v=rYmA2VPOC-A
https://www.youtube.com/watch?v=DiAMlJ0DiAo
https://www.youtube.com/watch?v=PDQb2Xr8kCk
https://www.youtube.com/watch?v=peUZqWSSt24

Unit V
https://www.youtube.com/watch?v=m1UUsffPKEA
https://www.youtube.com/watch?v=n1EWlOvX6Wk
https://www.youtube.com/watch?v=3JdwvXlrgyQ
https://www.youtube.com/watch?v=F5tv4c-f2Bw

MCS23E5	INFORMATION RETRIEVAL	Category	L	T	P	Credit
		III	58	2	-	4

Preamble

This course presents the concepts of document representation, document indexing, digital information storage, retrieval and distribution. It also introduces effective search strategies for IR systems, vector space model, text classification and evaluation methods of IR systems.

Prerequisite

- Database Management systems
- Data mining

Course Learning Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of document representation, document indexing, digital information storage, retrieval and distribution	K2
CLO2	Apply the concepts of vector spaces and classifiers to perform document classification.	K3
CLO3	Examine the advantages and disadvantages of different information retrieval models.	K4
CLO4	Determine the effective search strategies for IR systems	K5
CLO5	Able to develop information retrieval system for specific use cases.	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	M	M	M
CLO2	S	M	M	M
CLO3	S	S	M	M
CLO4	S	M	S	M
CLO5	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I   (11Hrs)

Boolean retrieval: Information retrieval problem - Processing Boolean queries - Boolean model versus ranked retrieval. **The term vocabulary** and postings list: Document delineation and character sequence decoding - Determining the vocabulary of terms - Faster postings list intersection via **skip pointers** - **Positional postings and phrase queries**

UNIT II   (12Hrs)

Dictionaries and tolerant retrieval: Search structures for dictionaries - **Wildcard queries** - Spelling correction - Phonetic correction. Index construction: Hardware basics - **Blocked sort-based indexing - Single-pass in-memory indexing** - Distributed indexing - Dynamic indexing - Other types of indexes

UNIT III   (12Hrs)

Scoring, term weighting and the **vector space model**: Parametric and zone indexes - Term frequency and weighting - The vector space model for scoring. **Evaluation in information retrieval**: Information Retrieval system – Standard test Collection – Evaluation of unranked retrieval sets – **Evaluation of ranked retrieval results** – Assessing relevance

UNIT IV   (12 Hrs)

XML retrieval: Basic XML concepts – A vector space model for XML retrieval – Evaluation of XML retrieval - Text-centric vs. data-centric XML retrieval. **Text classification and Naive Bayes**: The text classification problem - Naive Bayes text classification - Properties of Naive Bayes - Feature selection - **Evaluation of text classification**

UNIT V   (11Hrs)

Vector space classification: Document representations and measures of relatedness in vector spaces – **Rocchio classification** - Flat clustering: Clustering in information retrieval - Evaluation **of clustering** - **K-means** – Web search basics - Web characteristics - Advertising as the economic model – Search user experience – Basic Page Rank

Text Books

1.Christopher D. Manning, Prabhakar Raghavan, Henrich Schutze (2018). Introduction to Information Retrieval, 1/e; New York: Cambridge University Press

Reference Books

1. Stefan Buttcher et.al (2012). Information Retrieval - Implementing and Evaluating, MIT Press
2. Dr Ricardo Baeza-Yates et.al (2011). Modern Information Retrieval: The Concepts and Technology, Addison Wesley
3. David A. Grossman and Ophir Frieder (2010). Information Retrieval,2/e, Universities Press
Pedagogy: Lectures, Demonstrations, Guest Lectures, Video Lectures

Course Designers
   1. Dr. S. Poongodi
   2. Dr. S. Sasikala

BLENDED LEARNING VIDEO LINKS:

UNIT I
https://youtu.be/zKldk47xaJ4
https://www.youtube.com/watch?v=fKJHFfJEG4w
https://www.youtube.com/watch?v=tPsCQOsa7j0
https://www.youtube.com/watch?v=QVVvx_Csd2I&t=23s

UNIT II
https://www.youtube.com/watch?v=kVPY7UQHNlw
https://www.youtube.com/watch?v=uXq4aq51eKE
https://www.youtube.com/watch?v=7VzUvnZraSI

UNIT III
https://youtu.be/34ktO64Ys30
https://www.youtube.com/watch?v=4P55av1CMtQ
https://youtu.be/BxAzuCSvF8s
https://youtu.be/moHvTfZgPGQ

UNIT IV
https://youtu.be/O2L2Uv9pdDA
https://youtu.be/mqYa0LaA9WI

UNIT V
https://youtu.be/yPd3vHCG7N4
https://youtu.be/mAEpkmNjlSc
https://youtu.be/yid_lqC0SDo

MCS23E6	NATURAL LANGUAGE PROCESSING	Category	L	T	P	Credits
		III	58	2	-	4

Preamble

This course introduces the methods in Natural Language Processing (NLP). This course includes the various algorithms used in NLP. This course also covers various NLP tools and techniques

Prerequisite

- Data mining concepts
- Machine Learning Concepts

Course Learning Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of NLP in handling text data	K2
CLO2	Apply NLP analytical techniques on real time text data	K3
CLO3	Analyse text data with appropriate NLP algorithms and techniques.	K4
CLO4	Evaluate different NLP algorithms for handling and optimizing text data	K5
CLO5	Design and develop models for accomplishing NLP task	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	S	M	L
CLO2	S	S	L	M
CLO3	S	S	S	S
CLO4	S	M	S	S
CLO5	S	M	S	S

S- Strong; M-Medium; L-Low

Syllabus
UNIT I   (11 Hrs)
Introduction to NLP - Regular Expressions – **Words – Corpora** – Text Normalization – N-gram Language Models – N-Grams – Evaluating Language Models – Smoothing – Naïve Bayes Classifiers Training the NB Classifier – **Worked example**.

UNIT II   (11 Hrs)
Logistic Regression: Learning in Logistic Regression – The cross-entropy loss function – Gradient Descent – **Regularization** - Vector semantics and embeddings – Lexical semantics – vector semantics - **words and vectors** – TF-IDF: weighing terms in the vector – **Word2vec** – **visualizing embeddings.**

UNIT III   (12 Hrs)
Sequence labelling for parts of speech and named entities: English word classes – parts-of-speech tagging – **named entities and named entities tagging** – Constituency Grammars: constituency – context-free grammar. Logical representation of sentence meaning – first-order logic - **event and state representation**. Information Extraction: relation extraction – extraction events and their time

UNIT IV   (12 Hrs)
Word senses and wordnet – word sense – relation between sense – **wordnet: a database of lexical relations**. Semantic role labelling – semantic roles – Framenet - **semantic role labelling**– Lexicons for Sentiment, Affect and Connotation: Defining emotion – available sentiment and affect lexicons – creating affect lexicons by human labelling.

UNIT V   (12 Hrs)
Question Answering: Information retrieval - **Knowledge based question answering - Chatbots & dialog system: properties of human conversation – chatbots.**Phonetics: Speech Sounds and Phonetic Transcription – Automatic Speech Recognition and Text-to-Speech: The automatic speech recognition task – Feature extraction for ASR: Log Mel Spectrum – Speech Recognition Architecture.

Text Books
1. Daniel J and James H. Martin, "Speech and language processing: An introduction to natural language processing, computational linguistics & speech recognition", prentice hall,2020.

Reference Books
1.Lan H Written and Elbef, MarkA. Hall, "Data mining: practical machine learning tools and techiniques", Morgan Kaufmann,2013.
2.Steven Bird, Ewan Klein, and Edward Loper, "Natural Language Processing with Python", O'Reilly, 2009.
3. NitinIndurkhya, Fred J. Damerau, "Handbook of Natural Language Processing
4. Dwight Gunning, Sohom Ghosh, Natural Language Processing Fundamentals, Packt Publishers,2019.
5. Hobson Lane, Hannes Hapke, and Cole Howard, "Natural Language Processing in Action: Understanding, analyzing, and generating text with Python", Manning Publications, First edition, 2019.

Pedagogy: Lectures, Group Discussions, Case studies
Course Designers
1. Dr. M. Sasikala
2. Dr. S. Poongodi

BLENDED LEARNING VIDEO LINKS:

UNIT-I
https://www.youtube.com/watch?v=xsIDTmo1NOg
https://www.youtube.com/watch?v=NHCqtFO914k

UNIT-II
https://www.youtube.com/watch?v=ERibwqs9p38
https://www.youtube.com/watch?v=hQwFeIupNP0
https://www.youtube.com/watch?v=7tQi23rpGvo

UNIT-III
https://www.youtube.com/watch?v=7CRyqwCZFY0
https://www.youtube.com/watch?v=8pts0vrMSV8

UNIT-IV
https://www.youtube.com/watch?v=2IHA8QgKwbw
https://www.youtube.com/watch?v=awZprMxpTaA
https://www.youtube.com/watch?v=jb55DnSV1rk

UNIT-V
https://www.youtube.com/watch?v=bwAGtKqkNGU
https://www.youtube.com/watch?v=zlBM2DsVbFg
https://www.youtube.com/watch?v=38sL6pADCog

MCS23E7	SOCIAL MEDIA ANALYTICS	Category	L	T	P	Credit
		III	58	2	-	4

Preamble

The course covers concepts and techniques for retrieving, exploring, visualizing, and analyzing social network and social media data. Students learn the key metrics to assess social media goals, perform social network analysis to apply social media analytics process and formulate effective strategies based on the analytics.

Prerequisite

● Foundations of Data Science

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand sources and limitations of social media data.	K2
CLO2	Apply social media analytics process and evaluate metrics.	K3
CLO3	Examine different social media platforms and their associated tools	K4
CLO4	Apply social media information to create dashboards and reports for visualization.	K5
CLO5	Design effective strategy based on the social media analytics data.	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	M	M	M
CLO2	S	S	M	M
CLO3	S	M	S	M
CLO4	S	S	S	M
CLO5	S	S	M	M

S- Strong, M-Medium, L-Low

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Syllabus

UNIT I   (11Hrs)
Foundation for Analytics: – Digital Gap – Social Media Data Sources – Defining Social Media Data– Data Sources – Estimated vs. Factual Data Sources – Data Gathering in Social Media Analytics. **From Data to Insights:** Actionable Analytics – Focus on objective – Plan to shape data to insights – choosing

a good analytics tool – Data Aggregation calculations and display – Data display – Social media and its data – Potential Challenges. **Data Identification: Professional** networking sites - social sites – formation sharing sites – microblogging sites – blogs /wikis.

UNIT II   (12 Hrs)
Analytics in social media: Types of analytics. Dedicated Vs. Hybrid Tools – Dedicated tools – Hybrid tools – Data Integration Tools – Best Setup. **Social Network Landscape:** Concept and UX on social networks – Interactivity of social network – Content flow on social network – Interaction Pattern between users –social media as a two-way channel.

UNIT III   (12 Hrs)
Analytics Process: Analysis – Insight – Investigation beyond social analytics – Shaping a method – analysis cycle – Community Activity – Resources – Attention span – Dynamic cycles – Short Periods – Long Periods – Analyst Mindset – Instinctive Analyst. **Metrics:** Introduction – Default and custom metrics – Metrics Categories – Graph Types – Metric Capabilities – Metrics and Strategy – Estimated Metrics–Metrics and Tactics.

UNIT IV   (12 Hrs)
Dashboards: Purpose and Objectives – Default Vs. Custom Dashboards – Linearity and order of metrics – Metrics Positioning and Correlation – Metric and dashboard layout – Graphic design – Data Integration dashboards. **Reports:** Elements of reporting – Reporting approaches and formats – Animation and effects in reporting – Stake holders and feedback – Reporting with teams.

UNIT V   (11 Hrs)
Strategy: Strategy in social media analytics – Strategic planning – Data availability and data sources – Knowledge beyond social media – Tools and technology preparation – Team Preparation – Goals and objectives – Contingency plans – application of social media analytics strategy – Strategy and tactics – Evaluation of a strategic analytics cycle.
Case Studies : Targeting the audience using Facebook Analytics, Tracking profile analytics in LinkedIn, Analysis of Political Tweets, ROI Analytics using Facebook, Marketing Strategy in Pinterest.

Text Book
Alex Goncalves (2017). Social Media Analytics Strategy: Using Data to Optimize Business Performance, APress

Reference Books
1. Ganis, Kohirkar (2016). Social media Analytics, IBM Press PTG, 1st Edition
2. Nancy Flynn (2012). The Social Media Hand book Policies, and Best Practices, Wiley

Pedagogy: Lectures, Demonstrations, Group Discussions, Case studies

Course Designers
1. Dr. S. Poongodi
2. Dr. S. Sasikala

BLENDED LEARNING VIDEO LINKS:

UNIT I:
https://www.talkwalker.com/blog/social-media-data-sourceshttps://blog.hootsuite.com/social-media-data-collection/

UNIT II:
https://blog.tubikstudio.com/social-network-design-ux-for-communication/
https://www.cyberclick.net/numericalblogen/two-way-communication-how-to-use-it-in-your-social-media-strategy
https://www.impactplus.com/blog/social-media-marketing-the-importance-of-a-two-way-conversation

UNIT III:
https://blog.hootsuite.com/social-media-metrics/

UNIT IV:
https://www.datapine.com/blog/social-media-reports-examples-and-templates/
https://monkeylearn.com/blog/customer-feedback-report/

UNIT V:
https://theintactone.com/2022/01/21/application-of-social-media-analytics-in-different-social-media-platforms/

MCS23E8	SOFT COMPUTING	Category	L	T	P	Credit
		III	58	2	-	4

Preamble

This course aims to explain importance of optimization techniques and genetic programming and to gather knowledge about various hybrid soft computing techniques and apply in real time problems

Prerequisite

Basic knowledge of problem solving and Networking.

Course Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of soft computing and their applications	K2
CLO2	Apply supervised and unsupervised learning in neural networks	K3
CLO3	Analyze soft computing techniques for small applications	K4
CLO4	Evaluate the results of knowledge base system	K5
CLO5	Design soft computing techniques suitable for real time applications	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	S	M	M
CLO2	S	M	S	M
CLO3	S	M	M	S
CLO4	S	M	S	S
CLO5	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I   **(11 hrs)**

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-**Adaline Network-Madaline Network.**

UNIT II   **(11 hrs)**

Neural Networks Back Propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization -Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory

-Adaptive Resonance Theory Neural Networks- Support Vector Machines - **Spike Neuron Models**

UNIT III   **(12 hrs)**

Fuzzy system Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations -Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - **Fuzzy Rule Base and Approximate Reasoning** - **Introduction to Fuzzy Decision Making**

UNIT IV   **(12 hrs)**

Genetic Algorithm Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - **Bit-wise Operators** - **Convergence of Genetic Algorithm**

UNIT V   **(12 hrs)**

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy Art Map: A Brief Introduction - Soft Computing Tools - GA in Fuzzy **Logic Controller Design** - Fuzzy Logic Controller

Text Books

1. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt.Ltd., 2017..
2. S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt.Ltd., 2nd Edition, 2011

Reference Books

1. Vinoth Kumar and R. Saravana Kumar (2012). Neural Network and Fuzzy logic, S.K. Katria& Sons
2. Haykin Simon (2011). Neural Networks and Learning Machines, Prentice Hall of India
3. Tang,Tan and Yi (2010).Neural Networks: Computational Models and Application, Springer Verlag Publications

Pedagogy: Lectures, Group Discussions, Case studies

Course Designers

1. Dr. S. Lakshmi Priya
2. Dr. S. Sasikala

BLENDED LEARNING VIDEO LINKS:

UNIT I
https://youtu.be/MTe2qsS56MQ
https://youtu.be/zDtMiliSZe8

UNIT II
https://youtu.be/7TybETlCslM
https://youtu.be/KL09IQOvQg4

UNIT III
https://youtu.be/nXAjXdBTEYM
https://youtu.be/pk1zPB812Cs

UNIT IV
https://youtu.be/y8Tm4hlbLCE
https://youtu.be/egUyaWtsQc0

UNIT V
https://youtu.be/krVMZ8sUJK4
https://youtu.be/OnJRw2EP3_g

MCS23E9	VIRTUAL REALITY	Category	L	T	P	Credit
		III	58	2	-	4

Preamble

This course provides the technology behind virtual reality and introduces input, output devices used for virtual reality. It also presents the techniques and applications used for augmented reality.

Prerequisite

- Animation Techniques
- Image Processing

Course Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basic concepts of virtual reality	K2
CLO2	Apply appropriate techniques and design augmented reality applications	K3
CLO3	Analyze the techniques required for virtual reality environments	K4
CLO4	Assess the methods and techniques appropriate for virtual reality applications	K5
CLO5	Design and manipulate objects within the virtual environment.	K6

Mapping with Programming Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	M	M	M
CLO2	M	M	M	M
CLO3	M	M	M	M
CLO4	S	M	M	M
CLO5	S	M	M	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs)

Introduction: The Three I's of Virtual Reality - A Short History of Early Virtual Reality – Early Commercial VR Technology - **VR Becomes an Industry - The Five Classic Components of a VR System.**

UNIT II (12 Hrs)

Input Devices: Three – Dimensional Position trackers - Hybrid Inertial Trackers - Navigation and Manipulation Interfaces - Tracker-Based Navigation/Manipulation Interfaces – **Three-Dimensional Probes** - Gesture Interfaces - The Pinch Glove - The 5DT Data Glove - The Didjiglove - The CyberGlove.Output Devices: Graphics Displays: The Human Visual System -Personal Graphics Displays -Large- Volume Displays - Sound Displays - The Human Auditory System - The Convolvotron– **Speaker Based Three-Dimensional Sound** - **Haptic Feedback: The Human Haptic System - Tactile Feedback Interfaces - Force Feedback Interfaces**

UNIT III (12 Hrs)

Getting started with Unity and Playmaker: **Downloading and Installing Unity – Buying and importing playmaker – Setting up your project.** Unity's and Playmaker's User Interface: Interface overview and main menu – Hierarchy panel – Inspector panel – Project panel – Project panel – Views – Playmaker interface. Components and State Machines: Game objects, components and properties – Working with prefabs – Finite state machines, states and actions – **Interaction between game objects**

UNIT IV (11 Hrs)

Scripting and Custom Actions: Writing unity script – Overview of standard unity classes – Creating a playmaker action. Networking and Multiplayer: **Understanding networking and multiplayer – Setting up photon unity networking – Making multiplayer**

UNIT V (12 Hrs)

Introduction to Augmented Reality: Definition – Examples – Displays - Visual perception - Requirements and characteristics – Tracking - Characteristics of tracking technology- Stationary tracking systems - Mobile sensors. Computer Vision for Augmented Reality: **Natural feature tracking by detection – Simultaneous localization and mapping – Interaction - Output modalities** – Input modalities – Tangible interfaces –Navigation

Reference Books
1. Grigore C. Burdea, Philippe Coiffet (2010), Virtual Reality Technology, 2/e, Wiley Dream Tech India
2. Sergey Mohov (2013), Practical Game Design with Unity and Playmaker, Packt Publishing Ltd.
3. Dieter Schmalstieg, Tobias Hollerer (2016), Augmented Reality: Principles and Practice, Pearson education Inc
4. Jonathan Linowes , Krystian Babilinski (2017), Augmented reality for developers, 1/ e, Packt Publishing
5. William R. Sherman, Alan B. Craig (2013), Understanding Virtual Reality: Interface, Application and Design, Morgan Kaufmann Publishers

Pedagogy

Lectures**,** GroupDiscussions, Demonstrations

Course Designers
1. Mrs.A.Sheela Rini
2. Dr.R.Kowsalya

BLENDED LEARNING VIDEO LINKS:

Unit I
 https://www.youtube.com/watch?v=TQhwijicDkY
https://www.youtube.com/watch?v=XJZpf0gk1ZM
https://www.youtube.com/watch?v=h3rKvsFTfPA

Unit II
https://www.youtube.com/watch?v=NRcfXSnDoT8
https://www.youtube.com/watch?v=uPnHzQ7qJ2Y
https://www.youtube.com/watch?v=a6VWE_jckWg
https://www.youtube.com/watch?v=WhzAk-XzmYQ

Unit III
https://www.youtube.com/watch?v=Yr_Y8boO0Sg
https://www.youtube.com/watch?v=Z8_TWqsDMMU
https://www.youtube.com/watch?v=cLzG1HDcM4s

Unit IV
https://www.youtube.com/watch?v=zeHhXzWKbSU
https://www.youtube.com/watch?v=JOJP0CvpB8w
https://www.youtube.com/watch?v=93SkbMpWCG

Unit V
https://www.youtube.com/watch?v=gAbhM59N54k
https://www.youtube.com/watch?v=mQQL8pmztb4
https://www.youtube.com/watch?v=0CPcc2xp3_s
https://www.youtube.com/watch?v=BU_iZ96yG9k

MCS2309	ADVANCED JAVA PROGRAMMING	Category	L	T	P	Credit
		Theory	73	2	-	5

Preamble

This course presents concepts to design and develop web based applications using Servlets and Web Sockets. It also covers concepts such as Java Persistence API, EJB, JSF, Hibernate, Spring and Struts framework.

Prerequisite
• Java
• HTML

Course Learning Outcomes

On completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1.	Understand the basic concepts of web designing	K2
CLO2.	Determine the importance of scripting language in making a web page interactive	K3
CLO3.	Examine the utilization of Servlets, EJB, JSF and Hibernate in the development of dynamic web applications	K4
CLO4.	Design web based applications using Spring, Struts and Java Persistence API	K5
CLO5.	Develop modern Web Applications using the client and server-side technologies	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	S	S	M
CLO2	S	S	M	L
CLO3	S	M	M	M
CLO4	S	M	L	M
CLO5	S	M	M	L

S- Strong; M-Medium; L-Low

UNIT I (15 Hrs)

Java Servlets: Java Servlets and Common Gateway Interface Programming – A Simple Java Servlet – Anatomy of a Java Servlet – Reading data from a Client – Reading HTTP Request Headers –Sending Data to a Client and Writing the HTTP Response Header – Working with Cookies – Tracking Sessions.

Java Server Pages (JSP): Introduction to JSP- JSP architecture and lifecycle - JSP scripting elements and directives - JSP standard actions and custom Tags-Expression Language.

UNIT II (15 Hrs)

Introduction to EJB, Benefits of EJB, Types of EJB, Session Bean: State Management Modes; Message-Driven Bean, Differences between Session Beans and Message- Driven Beans, Defining Client Access with Interfaces: Remote Access, Local Access, Local Interfaces and Container-Managed Relationships, Deciding on Remote or Local Access, Web Service Clients, Method Parameters and Access, The Contents of an Enterprise Bean, Naming Conventions for Enterprise Beans, The Life Cycles of Enterprise Beans, The Life Cycle of a Stateful Session Bean, The Life Cycle of a Stateless Session Bean, The Life Cycle of a Message-Driven Bean.

UNIT III (15 Hrs)

Java Server Faces Introduction to JSF 2.0, JSF request processing Life cycle, JSF Expression Language, JSF Standard Component, JSF Facelets Tag, JSF Convertor Tag, JSF Validation Tag, JSF Event Handling and Database Access, JSF Libraries: PrimeFaces.

SPRING: Introduction to Spring: IoC Container and Dependency Injection (DI) - Spring Configuration and Spring Boot, Spring MVC, Spring Bean Lifecycle – Dispatcher Servlet and Configuration - Interceptors – Annotations, Controllers - Views - Input Validation -File Upload-Container, Dependency and IOC - Building Restful Web Services.

UNIT IV (14 Hrs)

AOP, JAVA PERSISTENCE API AND HIBERNATE: Aspect Oriented Programming (AOP) - Entity: Basic, Embeddable and Collection Types - Identifiers - Entity Relationship - Inheritance, Persistence Context and Entity Manager, JPQL, Criteria API, Spring Data JPA - Specification and Projection.

UNIT V (14 Hrs)

STRUTS FRAMEWORK: Introduction to Struts – Two Development Models – Model View Architecture – Enter struts – Basic Components of Struts – Building Simple Struts Application – Model Layer: Struts and the model - View Layer: Struts and view layer -The Controller Layer: Struts and controller layer.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION/ EDITION
1.	Jim Keogh	The Complete Reference J2EE	McGraw Hill Education (India) Private Limited	2014
2.	Santosh Kumar	JDBC Servlets and JSP	Dream tech Press	2014,1/e

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Alex Banks, Eve Porcello	Learning React	O'Reilly Media, Inc	2020,2/e
2.	David R. Heffelfinger	Java EE 8 Application Development	Packt Publishing	2017,1/e

Pedagogy: Lectures, Demonstrations, Case Studies

BLENDED LEARNING VIDEO LINKS:

UNIT I
https://www.youtube.com/watch?v=5tLGwdyPGRY
https://www.youtube.com/watch?v=bQqWTRhkhWA
https://www.youtube.com/watch?v=5SIJnF7hqak

UNIT II
https://www.youtube.com/watch?v=utANrHfAh28
https://www.youtube.com/watch?v=6F6oe8Lxbyc
https://www.youtube.com/watch?v=XA8rHKbYHTs

UNIT III
https://www.youtube.com/watch?v=cqhzCE-r-8s
https://www.youtube.com/watch?v=yv0eUMb0vWs

UNIT IV

https://www.youtube.com/watch?v=8dXZZBCFjwk
https://www.youtube.com/playlist?list=PL6oD2syjfW7COL__RNrWl4S97vNcqh3mO

UNIT V
https://www.youtube.com/watch?v=br868ThE5fQ
https://www.youtube.com/watch?v=CHmYSbwI5WQ

MCS23CE	PYTHON PROGRAMMING	Category	L	T	P	Credit
		Theory	45	-	-	3

Preamble

This course introduces the core concepts of programming in Python. It also provides knowledge in concepts like regular expressions, text processing, multithreading, internet programming, GUI programming and database programming. It also explores Web Development using Python.

Prerequisite

● Basic concepts of Programming Language
● Database concepts

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the programming constructs of Python	K2
CLO2	Apply the concepts of Python in simple tasks	K3
CLO3	Analyze python packages suitable to develop solutions for real time problems	K4
CLO4	Evaluate the complex problems and solve using python modules	K5
CLO5	Create python projects for real time applications	K6

Mapping with Program Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	S	M	M
CLO2	S	S	S	M
CLO3	S	S	M	L
CLO4	S	S	S	M
CLO5	S	S	S	L

S- Strong; M-Medium; L-Low

Sl.No.	Coursera Courses	Coursera Link	No. of Hours
1	Crash Course on Python	https://www.coursera.org/programs/psgr-faculty-learning-program-1luew/skills/python-programming-language?collectionId=skill~python-programming-language&productId=8D3R5HiaEeioIg7r4jw_PA&productType=course&showMiniModal=true	22
2	Capstone: Retrieving Processing, and Visualizing Data with Python	https://www.coursera.org/programs/psgr-faculty-learning-program-1luew/learn/python-data-visualization?specialization=python	**9**
3	Using Python to Access Web Data	https://www.coursera.org/programs/psgr-faculty-learning-program-1luew/learn/python-network-data?specialization=python	14

MCS2310	ARTIFICIAL INTELLIGENCE (SEMESTER II / III)	Category	L	T	P	Credit
		Theory	43	2	-	3

Preamble

This course introduces the concepts of Artificial Intelligence and the various methods of solving problems using Artificial Intelligence. It also provides insights on machine learning techniques and its applications.

Prerequisite

Probability and Statistics
Discrete Structures

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the techniques of knowledge representation and problem solving in the field of artificial intelligence	K2
CLO2	Apply appropriate AI techniques for real time scenarios	K3
CLO3	Analyze suitable Artificial Intelligence principles to solve a given problem	K4
CLO4	Evaluate different AI algorithms appropriate for solving a given problem	K5
CLO5	Design and develop models for predictive tasks in various domains	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	S	M	M
CLO2	M	M	M	M
CLO3	M	M	M	L
CLO4	S	M	L	M
CLO5	S	S	M	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (9 hrs)
Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth- First, Depth First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

UNIT II (9 hrs)
Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning. Randomized Search: Genetic Algorithm - Ant Colony Optimization. **Basic Knowledge Representation and Reasoning:** Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem.

UNIT III (9 hrs)
Knowledge representation issues: Representations and mappings – Approaches to Knowledge representations – Issues in Knowledge representations – Frame Problem. **Using Predicate Logic:** Representing simple facts in logic – Representing Instance and Is a relationship – Computable functions and predicates – Resolution

UNIT IV (8 hrs)
Representing knowledge using rules: Procedural Vs Declarative knowledge – Logic programming – Forward Vs Backward reasoning – Matching – Control knowledge

UNIT V (8 hrs)
Expert Systems: Representing and Using Domain Knowledge- Expert Knowledge Shell- Knowledge Acquisition- Perception. **Case Studies:** AI in Environmental Management (Smart Pollution Control, Water Management, Farming) - AI in Retail (Alibaba, Walmart) - AI in Medical Imaging (MRI, US, Mammography)

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Stuart Russell, Peter Norvig,	Artificial Intelligence: A Modern Approach	Pearson Publishing	2020,4/e
2.	Lavika Goel	Artificial intelligence: Concepts and applications	Wiley Publications	2021,1/e

Reference Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	G. Luger	Artificial Intelligence: Structures and Strategies for complex problemsolving	Pearson Publishing	2021,4/e

Pedagogy: Lectures, Demonstrations, Case Studies

BLENDED LEARNING VIDEO LINKS:

Unit I
https://www.youtube.com/watch?v=M6V-TvwqwnU

Unit II
https://www.youtube.com/watch?v=kXlr6ydiPAQ

Unit III
https://www.youtube.com/watch?v=UIM-7213nyM

Unit IV
https://www.youtube.com/watch?v=zT0sGjOSPt8&list=PLyqSpQzTE6M-t-Qr2Z0Gf_KP5RC97uOKC

Unit V
https://www.youtube.com/watch?v=nEahhnk3VvM

MCS2311	ROBOTIC PROCESS AUTOMATION	Category	L	T	P	Credits
		Theory	58	2	-	4

Preamble

The course introduces the concepts around Robotic Process Automation, its benefits and best practices. It covers the design, development and deployment of effective RPA solutions for organizations using UiPath platform. It also deals with RPA use cases in various domains.

Prerequisite

● Basic programming knowledge

Course Learning Outcomes

On successful completion of the course, the student will be able to

CLOs	CLO statement	Knowledge Level
CLO1	Understand the key concepts of Robotic Process Automation and its working	K2
CLO2	Apply automation concepts to design RPA solutions using UiPath RPA platform	K3
CLO3	Analyze the processes suitable for Robotic Process Automation	K4
CLO4	Assess the key considerations while designing an RPA solution	K5
CLO5	Create and deploy RPA bots for various industrial applications	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PO4
CLO1	S	M	M	M
CLO2	S	M	M	L
CLO3	S	S	M	L
CLO4	S	M	M	M
CLO5	S	M	S	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I   **(11 Hrs)**

RPA: Importance of RPA-Benefits and challenges of implementing RPA-RPA tools and platforms-Use cases and applications of RPA -RPA Fundamentals-Components and architecture of an RPA system-RPA development life cycle-**RPA workflow and process automation-Error handling and exception management in RPA.**

UNIT II   **(11 Hrs)**

Process methodologies: Lean - Six Sigma –Implementing six sigma – Six sigma roles and levels - Lean six sigma – Applying lean and six sigma to RPA. Planning: Preliminaries – **RPA consulting case studies – What to Automate - ROI for RPA – RPA use cases – The Plan .**

UNIT III (11 Hrs)

Bot development with UiPath: Activities- Flowcharts and sequences-Log message-Variables-Loops and conditionals- Switch- Debug- **Common Uipath functions- Uipath orchestrator – best practices.** Uipath - IQ Bot - Bot Store - Using software to optimize processes.

UNIT IV (12 Hrs)

Deployment and monitoring: Testing – Production – Monitoring - Security- Scaling. Data Preparation: Types of Data – Big Data – Issues with Big Data-. Data Process-Types of algorithms - Bias. **Process mining: Old way Vs Process mining – Backgrounder on process mining- Working of process mining.**

UNIT V (11 Hrs)

RPA in enterprise: RPA in traditional IT models- Business process management and workflow automation-RPA as digital disruptor-Benefits- RPA platforms - U**se cases : Retail, Healthcare, Finance & accounting, E-commerce.** Automation Anywhere-Automation Anywhere Mobile App-**Blue Prism-PEGA-Nintex-Kofax**- IntelliBot- Kryon Systems.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Tom Taulli	The Robotic Process Automation handbook	Apress Publishing	2020
2.	Richard Murdoch	Robotic Process Automation: Guide to Building software robots, automate repetitive tasks & become an RPA Consultant	Kindle edition.	2020

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Alok Mani Tripathi	Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath: Create Software robots with the leading RPA tool	PacktPublishing	2018
2.	Kelly wibbenmeyr	The Simple Implementation Guide to Robotic Process Automation (Rpa): How to Best Implement RPA in an Organization	iUniverse publications.	2018

Pedagogy : Lectures, Group Discussions, Case studies

Blended Learning Video Links:

UNIT I
1.https://www.youtube.com/watch?v=9URSbTOE4YI
2.https://www.youtube.com/watch?v=lRnNIIj13Os

UNIT II
1.https://www.youtube.com/watch?v=vgdMjzCfh1Y
2.https://www.youtube.com/watch?v=lNeCTzNRtUs
3.https://www.youtube.com/watch?v=ayPeQMNfb7c
4.https://www.youtube.com/watch?v=vgdMjzCfh1Y&t=67s

UNIT III
1.https://www.youtube.com/watch?v=E04SdGTMSBU
2.https://www.youtube.com/watch?v=ihz2GWoxx0U&list=PL41Y-9S9wmyI_NdUudx9S2qvRwP_oZ7Rr

UNIT IV
1.https://www.youtube.com/watch?v=8bJ3HCBj24g
2.https://www.youtube.com/watch?v=c4_SHZBXACk
3.https://www.youtube.com/watch?v=m5xyM9SjcNQ

UNIT V
1.https://www.youtube.com/watch?v=JMEZJOmGa-A
2.https://www.youtube.com/watch?v=uuvIAno5kbM
3.https://www.youtube.com/watch?v=sN4lqSEoFbg
4.https://www.youtube.com/watch?v=ezTBP9vPaus
5.https://www.youtube.com/watch?v=ezTBP9vPaus
6.https://www.youtube.com/watch?v=DwMUwaSX0ww

MCS22S1	RESEARCH METHODOLOGY	Category	L	T	P	Credits
		Theory	60	-	-	4

Preamble
This course presents the concepts of research, types of research, research design, literature review and writing reports. It also covers various areas of computer science.

Prerequisite
This course is most appropriate for postgraduate students who are interested in research but do not have prior research experience.

Course Learning Outcomes
On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of research design, research process and various types of research	K2
CLO2	Apply the research methodologies in different research areas	K3
CLO3	Analyze the ethical issues in research	K4
CLO4	Evaluate the methods and techniques for various experimental study	K5
CLO5	Develop solutions for research problems in a responsible and ethical manner	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	M	M	M
CLO2	S	L	M	M
CLO3	S	S	S	L
CLO4	S	M	S	S
CLO5	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (12 Hrs)
Research Methodology: An Introduction: Meaning of research - Objective of research -Types of research - Significance of research -Research methods versus Methodology - Research and scientific method - Research process - Criteria of good research -**Problems encountered by researchers in India**. **Defining the research problem:** What is a research problem? - Selecting the problem - Necessity of defining the problem - **Technique involved in defining a problem**

UNIT II (12 Hrs)
Reviewing the literature: Literature review in research - How to review the research? - **Writing about the literature reviewed** -**Formulating a research problem**. **Research Design:** Research Design: Meaning of

research design - Need for research design - Features of a good design - **Important concepts relating to research design** - **Different research designs** - Basic principles of experimental designs

UNIT III (12 Hrs)
Data Collection: Introduction - Experiments and Surveys - Collection of primary data - Collection of secondary data - **Selection of appropriate method for data collection** - Case study method. **Data Preparation:** Data Preparation Process - Some problems in preparation process- **Missing values and outliers** -Types of analysis - Statistics in research

UNIT IV (12 Hrs)
Interpretation and report writing: Meaning of interpretation - Technique of interpretation -Precaution in interpretation - Significance of report writing - Different steps in writing report - Layout of the research report - Types of reports - Oral Presentation - Mechanics of writing a research report - Precautions for writing research reports **Research Publications: Preparing Research papers for journals, Seminars and Conferences – Design of paper using template, Plagiarism, Calculations of Impact factor of a journal, citation Index, ISBN & ISSN, IPR, Patent.**

UNIT V (12 Hrs)
Research Ethics and Responsible Conduct in Research: Brief history and analytical basis of research ethics, responsible conduct in research (Honesty in Science: Integrity, Authorship, Conflicts of Interest, Privacy and Confidentiality, Informed Consent, Risk/Benefit Assessment), The legal regulation of research ethics in India (From UGC, MHRD and other governing agencies), Regulatory requirements relevant to international research.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Kothari, GauravGarg	Research Methodology - Methods and Techniques	New Age International Publishers	2021,4/e

Reference Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	RanjitKumar	Research Methodology A step-by-step guide for beginners	Pearson Education	2015,3/e

Pedagogy:
Lectures, Demonstration, Case Studies

Blended Learning Video Links:

Unit I
https://youtu.be/6P3aWfExUho
https://youtu.be/fPuubs_jqUw
https://youtu.be/6P3aWfExUho
https://youtu.be/fPuubs_jqUw
https://www.youtube.com/watch?v=Y3AjpKoHfn0

Unit II
https://youtu.be/-ny_EUJXHHs
https://youtu.be/fLmzf4GpfvM
https://youtu.be/SPaP13d-g6g
https://youtu.be/LpmGSioXxdo
https://youtu.be/0xV52b5HGSo

Unit III
https://youtu.be/pZLoe5hPTgM
https://youtu.be/q17s84ADGfA
https://youtu.be/GJbpci4taUc

Unit IV
https://youtu.be/bnESU9dBAaM

Unit V
https://youtu.be/hqDUChyVRh8?list=PLnIj1GYixjfrOhcWQq_ANzLFDniGYZ_-Q

MCS23P5	ADVANCED JAVA PROGRAMMING LAB	Category	L	T	P	Credit
		Practical	-	-	75	3

Preamble

This course provides exercises to design and develop web based applications using MVC concepts. It also provides exercises to implement Spring, Java Persistence API, Hibernate and Struts concepts to create an interactive application.

Prerequisite
- Java
- HTML

Course Learning Outcomes

On completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the method of compiling and running web based applications	K2
CLO2	Implement database connectivity techniques to connect application with the database	K3
CLO3	Analyze the importance of web services in making a webpage interoperable	K4
CLO4	Design web based applications using Spring and Java Persistence API	K5
CLO5	Develop modern Web Applications using the client and server-side technologies	K6

Mapping with Programme Learning Outcomes

CLOS	PLO1	PLO2	PLO3	PLO4
CLO1	S	S	M	S
CLO2	M	S	M	S
CLO3	M	S	L	S
CLO4	M	S	M	S
CLO5	S	S	L	S

S- Strong; M-Medium; L-Low

Syllabus

- Exercise to implement web sockets.
- Exercise to implement form validation techniques.
- Exercise to implement file upload.
- Exercise to implement exception handling.
- Exercise to inject date into spring bean property.
- Exercise to develop a servlet application.
- Exercise to implement dependency injection in spring.
- Exercise to implement JPA and Hibernate.
- Exercise to design a web application using struts.

Pedagogy: Demonstrations

MCS23P6	Robotic Process Automation LAB	Category	L	T	P	Credit
		Practical	-	-	75	3

Preamble

This course provides an understanding of basic concepts of Robotic Process Automation and also various exercises to implement RPA Design and Development strategies in the context of UiPath. This course also develops the competence to design and develop a robot for a defined process

Prerequisite

● Basic Programming Concepts

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand Ui-Path Studio	K2
CLO2	Apply simple RPA basics	K3
CLO3	Analyse arithmetic operations for different fields from an excel file	K4
CLO4	Evaluate different formats for input and output validations	K5
CLO5	Develop bots for real time automation applications	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	L	M	M
CLO2	S	S	M	M
CLO3	S	S	M	L
CLO4	S	S	S	M
CLO5	S	S	S	M

S- Strong, M-Medium, L-Low

Syllabus

- Download, Install and Activate Ui-Path Studio
- Exercises to implement basics of RPA (Variables, Arguments, Control Flow. etc)
- Exercises to empty the trash folder in Gmail and recycle Bin
- Exercises to implement loops. (if, switch, while, do-while, for loop, etc.)
- Exercise to implement static and Dynamic table
- Exercise to implement separate workflow and arguments
- Exercise to implement clipboard management

- Exercise to perform operations on excel file (Read cell, Write Cell, arithmetic operations. Etc.,)
- Exercise to implement controls using mouse and keyboard activities
- Develop simple bots. (data transfer from on system to another, Email Automation, Password Generator, Generating mass emails etc.,)

Pedagogy: Demonstrations

ELECTIVES

MCS23E3	DEEP LEARNING	Category	L	T	P	Credits
		Theory	58	2	-	4

Preamble

This course covers the context of deep learning, know how to use a neural network, understand the data needs of deep learning, have a working knowledge of deep learning, and explore the parameters for deep learning

Prerequisite
- Artificial Intelligence
- Machine Learning

Course Learning Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basics of deep learning	K2
CLO2	Apply the concept of optimization and generalization in deep learning.	K3
CLO3	Explore the deep learning applications.	K4
CLO4	Evaluate the analysis of algorithm efficiency using different notations.	K5
CLO5	Implement various deep learning models.	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	M	S	S
CLO2	S	S	S	M
CLO3	S	S	M	S
CLO4	L	S	S	S
CLO5	S	S	L	S

S- Strong; M-Medium; L-Low

UNIT I   (11 Hrs)
Introduction to Machine learning: Linear models (SVMs and Perceptions and logistic regression)-Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates.

UNIT II   (11Hrs)
History of Deep Learning: A Probabilistic Theory of Deep Learning- Back propagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks, Convolution Networks-Generative Adversarial Networks (GAN), Semi-supervised Learning.

UNIT III   (12 Hrs)
Linear (PCA, LDA) and manifolds, metric learning: Auto encoders and dimensionality reduction in networks - Introduction to Convent - Architectures – Alex Net, VGG, Inception, Res Net - Training a Convent: weights initialization, batch normalization, hyper parameter optimization.

UNIT IV   (12 Hrs)
Optimization in deep learning: Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience.

UNIT V   (12 Hrs)
Applications of Deep Learning: Images segmentation – Object Detection – Automatic Image Captioning – Image generation with Generative adversarial networks – Video to Text with LSTM models – Attention models for Computer Vision – Case Study: Named Entity Recognition – Opinion Mining using Recurrent Neural Networks – Parsing and Sentiment Analysis using Recursive Neural Networks – Sentence Classification using Convolutional Neural Networks – Dialogue Generation with LSTMs.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Ian Goodfellow, YoshuaBengio, Aaron Courville	Deep Learning	MIT Press	2017

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION/EDITION
1.	Francois Chollet	Deep Learning with Python	Manning Publications	2018
2.	Phil Kim	Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence	Apress	2017

Pedagogy: Lectures, Group Discussions, Case studies

BLENDED LEARNING VIDEO LINKS:

UNIT I
https://www.youtube.com/watch?v=Ijqkc7OLenI
https://www.youtube.com/watch?v=Ln8pV1AXAgQ
https://www.youtube.com/watch?v=CeIS2L86ppU
https://www.youtube.com/watch?v=15bmcav7ynE

UNIT II
https://www.youtube.com/watch?v=MZmNxvLDdV0
https://www.youtube.com/watch?v=5g1eXmQtl0E
https://www.youtube.com/watch?v=7GTAw4GYYdg
https://www.youtube.com/watch?v=b-yhKUINb7o
https://www.youtube.com/watch?v=g5y9dwXRprg

UNIT III
https://www.youtube.com/watch?v=DtEq44FTPM4
https://www.youtube.com/watch?v=GVB2ALC1T8g
https://www.youtube.com/watch?v=dXB-KQYkzNU
https://www.youtube.com/watch?v=cyIINCqyi5g
https://www.youtube.com/watch?v=ttE0F7fghfk

UNIT IV
https://www.youtube.com/watch?v=lDkEC7H88_A
https://www.youtube.com/watch?v=SEnXr6v2ifU
https://www.youtube.com/watch?v=43T8QXyJZsE
https://www.youtube.com/watch?v=QZXP1g42CIY

UNIT V
https://www.youtube.com/watch?v=wp1bgd8reDk
https://www.youtube.com/watch?v=AqEF2HIMjYA
https://www.youtube.com/watch?v=IFfFwUwEOqE
https://www.youtube.com/watch?v=eMPQw7Xbjd0

MCS23E4	CYBER SECURITY AND FORENSICS	Category	L	T	P	Credits
		Theory	58	2	-	4

Preamble
This course covers the fundamental techniques of security aspects like threats, attacks and authentication procedures. It also presents effective security systems and investigates security incidents.

Prerequisite
- Computer Security

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of various security aspects like threats, attacks and authentication procedures	K2
CLO2	Apply various type security attacks by inspecting their characteristics.	K3
CLO3	Analyze security issues in network and computer systems	K4
CLO4	Evaluate and communicate the human role in security systems	K5
CLO5	Interpret and forensically investigate security incidents	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	M	S	S
CLO2	S	S	S	M
CLO3	S	S	L	S
CLO4	M	S	S	S
CLO5	S	S	M	L

S- Strong; M-Medium; L-Low

Syllabus
UNIT I (11 Hrs)
Introduction to Cybercrime: Cybercrime and Information Security - Classifications of Cybercrimes – Legal Perspectives of Cybercrimes - Indian Perspectives of Cybercrimes –Cybercrime and the Indian ITA 2000 – Global Perspective on Cybercrimes. Cyber offenses: Categories of Cybercrime – **How Criminal Plan the Attacks – Social Engineering – Cybers talking – Cybercafé and cybercrimes- Botnets**.

UNIT II (11 Hrs)
Cybercrime in Mobile and Wireless Devices: Introduction – proliferation of Mobile and Wireless Devices

– Trends in mobility – **Credit card Frauds in Mobile and Wireless Computing Era** – Security Challenges posed by Mobile Devices – Registry settings for Mobile Devices –Authentication Service Security – **Attacks on Mobile/Cell Phones** – Mobile Devices Security Implications for Organizations – Organizational Measures for Handling Mobile Devices – Organizational Security Policies and Measures in Mobile Computing Era. Phishing and Identity Theft: – Introduction – Phishing – **Identity Theft.**

UNIT III (12 Hrs)

Cyber Crime and Cyber Laws: Cybercrime and the legal landscape around the World – Need for Cyber Laws – Indian IT Act – **Challenges in Indian law and Cybercrime Scenario in India – Consequences of Not Addressing the weakness in IT Act** - Digital Signatures and the Indian IT Act – Amendments to the Indian IT Act – Cybercrime and Punishment.

UNIT IV (12 Hrs)

Understanding Computer Forensics: Historical Background – Need for Computer Forensics – Cyber forensics and Digital Evidence – Forensics Analysis of Email – Digital Forensics Life Cycle- Chain of Custody Concept – Network forensics – Approaching a Computer Forensics Investigation – **Forensics and Social Networking Sites – Computer forensics from Compliance perspectives- Challenges in Computer Forensics.**

UNIT V (12 Hrs)

Digital Forensics: Overview - Preparing for Digital Investigations – Maintaining Professional Conduct – Preparing a Digital Forensics Investigation – Procedures for Private Sector High Tech Investigations – **Understanding Data Recovery Workstations and Software – Conducting an Investigation.** Data Acquisition: Understanding Storage Formats for Digital Evidence – Determining the Best Acquisition Method – Contingency planning for Image Acquisitions - Using Acquisition Tools – **Validating Data Acquisitions – Using Other Forensics Acquisitions Tools.**

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Bill Nelson, Amelia Phillips and Christopher Steuart	Guide to Computer Forensics and Investigations	Cengage	2019,6/e
2.	Nina Godbole and SunitBela pore	Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives	Wiley Publications	2011

Reference Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Harlan Carvey	Windows Forensic Analysis Toolkit	Syngress	2012

Pedagogy: Lectures, Group Discussions, Case studies

BLENDED LEARNING VIDEO LINKS:

Unit I
https://www.youtube.com/watch?v=z2ilqLn_qjc
https://www.youtube.com/watch?v=dJBD_MAK_HI
https://www.youtube.com/watch?v=NbvBQRXL7WQ

Unit II
https://www.youtube.com/watch?v=NcsvwyZQt5E
https://www.youtube.com/watch?v=VIH03887UfA
https://www.youtube.com/watch?v=NAEb_vPxN_w
https://www.youtube.com/watch?v=etSXASmJAzE

Unit III
https://www.youtube.com/watch?v=S48gRv3_I6E
https://www.youtube.com/watch?v=0Hm5mla2c0o
https://www.youtube.com/watch?v=vEXoUOtI8lQ
https://www.youtube.com/watch?v=c-1nT5IGpe8

Unit IV
https://www.youtube.com/watch?v=rYmA2VPOC-
Ahttps://www.youtube.com/watch?v=DiAMlJ0DiAo
https://www.youtube.com/watch?v=PDQb2Xr8kCk
https://www.youtube.com/watch?v=peUZqWSSt24

Unit V
https://www.youtube.com/watch?v=m1UUsffPKEA
https://www.youtube.com/watch?v=n1EWlOvX6Wk
https://www.youtube.com/watch?v=3JdwvXlrgyQ
https://www.youtube.com/watch?v=F5tv4c-f2Bw

MCS23E6	NATURAL LANGUAGE PROCESSING	Category	L	T	P	Credits
		Theory	58	2	-	4

Preamble

This course introduces the methods in Natural Language Processing (NLP). This course includes the various algorithms used in NLP. This course also covers various NLP tools and techniques

Prerequisite

- Data mining concepts
- Machine Learning Concepts

Course Learning Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of NLP in handling text data	K2
CLO2	Apply NLP analytical techniques on real time text data	K3
CLO3	Analyze text data with appropriate NLP algorithms and techniques.	K4
CLO4	Evaluate different NLP algorithms for handling and optimizing text data	K5
CLO5	Design and develop models for accomplishing NLP task	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	S	M	L
CLO2	S	S	L	M
CLO3	S	S	S	S
CLO4	S	M	S	S
CLO5	S	L	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I   **(11 Hrs)**

Introduction to NLP - Regular Expressions – **Words – Corpora** – Text Normalization – N-gram Language Models – N-Grams – Evaluating Language Models – Smoothing – Naïve Bayes Classifiers Training the NB Classifier – **Worked example**.

UNIT II   **(11 Hrs)**

Logistic Regression: Learning in Logistic Regression – The cross-entropy loss function – Gradient Descent – **Regularization** - Vector semantics and embeddings – Lexical semantics – vector semantics - **words and vectors** – TF-IDF: weighing terms in the vector – **Word2vec** – **visualizing embeddings.**

UNIT III   **(12 Hrs)**

Sequence labelling for parts of speech and named entities: English word classes – parts-of-speech tagging – **named entities and named entities tagging** – Constituency Grammars: constituency – context-free grammar. Logical representation of sentence meaning – first-order logic - **event and state representation**. Information Extraction: relation extraction – extraction events and their time

UNIT IV   **(12 Hrs)**

Word senses and wordnet – word sense – relation between sense – **wordnet: a database of lexical relations**. Semantic role labelling – semantic roles – Frame net - **semantic role labelling**– Lexicons for Sentiment, Affect and Connotation: Defining emotion – available sentiment and affect lexicons – creating affect lexicons by human labelling.

UNIT V   **(12 Hrs)**

Question Answering: Information retrieval - **Knowledge based question answering - Chatbots & dialog system: properties of human conversation – chatbots.** Phonetics: Speech Sounds and Phonetic Transcription – Automatic Speech Recognition and Text-to-Speech: The automatic speech recognition task – Feature extraction for ASR: Log Mel Spectrum – Speech Recognition Architecture.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Daniel J and James H. Martin	Speech and language processing An introduction to natural language processing, computational linguistics & speech recognition	Prentice hall	2020

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Dwight Gunning, Sohom Ghosh	Natural Language Processing Fundamentals	Packt Publishers.	2019
2.	Hobson Lane, Hannes Hapke, and Cole Howard	Natural Language Processing in Action: Understanding, analyzing, and generating text with Python	Manning Publications	2019

Pedagogy: Lectures, Group Discussions, Case studies

BLENDED LEARNING VIDEO LINKS:

UNIT-I
https://www.youtube.com/watch?v=xsIDTmo1NOg
https://www.youtube.com/watch?v=NHCqtFO914k

UNIT-II
https://www.youtube.com/watch?v=ERibwqs9p38
https://www.youtube.com/watch?v=hQwFeIupNP0
https://www.youtube.com/watch?v=7tQi23rpGvo

UNIT-III
https://www.youtube.com/watch?v=7CRyqwCZFY0
https://www.youtube.com/watch?v=8pts0vrMSV8

UNIT-IV
https://www.youtube.com/watch?v=2IHA8QgKwbw
https://www.youtube.com/watch?v=awZprMxpTaA
https://www.youtube.com/watch?v=jb55DnSV1rk

UNIT-V
https://www.youtube.com/watch?v=bwAGtKqkNGU
https://www.youtube.com/watch?v=zlBM2DsVbFg
https://www.youtube.com/watch?v=38sL6pADCog

MCS23E7	SOCIAL MEDIA ANALYTICS	Category	L	T	P	Credit
		Theory	58	2	-	4

Preamble

The course covers concepts and techniques for retrieving, exploring, visualizing, and analyzing social network and social media data. Students learn the key metrics to assess social media goals, perform social network analysis to apply social media analytics processes and formulate effective strategies based on the analytics.

Prerequisite

● Foundations of Data Science

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand sources and limitations of social media data.	K2
CLO2	Apply social media analytics and evaluate metrics.	K3
CLO3	Examine different social media platforms and their associated tools	K4
CLO4	Apply social media information to create dashboards and reports for visualization.	K5
CLO5	Design effective strategy based on the social media analytics data.	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	M	M	M
CLO2	S	S	M	M
CLO3	S	M	S	L
CLO4	S	L	S	M
CLO5	S	S	M	M

S- Strong, M-Medium, L-Low

Syllabus

UNIT I (11 Hrs)

Foundation for Analytics: – Digital Gap – Social Media Data Sources – Defining Social Media Data– Data Sources – Estimated vs. Factual Data Sources – Data Gathering in Social Media Analytics. **From Data to Insights:** Actionable Analytics – Focus on objective – Plan to shape data to

insights – choosing a good analytics tool – Data Aggregation calculations and display – Data display – Social media and its data – Potential Challenges. **Data Identification: Professional** networking sites - social sites – formation sharing sites – microblogging sites – blogs /wikis.

UNIT II   (12 Hrs)
Analytics in social media: Types of analytics. Dedicated Vs. Hybrid Tools – Dedicated tools – Hybrid tools – Data Integration Tools – Best Setup. **Social Network Landscape:** Concept and UX on social networks – Interactivity of social network – Content flow on social network – Interaction Pattern between users –social media as a two-way channel.

UNIT III   (12 Hrs)
Analytics Process: Analysis – Insight – Investigation beyond social analytics – Shaping a method – analysis cycle – Community Activity – Resources – Attention span – Dynamic cycles – Short Periods – Long Periods – Analyst Mindset – Instinctive Analyst. **Metrics:** Introduction – Default and custom metrics – Metrics Categories – Graph Types – Metric Capabilities – Metrics and Strategy – Estimated Metrics–Metrics and Tactics.

UNIT IV   (12 Hrs)
Dashboards: Purpose and Objectives – Default Vs. Custom Dashboards – Linearity and order of metrics – Metrics Positioning and Correlation – Metric and dashboard layout – Graphic design – Data Integration dashboards. **Reports:** Elements of reporting – Reporting approaches and formats – Animation and effects in reporting – Stake holders and feedback – Reporting with teams.

UNIT V   (11 Hrs)
Strategy: Strategy in social media analytics – Strategic planning – Data availability and data sources – Knowledge beyond social media – Tools and technology preparation – Team Preparation – Goals and objectives – Contingency plans – application of social media analytics strategy – Strategy and tactics – Evaluation of a strategic analytics cycle.

Case Studies: Targeting the audience using Facebook Analytics, Tracking profile analytics in LinkedIn, Analysis of Political Tweets, ROI Analytics using Facebook, Marketing Strategy in Pinterest.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Alex Goncalves	Social Media Analytics Strategy: Using Data to Optimize Business Performance	APress	2022

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Ganis, Kohirkar	Social Media Analytics	IBM Press PTG	2016
2.	Nancy Flynn	The Social Media Hand book Policies, and Best Practices	Wiley	2012

Pedagogy: Lectures, Demonstrations, Group Discussions, Case studies

BLENDED LEARNING VIDEO LINKS:

UNIT I

https://www.talkwalker.com/blog/social-media-data-sources
https://blog.hootsuite.com/social-media-data-collection/

UNIT II

https://blog.tubikstudio.com/social-network-design-ux-for-communication/
https://www.cyberclick.net/numericalblogen/two-way-communication-how-to-use-it-in-your-social-media-strategy
https://www.impactplus.com/blog/social-media-marketing-the-importance-of-a-two-way-conversation

UNIT III

https://blog.hootsuite.com/social-media-metrics/

UNIT IV

https://www.datapine.com/blog/social-media-reports-examples-and-templates/
https://monkeylearn.com/blog/customer-feedback-report/

UNIT V

https://theintactone.com/2022/01/21/application-of-social-media-analytics-in-different-social-media-platforms/

MCS23E9	VIRTUAL REALITY	Category	L	T	P	Credit
		Theory	58	2	-	4

Preamble

This course provides the technology behind virtual reality and introduces input, output devices used for virtual reality. It also presents the techniques and applications used for augmented reality.

Prerequisite

- Animation Techniques
- Image Processing

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basic concepts of virtual reality	K2
CLO2	Apply appropriate techniques and design augmented reality applications	K3
CLO3	Analyze the techniques required for virtual reality environments	K4
CLO4	Assess the methods and techniques appropriate for virtual reality applications	K5
CLO5	Design and manipulate objects within the virtual environment.	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	M	S	M
CLO2	M	S	S	M
CLO3	M	L	M	M
CLO4	S	M	L	M
CLO5	S	M	M	L

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs)

Introduction: The Three I's of Virtual Reality - A Short History of Early Virtual Reality – Early Commercial VR Technology - **VR Becomes an Industry - The Five Classic Components of a VR System.**

UNIT II   **(12 Hrs)**

Input Devices: Three – Dimensional Position trackers - Hybrid Inertial Trackers - Navigation and Manipulation Interfaces - Tracker-Based Navigation/Manipulation Interfaces – **Three-Dimensional Probes** - Gesture Interfaces - The Pinch Glove - The 5DT Data Glove - The Didjiglove - The Cyber Glove. Output Devices: Graphics Displays: The Human Visual System -Personal Graphics Displays - Large- Volume Displays - Sound Displays - The Human Auditory System - The Convolvotron– **Speaker Based Three-Dimensional Sound** - **Haptic Feedback: The Human Haptic System - Tactile Feedback Interfaces - Force Feedback Interfaces**

UNIT III   **(12 Hrs)**

Getting started with Unity and Playmaker: **Downloading and Installing Unity** – **Buying and importing playmaker – Setting up your project.** Unity's and Playmaker's User Interface: Interface overview and main menu – Hierarchy panel – Inspector panel – Project panel – Project panel – Views – Playmaker interface. Components and State Machines: Game objects, components and properties – Working with prefabs – Finite state machines, states and actions – **Interaction between game objects**

UNIT IV   **(11 Hrs)**

Scripting and Custom Actions: Writing unity script – Overview of standard unity classes – Creating a playmaker action. Networking and Multiplayer: **Understanding networking and multiplayer** – **Setting up photon unity networking – Making multiplayer**

UNIT V   **(12 Hrs)**

Introduction to Augmented Reality: Definition – Examples – Displays - Visual perception - Requirements and characteristics – Tracking - Characteristics of tracking technology- Stationary tracking systems - Mobile sensors. Computer Vision for Augmented Reality: **Natural feature tracking by detection** – **Simultaneous localization and mapping** – **Interaction** - **Output modalities** – Input modalities – Tangible interfaces –Navigation

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Jonathan Linowes ,Krystian Babilinski	Augmented reality for developers	Packt Publishing	2017,1/e

Reference Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Jonathan Linowes ,Krystian Babilinski	Augmented Reality : Principles and Practice	Pearson education Inc	2016,1/e

Lectures**,** Group Discussions, Demonstrations

BLENDED LEARNING VIDEO LINKS:

Unit I
https://www.youtube.com/watch?v=TQhwijicDkY
https://www.youtube.com/watch?v=XJZpf0gk1ZM
https://www.youtube.com/watch?v=h3rKvsFTfPA

Unit II
https://www.youtube.com/watch?v=NRcfXSnDoT8https://www.youtube.com/watch?v=uPnHzQ7qJ2Y
https://www.youtube.com/watch?v=a6VWE_jckWg
https://www.youtube.com/watch?v=WhzAk-XzmYQ

Unit III
https://www.youtube.com/watch?v=Yr_Y8boO0Sg
https://www.youtube.com/watch?v=Z8_TWqsDMMU
https://www.youtube.com/watch?v=cLzG1HDcM4s

Unit IV
https://www.youtube.com/watch?v=zeHhXzWKbSU
https://www.youtube.com/watch?v=JOJP0CvpB8w
https://www.youtube.com/watch?v=93SkbMpWCG

Unit V
https://www.youtube.com/watch?v=gAbhM59N54k
https://www.youtube.com/watch?v=mQQL8pmztb4
https://www.youtube.com/watch?v=0CPcc2xp3_s
https://www.youtube.com/watch?v=BU_iZ96yG9k

MCS23E10	QUANTUM COMPUTING	Category	L	T	P	Credit
		Theory	58	2	-	4

Preamble

This course introduces the fundamentals of Quantum Computing. It also covers basic architecture of quantum computing.

Prerequisite

● Basic Skills in Maths and Physics

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the fundamental concepts of quantum mechanics	K2
CLO2	Apply the Quantum Architecture and cryptographic techniques related with Quantum Computation.	K3
CLO3	Analyze the Algorithms required for reality environments	K4
CLO4	Assess the hardware methods and techniques available for Quantum Computing	K5
CLO5	Designing appropriate solution to more complex quantum mechanical systems	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	M	S	M	M
CLO2	S	M	S	M
CLO3	S	M	S	M
CLO4	S	S	L	S
CLO5	S	L	S	S

S- Strong; M-Medium; L-Low.

Syllabus

UNIT I (12 Hrs)

Classical to Quantum: Classical Deterministic Systems, Probabilistic Systems, Quantum Systems, Assembling Systems. **Basic Quantum Theory: Quantum States, Observables,** Measuring, Dynamics, Assembling Quantum Systems.

UNIT II (12 Hrs)

Architecture: Bits and Qubits, Classical Gates, Reversible Gates, Quantum Gates. Algorithms: Deutsch's Algorithm, The Deutsch–Jozsa Algorithm, Simon's Periodicity Algorithm, **Grover's Search Algorithm, Shor's Factoring Algorithm.**

UNIT III (12 Hrs)

Programming Languages: Programming in a Quantum World, Quantum Assembly Programming, Toward Higher-Level Quantum Programming, **Quantum Computation Before Quantum Computers.** Theoretical Computer Science: Deterministic and Nondeterministic Computations, Probabilistic Computations, Quantum Computations

UNIT IV (10 Hrs)

Cryptography: Classical Cryptography, Quantum Key Exchange I: The BB84 Protocol, Quantum Key Exchange II: The B92 Protocol, Quantum Key Exchange III: **The EPR Protocol, Quantum Teleportation.**

UNIT V (12 Hrs)

Information Theory: Classical Information and Shannon Entropy, Quantum Information and von Neumann Entropy, **Classical and Quantum Data Compression**, **Error-Correcting Codes**. Hardware: Implementing a Quantum Computer I: Ion Traps, Implementing a Quantum Computer II: Linear Optics.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Noson S. Yanofsky Mirco A. MannucciHoloMathics, LLC	Quantum Computing for Computer Scientists	Cambridge University Press	2008

Reference Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Michael Nielsen, Isaac Chuang	Quantum Computation and Quantum Information	Cambridge University Press	2008

Pedagogy: Lectures, Group Discussions, Demonstrations**.**

BLENDED LEARNING VIDEO LINKS:

Unit I:
https://www.youtube.com/watch?v=u1R3kRWh1ek
https://www.youtube.com/watch?v=uOg4YG60Dlc
https://www.youtube.com/watch?v=ZbpRlKRaE8Q

Unit II:
https://www.youtube.com/watch?v=EoH3JeqA55A
https://www.youtube.com/watch?v=5_56TXtFVK4
https://www.youtube.com/watch?v=dONacVnW1Ng

Unit III:
https://www.youtube.com/watch?v=X8MZWCGgIb8
https://www.youtube.com/watch?v=g_IaVepNDT4

Unit IV:
https://www.youtube.com/watch?v=lbrO_0EImZ4
https://www.youtube.com/watch?v=FRapoIr1xlo

Unit V:
https://www.youtube.com/watch?v=txEdbhAPTwU
https://www.youtube.com/watch?v=HUxEa77xdFI
https://www.youtube.com/watch?v=WJr7jqpjge0

Course Designers
1. Dr.R.Kowsalya

<div align="center">**JOB ORIENTED COURSE**</div>

Company: Fintech Software, Coimbatore
Course: Advance Excel & Power BI
Course Modules:
Advanced Excel
- Customizing Excel
- Absolute, Mixed and Relative Referencing
- Formatting and Proofing
- Protecting Excel
- Using 3-D map
- Macro Functions
- Lookup Function
- Data Validation
- Logical Function
- Advanced Paste Special Techniques

Power BI
- Introduction to Power BI
- Power BI Desktop
- Viz and Tiles
- Reports and Dashboards
- Publishing Workbooks and Workspace
- Power BI Report Servers
- Power Query: Text, Number, Append, Merge, Conditional Columns
- DAX Functions
- Table Relationship

MNM22CS2	CYBER SECURITY II	Category	L	T	P	Credits
		Theory	-	-	-	-

Preamble

This course provides the classification of cyber security and cybercrime and its laws and data privacy and security in social media

Prerequisite

Basics of Internet

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basic concepts of Cyber security and Cyber security threat landscape.	K2
CLO2	Apply the methods to identify the cyber-attacks and crimes.	K3
CLO3	Analyze the legal framework that exists in India for cybercrime and legal frame work followed by other countries.	K4
CLO4	Estimate the data privacy and security issues related to personal data privacy and security.	K5
CLO5	Create a privacy setting on social media platform and register complaints on a social media platform.	K6

Syllabus

UNIT I   **(6 hrs)**

Overview of cyber security: Cyber security terminologies - Cyberspace - Cyber attack - Cyber threats - Cyber terrorism - Cyber warfare.

UNIT II   **(8 hrs)**

Cyber crimes: Cyber Crimes targeting computer system and mobiles- Online scam frauds: emails Scams-Phishing- Vishing- Smishing- Online job fraud- online extortion- Debit and credit card fraud- Online payment fraud- cyberbullying. Social Media Scam & Frauds: Impersonation- Identify theft -Job scams- Misinformation- Fake news cyber crime against persons - Cyber grooming - Child pornography - cyber stalking-Cyber police station -Crime reporting produce.

UNIT III   **(4 hrs)**

 Cyber law: Cyber laws and legal and ethical aspects related to new technologies: AI/ML- IoT- Block chain - Darknet and social media- Cyber law of other countries.

UNIT IV (5 hrs)

Data privacy and Data security: Defining data- Metro-Big data- Non personal data- Data protection-General Data Protection Regulations(GDPR)- 2016 Personal Information Protection and the Electronic document Act(PIPEDA)- Social media Data privacy and Security issues.

UNIT V (7 hrs)

Social Media Platforms and Cyber Security : Case Study on Platform for reporting Cyber Crimes, Checklist for reporting cybercrimes online, Setting privacy settings on social media platforms, Registering complaints on social media platforms, Do's and Don'ts for posting content on social media platforms, prepare password policy for computer and mobile device, security controls for computer and mobile phones , digital Forensics, Cyber Bulling, Phishing, Facebook Attack, Cyber Security audit and Compliance and National Security Policies.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Anand Shinde	Introduction to Cyber Security – Guide to the world of Cyber Security	Notion Press, Sumit Belapure,Nina Godbole	2021

Reference Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Martin Weiss, Michael G. Solomon	Auditing IT Infrastructure for compliance	JonesBartlett Learning.	2015,2/e

Pedagogy
Video Lectures, Case studies

MCS2014	Advanced Learner Course 1- BLOCKCHAIN	Category	L	T	P	Credit
		III	-	-	-	5 **

Preamble

This course covers the technical principles of blockchain, cryptographic primitives used in blockchain, distributed system concepts, decentralization behind blockchain and the working of bitcoin. It also introduces the Ethereum platform and highlights the tools, use cases of blockchain technology.

Prerequisite

- Distributed systems
- Cryptography
- Information security

Course Learning Outcomes

On successful completion of the course, the student will be able to

CLO Number	CLO statement	Knowledge Level
CLO1	Understand the technical concepts of block chain technology at sufficient depth to perform analysis	K2
CLO2	Apply relevant legal and ethical issues of block chain and their impact on policy and actions of organizations	K3
CLO3	Analyze various block chain concepts to analyze proposals, case studies and preliminary block chain system design discussions	K4
CLO4	Evaluate the use of block chain technology in systems and support decisions with relevant arguments	K5
CLO5	Implement real world challenges that block chain technologies may assist to solve	K6

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	M	M	M
CLO2	S	M	M	M
CLO3	S	S	M	M
CLO4	S	M	M	M
CLO5	S	M	S	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

Introduction to Blockchain: Distributed systems - History of block chain - Introduction to blockchain - Features -Applications -Tiers - Types of blockchain - Consensus in blockchain- Benefits and limitations

UNIT II

Decentralization: Decentralization using blockchain - Methods -Routes -Blockchain and full ecosystem decentralization SmartContract Decentralizedapplications platforms for decentralization

UNIT III
Bitcoin : Bitcoin Public, Private keys Transaction life cycle Transaction structure Types of transaction - Block chain Structure of a block Mining Task of miners- Proof of work Mining algorithm- Bitcoin network - Wallets-Payments

UNIT IV
Ethereum 101:Introduction - Ethereumblock chain - Currency Fork - Gas - Elements of Ethereumblockchain- EVM- Accounts- Transaction receipt - Block validation mechanism - Ether Ethereum network

UNIT V
Emerging trends - Tools: Solidity- Metamask Stratis Embark. Use cases: Know Your customer (KYC) and Syndicated loan use case in Finance domain, Interest rate swapping in Banking, Re-insurance in Insurance, Auditing in Hotel reservation, Loyalty management system in retail domain, Order management system in Supply chain.

Text Book
1. Imran Bashir, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, Packet Publishing, 2017 (Unit I to V)
2. Debajani Mohanty, Blockchain : From Concept to Execution, BPB Publications, 2018 (Unit V Use cases)

Reference Books
1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
2. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015

Course Designers
1. Dr. S.Poongodi

MCS2213	Advanced Learner Course 2- AUGMENTED REALITY	Category	L	T	P	Credit
		III	-	-	-	5**

Preamble

This course on Augmented Reality (AR) provides students with a comprehensive understanding AR technologies, principles, and applications. Students will learn about the underlying concepts of techniques used in developing AR systems and gain practical experience in creating AR applications.

Prerequisite

● Computer Graphics
● Computer vision and 3D Programming

Course Learning   Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the fundamental concepts and components of Augmented Reality (AR).	K2
CLO2	Apply computer vision techniques for AR marker detection and tracking.	K3
CLO3	Analyze and evaluate different AR techniques and technologies.	K4
CLO4	Evaluate the performance and usability of AR applications.	K5
CLO5	Design and implement AR applications using appropriate development tools and frameworks.	K6

Mapping with Programming Outcomes

CLOs	PO1	PO2	PO3	PO4
CLO1	S	M	M	M
CLO2	M	M	M	M
CLO3	M	M	S	S
CLO4	S	M	M	M
CLO5	S	M	M	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

Introduction to Augmented Reality: Basic concepts of Augmented Reality-Historical background and evolution of AR-AR applications and use cases-Challenges and future trends in AR- AR Technologies and Devices-Marker-based AR-Marker less AR-Projection-based AR-Wearable AR devices- Displays- Multimodal Displays - Audio Displays-Haptic, Tactile, and Tangible Displays- Olfactory and Gustatory Displays

UNIT II

AR Marker Detection and Tracking: Tracking, Calibration, and Registration- Coordinate Systems- Model Transformation - View Transformation - Projective Transformation - Frames of Reference- Mobile Sensors - Global Positioning System - Wireless Networks-Magnetometer- Gyroscope -Linear Accelerometer - Odometer- Computer Vision for Augmented reality- Marker Tracking

UNIT III

Integrating Virtual Content in AR:3D modeling and animation for AR-Texture mapping and lighting in AR-Physics simulations in AR-Audio and haptic feedback in AR-Performance Optimization in AR-Rendering techniques for AR-Optimization for mobile devices-Handling large datasets in AR-Real-time performance considerations

UNIT IV

Interactive Techniques in AR: Spatial mapping and scene understanding-voice and speech recognition in AR-Natural uses interface of AR-Object recognition and tracking- Multi-user and collaborative AR- Networked AR and Remote Collaboration- Synchronization and consistency in multi-user AR.

UNIT V

Evaluation and Testing of AR Applications: Usability testing and user feedback-Performance benchmarking and optimization-User acceptance and adoption studies-Ethical and privacy considerations in AR

Text Books

1. Dieter Schmalstieg, Tobias Hollerer (2016), Augmented Reality : Principles and Practice, Pearson education Inc
2. Joseph Howse, Joe Minichino, and Vikas Gupta (2019), Learning OpenCV 4 Computer Vision with Python 3: Get to grips with tools, techniques, and algorithms for computer vision and augmented reality.
3. Val Head (2019), Designing Interface Animation: Meaningful Motion for User Experience
4. Mohammad Azam (2020),ARKit and Unity: Build 15 Augmented Reality apps with ARKit 2.0 and Unity.

Reference Books

1. Jonathan Linowes ,Krystian Babilinski (2017), Augmented reality for developers, 1/ e, Packt Publishing
2. William R. Sherman, Alan B. Craig (2018), Understanding Virtual Reality: Interface, Application and Design, 2nd edition, Morgan Kaufmann Publishers

Pedagogy

Lectures**,** Group Discussions, Demonstrations

Course Designer

1.Dr.S.Sasikala