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Bachelor of Technology (B.Tech.) VII Semester (Artificial Intelligence & Data Science)

w.e.f. July 2023

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical			L	T	P	
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work					
1	AI71	PEC	Professional Elective Course-III	70	20	10	-	-	100	3	1	-	4
2	AI72	OEC	Open Elective Course-II	70	20	10	-	-	100	3	1	-	4
3	AI73	PCC	Big Data Analysis	70	20	10	30	20	150	3	-	2	4
4	AI74	PCC	Digital Image Processing	70	20	10	30	20	150	3	-	2	4
5	AI75	PCC	Statistical Data Analysis	70	20	10	30	20	150	3	-	2	4
6	AI76	MC	Industrial Training Evaluation	-	-	-	60	40	100	-	-	4	2
			Total	**350**	**100**	**50**	**150**	**100**	**750**	**15**	2	**10**	**22**
7	AI77	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	8
8	AI78	MC	NSS/NCC/Swatchhata Abhiyan/Rural Outreach	Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum 8 credits against additional MOOC courses in subject code AI77 for the award of Honours (Minor Specialization).									

Note: 01. Departmental BOS will decide list of three/four elective subjects for each PEC and OEC.
02. MOOC/NPTEL subjects shall be taken with permission of HOD/Coordinator
03. Industrial training presentation & viva shall take place in VII Sem. which students have already done in VI Sem.

Professional Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	AI71A	AI-Natural Language Processing (NLP)
2	AI71B	Block Chain Technique
3	AI71C	Simulation & Modeling

Open Elective Course-II		
S.No.	**Subject Code**	**Subject Name**
1	AI72A	Cloud Computing
2	AI72B	Network Management
3	AI72C	Cyber Security

1 hour lecture (L) = 1 credit | 1 hour Tutorial (T) = 1 credit | 2 hour Practical (P) = 1 credit

PEC: Professional Elective Course, OEC: Open Elective Course, PCC: Professional Core Course, DLC: Distance Learning Course, MC: Mandatory Course

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Subject Code	Subject Name & Title	Maximum Marks Allocated						Hours/ Weeks			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem Exam	Quiz/ Assignment	End Sem	Lab Work					
AI71A	AI-Natural Language Processing (NLP)	70	20	10	-	-	100	3	1	_	4

Module-I:Introduction
Introduction to NLP, stages of NLP ,Basic text processing, spelling correction, Language modelling Lexical Analysis –Regular expression and Automata for string matching - Words and Word Forms –In brief Morphology fundamentals - Morphological Diversity of Indian Languages - Morphology Paradigms - Finite State Machine / Transducers Based Morphology - Automatic Morphology Learning - Parts of Speech - N-gram Models - Hidden Markov Models.

Module-II: Speech Processing
Biology of Speech Processing - Place and Manner of Articulation - Word Boundary Detection - Argmax based computations - HMM and Speech Recognition - Text to Speech Synthesis - Rule based-Concatenative based approach. Concept of Speech compression techniques and standards.

Module-III: Parsing
Theories of Parsing - Parsing Algorithms – Earley Parser - CYK Parser - Probabilistic Parsing - CYK - Resolving attachment and structural ambiguity - Shallow Parsing - Dependency Parsing - Named Entity Recognition - Maximum Entropy Models - Conditional Random Fields.

Module- IV: Lexical Knowledge Networks
Meaning: Lexical Knowledge Networks - Wordnet Theory - Indian Language Wordnets and Multilingual Dictionaries - Semantic Roles - Word Sense Disambiguation - WSD and Multilinguality- Metaphors - Coreference and Anaphora Resolution.

Module- V: Applications: Sentiment Analysis –Openion mining- Text Entailment - Machine Translation - Question Answering System - Information Retrieval - Information Extraction - Cross Lingual Information Retrieval (CLIR).All types of algorithm used for NLP. Assignment for designing of solutions of Industry based problems.

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Reference Books

1.Jurafsky Daniel, Martin James, "Speech and Language Processing", Second Edition, Tenth Impression, Pearson Education, 2018.
2.Christopher Manning, Schutze Heinrich, "Foundations of Statistical Natural Language Processing", MIT Press, 1999.
3.Allen James, "Natural Language Understanding", Second Edition, Benjamin Cumming, 1995.
Charniack Eugene, "Statistical Language Learning", MIT Press, 1993.

Course Outcomes

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

CO1	Justify the various steps necessary for processing natural language
CO2	Suggest appropriate lexical and parsing techniques for a given natural language
CO3	Apply appropriate statistical models for a given natural language application
CO4	Modify existing algorithms to suit any natural language for processing
CO5	Suggest appropriate pre-processing steps essential for the various applications involving natural language processing and all applications

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		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem Exam	Quiz/ Assignment	End Sem	Lab Work					
AI71B	Block Chain Technique	70	20	10	-	-	100	3	1	_	4

Module-I Introduction-
Overview of Block chain, Public Ledgers, Bit coin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain; Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic crypto currency.

Module-II Understanding Block chain with Crypto currency:
Bit coin and Block chain: Creation Of coins, Payments and double spending, Bit coin Scripts, Bit coin P2P Network, Transaction In Bit coin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bit coin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, Hash Cash PoW, Bit coin PoW, Attackson PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

Module-III Understanding Block chain for Enterprises: Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

Module-IV Enterprise application of Block chain:
Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, and Identity on Block chain.

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Module-V Block chain application development:
Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, writing smart contract using Hyperledger Fabric, writing smart contract using Ethereum, Overview of Ripple and Corda.

References Books:

1. Melanie Swan, "Block Chain: Blueprint for a New Economy", O'Reilly, 2015
2. Josh Thompsons, "Block Chain: The Block Chain for Beginners- Guide to Blockchain Technology and Leveraging Block Chain Programming"
3. Daniel Drescher, "Block Chain Basics", Apress; 1stedition, 2017
4. Anshul Kaushik, "Block Chain and Crypto Currencies", Khanna Publishing House, Delhi.
5.Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralization
And Smart Contracts Explained", Packt Publishing
6. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain", Packt Publishing
7. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer", Import, 2018.

Course Outcome-

CO1	Understanding of Blockchain and Crypto currency.
CO2	Knowledge of Block chain for enterprise and its ethics.
CO3	Design technique and application of Block chain.

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Subject Code	Subject Name & Title	Maximum Marks Allocated						Hours/ Weeks			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem Exam	Quiz/ Assignment	End Sem	Lab Work					
AI71C	Simulation & Modelling	70	20	10	-	-	100	3	1	_	4

Module –I Introduction:
System, model and simulation,Discrete and continuous systems ,Model of a system,Types of models, Steps in simulation study, Model development life cycle, Advantage and disadvantage of simulation, Limitations of the simulation techniques,Areas of application. Introduction to Software Reliability, Review of Probability, Statistics, Description of Specific Models, Principles used in Modeling, System models and role of simulation. Entities, Attributes, States and Activities,

Module-II Random Variables:
Discrete Random variable, Probability mass function, Cumulative Distribution function, Continuous Random variable, Probability Density function, Exponential Distribution, Statistical tools and techniques- generation of pseudo random numbers, Random variant generation for uniform, Poisson and normal distributions.

Module -III Stochastic processes:
Introduction, Classification of Stochastic processes, Renewal process, independent process, Poisson process, Stationary process, Markov Process: Introduction to Discrete Parameter Markov Chains and Continuous Parameter Markov Chains, Birth-death process. Markov models. Introductory ideas of Simulation of inventory and queuing systems - single and multi-server queues.

Module -IV Simulation Languages and Mathematical models:
Continuous system simulation languages, discrete event simulation languages, merits of simulation languages, Exponential Growth and decay models, System dynamics diagrams, Static physical model, Dynamic physical model,static mathematical models, Dynamic mathematical models,Verification and validation of simulation models - input /output validation using a Turing test, Face validity, Sensitivity Analysis.

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Module-V Introductory ideas of the following:

Sampling, Estimation, Parameter Estimation, Maximum likelihood estimation, Confidence intervals, Hypothesis testing, Performance measures and their estimation: run length of a static and dynamic stochastic simulation.

Reference Books:

1.Narsingh, Deo, "System Simulation with Digital Computers", PHI.
2.Gordon, Geoferey, "System Simulation", 2nd Edition, Prentice Hall India.
3A.M. Law and W.D. Kelton: Simulation and Modeling and analysis.
4.R. Y. Rubinstein, B. Melamed: Modern Simulation and Modeling
5.S. Shakya: Lab Manual on Simulation and modeling
6.Kishore Trivedi, "Probability and Statistics with Reliability, Queuing, and Computer Science
Applications", John Wiley and Sons.
7. Law, Kelton, "Simulation Modeling and Analysis" Tata Mc-Graw Hill.
8.D.S. Hira, "System.

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		End Sem	Mid Sem Exam	Quiz/ Assignment	End Sem	Lab Work					
AI72A	Cloud Computing	70	20	10	-	-	100	3	1	_	4

Module- I Introduction
Evolution: Clustering - Grid computing – Virtualization – Basic concepts - Benefits and Risks - Roles and Boundaries - Characteristics - XaaS based service offerings - Basic Deployment models.

Module- II Enabling Technologies
Networks: ISPs - Connectionless Packet Switching - Router-based Interconnectivity - Technical and Business Considerations - Data Center: Standardization and Modularity - Automation - Remote Operation - High Availability - Hardware Virtualization: Hardware Independence - Server Consolidation - Resource Replication - OS and hardware based Virtualization - Web Technology - Multitenant Technology - Service Technology.

Module- III Computing Mechanisms
Infrastructure: Logical Network Perimeter - Virtual Server - Storage Device - Usage Monitor - Resource Replication - Specialized: Automated Scaling Listener - Load Balancer - Monitors - Failover System - Hypervisor - Resource Cluster - Multi-Device Broker - State Management Database - Management: Resource - SLA - Billing - Remote Administration - Security.

Module- IV Cloud Providers & Software Platforms
Globally available public clouds (Microsoft Azure - Amazon Web Services - Google Cloud Platform): Overview and Comparison - Instances - Images - Networking and Security - Storage - Monitoring and Automation Introduction to Open-source softwares: Eucalyptus - OpenNebula - OpenStack - Apache CloudStack.

Module- V Programming Models & Advances
Introduction to MapReduce - Apache Spark - TensorFlow - Intercloud: Architecture - Resource Provisioning - Billing - Security - Mobile Cloud Computing: Resource Allocation - Security - Business Aspects - Application - Future Scope - Introduction to Edge and Fog Computing.

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Reference Books

1.Barrie Sosinsky, "Cloud Computing Bible", John Wiley & Sons, 2010.

2.Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise 3.Perspective on Risks and Compliance", O'Reilly, 2009.

4.James Turnbull, "The Docker Book: Containerization is the New Virtualization", E-Book, 2015.

5.Kai Hwang, Geoffrey C. Fox, and Jack J. Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier, 2012.

Course Outcomes :

Upon completion of this course, the students will be able to:

CO1	Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state oftheart cloud computing .
CO2	Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud
CO3	Adopt suitable computing mechanisms for establishing a cloud environment .
CO4	Design the appropriate cloud computing solutions and recommendations according to the applications used and knowledge on recent advances and implementation of programming modes in cloud computing

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		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem Exam	Quiz/ Assignment	End Sem	Lab Work					
AI72B	Network Management	70	20	10	-	-	100	3	1	_	4

Module-I: Introduction to Network Managements:
Network Management Framework, Network Based Managements, Evolution of Network Management: SGMP, CMIP, SNMP. Network Implementation and Management Strategies, Network Management Categories: Performance Management, Fault Management, Configuration Management, Security Managements, Accounting Managements. Network Management Configuration: Centralized Configuration, Di stributed Configuration. Selected Management Strategy.

Module-II: Management Information Base (MIB):
MIB, Structure of Management Information, NMS Presentation of the SMI, NMS Meter-ware Network view. Remote Monitoring (RMON), RMON Group.Desktop Management: Desktop Management Interface (DMI), DMI Architecture, DMI Browser, DMV/SNMP Mapping, Desktop SNMP Extension Agents. Setting up LAN Access, SNMP Configuration.

Module-III: OSI Layering:
OSI Layering-TCP/IP Layering, Protocols & Standards, Internet standards, Internet administration, Internet Addresses, Internet protocol: introduction, IP header, IP routing, Subnet addressing, subnet mask, special case of IP addresses, Comparative Study of IPV4 & IPV6, port numbers Address Resolution Protocol, ARP packet format, Proxy ARP, ARP command, ARP Example, Reverse Address Resolution Protocol (RARP): Introduction, RARP Packet format, RARP Examples, RARP server design.

Module-IV Delivery and Routing:
Delivery and Routing of IP Packets, Routing Methods, Static versus Dynamic Routing, Routing table. And Routing Module, Classless Addressing: CIDR. Internet Protocol (IP), Datagram, Fragmentation, Options, IP Package. Interior and Exterior Routing, Routing information protocol (RIP), Open shortest path first protocol (OSPF). BGP, GGP. Private Networks. Virtual Private Network (VPN), Network Address Translation (NAT).

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Module-V: Internet Control Message Protocols (ICMP):
Types of message, message format. error reporting, query, checksum, ICMP Package. IGMP, IGMP Message and its operation, IGMP package.Transmission control protocol, Process-to-Process Communication. TCP Services Flow Control, TCP Timers. TCP Operation, TCP Package. Application layers protocols Telnet Protocol. File Transfer Protocol (FTP), Simple Mail Transfer Protocol (SMTP). X-Window system protocol, Remote procedure call, and Network file system.

Reference Books:

1. Forouzan. TCP/IP Protocol Suite 4th edition, TMH
2. J.RichardBurkey. Netrvork Management Concept and Practice. PHI
3. Stevens,'I'CP/IP Illustrated Volume-I, Pearson
4. Tittel:TCP/IP, Cenage Learning
5. [-iyless Black. TCP,IP and related protocols, McGrarv Hill.
6. DougJrals E. Comer, Internetr+'orking with TCP/IP Vol. I, Principles" Protocols, and Architecture, Prentice
Hall,India.

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

CO1	Explain and demonstrate Network Management Architecture, Routing & Protocols used for Network Management.
CO2	Select Routing methods and Protocols for Network Based Management & Construct Computer Network.
CO3	Compare Routing Strategies, Networks Configuration and various protocols
CO4	Select network Management Protocols Maintain the network by performing routine maintenance tasks.

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		End Sem	Mid Sem Exam	Quiz/ Assignment	End Sem	Lab Work					
AI72C	Cyber Security	70	20	10	-	-	100	3	1	_	4

Module-I: Introduction to Cyber security:
Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and webtechnology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept ofcyber security, Issues and challenges of cyber security.

Module-II: Cyber-crime and Cyber law:
Classification of cyber-crimes, CommonCyber-crimes- cyber-crime targeting computers and mobiles, cyber-crime againstwomen and children, financial frauds, social engineering attacks, malware andransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi,Reporting of cyber-crimes, Remedial and mitigation measures, Legal perspectiveof cyber-crime, IT Act 2000 and its amendments, Cyber-crime and offences,Organisations dealing with Cyber-crime and Cyber security in India, Case studies.

Module-III: Social Media Overview and Security:
Introduction to Social networks. Types of social media, social media platforms, social media monitoring, Hashtag, Viral content, Social media marketing, social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of social media, Case studies.

Module -IV: E-Commerce and Digital Payments:
Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commercethreats, E-Commerce security best practices, Introduction to digital payments,Components of digital payment and stake holders, Modes of digital payments-BankingCards, Unified Payment Interface (UPI), e-Wallets, Unstructured SupplementaryService Data (USSD), Aadhar enabled payments, Digital payments relatedcommon frauds and preventive measures. RBI guidelines on digital payments andcustomer protection in unauthorised banking transactions. Relevant provisions of Payment Settlement Act,2007.

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Module- V: Digital Devices Security, Tools and Technologies for Cyber Security:
End Point device and Mobile phone security, Password policy, Security patchmanagement, Data backup, Downloading and management of third-party software,Device security policy, Cyber Security best practices, Significance of host firewall andAnt-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration ofbasic security policy and permissions.

Reference Books:

1. Cyber Crime Impact in the New Millennium, by R. C Mishra , Auther Press. Edition2010.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and LegalPerspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (FirstEdition, 2011)
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities byHenry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13thNovember, 2001)
4. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
5. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
6. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition,Wiley India Pvt. Ltd.
7. Fundamentals of Network Security by E. Maiwald, McGraw Hill.

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		End Sem	Mid Sem Exam	Quiz/ Assignment	End Sem	Lab Work					
AI73	Big Data Analysis	70	20	10	30	20	150	3	-	2	4

Module-I Introduction to Big Data
Introduction: Big Data - Characteristics of Big Data - Big data management architecture - Examining Big Data Types - Big Data Technology Components - Big data analytics - Big data analytics examples - Web Data Overview - Web Data in Action.

UNIT- II Hadoop
Introduction: History of Hadoop - Hadoop Ecosystem - Analyzing data with Hadoop - Hadoop Distributed File System - Design - HDFS concepts - Hadoop filesystem - Data flow – Hadoop I / O - Data integrity - Serialization - Setting up a Hadoop cluster - Cluster specification - cluster setup and installation - YARN.

UNIT- III MapReduce
Introduction: Understanding MapReduce functions - Scaling out - Anatomy of a MapReduce Job Run - Failures - Shuffle and sort - MapReduce types and formats - features - counters - sorting - MapReduce Applications – Configuring and setting the environment - Unit test with MR unit - local test.

UNIT- IV Spark
Installing spark - Spark applications - Jobs - Stages and Tasks - Resilient Distributed databases - Anatomy of a Spark Job Run - Spark on YARN - SCALA: Introduction - Classes and objects - Basic types and operators - builtin control structures - functions and closures - inheritance.

UNIT- V NoSQL Databases
Introduction to NoSQL – MongoDB: Introduction - Data types - Creating - Updating and deleing documents - Querying - Introduction to indexing - Capped collections - Hbase: Concepts - Hbase Vs RDBMS - Creating records - Accessing data - Updating and deleting data - Modifying data - exporting and importing data. USE CASES: Call detail log analysis - Credit fraud alert - Weather forecast.

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Reference Books

1.David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, No SQL, and Graph", Morgan Kaufmann/Elsevier Publishers, 2013.
2.Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
3.Kim H. Pries, Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers", CRC Press, 2015.
4.EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley Publishers, 2015.
5.Simon Walkowiak, "Big Data Analytics with R", PackT Publishers, 2016.

Course Outcomes

Upon completion of this course, the students will be able to:

CO1	Understand the characteristics of big data and concepts of Hadoop ecosystem
CO2	Implement the fundamental concepts of programming for Big Data.
CO3	Apply Mapreduce programming model to process big data
CO4	Analyze Spark and its uses for big data processing
CO5	Design programs for big data applications using Hadoop components

Lab Work – AI 71Lab

All the Experiments and Programme as per syllabus would be assigned by the Subject Professor.

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		End Sem	Mid Sem Exam	Quiz/ Assignment	End Sem	Lab Work					
AI74	Digital Image Processing	70	20	10	30	20	150	3	-	2	4

Module-I Introduction
Fundamentals of Image Processing - Applications of Image Processing –Image acquisition Introduction to Image Formation - Sampling and Quantization - Binary Image -,Grey Image, Negative image-Image Matrix- Image formats,Three-Dimensional Imaging - Image file formats - Color and Color Imagery: Perception of Colors.

Module-II Image Transforms
Introduction and Applied solutions of different transforms- Fourier Transforms – Discrete Fourier Transform ,Discrete Cosine Transform, Walsh-transform, Slant, Hilbert, Hadmard, Hough transform , Karhaunen Loeve Transform, Haar Transform ,Discrete Wavelet Transform: and Extension to 2D Signals - Lifting Implementation of the Discrete Wavelet Transforms.

Module-III Image Enhancement and Restoration
Introduction - Distinction between image enhancement and restoration - Histogram-based Contrast Enhancement - Frequency Domain Methods of Image Enhancement - Noise Modelling - Image Restoration - Image Reconstruction. Enhancement: Median filtering, Low pass filtering, Averaging of multiple images, Edge detection - Edge linking via - Thresholding - Region based segmentation, Image sharpening by differentiation and high pass filtering. Restoration: Circulant matrices, Block circulantmatrices, Inverse filtering, Wiener filter.

Module- IV Image Compression
Need of Compression, Watershed algorithm - Use of motion in segmentation - Block diagrams Encoder-Decoder model - Types of redundancies - Lossy and Lossless compression. Different types of Image compression techniques and standards, CCITT, JPEG, JPEG2000, Video Compression Standards.

UNIT- V Recognition of Image Patterns
Introduction - Decision Theoretic Pattern Classification - LDA - Bayesian Decision Theory - Texture and Shape Analysis - Case study - Image mining and Content-Based Retrieval.

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Reference Books

1.Gonzalez, Woods, "Digital Image Processing", Third Edition (DIP/3e), Prentice Hall, 2008.
2.A.K.Jain Digital Image Processing
3.Tinku Acharya, Ajoy K. Ray, "Image Processing Principles and Applications", John Wiley & Sons Publishers, 2005.
4Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Second Edition, Gatesmark Publishing, 2009.
5.Maria Petrou, Costas Petrou, "Image Processing the Fundamentals", Second Edition, John-Wiley and Sons Publishers, 2010.

Course Outcomes

Upon completion of this course, the students will be able to:

CO1	Understand Digital Image Processing, enhancement and restoration techniques .
CO2	Apply Different Image transforms for processing and conversion in different domain of images .
CO3	Apply image compression and segmentation Techniques, awareness of different Compression Standards.
CO4	Design and develop image processing techniques for Pattern recognition and Identification.

Lab Work – AI 74 Lab

All the Experiments and Programme as per syllabus would be assigned by the Subject Professor.

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Bachelor of Technology (B.Tech.) VII Semester (Artificial Intelligence & Data Science)
COURSE CONTENTS w. e. f. July 2023

Subject Code	Subject Name & Title	Maximum Marks Allocated						Hours/ Weeks			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem Exam	Quiz/ Assignment	End Sem	Lab Work					
AI75	Statistical Data Analysis	70	20	10	30	20	150	3	-	2	4

Module-I Introduction:
Basics of Statistical Data Analysis,Types of Statistical Data Analysis, Clustering and its applications, All live data retrival based Applications.

Module- II Descriptive Data Analytics:
Introduction, descriptive vs predictive vs prescriptive data analytics. Clustering: definition, applications and examples, objective functions: Intracluster and Intercluster distance, clustering method taxonomy, hard clustering, soft clustering.

Module- III K-Means:
key points, procedure, stopping criteria, various distance matrices, distance calculation, examples, choosing an appropriate number of clusters, limitations, assumptions.

Module-IV Hierarchical Clustering:
Introduction and background, divisive method, agglomerative method, dendrogram, agglomerative clustering algorithm, linkage methods: single linkage, complete linkage, average linkage, Centroid distance, time complexity .

Module-V Density based clustering:
Introduction and background, Density-Based Spatial Clustering of Applications with Noise (DBSCAN), parameters: eps (ε), MinPt, Core point, Border point, Noise point, Directly density-reachable, Density-reachable , Density-connected, DBSCAN procedure, advantages, limitations. Assign applied problems.

DEAN
Academic
JEC, Jabalpur (M.P.)

Reference Books:

1.An Introduction to Statistical Learning, Gareth James, Springer.
2.Paul L. Meyer, Addison-Wesley, Introductory Probability and Statistical Applications, 1966.

Course Outcomes-Upon completion of this course, the students will be able to:

CO1	Understanding of Statistical analysis of Data
CO2	Implement different techniques for statiscally data analysis
CO3	Design different algorithm and techniques for all types of statistics and data analytics

Lab Work – AI 75 Lab

All the Experiments and Programme as per syllabus would be assigned by the Subject Professor.

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