

3rd Semester

PROGRAM ELECTIVE-V

Course Title: Big Data Processing Frameworks						
Course Code: MCSEDA324				Examination Scheme		
Total Number of Lecture Hours: 50				External	54	
				Internal	21	
Lecture (L)	3	Practical (P)	0	Tutorial (T)	0	Total Credits 3

Course Objectives

1. To understand the core concepts and architecture of big data processing frameworks.
2. To enable students to process and analyze massive datasets using distributed computing tools like Hadoop and Spark.
3. To develop practical skills in data ingestion, transformation, and real-time analytics using modern big data frameworks.
4. To apply scalable algorithms and best practices in big data application development.

Course Content	No. of Teaching Hours
UNIT 1	10 Hrs

Introduction to Big Data and Hadoop Ecosystem

Characteristics of Big Data: Volume, Velocity, Variety, Veracity, Value, Challenges in Big Data Management, Hadoop Architecture: HDFS, MapReduce, YARN, Hadoop Ecosystem Tools: Hive, Pig, HBase, Flume, Sqoop

UNIT 2	12 Hrs
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Apache Spark Fundamentals

Spark Architecture and Components: Driver, Executor, Cluster Manager, RDDs and DataFrames, Transformations and Actions, Spark SQL and DataFrames, Introduction to Structured Streaming

UNIT 3	12 Hrs
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Data Processing and Analytics in Spark

Data ingestion using Kafka, Flume, and Sqoop, ETL operations in Spark, Machine Learning with Spark MLlib, Graph Processing with GraphX, Spark Tuning and Performance Optimization

UNIT 4	14 Hrs
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Real-Time Processing and Case Studies

Real-time Data Processing using Spark Streaming, Integration with NoSQL databases: Cassandra, HBase, Case Studies: Log Analysis, Fraud Detection, Recommendation Systems, Industry Use Cases and Trends in Big Data Frameworks

Recommended Books:

1. Tom White, "Hadoop: The Definitive Guide," O'Reilly Media.
2. Holden Karau, Andy Konwinski, Patrick Wendell, and Matei Zaharia, "Learning Spark," O'Reilly Media.
3. Bill Chambers and Matei Zaharia, "Spark: The Definitive Guide," O'Reilly Media.
4. Chuck Lam, "Hadoop in Action," Manning Publications

Course Outcomes

1. Understand and explain big data architecture, tools, and frameworks.
2. Develop and deploy big data applications using Hadoop and Spark.
3. Perform batch and real-time analytics using Spark SQL and Streaming.
4. Evaluate and apply big data frameworks to solve real-world business problems.

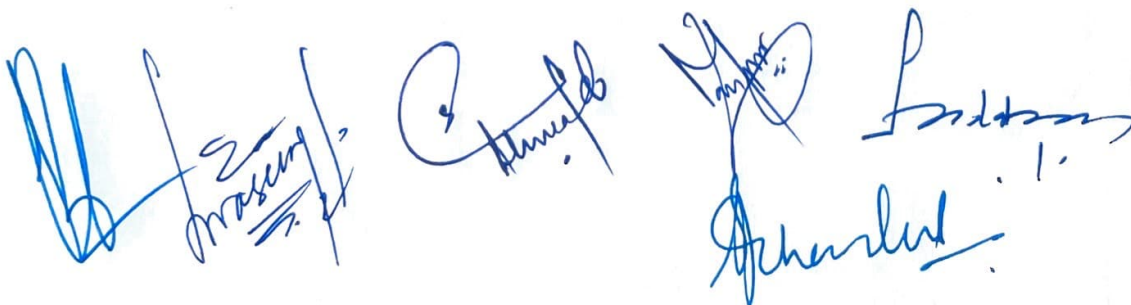
Level of CO-PO Mapping

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	-	-	3	-	-	-	-	1	-	-
2	3	3	2	2	3	-	-	-	-	2	-	-
3	2	3	3	2	3	-	-	-	-	2	-	-
4	2	3	3	3	3	-	-	-	-	2	2	-

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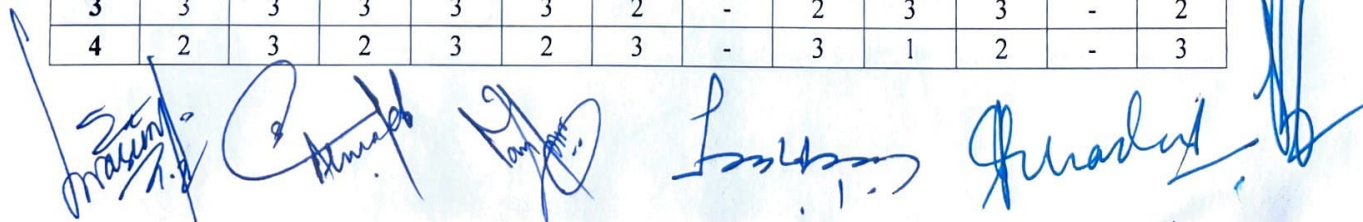
Course Title: Cloud Computing												
Course Code: MCSEDAB324								Examination Scheme				
Total Number of Lecture Hours: 50								External		54		
								Internal		21		
Lecture (L)	3	Practical (P)	0	Tutorial (T)	0	Total Credits			3			
Course Objectives												
<ul style="list-style-type: none">introduce the basic concepts and principles of Cloud Computing, its architecture, and service models.develop the ability to design and deploy scalable, reliable, and cost-efficient cloud-based applications.impart knowledge about various cloud deployment models (public, private, hybrid) and cloud architecture patterns.												
Course Content								No. of Teaching Hours				
UNIT 1								10 Hrs				
Overview of Computing Paradigm: Recent trends in Computing: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing. Evolution of cloud computing, business driver for adopting cloud computing. Introduction to Cloud Computing: Introduction to Cloud Computing (NIST Model), History of Cloud Computing, Cloud service providers. Properties, Characteristics & Disadvantages, Role of Open Standards. Cloud Computing Architecture: Cloud computing stack: Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services. Service Models (XaaS): Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS)												
UNIT 2								10 Hrs				
Deployment Models: Public cloud, Private cloud, Hybrid cloud, Community cloud Infrastructure as a Service (IaaS): IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, and Virtual Machine (VM). Resource Virtualization: Server, Storage, Network. Virtual Machine (resource) provisioning and manageability, storage as a service, Data storage in cloud computing (storage as a service). Examples: Amazon EC2, Renting, EC2 Compute Unit, Platform and Storage, pricing, customers												
UNIT 3								10 Hrs				
Platform as a Service (PaaS): What is PaaS? Service Oriented Architecture (SOA). Cloud Platform and Management: Computation, Storage. Examples: Google App Engine, MS Azure Software as a Service (SaaS): Introduction to SaaS, Web services, Web 2.0, Web OS, Case Study SaaS												
UNIT 4								10 Hrs				
Service Management in Cloud Computing: Service Level Agreements (SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously, Managing Data Cloud Security: Infrastructure Security: Network level security, Host level security, Application level security. Data security and Storage: Data privacy and security Issues, Jurisdictional issues raised by Data location. Identity & Access Management. Authentication in cloud computing. Case Study on Open Source & Commercial Clouds: Eucalyptus, Microsoft Azure, Amazon EC2												
Recommended Books:												
<ol style="list-style-type: none">Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010Cloud Computing: Principles & Paradigms, Editors: R. Buyya, J. Broberg, Andrzej, Wile, 2011Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010												
Course Outcomes:												
<ol style="list-style-type: none">Explain cloud computing principles and service models.Successfully deploy and manage cloud-based applications.Apply best practices for cloud service management.Assess the economic aspects of cloud computing platforms												
Level of CO-PO Mapping												
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	2	2	1	2	3	1	2	-	-	2	-	1
2	2	3	2	3	3	2	1	1	-	2	1	1
3	1	2	2	2	2	3	3	1	-	1	2	3
4	2	3	2	3	1	2	1	1	-	3	3	3

Course Title: Distributed Databases												
Course Code: MCSEDAC324								Examination Scheme				
Total Number of Lecture Hours: 50								External		54		
								Internal		21		
Lecture (L)	3	Practical (P)	0	Tutorial (T)				0	Total Credits		3	
Course Objectives												
1. To understand the architecture and key concepts of distributed databases.												
2. To explore query processing and optimization techniques in distributed environments.												
3. To study transaction management, concurrency control, and recovery mechanisms in distributed systems.												
4. To examine distributed data storage, replication, and distributed system reliability.												
Course Content								No. of Teaching Hours				
UNIT 1								10 Hrs				
Introduction to Distributed Databases												
Distributed database concepts and architecture, Goals and challenges of distributed databases, Types of distributed databases, Data fragmentation, allocation, and replication												
UNIT 2								12 Hrs				
Distributed Query Processing												
Query decomposition and data localization, Query optimization techniques, Join strategies in distributed databases, Cost models for distributed query optimization												
UNIT 3								12 Hrs				
Transaction Management in Distributed Databases												
ACID properties in distributed context, Distributed transactions and commit protocols (2PC, 3PC), Concurrency control: locking mechanisms, timestamp ordering, Deadlock detection and resolution												
UNIT 4								14 Hrs				
Reliability, Replication, and Current Trends												
Distributed database recovery techniques, Database replication: models and consistency, Fault tolerance and system reliability, Trends: NoSQL and NewSQL in distributed environments												
Recommended Books												
1. M. Tamer Özsu and Patrick Valduriez, Principles of Distributed Database Systems, Springer, 4th Ed.												
2. Stefano Ceri and Giuseppe Pelagatti, Distributed Databases: Principles and Systems, McGraw-Hill												
3. Elmasri and Navathe, Fundamentals of Database Systems, Pearson												
4. Recent papers and articles on distributed data management from IEEE/ACM Digital Libraries												
Course Outcomes: After successful completion of this course, the student will be able to:												
1. Explain the architecture, models, and design issues of distributed databases.												
2. Analyze distributed query processing and optimization strategies.												
3. Apply concurrency control and recovery techniques in a distributed setting.												
4. Evaluate data fragmentation, replication, and consistency models in distributed environments.												
Level of CO-PO Mapping												
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	2	2	2	0	0	0	0	0	0	1
2	3	3	3	2	2	0	0	0	0	1	0	1
3	2	3	3	3	3	0	0	0	0	1	0	1
4	2	2	3	2	3	1	0	1	1	1	0	2



Course Title: Natural Language Processing												
Course Code: MCSEDAD324								Examination Scheme				
Total Number of Lecture Hours: 50								External		54		
								Internal		21		
Lecture (L)	3	Practical (P)	0	Tutorial (T)	0	Total Credits			3			
Course Objectives												
1. To provide students with a comprehensive understanding of the key concepts, techniques, and tools used in Natural Language Processing (NLP).												
2. To familiarize students with linguistic resources and statistical models used in various NLP tasks.												
3. To explore advanced topics like discourse analysis, machine translation, & ethical challenges in NLP.												
Course Content								No. of Teaching Hours				
UNIT 1								14 Hrs				
Human languages, ambiguity, and language processing paradigms. Phases in natural language processing and key applications. Text representation and encoding schemes in computers. Linguistic resources – corpus creation, balanced corpora. Regular expressions and finite state automata for word recognition and lexical analysis. Morphological analysis and finite state transducers. Introduction to statistical approaches – n-gram models, smoothing techniques, and entropy. Overview of classification models – HMM, Maximum Entropy, and CRF. Part-of-speech tagging – stochastic tagging, HMM-based tagging, and transformation-based tagging (TBL); handling unknown words and named entities.												
UNIT 2								12 Hrs				
Overview of natural language grammars; basic linguistic elements – lexemes, phonemes, phrases, idioms. Grammatical constructs – word order, agreement, tense, aspect, and mood. Context-free grammars and their role in natural language syntax. Parsing strategies – unification-based parsing and probabilistic parsing using TreeBank data. Introduction to semantics – meaning representation, lexical semantics, and the use of WordNet. Word Sense Disambiguation.												
UNIT 3								12 Hrs				
Discourse analysis – reference resolution, co-reference constraints, pronoun resolution, and discourse coherence. Applications of NLP – spell-checking, text summarization, and information retrieval. Vector space model, term weighting, and linguistic challenges such as synonymy and polysemy. Introduction to machine translation – basic methods and challenges.												
UNIT 4								10 Hrs				
Formal language theory and the Chomsky hierarchy in the context of NLP. Overview of structured prediction with Conditional Random Fields. Challenges in NLP – ambiguity, sparse data, low-resource language processing, and multilingual NLP. Ethical issues in NLP – bias, fairness, and interpretability in language technologies. Recent trends – pre-trained transformers (e.g., BERT, GPT), large-scale language modeling, and emerging directions in NLP research												
Recommended Books												
1. "An Introduction to Natural Language Processing, Third Edition" by Daniel Jurafsky and James H. Martin, Tata McGraw-Hill												
2. "Computational Linguistics and Speech Recognition" by James H. Martin, Pearson Education												
3. "Natural Language Processing with Python" by S Bird, E Klein, and Edward Loper O'Reilly Media												
4. "Foundations of Statistical Natural Language Processing" Christopher D. Manning and Hinrich Schutze, MIT Press												
Course Outcomes												
CO1: Understand the foundational concepts and techniques in NLP, including text representation and linguistic resources.												
CO2: Apply NLP methods such as part-of-speech tagging, parsing, and word sense disambiguation.												
CO3: Solve practical problems in information retrieval, discourse analysis, and machine translation.												
CO4: Identify & evaluate challenges in NLP, including ambiguity, resource limitations, and ethical issues.												
Level of CO-PO Mapping												
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	1	2	2	1	-	1	1	2	-	2
2	3	3	2	3	3	1	-	1	2	2	-	2
3	3	3	3	3	3	2	-	2	3	3	-	2
4	2	3	2	3	2	3	-	3	1	2	-	3

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Course Title: Social Network Data Analytics												
Course Code: MCSEDA324						Examination Scheme						
Total Number of Lecture Hours: 50						External		54				
						Internal		21				
Lecture (L)	3	Practical (P)	0	Tutorial (T)		0	Total Credits		3			
Course Objectives												
1. To understand the basic concepts and models of social network analysis.												
2. To explore methods for analyzing the structure and dynamics of social networks.												
3. To study algorithms for mining data from large-scale social networks.												
4. To gain insight into real-world applications like influence maximization, link prediction, and recommendation.												
Course Content						No. of Teaching Hours						
UNIT 1						10 Hrs						
Introduction to Social Networks												
Social network definition and types (online/offline, explicit/implicit), Graph theory basics: nodes, edges, degree, paths, Properties of social networks: small world, scale-free, clustering, Examples: Facebook, Twitter, LinkedIn, citation networks												
UNIT 2						12 Hrs						
Network Measures and Models												
Centrality measures: degree, betweenness, closeness, eigenvector, Community detection: modularity, hierarchical clustering, Random graph models: Erdős-Rényi, Watts-Strogatz, Barabási-Albert, Influence and homophily in networks												
UNIT 3						12 Hrs						
Mining Social Network Data												
Crawling social network data, Link prediction techniques, Influence maximization models (independent cascade, linear threshold), Recommendation systems in social networks.												
UNIT 4						14 Hrs						
Applications and Tools												
Real-world applications: marketing, health, security, Case studies: misinformation detection, political polarization, Tools: Gephi, NetworkX, SNAP, Neo4j, Ethical issues in social network analysis (privacy, bias, fairness)												
Recommended Books:												
1. Charu C. Aggarwal, Social Network Data Analytics, Springer												
2. David Easley and Jon Kleinberg, Networks, Crowds, and Markets, Cambridge University Press												
3. Stanley Wasserman and Katherine Faust, Social Network Analysis: Methods and Applications, Cambridge University Press												
4. Matthew A. Russell, Mining the Social Web, O'Reilly Media												
5. Research papers from ACM/IEEE conferences (WSDM, KDD, WWW)												
Course Outcomes												
After successful completion of this course, students will be able to:												
1. Explain the fundamentals and types of social networks and their properties.												
2. Apply network analysis metrics and models to interpret social graphs.												
3. Implement and evaluate algorithms for mining social network data.												
4. Analyze applications of social network analysis in various domains such as marketing, recommendation, and cybersecurity.												
Level of CO-PO Mapping												
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	1	1	1	0	0	1	0	0	0	1
2	3	3	2	2	2	1	1	1	0	1	0	2
3	3	3	3	3	3	1	1	1	1	1	1	2
4	3	2	3	2	3	1	1	2	1	2	1	-

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Course Title: GPU Computing												
Course Code: MCSEDAF324									Examination Scheme			
Total Number of Lecture Hours: 48									External		54	
									Internal		21	
Lecture (L)	3	Practical (P)	0	Tutorial (T)	0	Total Credits			3			
Course Objectives												
<ul style="list-style-type: none">• Introduction to parallel computing paradigms with a focus on GPU• Harness the massively parallel GPU architecture for solving computationally demanding tasks.• Introduction to NVIDIA CUDA and industry standard OpenCL frameworks.• Understanding GPU programming through scientific computational problems.												
Course Content									No. of Teaching Hours			
UNIT 1									12 Hrs			
Review of traditional computer architecture, Brief history, GPU Architecture, Clock speeds, CPU / GPU comparisons, Heterogeneity, Accelerators, Parallel programming, CUDA OpenCL / OpenACC, Kernels Launch parameters, Thread hierarchy, Warps/Wavefronts, Threadblocks/Workgroups, Streaming multiprocessors, 1D/2D/3D thread mapping, Device properties, Simple programs												
UNIT 2									12 Hrs			
Memory hierarchy, Locality of reference, Spatial and temporal locality, DRAM / global, local / shared, private / local, textures, Constant memory, Pointers, Parameter passing, Arrays and dynamic memory, Multi-dimensional arrays, Memory allocation, Memory copying across devices, Programs with matrices, Performance evaluation with different memories, Unified virtual memory												
UNIT 3									12 Hrs			
Synchronization: Memory consistency, Barriers (local versus global), Atomics, Memory fence. Prefix sum, Reduction, Programs for concurrent data, Structures such as worklists, linked-lists. Synchronization across CPU and GPU, Functions: device functions, host functions, kernels functions, Using libraries (such as Thrust), and developing libraries.												
UNIT 4									12 Hrs			
Programming support, Debugging GPU programs, Profiling, Profile tools, Performance aspects, Streams: Asynchronous processing, tasks, Task-dependence, Overlapped data transfers, Default stream, Synchronization with streams, Events, Event-based synchronization - Overlapping data transfer and kernel execution, pitfalls, Case studies: Image Processing, Graph algorithms, Simulations, Deep learning												
Recommended Books:												
<ul style="list-style-type: none">• David Kirk and Wen-mei Hwu, Programming Massively Parallel Processors: A Hands-On Approach, 2nd Edition, Publisher: Morgan Kaufman, 2012.• Shane Cook, CUDA Programming: A Developer's Guide to Parallel Computing with GPUs, Morgan Kaufman; 2012.• The CUDA Handbook: A Comprehensive Guide to GPU Programming: 1st edition, 2nd edition.												
Course Outcomes:												
<ol style="list-style-type: none">1. Understand parallel computing paradigms including GPU architecture and development frameworks viz. CUDA and OpenCL.2. Analyse memory hierarchy and comprehend advanced concepts like unified virtual memory.3. Implement efficient algorithms for common application kernels, such as matrix multiplication.4. Highlight the important role of GPUs in domains such as image processing, deep learning, etc.												
Level of CO-PO Mapping												
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	2	2	2	0	0	0	0	0	0	1
2	3	3	3	3	2	0	0	1	0	0	0	2
3	3	3	3	3	3	0	0	0	0	1	0	2
4	3	2	2	2	3	1	1	2	1	2	1	3

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OPEN ELECTIVE
(MCSEOXX324)

Course Title: Business Analytics												
Course Code: MCSEOBA324								Examination Scheme				
Total Number of Lecture Hours: 40								External		54		
								Internal		21		
Lecture (L)	3	Practical (P)	0	Tutorial (T)	0	Total Credits			3			
Course Objectives												
<ul style="list-style-type: none">Understand the role of business analytics within an organization.Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization. Gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.To become familiar with processes needed to develop, report, and analyze business data.Use decision-making tools/Operations research techniques.Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.												
Course Content								No. of Teaching Hours				
UNIT 1								10Hrs				
Business analytics: Overview and scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process & organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Review of probability distribution and data modelling, sampling & estimation methods overview. Trendiness & Regression Analysis: Modelling Relationships & Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, Visualizing & Exploring Data, Business Analytics Technology.												
UNIT 2								10 Hrs				
Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.												
UNIT 3								10 Hrs				
Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.												
UNIT 4								10 Hrs				
Decision Analysis: Formulating Decision Problems, Decision Strategies with Outcome Probabilities, Decision Trees, Value of Information, Utility and Decision Making. Recent Trends in: Embedded & collaborative business intelligence, Visual data recovery, Data Storytelling & Data journalism.												
Recommended Books:												
<ol style="list-style-type: none">Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.Business Analytics by James Evans, persons Education.												
Course Outcomes: After completing this course the students will:												
<ol style="list-style-type: none">demonstrate knowledge of data analytics.demonstrate the ability of think critically in making decisions based on data and deep analytics.demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.demonstrate the ability to translate data into clear, actionable insights.												
Level of CO-PO Mapping												
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	2	2	2	1	1	1	1	2	1	2
2	3	3	3	3	2	2	1	1	1	2	1	3
3	3	3	3	3	3	2	1	1	2	2	1	3
4	3	3	3	3	2	2	1	1	2	3	1	3

Course Title: Industrial Safety												
Course Code: MCSEOIS324								Examination Scheme				
Total Number of Lecture Hours: 40								External		54		
								Internal		21		
Lecture (L)	3	Practical (P)	0	Tutorial (T)	0	Total Credits			3			
Course Objectives												
<ul style="list-style-type: none">To provide fundamental knowledge of industrial safety measures, accident prevention techniques, and legal safety frameworks.To introduce maintenance engineering concepts, like cost, wear, corrosion, and prevention strategies.To develop skills for systematic fault tracing and maintenance of industrial machinery and equipment.To promote the practice of periodic and preventive maintenance for enhancing equipment life and operational efficiency.												
Course Content								No. of Teaching Hours				
UNIT 1								10Hrs				
Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.												
UNIT 2								10 Hrs				
Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment. Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.												
UNIT 3								10 Hrs				
Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault-finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.												
UNIT 4								10 Hrs				
Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.												
Recommended Books:												
<ol style="list-style-type: none">Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.Maintenance Engineering, H. P. Garg, S. Chand and Company.Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.												
Course Outcomes: After completing this course the students will:												
<ol style="list-style-type: none">Understand the causes, effects, and prevention methods for industrial accidents, and explain relevant safety regulations.Apply maintenance engineering concepts to reduce equipment failures and extend service life.Develop and use decision trees for effective fault diagnosis in mechanical, hydraulic, pneumatic, thermal, and electrical systems.Plan and implement periodic and preventive maintenance schedules for different types of industrial equipment.												
Level of CO-PO Mapping												
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	2	2	2	3	3	2	1	1	2	2
2	3	3	2	3	2	2	2	2	1	2	1	2
3	3	3	3	3	3	2	1	2	2	2	2	2
4	3	3	3	3	2	2	2	2	2	2	2	3

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Dr. S. S.

Dr. S. S.

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Course Title: Operations Research												
Course Code: MCSEOOR324								Examination Scheme				
Total Number of Lecture Hours: 40								External		54		
								Internal		21		
Lecture (L)	3	Practical (P)	0	Tutorial (T)	0	Total Credits		3				
Course Objectives:												
1. To introduce students to mathematical modelling and optimization techniques for decision-making.												
2. To provide foundational knowledge of linear, non-linear, and dynamic programming problems and their solution methods.												
3. To develop analytical skills using tools such as network flow models, scheduling, inventory control, and game theory.												
4. To enable students to apply operations research techniques in real-life engineering and computational scenarios using simulation and algorithmic strategies.												
Course Content								No. of Teaching Hours				
UNIT 1								10Hrs				
Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming												
UNIT 2								10 Hrs				
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT												
UNIT 3								10 Hrs				
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.												
UNIT 4								10 Hrs				
Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation												
Recommended Books:												
1. H.A. Taha, Operations Research, An Introduction, PHI, 2008												
2. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008												
3. Hitler Libermann Operations Research: McGraw Hill Pub. 2009												
4. Pannerselvam, Operations Research: Prentice Hall of India 2010												
Course Outcomes: After completing this course the students will:												
1. Formulate and solve linear programming problems using simplex, dual simplex, and sensitivity analysis methods.												
2. Apply techniques of nonlinear programming, CPM/PERT, to solve optimization problems.												
3. Analyze inventory, scheduling, & queuing models to optimize resource allocation & service efficiency. Use advanced topics such as game theory, dynamic programming, simulation, and graph theory to model complex decision-making problems.												
Level of CO-PO Mapping												
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	3	2	2	1	1	1	1	2	1	2
2	3	3	3	3	3	2	1	1	2	2	1	2
3	3	3	3	3	2	2	1	1	1	2	1	2
4	3	3	3	3	3	2	2	2	2	2	2	3

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Course Title: Cost Management of Engineering Projects												
Course Code: MCSEOCE324						Examination Scheme						
Total Number of Lecture Hours: 40						External		54				
						Internal		21				
Lecture (L)	3	Practical (P)	0	Tutorial (T)	0	Total Credits		3				
Course Objectives												
<ul style="list-style-type: none">• To provide foundational knowledge of strategic cost management & its role in engineering projects.• To develop an understanding of cost concepts in decision-making & their application in project execution.• To equip students with the skills for cost estimation, budgeting, and cost control throughout a project's lifecycle.• To introduce tools like ERP, TQM, and optimization methods (LP, PERT/CPM) for efficient project and cost management.												
Course Content						No. of Teaching Hours						
UNIT 1						10Hrs						
Introduction and Overview of the Strategic Cost Management Process Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.												
UNIT 2						10 Hrs						
Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types & contents. Project execution Project cost control. Bar charts & Network diagram. Project commissioning: mechanical and process.												
UNIT 3						10 Hrs						
Cost Behaviour and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning,												
UNIT 4						10 Hrs						
Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing. Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.												
Recommended Books:												
<ol style="list-style-type: none">1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi2. Charles T. Horngren and George Foster, Advanced Management Accounting3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting4. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.												
Course Outcomes: After completing this course the students will:												
<ol style="list-style-type: none">4. Understand strategic cost management principles and various cost concepts applicable in decision-making.5. Explain phases of project execution & identify causes of cost overruns and control mechanisms.6. Apply marginal costing, break-even analysis, & pricing strategies to support managerial decisions.7. Implement quantitative techniques such as Linear Programming, PERT/CPM, and simulation for cost optimization.												
Level of CO-PO Mapping												
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	2	2	1	2	2	1	1	2	1	2
2	3	3	3	3	2	3	2	1	2	2	2	2
3	3	3	2	2	2	2	1	1	1	2	1	2
4	3	3	3	3	3	2	2	2	1	2	1	3

11

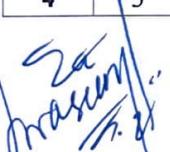


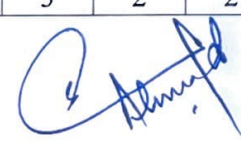
Course Title: Composite Materials												
Course Code: MCSEOCM324								Examination Scheme				
Total Number of Lecture Hours: 40								External		54		
								Internal		21		
Lecture (L)	3	Practical (P)	0	Tutorial (T)	0	Total Credits			3			
Course Objectives												
<ul style="list-style-type: none">To introduce the fundamentals, classification, and characteristics of composite materials.To develop understanding of different reinforcement materials and their roles in composites.To familiarize students with manufacturing techniques for metal, ceramic, polymer, and carbon-carbon matrix composites.To impart knowledge on mechanical behavior, strength analysis, and failure criteria of composite structures.To enhance students' skills in analyzing the properties and performance of composite materials for various engineering applications.												
Course Content								No. of Teaching Hours				
UNIT 1								10Hrs				
INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance. REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.												
UNIT 2								10 Hrs				
Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.												
UNIT 3								10 Hrs				
Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.												
UNIT 4								10 Hrs				
Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.												
Recommended Books:												
<ol style="list-style-type: none">Material Science and Technology – Vol 13 – Composites by R. W. Cahn – VCH, West Germany.Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R.Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.												
Course Outcomes: After completing this course the students will:												
<ol style="list-style-type: none">Understand the classification, advantages, and functional requirements of composite materials.Analyze the properties and preparation methods of various reinforcement fibers and particles.Evaluate manufacturing techniques for different types of matrix composites and their applications.Analyze mechanical behaviour and apply rules of mixtures to predict composite performance.												
Level of CO-PO Mapping												
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	2	1	1	2	2	1	1	1	1	2
2	3	3	3	2	2	2	2	1	1	1	1	2
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4	3	3	3	3	2	2	2	1	1	1	1	2

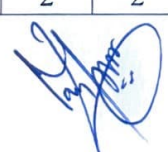
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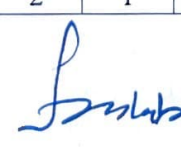


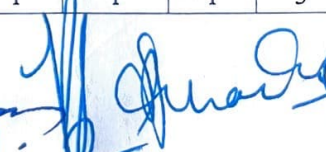
Course Title: Waste to Energy												
Course Code: MCSEOWE324							Examination Scheme					
Total Number of Lecture Hours: 40							External	54				
							Internal	21				
Lecture (L)	3	Practical (P)	0	Tutorial (T)	0	Total Credits		3				
Course Objectives												
<ul style="list-style-type: none">To introduce the fundamental concepts and classification of waste materials suitable for energy production.To understand the various thermal, thermochemical, and biochemical technologies used for energy conversion from waste.To impart knowledge about design, construction, and operational features of gasifiers, combustors, and biogas plants.To analyze and evaluate different waste-to-energy processes for sustainable energy solutions.To familiarize students with national biomass energy programs and real-world applications of waste-to-energy technologies.												
Course Content							No. of Teaching Hours					
UNIT 1							10Hrs					
Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods – Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.												
UNIT 2							10 Hrs					
Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers –Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.												
UNIT 3							10 Hrs					
Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.												
UNIT 4							10 Hrs					
Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion – Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.												
Recommended Books:												
<ol style="list-style-type: none">Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.												
Course Outcomes: After completing this course the students will:												
<ol style="list-style-type: none">Understand classification of waste and the technologies used for converting waste into energy.Analyze the design and operation of various biomass gasification and combustion systems.Evaluate the construction and working of pyrolysis devices and biogas plants.Compare different biomass conversion methods including thermochemical and biochemical processes.												
Level of CO-PO Mapping												
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	2	2	2	2	2	1	1	1	1	2
2	3	3	3	3	2	2	2	1	1	1	1	2
3	3	3	2	2	3	2	2	1	1	1	1	2
4	3	3	2	2	2	2	2	1	1	1	1	3












Course Title: Big Data Processing Frameworks Lab												
Course Code: MCSELAA324								Examination Scheme				
Total Number of Lecture Hours: 30								External		36		
								Internal		14		
Lecture (L)		0	Practical (P)		4	Tutorial (T)		0	Total Credits		2	
Course Objectives												
<div>1. To provide hands-on experience in using Hadoop and Spark frameworks.</div> <div>2. To implement data processing workflows using Hive, Pig, and Spark SQL.</div> <div>3. To practice developing streaming applications and integrating with Kafka.</div> <div>4. To apply performance tuning techniques and visualize insights.</div>												
List of Experiments												
<div>1. Setup and configuration of Hadoop and Spark environments</div> <div>2. Implementing HDFS file operations and MapReduce programs</div> <div>3. Writing HiveQL scripts for data analytics</div> <div>4. Data ingestion with Flume and Sqoop</div> <div>5. Data processing using Spark RDDs and DataFrames</div> <div>6. ETL workflow implementation in Spark</div> <div>7. Real-time streaming data processing with Spark Streaming</div> <div>8. Integration of Spark with Kafka</div> <div>9. Machine Learning using Spark MLlib</div> <div>10. Mini-project using big data pipelines (e.g., recommendation engine, fraud detection)</div>												
Course Outcomes:												
<div>1. Demonstrate Hadoop and Spark setup and perform data operations.</div> <div>2. Implement data ingestion, transformation, and querying on big datasets</div> <div>3. Develop real-time processing applications using Spark Streaming.</div> <div>4. Apply and test big data solutions for real-world analytics problems.</div>												
Level of CO-PO Mapping												
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	-	-	3	-	-	-	-	1	-	-
2	3	3	2	-	3	-	-	-	-	2	-	-
3	2	3	3	2	3	-	-	-	-	2	-	-
4	2	3	3	3	3	-	-	-	-	2	2	-










Course Title: Cloud Computing Lab							
Course Code: MCSELAB324					Examination Scheme		
Total Number of Lecture Hours:30					External	36	
					Internal	14	
Lecture (L)	0	Practical (P)	4	Tutorial (T)	0	Total Credits	2
List of Experiments							
<ol style="list-style-type: none"> 1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8. 2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs. 3. Install Google App Engine. Create hello world app and other simple web applications using python/java. 4. Use GAE launcher to launch the web applications. 5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim. 6. Find a procedure to transfer the files from one virtual machine to another virtual machine. 7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version) 8. Install Hadoop single node cluster and run simple applications like wordcount. 							
<p><i>*This is only a suggested list of experiments/simulations. The instructor is encouraged to familiarize students with additional relevant exercises.</i></p>							



Course Title: Distributed Databases Lab

Course Code: MCSELAC324

Examination Scheme

Total Number of Lecture Hours: 30

External 36

Internal 14

Lecture (L)	0	Practical (P)	4	Tutorial (T)	0	Total Credits	2
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Course Objectives

1. To implement distributed database functionalities such as fragmentation, replication, and distributed queries.
2. To simulate distributed transaction and concurrency control mechanisms.
3. To gain hands-on experience with modern distributed database platforms (e.g., MongoDB).
4. To provide practical exposure to NoSQL/NewSQL systems and replication strategies.

List of Experiments

1. **Fragmentation and Allocation:** Simulate horizontal and vertical fragmentation and perform allocation over multiple nodes.
2. **Distributed Query Execution:** Write and execute distributed queries involving joins and aggregates using PostgreSQL or MySQL clusters.
3. **Replication:** Implement basic master-slave and peer-to-peer replication models.
4. **Two-Phase Commit Protocol (2PC):** Simulate distributed transactions and 2PC.
5. **Concurrency Control:** Demonstrate concurrency control using distributed locking or timestamp ordering.
6. **NoSQL Experimentation:** Create, replicate, and query collections in MongoDB or Cassandra.
7. **Fault Tolerance:** Simulate node failure and recovery using distributed replication strategies.
8. **Case Study or Demo:** Compare query performance in a centralized vs. distributed setup.

**This is only a suggested list of experiments/simulations. The instructor is encouraged to familiarize students with additional relevant exercises.*

Course Outcomes:

After completing this lab, students will be able to:

1. Simulate fragmentation, replication, and data allocation schemes.
2. Construct and evaluate distributed queries.
3. Demonstrate distributed transaction management protocols and concurrency control.
4. Experiment with NoSQL databases and replication techniques.

Level of CO-PO Mapping

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	2	2	2	0	0	0	0	0	0	1
2	3	3	3	2	3	0	0	0	1	1	0	1
3	2	3	3	2	3	0	0	0	1	1	0	2
4	2	2	2	2	3	1	0	1	1	1	-	-

Course Title: Natural Language Processing Lab							
Course Code: MCSELAD324				Examination Scheme			
Total Number of Lecture Hours: 30				External	36		
				Internal	14		
Lecture (L)	0	Practical (P)	4	Tutorial (T)	0	Total Credits	2

Course Objectives

1. To provide students with hands-on experience in implementing foundational NLP techniques like regular expressions, finite state automata, and statistical models for text processing.
2. To familiarize students with modern NLP techniques, including **BERT-based models**, for advanced tasks like text classification, named entity recognition, and machine translation.
3. To equip students with the skills to apply and fine-tune pre-trained transformer models (like BERT) for real-world NLP applications such as sentiment analysis, discourse analysis, and information retrieval.

Suggested List of experiments

1. Implement regular expressions and finite state automata for word recognition and lexical analysis.
2. Perform morphological analysis using finite state transducers.
3. Apply statistical models such as n-grams, HMM, and CRF for tasks like part-of-speech tagging and named entity recognition.
4. Implement context-free grammar parsing and probabilistic parsing for syntactic analysis.
5. Perform word sense disambiguation using both machine learning and dictionary-based approaches.
6. Work on discourse analysis tasks like reference resolution and co-reference resolution.
7. Apply text summarization techniques for extracting key information from documents.
8. Implement BERT-based models for text classification, named entity recognition, and question answering tasks.
9. Fine-tune pre-trained BERT models on custom datasets for tasks like sentiment analysis and machine translation.
10. Complete a mini-project on an advanced NLP application, utilizing transformer-based models (e.g., BERT, GPT).

Course Outcomes:

CO1: Students will be able to implement basic NLP techniques such as word recognition, part-of-speech tagging, and syntactic parsing using traditional models and finite state automata.

CO2: Students will develop proficiency in using BERT and other transformer-based models for tasks such as text classification, named entity recognition, and question answering.

CO3: Students will be able to perform text summarization, discourse analysis, and information retrieval using modern NLP techniques and statistical models.

CO4: Students will gain experience in fine-tuning pre-trained models like BERT on custom datasets to solve real-world problems, including sentiment analysis and machine translation.

Level of CO-PO Mapping

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	2	2	2	1	-	1	2	2	-	2
2	3	3	3	3	3	1	-	1	2	3	-	3
3	3	3	3	3	3	2	-	2	3	3	-	3
4	3	3	3	3	3	1	-	1	3	3	-	3

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Course Title: Social Network Data Analytics Lab												
Course Code: MCSELA324								Examination Scheme				
Total Number of Lecture Hours: 30								External		36		
								Internal		14		
Lecture (L)	0	Practical (P)	4	Tutorial (T)				0	Total Credits		2	
Course Objectives:												
1. To provide hands-on experience with social network data collection, visualization, and analysis.												
2. To implement core algorithms for centrality, community detection, and influence analysis.												
3. To use modern tools and libraries for real-world social network data mining.												
4. To enable students to extract insights from real-world social datasets through analysis and visualization.												
List of Experiments												
1. Graph Basics: Represent and visualize simple networks using NetworkX or Gephi.												
2. Centrality Measures: Compute degree, closeness, betweenness, and eigenvector centrality.												
3. Community Detection: Apply modularity-based and label propagation algorithms.												
4. Network Structure: Identify small-world and scale-free properties in real-world datasets.												
5. Graph Visualization: Use Gephi to visualize Twitter or Facebook datasets.												
6. Social Media Crawling: Extract data from Twitter using Tweepy API.												
7. Link Prediction: Implement Jaccard, Adamic-Adar, and common neighbor algorithms.												
8. Influence Maximization: Simulate Independent Cascade and Linear Threshold models.												
9. Recommender Systems: Create a basic friend or content recommendation engine using graph proximity.												
10. Case Study: Analyze retweet/repost networks during a trending event (e.g., elections, disasters).												
*This is only a suggested list of experiments/simulations. The instructor is encouraged to familiarize students with additional relevant exercises.												
Recommended Books:												
Course Outcomes:												
After completing the lab, students will be able to:												
1. Represent and analyze social networks using real-world tools and libraries.												
2. Apply algorithms for centrality, community detection, and graph metrics.												
3. Extract, process, and visualize social media data using APIs and visualization tools.												
4. Analyze influence, recommend connections, and derive insights from large-scale networks.												
Level of CO-PO Mapping												
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	2	2	2	0	0	1	0	0	0	1
2	3	3	3	2	2	1	1	1	1	1	0	2
3	3	3	3	3	3	1	1	1	1	1	1	2
4	3	3	3	3	3	1	1	2	1	2	1	3

Handwritten signatures of faculty members in blue ink, including names like 'Masum', 'Anwar', 'Shahid', and others, located below the CO-PO mapping table.

Course Title: GPU Computing Lab									
Course Code: MCSELA324					Examination Scheme				
Total Number of Lecture Hours: 30					External		36		
					Internal		14		
Lecture (L)	0	Practical (P)	4	Tutorial (T)	0	Total Credits	2		

Course Objectives

1. To understand and explore GPU architecture and the CUDA programming model.
2. To develop efficient parallel code using CUDA/OpenCL/OpenACC for various computing problems.
3. To understand GPU memory hierarchy and optimize memory usage for performance.
4. To implement and test parallel algorithms on real-world data using GPU acceleration.

List of Experiments

1. Write simple programs using CUDA to understand kernel launches and thread hierarchies.
2. Programs using 1D, 2D, and 3D thread mapping to manipulate arrays and matrices.
3. Implement matrix operations using GPU with global memory and shared memory.
4. Use different memory types (global, shared, constant) and evaluate their performance.
5. Parallel implementation of scan and reduction algorithms using thread synchronization.
6. Explore memory consistency and atomic functions in CUDA.
7. Use NVIDIA Nsight / Visual Profiler to debug and optimize GPU programs.
8. **Mini-Project:** Choose one of the following: image filtering, graph BFS/DFS, deep learning kernel simulation, or numerical simulation using GPU.

Course Outcomes:

1. Understand the architecture of modern GPUs and fundamentals of GPU programming
2. Develop and debug CUDA programs with proper use of memory hierarchy
3. Implement parallel algorithms using thread synchronization and shared memory
4. Optimize GPU programs using profiling tools and asynchronous execution models

Level of CO-PO Mapping

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	-	-	3	-	-	-	-	1	-	-
2	3	3	2	-	3	-	-	-	-	1	-	-
3	2	3	3	2	2	-	-	-	-	2	-	-
4	2	3	3	3	3	-	-	-	-	2	2	-

Course Title: Dissertation-I/ Industrial Project							
Course Code: MCSEPD1324				Examination Scheme			
Total Number of Lecture Hours: 30				External	252		
				Internal	98		
Lecture (L)	6	Practical (P)	16	Tutorial (T)	0	Total Credits	14
Description							
<ul style="list-style-type: none"> In the Dissertation-I, students shall choose a specific topic/area for their dissertation and carry out the literature survey of the chosen area. Students are encouraged to work towards the real-life problem or issue/s of societal importance in order to ensure relevant research. Each student shall submit a dissertation report at the end of the third semester and appear in presentation/viva voce before the Departmental Committee. The dissertation report should also contain the problem specification and milestones to be achieved in solving the problem. At the beginning of the third semester, a supervisor will be assigned to each student. The Supervisor shall provide a syllabus and plan of study including relevant research papers to the student. The student shall have to maintain a proper diary reflecting the activities and progress accomplished in his/her work and update the same regularly. The Supervisor shall monitor the progress of the student on weekly basis. Out of the 98 marks stipulated for Internal Semester Evaluation (ISE) of the Dissertation-I, fifty percent shall be awarded on the basis of continuous assessment by the respective Supervisor, while the remaining fifty percent shall be evaluated during the presentation/viva-voce to be held before the Departmental Committee. The External Semester Evaluation (ESE) shall be held by an approved external examiner. The External Semester Evaluation (ESE) shall be of 252 marks. The break-up of ESE 252 marks shall be as follows: Presentation: 20% marks Viva-voce: 40 % marks Dissertation writing based on state of art, fundamentals of the topic and its viability: 40 % marks 							

Handwritten signatures of six individuals in blue ink, likely representing the Departmental Committee and the Supervisor.

4th Semester

Course Title: Dissertation-II/ Industrial Project							
Course Code: MCSEPD1424				Examination Scheme			
Total Number of Lecture Hours: 30				External	396		
				Internal	154		
Lecture (L)	8	Practical (P)	20	Tutorial (T)	4	Total Credits	22
Description							
<ul style="list-style-type: none"> Dissertation-II shall commence with the fourth semester wherein a student accumulates 22 credits on successful completion of the same. This is in addition to the Dissertation-I during the third semester wherein a student shall choose a specific research topic/area and undertake its study. A thesis outlining the entire problem, including a survey of literature (results from Dissertation-I) and the various results obtained along with their solutions is expected to be produced by each student. A Thesis Committee shall check the thesis for its completeness. A soft copy of the thesis in PDF format (in specific style) should be sent to the Thesis Committee, before its final submission. The Thesis Committee can recommend for modifications of the thesis or offer suggestions for improvement of the same for resubmission. The Thesis committee shall also examine for suitability of publication (including any possible plagiarism) before the thesis goes in print and for binding. Consequent to the thesis being accepted and approved by the Thesis Committee, the Viva-voce examination of the student shall be conducted by an approved Examiner. The candidates who fail to submit the dissertation work within the stipulated time have to submit the same at the time of next ensuing examination. Out of the 154 marks stipulated for Internal Semester Evaluation (ISE) of the Dissertation-II, fifty percent shall be awarded on the basis of continuous assessment by the respective Supervisor, while the remaining fifty percent shall be evaluated during the presentation/viva-voce to be held before the Departmental Committee. Out of the 396 marks stipulated for the External Semester Evaluation (ESE), fifty percent marks shall be awarded on the basis of viva-voce and fifty percent marks for general evaluation of thesis 							

Handwritten signatures of six individuals in blue ink, arranged in two rows. The top row contains five signatures, and the bottom row contains one signature centered below the others.