ADVANCES IN OPERATING SYSTEMS			
Course Code	**MSCS201**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3

Course Learning objectives:

- Analyze the characteristics of operating systems for multiprocessor and multicomputer architectures.
- Understand and address the challenges related to designing operating systems.
- Explore the latest trends in developing mobile operating systems.
- Evaluate the implications of these trends on performance and user experience.

Module-1	
Multiprocessor Operating Systems: System Architectures- Structures of OS – OS design issues – Process synchronization – Process Scheduling and Allocation- Memory Management.	
Teaching-Learning Process	Chalk and board and PPT

Module-2	
Distributed Operating Systems: System Architectures- Design issues – Communication models – clock synchronization – mutual exclusion – election algorithms- Distributed Deadlock detection.	
Teaching-Learning Process	Chalk and board and PPT

Module-3	
Distributed scheduling - Distributed shared memory - Distributed File system – Multimedia file systems - File placement – Caching.	
Teaching-Learning Process	Chalk and board and PPT

Module-4	
Database Operating Systems: Requirements of Database OS – Transaction process model – Synchronization primitives - Concurrency control algorithms.	
Teaching-Learning Process	Chalk and board and PPT

Module-5	
Mobile Operating Systems: ARM and Intel architectures - Power Management - Mobile OS Architectures - Underlying OS - Kernel structure and native level programming - Runtime issues- Approaches to power management.	
Teaching-Learning Process	Chalk and board and PPT

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks**or **one Skill Development Activity of 50 marks** to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

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Suggested Learning Resources:

Books

1. M Singhal and NG Shivaratri , Advanced Concepts in Operating Systems, Tata McGraw Hill Inc, 2001

Reference Book

1. A S Tanenbaum, Distributed Operating Systems, Pearson Education Asia, 2001
2. Source Wikipedia, Mobile Operating Systems, General Books LLC, 2010

Skill Development Activities Suggested

- The students, with the help of the course teacher, can take up relevant technical activities that will enhance their skills. The prepared report shall be evaluated for CIE marks.

Course outcome (Course Skill Set)

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

Sl.No.	Description	BloomsLevel
CO1	Analyze the characteristics of operating systems for multiprocessor and multicomputer architectures.	L2
CO2	Understand and address the challenges related to designing operating systems and their implications.	L3
CO3	Explore the latest trends in developing mobile operating systems and evaluate their impact on performance.	L4

Program Outcome of this course :

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Mapping of COS and POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	x		x									
CO2	x	x		x	x		x					
CO3	x		x	x								

BIG DATA ANALYTICS			
Course Code	MSAD202	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Explore the Hadoop framework and Hadoop Distributed File system
- Study HDFS and MapReduce concepts
- Employ MapReduce programming model to process the big data
- Explore the working of pig and SPARK tool

Module-1

Meet Hadoop: Data!, Data Storage and Analysis, Querying All Your Data, Beyond Batch, Comparison with Other Systems: Relational Database Management Systems, Grid Computing, Volunteer Computing Hadoop Fundamentals MapReduce: A Weather Dataset: Data Format, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop: Map and Reduce, Java MapReduce, Scaling Out: Data Flow, Combiner Functions, Running a Distributed MapReduce Job, Hadoop Streaming The Hadoop Distributed File systemThe Design of HDFS, HDFS Concepts: Blocks, Namenodes and Datanodes, HDFS Federation, HDFS High-Availability, The Command-Line Interface, Basic Filesystem Operations, HadoopFilesystems Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the FileSystem API, Writing Data, Directories, Querying the Filesystem, Deleting Data, Data Flow: Anatomy of a File Read, Anatomy of a File Write.

Teaching- Learning Process	Chalk and board /PPT /Web Contents

Module-2

YARN Anatomy of a YARN Application Run: Resource Requests, Application Lifespan, Building YARN Applications, YARN Compared to MapReduce, Scheduling in YARN: The FIFO Scheduler, The Capacity Scheduler, The Fair Scheduler, Delay Scheduling, Dominant Resource Fairness. Hadoop I/O Data Integrity, Data Integrity in HDFS, Local FileSystem, Checksum File System, Compression, Codecs, Compression and Input Splits, Using Compression in MapReduce, Serialization, The Writable Interface, Writable Classes, Implementing a Custom Writable, Serialization Frameworks, File-Based Data Structures: SequenceFile

Teaching- Learning Process	Chalk and board /PPT /Web Contents / Case Study

Module-3

Developing a MapReduce Application The Configuration API, Combining Resources, Variable Expansion, Setting Up the Development Environment, Managing Configuration, Generic Options Parser, Tool, and Tool Runner, Writing a Unit Test with MRUnit: Mapper, Reducer, Running Locally on Test Data, Running a Job in a Local Job Runner, Testing the Driver, Running on a Cluster, Packaging a Job, Launching a Job, The MapReduce Web UI, Retrieving the Results, Debugging a Job, Hadoop Logs, Tuning a Job, Profiling Tasks, MapReduce Workflows: Decomposing a Problem into MapReduce Jobs, JobControl, Apache Oozie How MapReduce WorksAnatomy of a MapReduce Job Run, Job Submission, Job Initialization, Task Assignment, Task Execution, Progress and Status Updates, Job Completion, Failures: Task Failure, Application Master Failure, Node Manager Failure, Resource Manager Failure, Shuffle and Sort: The Map Side, The Reduce Side, Configuration Tuning, Task Execution: The Task Execution Environment, Speculative Execution, Output Committers.

Teaching- Learning Process	Chalk and board /PPT /Web Contents / Case Study

Module-4

MapReduce Types and Formats:MapReduce Types, Input Formats: Input Splits and Records, Text Input, Binary Input, Multiple Inputs, Database Input (and Output) Output Formats: Text Output, Binary Output, Multiple Outputs, Lazy Output, Database Output, FlumeInstalling Flume, An Example, Transactions and Reliability, Batching, The HDFS Sink, Partitioning and Interceptors, File Formats, Fan Out, Delivery Guarantees, Replicating and Multiplexing Selectors, Distribution: Agent Tiers, Delivery Guarantees, Sink Groups, Integrating Flume with Applications, Component Catalog.

Teaching- Learning Process	Chalk and board /PPT /Web Contents

Module-5

Pig Installing and Running Pig, Execution Types, Running Pig Programs, Grunt, Pig Latin Editors, An Example: Generating Examples, Comparison with Databases, Pig Latin: Structure, Statements, Expressions, Types, Schemas, Functions, Data Processing Operators: Loading and Storing Data, Filtering Data, Grouping and Joining Data, Sorting Data, Combining and Splitting Data.
Spark An Example: Spark Applications, Jobs, Stages and Tasks, A Java Example, A Python Example, Resilient Distributed Datasets: Creation, Transformations and Actions, Persistence, Serialization, Shared Variables, Broadcast Variables, Accumulators, Anatomy of a Spark Job Run, Job Submission, DAG Construction, Task
Scheduling, Task Execution, Executors and Cluster Managers: Spark on YARN

Teaching- Learning Process	Chalk and board /PPT /Web Contents / Case Study

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks**or**oneSkill Development Activity of 50 marks** to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books:

1. *Hadoop: The Definitive Guide* ,Tom White, O'Reilley 3rd Edition, 2012.

2. *SPARK: The Definitive Guide*, Bill Chambers MateiZaharia, O'Reilley 2018.

References:

1. *Apache Flume: Distributed Log Collection for Hadoop*, D'Souza and SteveHoffman O'Reilley 2014.

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc20_cs92/

Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Figure out concepts of managing big data using Hadoop and SPARK technologies	L1
CO2	Explain HDFS and MapReduce concepts	L2
CO3	Install, configure, and run Hadoop and HDFS	L2
CO4	Perform map-reduce analytics using Hadoop and related tools (can be attained through assignments and CIE)	L3
CO5	Explain SPARK concepts (can be attained through assignments and CIE)	L3

Program Outcome of this course

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	x											x
CO2	x		x									
CO3	x		x		x							
CO4	x				x							
CO5	x				x							

INTERNET OF THINGS AND APPLICATIONS			
Course Code	MSAD203	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:1	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	04	Exam Hours	03

Course Learning objectives:

- Able to interpret the application areas of IOT ·
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks ·
- Able to interpret building blocks of Internet of Things and characteristics.

Module-1

What is The Internet of Things? Overview and Motivations, Examples of Applications, IPV6 Role, Areas of Development and Standardization, Scope of the Present Investigation. Internet of Things Definitions and frameworks-IoT Definitions, IoT Frameworks, Basic Nodal Capabilities. Internet of Things Application Examples-Overview, Smart Metering/Advanced Metering Infrastructure-Health/Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking, Over The-Air-Passive Surveillance/Ring of Steel, Control Application Examples, Myriad Other Applications.

Teaching-Learning Process	Chalk and talk/PPT/case study/web content

Module-2

Fundamental IoT Mechanism and Key Technologies-Identification of IoT Object and Services, Structural Aspects of the IoT, Key IoT Technologies. Evolving IoT Standards-Overview and Approaches, IETF IPV6 Routing Protocol for RPL Roll, Constrained Application Protocol, Representational State Transfer, ETSI M2M,Third Generation Partnership Project Service Requirements for Machine-Type Communications, CENELEC, IETF IPv6 Over Low power WPAN, Zigbee IP(ZIP),IPSO

Teaching-Learning Process	Chalk and talk/PPT/case study/web content

Module-3

Layer ½ Connectivity: Wireless Technologies for the IoT-WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M,Layer 3 Connectivity:IPv6 Technologies for the IoT: Overview and Motivations. Address Capabilities,IPv6 Protocol Overview, IPv6 Tunnelling, IPsec in IPv6,Header Compression Schemes, Quality of Service in IPv6, Migration Strategies to IPv6.

Teaching-Learning Process	Chalk and talk/PPT/case study/web content

Module-4

Case Studies illustrating IoT Design-Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.

Teaching-Learning Process	Chalk and talk/PPT/case study/web content

Module-5

Data Analytics for IoT – Introduction, Apache Hadoop, Using HadoopMapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis, Structural Health Monitoring Case Study.

Teaching-Learning Process	Chalk and talk/PPT/case study/web content

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks**or**oneSkill Development Activity of 50 marks** to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books:

1. Building the Internet of Things with IPv6 and MIPv6:The Evolving World of M2M Communications, Daniel Minoli, Wiley,2013.

2. Internet of Things: A Hands on Approach, ArshdeepBahga, Vijay Madisetti, Universities Press, 2015.

Reference Books:

1. The Internet of Things, Michael Miller, Pearson, 2015 First Edition

2. Designing Connected Products, Claire Rowland,Elizabeth Goodman et.al, O'Reilly, First Edition, 2015

Web links and Video Lectures (e-Resources):

- https://www.coursera.org/specializations/internet-of-things
- https://www.youtube.com/watch?v=Ic63-yf-zuc&list=PL3uLubnzL2Tm5PAw88N1jR9MLTJpuPEnX

Skill Development Activities Suggested

- The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Develop schemes for the applications of IOT in real time scenarios	L3
CO2	Manage the Internet resources	L1
CO3	Model the Internet of things to business	L2
CO4	Interpret data sets received through IoT devices and tools used for analysis	L1

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			x							x		
CO2							x					x
CO3			x			x						
CO4	x	x			x							

DECISION SUPPORT SYSTEM			
Course Code	MSAD214A	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Recognize the relationship between business information needs and decision making
- Select appropriate modeling techniques
- Able to Analyze, design and implement a DSS

Module-1

Introduction to decision support systems: DSS Defined, History of decision support systems, Ingredients of a DSS, Data and model management, DSS Knowledge base, User interfaces, User interfaces, The DSS user, Categories and classes of DSSs, Chapter Summary. Decisions and decision makers Decision makers: who are they, Decision styles, Decision effectiveness, How can a DSS help?, A Typology of decisions, Decision theory and simon's model of problem solving, Bounded decision making, The process of choice,
Cognitive processes, Biases and heuristics in decision making,

Teaching-Learning Process	Chalk and talk/PPT/case study/web content

Module-2

Decisions in the organization: Understanding the organization, Organizational culture. Modelling decision processes: Defining the problem and its structures, Decision models, Types of probability, Techniques for forecasting probabilities, Calibration and sensitivity

Teaching - Learning Process	Chalk and talk/PPT/case study/web content

Module-3

Group decision support and groupware technologies: Group Decision making, the problem with groups, MDM support technologies, Managing MDM activities, the virtual workspace, chapter summary. Executive information systems: What exactly is an EIS, Some EIS history, Why area top executives so different?, EIS components, Making the EIS work, The future of executive decision making and the EIS.

Teaching-Learning Process	Chalk and talk/PPT/case study/web content

Module-4

Designing and building decision support systems: Strategies for DSS analysis and design, The DSS developer, DSS user interface issues, chapter summary. Implementing and integrating decision support systems: DSS implementation, System evaluation, The importance of integration, chapter summary.

Teaching - Learning Process	Chalk and talk/PPT/case study/web content

Module-5

	Creative decision making and problem solving What is creativity?, Creativity defined, The occurrence of creativity, Creative problem solving techniques, Creativity and the role of technology, chapter summary.	
	Teaching - Learning Process	Chalk and talk/PPT/case study/web content

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks**or**oneSkill Development Activity of 50 marks** to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub- questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. *Decision support system*, George M.Marakas, PHI, 2011.
2. *Decision Support Systems*, Marakas, 2nd Edition, Pearson India, 2015.

Web links and Video Lectures (e-Resources):

https://www.coursera.org/lecture/business-intelligence-tools/decision-support-systems-video-lecture-E8P9x

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Lev	el
CO1	Appraise issues related to the development of DSS	L1	
CO2	Select appropriate modeling techniques	L2	
CO3	Analyze and implement a DSS	L3	
CO4	Demonstrate qualitative and quantitative skills and critical thinking to proficiencies in the application of theory surrounding the DSS.	L3	

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	x											x
CO2		x				x						
CO3		x	x									
CO4			x				x					x

Program Outcome of this course

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**x**											**x**
CO2		**x**				**x**						
CO3		**x**	**x**									
CO4			**x**				**x**					**x**

12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

	PREDICTIVE ANALYSIS			
	Course Code	MSAD214B	CIE Marks	50
	Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
	Total Hours of Pedagogy	40	Total Marks	100
	Credits	03	Exam Hours	03

Course Learning objectives:

- Explore various classification and regression models.
- Explore working of supervised and unsupervised algorithms.
- Identify the best working models to solve real world problems.

	Module-1	
	Overview of Supervised Learning: Introduction, Variable Types and Terminology, Two Simple Approaches to Prediction: Linear Methods for Regression and Classification: Introduction, Linear regression models and least squares, , Subset selection , Shrinkage Methods, A Comparison of the Selection and Shrinkage Methods, Linear Discriminant Analysis, Logistic regression. Text Book 1:Chapters 2.1 – 2.3, 3.1 – 3.4, 3.6, 4.1, 4.3 – 4.4	
	Teaching-Learning Process	Chalk and board / Web Content / PPT
	Module-2	
	Model Assessment and Selection: Bias, Variance, and model complexity, The Bias-variance Decomposition, Optimism of the training error rate, Estimate of In-sample prediction error, The Effective number of parameters, Bayesian approach and BIC, Cross- validation, Boot strap methods, Conditional or Expected Test Error. Text Book 1:Chapters 7.1 – 7.7, 7.10 – 7.12	
	Teaching-Learning Process	Chalk and board / Web Content / PPT
	Module-3	
	Additive Models, Trees, and Related Methods: Generalized additive models, Tree-Based Methods, Boosting and Additive Trees: Boosting Methods, Exponential Loss and AdaBoost, Example: Spam Data, Numerical Optimization via Gradient Boosting , Illustrations (California Housing , New Zealand Fish, Demographic Data) Text Book 1: Chapters 9.1 – 9.2, 10.4, 10.8, 10.10, 10.13	
	Teaching-Learning Process	Chalk and board / Web Content / PPT
	Module-4	
	Neural Networks: Introduction, Fitting Neural Networks, Some Issues in Training Neural Networks Support Vector Machines: Introduction, The Support Vector Classifier, Support Vector Machines and Kernels Unsupervised Learning and Random forests: Association rules, Cluster analysis, Details of Random Forests, Random forests and analysis. Text Book 1: Chapters 11.1, 11.3 – 11.5, 12.1 – 12.3, 14.1 – 14.3, 15.1 – 15.4	
	Teaching-Learning Process	Chalk and board / Web Content / PPT
	Module-5	

	Assessing Performance of a classification Algorithm (t-test, McNemar's test, Paired t-test, F-test), Analysis of Variance, Creating data for analytics through designed experiments. Text Book 2: Chapter 19
Teaching-Learning Process	Chalk and board / Web Content / PPT

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks**or**oneSkill Development Activity of 50 marks** to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books:

1. *The Elements of Statistical Learning-Data Mining, Inference, and Prediction Trevor Hastie*, Robert Tibshirani, Jerome Friedman Springer 2009.
2. *Introduction to Machine Learning*, E. Alpaydin PHI 2010.

Reference Books:

1. *Pattern Recognition and Machine Learning*, Christopher M. Bishop Springer 2007.
2. *All of statistics*, L.Wasserman Springer 2004.
3. *An Introduction to statistical learning with applications in R*, G. James, D. Witten, T. Hastie, R. Tibshirani Springer 2017

Web links and Video Lectures (e-Resources):

- https://www.udemy.com/tutorial/become-a-python-data-analyst/introduction-to-predictive- analytics-models/
- https://intellipaat.com/blog/what-is-predictive-analytics/
- https://www.youtube.com/watch?v=Kd0C-8q0HkI

Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Le
CO1	Apply Regression and classification models to solve real world problems(can be attained through assignment and CIE)	L3
CO2	Identify and analyze different analytical models	L2
CO3	Identify and apply Additive models to different data science related problems	L2
CO4	Apply Supervised and Unsupervised learning techniques (can be attained through assignment and CIE)	L3
CO5	Choose appropriate assessment evaluation criterion for different analytical methods	L2

Program Outcome of this course

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	x		x									
CO2	x	x										
CO3	x		x									
CO4	x		x									
CO5	x	x										

COMPUTER VISION			
Course Code	MSAD214C	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Explore the fundamentals of computer vision.
- Build skills to perform shape analysis and other computer vision operations.

Module-1

CAMERAS: Pinhole Cameras, Radiometry – Measuring Light: Light in Space, Light Surfaces, Important Special Cases, Sources, Shadows, And Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models, Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

Teaching-Learning Process	Chalk and board / Web Content / PPT

Module-2

Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, Edge Detection: Noise, Estimating Derivatives, Detecting Edges, Texture: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

Teaching-Learning Process	Chalk and board / Web Content / PPT

Module-3

The Geometry of Multiple Views: Two Views, Stereopsis: Reconstruction, Human Stereposis, Binocular Fusion, Using More Cameras, Segmentation by Clustering: What Is Segmentation?, Human Vision: Grouping and Getstalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,

Teaching-Learning Process	Chalk and board / Web Content / PPT

Module-4

Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness, Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice, Tracking With Linear Dynamic Models: Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples.

Teaching-Learning Process	Chalk and board / Web Content / PPT

Module-5

Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations, Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization, Model- Based Vision: Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.

Teaching-Learning Process	Chalk and board / Web Content / PPT

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks**or**oneSkill Development Activity of 50 marks** to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub- questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books:

1. *Computer Vision – A Modern Approach,* David A. Forsyth and Jean Ponce PHI Learning 2009

Reference Books:

2. *Computer and Machine Vision – Theory, Algorithms and Practicalities*, E. R. Davies Elsevier 4th edition, 2013

Web links and Video Lectures (e-Resources):

- https://www.projectpro.io/data-science-in-python-tutorial/computer-vision-tutorial-for- beginners
- https://www.javatpoint.com/computer-vision

Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Le
CO1	Implement fundamental image processing techniques required for computer vision	L3
CO2	Perform shape analysis	L2
CO3	Implement boundary tracking techniques	L3
CO4	Apply chain codes and other region descriptors	L3
CO5	Apply Hough Transform for line, circle, and ellipse detections.	L2

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	x		x									
CO2	x	x										
CO3	x		x									
CO4	x		x									
CO5	x	x										

Program Outcome of this course

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4

5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

	DATABASE SECURITY			
	Course Code	**MSAD214D**	CIE Marks	50
	Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
	Total Hours of Pedagogy	40	Total Marks	100
	Credits	03	Exam Hours	03

Course Learning objectives:

- Identify contemporary practices of Database system security
- Demonstrate the knowledge and skills for administration of user, profiles, password policies, privileges and roles.
- Manage database security on application level.
- Protection of New Generation Database Systems,

	Module-1	
	Introduction: Introduction to Databases, Security Problems in Databases Security Controls Conclusions. Security Models, Introduction, Access Matrix Model, Take-Grant Model, Acten Model, PN Model, Hartson and Hsiao's Model, Fernandez's Model, Bussolati and Martella's Model for Distributed databases.	
	Teaching-Learning Process	Chalk and talk/PPT/case study/web content: https://youtu.be/2YIhzk7tJI8 https://webuyusedtape.net/2022/08/11/why-data-security-is-important-in-dbms%EF%BF%BC/
	Module-2	
	Security Models 2: Bell and LaPadula's Model, Biba's Model, Dion's Model, Sea View Model, Jajodia and Sandhu's Model, The Lattice Model for the Flow Control conclusion. Security Mechanisms: Introduction, User Identification/Authentication, Memory Protection, Resource Protection, Control Flow Mechanisms, Isolation, Security Functionalities in Some Operating Systems, Trusted Computer System, Evaluation Criteria	
	Teaching-Learning Process	Chalk and talk/PPT/case study/web content: https://youtu.be/NdsP0yM1yTo
	Module-3	
	Security Software Design: Introduction, A Methodological Approach to Security, Software Design, Secure Operating System Design, Secure DBMS Design, Security Packages, Database Security Design	
	Teaching-Learning Process	Chalk and talk/PPT/case study/web content:
	Module-4	
	Statistical Database Protection & Intrusion Detection Systems: Introduction, Statistics, Concepts and Definitions, Types of Attacks, Inference Controls, evaluation Criteria for Control Comparison, Introduction IDES System, RETISS System, ASES System Discovery.	
	Teaching-Learning Process	Chalk and talk/PPT/case study/web content: https://www.howtonetwork.com/technical/security-technical/intrusion_detection_and_prevention/
	Module-5	
	Models For The Protection Of New Generation Database Systems1: Introduction, A Model for the Protection of Frame Based Systems, A Model for the Protection of Object-Oriented Systems, SORION Model for the Protection of Object-Oriented Databases. Models For The Protection Of New Generation Database Systems 2: A Model for the Protection of New Generation Database Systems, the Orion Model, Jajodia and Kogan's Model, A Model for the Protection of Active Databases Conclusions.	

	Teaching-Learning Process	Chalk and talk/PPT/case study/web content:

Assessment Details (both CIE and SEE)

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Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks**or**oneSkill Development Activity of 50 marks** to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

TEXT BOOKS

1. Database Security and Auditing Hassan A. Afyoun CENGAGE Learning 2009
2. Database Security Castano Pearson Education

REFERENCE BOOKS

1 Database security Alfred Basta, Melissa Zgola CENGAGE learning

Web links and Video Lectures (e-Resources):

- https://intellipaat.com/blog/importance-of-data-security/
- https://www.youtube.com/watch?v=HBEw6eUzDSs
- https://www.youtube.com/watch?v=D17lWqHy_3I
- https://www.youtube.com/watch?v=6xedgVwYuAg&list=PLhPyEFL5u-i0XXGLJawaTNLiXxmSp24TR

Skill Development Activities Suggested

- The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Describe at least one access control policy and mechanism for relational databases	L1
CO2	Summarize the integrity auditing techniques for outsourced databases	L2
CO3	Apply any one security technique to the distributed database systems	L3
CO4	Discuss about the Statistical Database Protection & Intrusion Detection Systems	L2

Mapping of COS and Pos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	x											
CO2				x								
CO3					x							
CO4										x		

Program Outcome of this course		
Sl. No.	**Description**	**POs**
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

BUSINESS INTELLIGENCE AND ANALYTICS			
Course Code	MSAD215A	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Be exposed with the basic rudiments of business intelligence system.
- Explore the modelling aspects behind Business Intelligence.
- Perceive the business intelligence life cycle and the techniques used in it.
- Be exposed with different data analysis tools and techniques.

Module-1

BUSINESS INTELLIGENCE Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence.

Teaching-Learning Process	Chalk and board / PPT / Web Content

Module-2

KNOWLEDGE DELIVERY The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.

Teaching-Learning Process	Chalk and board / PPT / Web Content

Module-3

EFFICIENCY Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis

Teaching-Learning Process	Chalk and board / PPT / Web Content

Module-4

BUSINESS INTELLIGENCE APPLICATIONS Marketing models – Logistic and Production models – Case studies.

Teaching-Learning Process	Chalk and board / PPT / Web Content

Module-5

FUTURE OF BUSINESS INTELLIGENCE: Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology.

Teaching-Learning Process	Chalk and board / PPT / Web Content

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks**or**oneSkill Development Activity of 50 marks** to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books:

1. *Decision Support and Business Intelligence Systems*, Efraim Turban, Ramesh Sharda, Dursun Delen, , 9 th Edition, Pearson 2013.
2. *Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making*, Larissa T. Moss, S. Atre, Addison Wesley, 2003.

Reference Books:

1. *Business Intelligence: Data Mining and Optimization for Decision Making*, Carlo Vercellis ,Wiley Publications, 2009.
2. *Business Intelligence: The Savvy Manager's Guide*, David Loshin Morgan, Kaufman Second Edition, 2012.
3. *Successful Business Intelligence: Secrets to Making BI a Killer App*, Cindi Howson, McGraw- Hill, 2007.
4. *The Data Warehouse Lifecycle Toolkit*, Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, , Wiley Publication Inc.,2007

Web links and Video Lectures (e-Resources):

- https://data-flair.training/blogs/business-intelligence/
- https://www.tutorialspoint.com/management_information_system/business_intelligence_system.h tm

Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Le
CO1	Explain the fundamentals of business intelligence and Link data mining with business intelligence.	L1
CO2	Apply various modelling techniques. (can be attained through assignment and CIE)	L3
CO3	Explain the data analysis and knowledge delivery stages.	L2
CO4	Apply business intelligence methods to various situations. (can be attained through assignment and CIE)	L3
CO5	Decide on appropriate technique.	L2

Program Outcome of this course

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	x										
CO2	x				x						
CO3			x		x						
CO4	x				x						
CO5	x		x								

ADVANCED DATABASE MANAGEMENT SYSTEM			
Course Code	MSAD215B	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	04	Exam Hours	03

Course Learning objectives:

- Strong foundation in advanced database concepts from an industry perspective.
- The database management system contributes with advanced data modelling concepts like OOD Modelling and ORD Modelling.
- The advanced database system arranges query processing and transaction management concepts for object-relational database and distributed database.

Module-1	
Review of Relational Data Model and Relational Database Constraints: Relational model concepts; Relational model constraints and relational database schemas; Update operations, anomalies, dealing with constraint violations, Types and violations. Object and Object-Relational Databases: Overview of Object Database Concepts, Object Database Extensions to SQL, The ODMG Object Model and the Object Definition Language ODL, Object Database Conceptual Design, The Object Query Language OQL, Overview of the C++ Language Binding in the ODMG Standard.	
Teaching-Learning Process	Chalk and Talk/ PPT / Web resources

Module-2	
Disk Storage, Basic File Structures, Hashing, and Modern Storage Architectures: Introduction, Secondary Storage Devices, Buffering of Blocks, Placing File Records on Disk Operations on Files, Files of Unordered Records (Heap Files), Files of Ordered Records (Sorted Files), Hashing Techniques, Other Primary File Organizations, Parallelizing Disk Access Using RAID Technology, Modern Storage Architectures. Distributed Database Concepts: Distributed Database Concepts, Data Fragmentation, Replication, and Allocation Techniques for Distributed	
Teaching-Learning Process	Chalk and Talk/ PPT / Web resources

Module-3	
NOSQL Databases and Big Data Storage Systems: Introduction to NOSQL Systems, The CAP Theorem, Document-Based NOSQL Systems and MongoDB, NOSQL Key-Value Stores, Column-Based or Wide Column NOSQL Systems, NOSQL Graph Databases and Neo4j. Big Data Technologies Based on MapReduce and Hadoop: What Is Big Data? Introduction to MapReduce and Hadoop, Hadoop Distributed File System (HDFS), MapReduce: Additional Details Hadoop v2 alias YARN, General Discussion.	
Teaching-Learning Process	Chalk and Talk/ PPT / Web resources

Module-4	
Enhanced Data Models: Introduction to Active, Temporal, Spatial, Multimedia, and Deductive Databases: Active Database Concepts and Triggers, Temporal Database Concepts, Spatial Database Concepts, Multimedia Database Concepts, Introduction to Deductive Databases. Introduction to Information Retrieval and Web Search:Information Retrieval (IR) Concepts, Retrieval Models, Types of Queries in IR Systems, Text pre-processing, Inverted Indexing, Evaluation Measures of Search relevance, web Search and Analysis. Trends in Information Retrieval	
Teaching-Learning Process	Chalk and Talk/ PPT / Web resources

Module-5

Data Mining Concepts: Overview of Data Mining Technology, Association Rules, Classification, Clustering, Approaches to Other Data Mining Problems, Applications of Data Mining, Commercial Data Mining Tools. Overview of Data Warehousing and OLAP: Introduction, Definitions, and Terminology, Characteristics of Data Warehouses, Data Modelling for Data Warehouses, building a Data Warehouse, Typical Functionality of a Data Warehouse, Data Warehouse versus Views, Difficulties of Implementing Data Warehouses.

Teaching-Learning Process	Chalk and Talk/ PPT / Case Study: https://www.researchgate.net/publication/47393965_Data_warehousing_and_data_mining_A_case_ study

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks**or**oneSkill Development Activity of 50 marks** to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. Fundamentals of Database Systems,Elmasri and Navathe, Pearson Education2013.
2. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill, 3rd Edition, 2013.
3. Database System Concepts, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw Hill, 6th Edition, 2010.

Web links and Video Lectures (e-Resources):

1. https://link.springer.com/book/10.1007/978-3-7091-2704-9
2. https://www.youtube.com/watch?v=ywTn9qHyI9I
3. https://www.youtube.com/watch?v=_qbKMdqQS6E
4. https://www.youtube.com/watch?v=PqPkYmRSQ_w
5. https://www.researchgate.net/publication/47393965_Data_warehousing_and_data_mining_A_case_study

Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Infer and represent the real-world data using object-oriented database	L2
CO2	Interpret rule set in the database to implement data warehousing of mining	L3
CO3	Discover and design database for recent applications database for better interoperability	L4

Program Outcome of this course

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Mapping of COS and Pos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		X	X									
CO2			X	X								
CO3		X	X									

CLOUD COMPUTING			
Course Code	MSAD215C	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	4	Exam Hours	03

Course Learning objectives:

- Discuss the concepts, characteristics, delivery models and benefits of cloud computing.
- Explore the key technical, organizational and compliance challenges of cloud computing.
- Grasp the concepts of virtualization efficiently.
- Explore the security issues that arise from cloud computing architectures intended for delivering Cloud based enterprise IT services.

Module-1

Introduction, Cloud Infrastructure: Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, User experience and software licensing. Exercises and problems.

Teaching-Learning Process	Chalk and talk/PPT/case study/web content

Module-2

Cloud Computing: Application Paradigms.: Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, A case study: The Gre The Web application, Cloud for science and engineering, High-performance computing on a cloud, Cloud computing for Biology research, Social computing, digital content and cloud computing.

Teaching-Learning Process	Chalk and talk/PPT/case study/web content

Module-3

Cloud Resource Virtualization: Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and paravirtualization, Hardware support for virtualization, Case Study: Xen a VMM based paravirtualization, Optimization of network virtualization, vBlades, Performance comparison of virtual machines, The dark side of virtualization, Exercises and problems

Teaching-Learning Process	Chalk and talk/PPT/case study/web content

Module-4

	Cloud Resource Management and Scheduling: Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling MapReduce applications subject to deadlines, Resource management and dynamic scaling, Exercises and problems	
	Teaching-Learning Process	Chalk and talk/PPT/case study/web content

Module-5

Cloud Security, Cloud Application Development: Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor, Amazon web services: EC2 instances, Connecting clients to cloud instances through firewalls, Security rules for application and transport layer protocols in EC2, How to launch an EC2 Linux instance and connect to it, How to use S3 in java, Cloud-based simulation of a distributed trust algorithm, A trust management service, A cloud service for adaptive data streaming, Cloud based optimal FPGA synthesis .Exercises and problems.	
Teaching-Learning Process	Chalk and talk/PPT/case study/web content

Assessment Details (both CIE and SEE)

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Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks**or**oneSkill Development Activity of 50 marks** to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books

1. *Cloud Computing:Theory and Practice,* Dan C Marinescu Elsevier (MK), 2013.
2. *Computing Principles and Paradigms,* RajkumarBuyya , James Broberg, Andrzej Goscinsk,i Willey, 2014.
3. *Cloud Computing Implementation*, Management and Security John W Rittinghouse, James F Ransome, CRC Press, 2013.

Web links and Video Lectures (e-Resources):

- https://www.javatpoint.com/cloud-computing-tutorial
- https://www.tutorialspoint.com/cloud_computing/index.htm
- https://www.digimat.in/nptel/courses/video/106105167/L01.html (**Video Lectures**)

Skill Development Activities Suggested

- The students with the help of the course teacher can take up relevant technical – activities which will enhance their skill.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Compare the strengths and limitations of cloud computing	L2
CO2	Identify the architecture, infrastructure and delivery models of cloud computing	L2
CO3	Demonstrate the working of VM and VMM on any cloud platforms(public/private), and run a software service on that.	L3
CO4	Identify the known threats, risks, vulnerabilities and privacy issues associated with Cloud based IT services.	L2

Program Outcome of this course

Sl. No.	Description	POs	
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1	
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2	
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3	
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4	
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5	
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6	
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7	
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8	
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9	
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10	
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11	
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12	

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		x				x						
CO2		x									x	
CO3	x											x
CO4							x					

HEALTH CARE DATA ANALYTICS			
Course Code	MSAD215D	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Data analytics promote the sharing of information and to ensure that the resultant insight and information is clearly defined and consistently interpreted throughout the HCO.
- The analyses investigate methods of improving the provision of clinical care, enhancing disease prevention, and measuring the effectiveness of various treatment options

Module-1	
An Introduction to Healthcare Data Analytics, Electronic Health Records-A survey: Components of HER, Coding Systems, Benefits of HER, Barrier to Adopting HER Challenges, Phenotyping Algorithms.	
Teaching-Learning Process	Chalk and Talk/ PPT/ Web resources : https://www.fsm.ac.in/bigdata/csha.pdf

Module-2	
Biomedical Image Analysis, Mining of Sensor Data in Healthcare, Biomedical Signal Analysis.	
Teaching-Learning Process	Chalk and Talk/ PPT/ Web resources : https://www.fsm.ac.in/bigdata/csha.pdf

Module-3	
Natural Language Processing and Data Mining for Clinical Text, Mining the Biomedical.	
Teaching-Learning Process	Chalk and Talk/ PPT/ Web resources : https://www.fsm.ac.in/bigdata/csha.pdf

Module-4	
Advanced Data Analytics for Healthcare: Review of Clinical Prediction Models, Temporal Data Mining for Healthcare Data, Visual Analytics for Healthcare, Privacy, Preserving Data Publishing Methods in Healthcare.	
Teaching-Learning Process	Chalk and Talk/ PPT / Web resources : https://www.managedhealthcareexecutive.com/view/advanced-analytics-an-essential-tool-for- value-based-care-success

Module-5	
Applications and Practical Systems for Healthcare: Data Analytics for Pervasive Health- Fraud Detection in Healthcare- Data Analytics for Pharmaceutical Discoveries- Clinical Decision Support Systems- Computer Assisted Medical Image Analysis Systems	
Teaching-Learning Process	Chalk and Talk/ PPT / Web resources : https://www.fsm.ac.in/bigdata/csha.pdf

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks**or**oneSkill Development Activity of 50 marks** to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. Healthcare data analytics, Chandan K. Reddy and Charu C Aggarwal, Taylor & Francis 1 st Edition, 2015
2. Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, Hui Yang and Eva K. Lee, Wiley 2016

Web links and Video Lectures (e-Resources):

1. https://www.fsm.ac.in/bigdata/csha.pdf

Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Analyze health care data using appropriate analytical techniques.	L3
CO2	Apply analytics for decision making in healthcare services.	L4
CO3	Apply data mining to integrate health data from multiple sources and develop efficient clinical decision support systems.	L4

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		X		X								
CO2					X							
CO3			X		X							

Program Outcome of this course

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6

7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

MINI PROJECT WITH SEMINAR			
Course Code	MSAD206	CIE Marks	50
Number of contact Hours/Week	3	SEE Marks	50
Credits	3	Exam Hours/Batch	03

Course objectives:

- To support independent learning and innovative attitude.
- To guide to select and utilize adequate information from varied resources upholding ethics.
- To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- To develop interactive, communication, organization, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instill responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

Mini-Project: Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism.

Course outcomes:

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

- Present the mini-project and be able to defend it.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
- Habituated to critical thinking and use problem solving skills.
- Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
- Work in a team to achieve common goal.
- Learn on their own, reflect on their learning and take appropriate actions to improve it.

CIE procedure for Mini - Project:

The CIE marks awarded for Mini - Project, shall be based on the evaluation of Mini - Project Report, Project Presentation skill and Question and Answer session in the ratio 50:25:25.The marks awarded for Mini - Project report shall be the same for all the batch mates.

Semester End Examination

SEE marks for the mini-project shall be awarded based on the evaluation of Mini-Project Report, Presentation skill and Question and Answer session in the ratio 50:25:25 by the examiners appointed by the University.

Big Data Analytics Laboratory			
Course Code	MSADL207	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:2:0	SEE Marks	50
Credits	02	Exam Hours	03

Course objectives:

- Practice java concepts required for developing map reduce programs.
- Impart the architectural concepts of Hadoop and introducing map reduce paradigm.
- Practice programming tools PIG and HIVE in Hadoop eco system.
- Implement best practices for Hadoop development.

Sl.NO	Experiments
	• Install VMWare to setup the Hadoop environment and its ecosystems. • Implement the basic commands of LINUX Operating System – File/Directory creation, deletion, update operations.
1	Implement the following file management tasks in Hadoop: i. Adding files and directories ii. Retrieving files iii. Deleting files Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities
2	Run a basic word count Map Reduce program to understand Map Reduce Paradigm.
3	Write a Map Reduce program that mines weather data. Hint: Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented.
4	Implement matrix multiplication with Hadoop Map Reduce
5	Run the Pig Latin Scripts to find Word Count.
6	Run the Pig Latin Scripts to find a max temp for each and every year.
7	Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

Course outcomes (Course Skill Set):

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

- Professional Skills: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.
- Problem-Solving Skills: The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.
- Successful Career and Entrepreneurship: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 40%of maximum marks in the semester-end examination(SEE). In total of CIE and SEE student has to secure 50% maximum marks of the course.

Continuous Internal Evaluation (CIE):

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks** or **one Skill Development Activity of 50 marks** to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Evaluation (SEE):

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University.

All laboratory experiments are to be included for practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%,

Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 10% Marks allotted to the procedure part to be made zero. The duration of SEE is 03 hours

SKILL ENHANCEMENT FOR RESEARCH EXCELLENCE-1			
Course Code	MSCS258	CIE Marks	50
Number of contact Hours/Week	2	SEE Marks	50
Credits	01	Exam Hours/Batch	03

The M.Tech Research Skills Development program equips students with essential skills for successful research and publication, including understanding research fundamentals, conducting literature reviews, selecting appropriate methodologies, writing proposals and papers, analyzing data, presenting findings, adhering to ethical standards, and engaging in networking and collaboration, culminating in the effective publication of only 1 research article to Scopus-indexed conferences.

Course objectives:

- **To** produce high-quality research papers that meet the standards of international conferences or peer-reviewed journals.
- **To** effectively identify suitable journals for publication based on the scope and impact of research findings.
- **To** demonstrate proficiency in writing and structuring research papers according to academic conventions.
- **To** engage in the peer review process, providing and receiving constructive feedback to enhance research quality.
- **To** develop skills for presenting research at conferences, including crafting effective abstracts and posters.
- **To** cultivate a strong understanding of ethical considerations in research and publication practices.
- **To** utilize citation management tools to organize references and ensure proper attribution in publications.
- **To** enhance collaboration skills for co-authoring papers and working within research teams.
- **To** stay informed about current trends and advancements in the field to ensure relevance in publications.
- **To** refine the ability to respond to reviewer comments and revise manuscripts effectively.
- **To** understand the importance of open access and alternative publication models in disseminating research.
- **To** build a professional network that supports research collaborations and publication opportunities.

Guidelines for Research paper preparation: Each student in a group of two members shall actively participate in carrying out the research work jointly, in constant consultation with the internal guide, mentors or co-guide, and external guide. They must prepare the project report as per the prescribed norms while ensuring plagiarism is avoided. A research group can have a maximum of two members.

1. **Understanding Research Fundamentals**
   - **Definition of Research:** Understand what constitutes research and its significance in technology and engineering.
   - **Types of Research:**

Basic Research: Focused on gaining comprehensive knowledge without immediate applications.
Applied Research: Aimed at solving specific problems.

Literature Review

- **Conducting a Literature Survey:**
  Identify relevant academic papers, journals, and conference proceedings.
  Summarize key findings and methodologies from existing literature.
- **Critical Analysis:**
  Evaluate the strengths and weaknesses of existing research.
  Identify gaps in the literature that your research can address.

2. **Research Methodology**
   - **Selecting a Research Topic:**
     Choose a topic that aligns with your interests and current trends in technology.
   - **Research Design:**
     Decide on qualitative, quantitative, or mixed methods based on your research objectives.
   - **Data Collection Techniques:**
     Surveys, interviews, experiments, and simulations.
3. **Writing Research Proposals**
   - **Structure of a Proposal:**
     Introduction, Literature Review, Methodology, Expected Outcomes, and References.
   - **Proposal Presentation:**
     Practice presenting your proposal to peers and faculty for feedback.
4. **Data Analysis**
   - **Statistical Tools:**
     Familiarize yourself with tools like MATLAB, R, or Python for data analysis.
   - **Interpreting Results:**
     Learn to draw meaningful conclusions from your data and relate them back to your research questions.
5. **Writing Research Papers**
   - **Structure of a Research Paper:**
     Abstract, Introduction, Methodology, Results, Discussion, Conclusion, and References.

- **Academic Writing Skills:**
  Focus on clarity, coherence, and proper citation of sources.
- **Peer Review Process:**
  Understand the importance of peer review and how to respond to reviewers' comments.

6. **Presentation Skills**
   - **Effective Communication:**
     Develop skills to present your research findings clearly and confidently.
   - **Use of Visual Aids:**
     Incorporate slides, charts, and graphs to enhance your presentations.
7. **Ethical Considerations in Research**
   - **Understanding Ethics:**
     Familiarize yourself with ethical guidelines related to research involving human subjects, data privacy, and plagiarism.
   - **Responsible Conduct of Research:**
     Promote integrity and accountability in your research practices.

Submitting Manuscripts to Scopus-Indexed Conferences or Web of Science or Proceedings /Book Chapters

1. **Identify Relevant Conferences**
   - **Research Scopus-Indexed Conferences:**
     Use platforms like Conference Alerts, IEEE Xplore, or the Scopus website to find conferences in your field.
   - **Check Conference Indexing:**
     Ensure that the conference is indexed in Scopus by checking its official website or the Scopus database.
2. **Prepare Your Manuscript**
   - **Follow Conference Guidelines:**
     Each conference has specific formatting and submission guidelines. Adhere to these requirements.
   - **Structure of the Manuscript:**
     Title, Abstract, Introduction, Methodology, Results, Discussion, Conclusion, and References.
   - **Language and Clarity:**
     Use clear and concise language. Consider having your manuscript proofread by peers or professionals.
   - **Submission of manuscript, Registration and Presentation finally Publication**

Course outcomes:

- At the end of the course the student will be able to:
- Produce High-Quality Research Papers: Create research papers that meet international conference and peer-reviewed journal standards.
- Identify Suitable Journals: Effectively select appropriate journals for publication based on research scope and impact.
- Proficiency in Writing: Demonstrate skill in writing and structuring research papers according to academic conventions.
- Engage in Peer Review: Actively participate in the peer review process by providing and receiving constructive feedback.
- Develop Presentation Skills: Acquire skills for presenting research at conferences, including crafting effective abstracts and posters.
- Understand Ethical Considerations: Cultivate a strong understanding of ethical issues in research and publication practices.
- Utilize Citation Management Tools: Use citation management tools to organize references and ensure proper attribution.
- Respond to Reviewer Comments: Refine the ability to address reviewer comments and revise manuscripts effectively.

The assessment for **Skill Enhancement for Research Excellence** will be divided into **Continuous Internal Evaluation (CIE) and Semester End Examination (SEE), each carrying 50 marks.**

Continuous Internal Evaluation (CIE) – 50 Marks

CIE shall be conducted **weekly** and will be assessed based on:

- **Base Papers Referred & Review** – 10 Marks
- **Presentations on Proposed Concepts** – 15 Marks
- **Preparation of Conference Papers (Preferably Scopus Indexed or Reputed Conferences)** – 25 Marks

Semester End Examination (SEE) – 50 Marks

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- The **SEE examiner may be appointed from the same college** for evaluation.
- The candidate must **present their research work** before the examiner.
- **Mandatory requirement:** The candidate must have **submitted a paper to a conference** or **accepted or presented** at a reputed conference.
- Marks will be awarded based on:
    - **Research Presentation Quality** – 25 Marks
    - **Clarity of Concept & Methodology** – 15 Marks
    - **Conference Submission & Acceptance/Presentation** – 10 Marks

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