Course Title	**Data Mining and Data warehousing**	**Semester**	**VI**
Course Code	**MVJ21CD61**	**CIE**	**50**
Total No. of Contact Hours	**40**	**SEE**	**50**
No. of Contact Hours/week	**4 (L : T : P :: 2 : 1 : 0)**	**Total**	**100**
Credits	**3**	**Exam. Duration**	**3 Hours**

Course objective is to:

Gather and analyze large sets of data to gain useful business understanding

Understand the data mining functionalities, technologies and steps in pre-processing the data

Learn data mining algorithms, methods and tools

Module-1	**L1, L2, L3**	**12 Hours**

Raw data to valuable information-Lifecycle of Data - What is data warehousing - The building Blocks: Defining Features - Data warehouses and data marts - Overview of the components - Metadata in the data warehouse - Basic elements of data warehousing - Principles of dimensional modelling: Star schema, Snowflake schema and Galaxy schema.

Application:

Identify the potential risk of default and manage and control collections

Performance analysis of each product, service, interchange, and exchange rates

Store and analyze information about faculty and students

Maintain student portals to facilitate student activities

Video Link:

https://www.youtube.com/watch?v=8lHpioyvSng

Module-2	**L1,L2,L3**	**12 Hours**

Introduction to Data Mining Systems, Knowledge Discovery Process -Data Objects and attribute types, Statistical description of data, Data Preprocessing- Data Cleaning, Data Integration and Transformation, Data Reduction.

Application:

Financial Analysis

Telecommunication Industry.

Intrusion Detection

Retail Industry

Higher Education

Video Link:

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

Module-3	L1,L2,L3	12 Hours

Market Basket Analysis, Frequent Item sets, Closed Itemsets, Association Rules, Frequent Itemset Mining Methods- Apriori algorithm, Generating Association rules from Frequent Itemsets, A Pattern- Growth Approach for mining frequent Itemsets, Mining Frequent Itemsets using the Vertical Data Format.

Application:

Market Basket Analysis

Medical Diagnosis:

Census Data

Protein Sequence

Video Link:

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

Module-4	L1,L2,L3	12 Hours

Classification and Prediction ,Basic Concepts, Decision Tree Induction, Bayesian Classification ,Rule Based Classification, Classification by Back propagation , Support Vector Machines, Lazy learners.

Application:

Sentiment Analysis

Email Spam Classification

Document Classification

Image Classification

Video Link:

https://www.youtube.com/watch?v=gkagE_fE2sk

Module-5	L1,L2,L3	12 Hours

Types of Data in Cluster Analysis , Data similarity and dissimilarity measures ,A Categorization of Major Clustering Methods -Partitioning Methods-K-means, K-medoids , Hierarchical Methods-Agglomerative vs Divisive, Distance measures, BIRCH, Clustering High-Dimensional Data- Outlier Analysis and Detection.

Application:

Clustering analysis

In the field of biology, it can be used to derive plant and animal taxonomies.

Identification of areas of similar land use in an earth observation database.

Video Link:

https://www.youtube.com/watch?v=2QTeuO0C-fY

Experimental Part:

Apriori Algorithm for market Basket Analysis

Bayesian Classification

Decision Tree Induction Algorithm

Frequent Pattern-Growth Algorithm

Course outcomes:

CO1	Design data warehouse by applying principles of dimensional modelling and ETL concepts
CO2	Analyze various data pre-processing techniques for efficient data mining.
CO3	Apply association rule mining for finding hidden and interesting patterns in data.
CO4	Apply statistical procedure, machine learning and neural network based classification algorithms for data prediction
CO5	Apply clustering algorithms for the application and generalizations for real time problems

Text/Reference Books:

1.	Jiawei Han, Micheline Kamber and Jian Pei, Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.
2.	Paulraj Ponniah, Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals, Wiley, 2010

3.	Alex Berson, Stephen J Smith, Data warehousing, Data mining, and OLAP, Tata McGraw Hill edition, 2007
4.	Pang-Ning Tan, Michael Steinbach and Vipin Kumar,Introduction to Data Mining, Pearson Education, 2007
5.	G. K. Gupta ,Introduction to Data Mining with Case Studies, Easter Economy Edition, Prentice Hall of India, 2006

CIE Assessment:

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Quizzes/mini tests (4 marks)

Mini Project / Case Studies (8 Marks)

Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3		2					
CO2	3	3	3	3	3		2					
CO3	3	3	3	3	3	3						3
CO4	3	3	3	3	3	3		3				3
CO5	3	3	3	3	3	3						3

High-3, Medium-2, Low-1

Course Title	Introduction to Data Science	Semester	VI
Course Code	MVJ21CD621	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 3 : 1 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

Understanding R for data science

Learn about requirement of data analysis

Can understand how machine learning algorithm works

How to visualize the data

Real world data analysis

Module -1	L1,L2,L3	12 Hours

What You Will Learn – What You Won't Learn – Prerequisites – Running R Code.

Data Visualization: Introduction – First Steps – Aesthetic mapping – Common Problems – Facets – Geometric Objects – Statistical Transformations – Position adjustments – Coordinate systems – Layered Grammar of Graphics.

Workflow Basics: Coding Basics – What's in a name? – Calling Functions – Exercises.

Data Transmission: Introduction – Filter rows with filter() – Arrange rows with arrange() – Select Columns with select() – Add new variables with mutate() – Grouped summaries with summarise() – Grouped mutates.

Workflow: Scripts.

Application: Data visualization can be used in storytelling of insight obtained from Bigdata.

Video Link:

https://nptel.ac.in/courses/111/104/111104100/

Module -2	**L1,L2,L3**	**12 Hours**
Exploratory Data Analysis: Introduction – Questions – Variation – Covariation – Patterns and models. Introduction: What is Data science? Big Data and Data Science Hype – Getting Past the Hype – Why Now: Datafication– The Current Landscape – A Data science Profile – Thought Experiment: Meta-Definition – What is a Data Scientist, Really? In Academia – In Industry Application: Banking, Health care, Transport, Manufacturing, Agriculture etc Video Link: https://www.digimat.in/nptel/courses/video/106106179/L08.html		
Module - 3	**L1,L2,L3**	**12 Hours**
Statistical Thinking in the Age of Big Data – Exploratory Data Analysis – The Data Science Process – Thought Experiment: How Would you Simulate Chaos? Algorithms: Machine Learning Algorithms – Three Basic Algorithms – Exercise: Basic Machine Learning Algorithms – Summing It All Up – Though Experiment: Automated Statistician. Application: Recommendation Systems(You tube) Video Link: https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs28/		
Module-4	**L1,L2,L3**	**12 Hours**
Thought Experiment: Learning by Example – Naïve Bayes – Fancy It Up: Laplace Smoothing – Comparing Naïve Bayes to K-NN – Sample Code in Bash – Scraping the Web: API and Other Tools – Jake's Exercise: Naïve Bayes for Article Classification. Data Visualization and Fraud Detection: Data Visualization History - What Is Data Science, Redux? - A Sample of Data Visualization Projects - Mark's Data Visualization Projects - Data Science and Risk - Data Visualization at Square - Ian's Thought Experiment - Data Visualization for the Rest of Us Application: Spam filter can be applied to get rid of unwanted spam messages in Email and SMS. Video Link: https://www.youtube.com/watch?v=9YXojHh_ZPY		
Module-5	**L1,L2,L3**	**12 Hours**

Social Network Analysis at Morning Analytics - Social Network Analysis - Terminology from Social Networks - Thought Experiment – Morning side Analytics - More Background on Social Network Analysis from a Statistical Point of View - Data Journalism

Data Engineering: MapReduce, Pregel, and Hadoop

Application: To find out the trending news for the day, Trending hash tags in face book or Twitter

Video Link:

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

Practical Experiments:

YouTube Data Analysis

Machine Learning algorithms – Hands-On Training

Share Market Analysis - Hands-On Training

Fraud Analysis of Trade document using Data Science

Identifying Revenue drop from customer behavior pattern in Banking Industry

Course outcomes:

CO1	R programming for data science
CO2	Analyze the data
CO3	Machine learning algorithms
CO4	Visualize the different data with different form
CO5	Interpret, analytic and visualize read world data

Text/Reference Books:

1.	Hadley Wickham and Garrett Grolemund , R for Data Science, Publisher: O'Reilly Media
2.	Cathy O'Neil and Rachel Schutt, Doing Data Science Straight Talk from the Frontline, Publisher: O'Reilly Media
3.	Ricardo Anjoleto Farias, Nataraj Dasgupta, Vitor Bianchi Lanzetta, Hands-On Data Science with R, O'reilly, 2018.

CIE Assessment:

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Quizzes/mini tests (4 marks) Mini Project / Case Studies (8 Marks) Activities/Experimentations related to courses (8 Marks)
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CO-PO Mapping												
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CO4	3	3	2	2	3					2		
CO5	3	3	3	2	3					2		

High-3, Medium-2, Low-1

Course Title	**Introduction to Cyber Security**	**Semester**	**VI**
Course Code	**MVJ21CD622**	**CIE**	**50**
Total No. of Contact Hours	**40**	**SEE**	**50**
No. of Contact Hours/week	**4 (L : T : P :: 4 : 0 : 0)**	**Total**	**100**
Credits	**3**	**Exam. Duration**	**3 Hours**

Course objective is to:
Explain the fundamental definitions of different security issues.

Familiarize cybercrimes happening with mobile and wireless devices.

Use cybercrime tools to analyze the security gaps.

Familiarize with different OSI layers and security aspects.

Explain legal aspects and Indian IT Act.

Module-1	**L1,L2,L3**	**12 Hours**

Syllabus Content:

Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes, How criminal plan the attacks, Social Eng., Cyber fraud vs. Cybercrime Cyber stalking, Cybercafe and Cybercrimes, Botnets, Attack vector, Cloud computing.

Application:

security services that are invoked at the interface between an application

Video Link:

https://www.youtube.com/watch?v=gfFKuiZ9Y7s

Module-2	**L1,L2,L3**	**12 Hours**

Syllabus Content:

Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Devices-Related Security Issues, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Application:

the usage of small wireless mobile devices such as PDAs, Blackberrys and smartphones

Video Link:

https://www.youtube.com/watch?v=frM_7UMD_-A

Module-3	**L1,L2,L3**	**12 Hours**

Syllabus Content:

Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Steganography, DoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless

Networks, Phishing, Identity Theft (ID Theft), Case Study.

Application:

Application-level gateway

Video Link:

https://www.youtube.com/watch?v=6MvRi2Ggh_Y

Module-4	L1,L2,L3	12 Hours

Syllabus Content:

Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidance, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting of a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to the Computer Forensics and Social Networking Sites: The Security/Privacy Threats, Forensics Auditing, Anti Forensics.

Application:

Application of Digital Forensics With increasing digital crime in each branch

Video Link:

https://www.youtube.com/watch?v=2ESqwX3qb94

Module-5	L1,L2,L3	12 Hours

Syllabus Content:

Cyber law: The Indian Context, The Indian IT Act, Digital Signature and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyber law, Technology and Students: Indian Scenario.

Application:

Case IV: Ownership of Program

Video Link:

https://www.youtube.com/watch?v=ZFHCZt5VnMs

Hands on Experiments:

Cyber fraud vs Cybercrime stalking, Cybercafé and Cybercrimes.

Mobile Devices: Security Implementation for organizations. Phishing, Password cracking, Dos Attacks. Cyber forensics and digital Evidence.	
Course outcomes:	
CO1	Understand Cybercrime and Cyber offenses
CO2	Explain cybercrime happening with Mobile and Wireless Devices.
CO3	Analyze cybercrimes using different tools and methods.
CO4	Cyber forensics and Digital forensics
CO5	Legal aspects of cybercrimes.

Text/Reference Books:	
1.	"Cyber Security", Nina Godbole, SunitBelapure, Wiley India, New Delhi, 2011.
2.	"Information Systems Security", Nina Godbole, Wiley India, New Delhi, 2017.
3.	"Cyber Security & Global Information Assurance", Kennetch J. Knapp, Information Science Publishing, 2009.
4.	"Cryptography and Network Security", William Stallings, Pearson Publication, 2005.
5.	"Cyber Security", Avantika Yadav, Narosa Publishing, 2017.

CIE Assessment:
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SEE Assessment:
i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

iii. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2										
CO2			2								2	
CO3					2							
CO4			2									2
CO5					2							

High-3, Medium-2, Low-1

Course Title	**ADVANCED JAVA AND J2EE**	**Semester**	**VI**
Course Code	**MVJ21CD623**	**CIE**	**50**
Total No. of Contact Hours	**40**	**SEE**	**50**
No. of Contact Hours/week	**4 (L : T : P :: 2 : 1 : 0)**	**Total**	**100**
Credits	**3**	**Exam. Duration**	**3 Hours**

Course objective is to: ***: This course will enable students to***

Construct client-server applications using Java socket API

Identify the need for advanced Java concepts like Enumerations and Collections

Make use of JDBC to access database through Java Programs

Adapt servlets to build server side programs

Demonstrate the use of JavaBeans to develop component-based Java software

Module-1	**L1,L2,L3**	**12 Hours**

Syllabus Content:

Enumerations, Autoboxing and Annotations(metadata): Enumerations, Enumeration fundamentals, the values() and value Of() Methods, java enumerations are class types, enumerations Inherits Enum, example, type wrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of Warning. Annotations, Annotation basics, specifying retention policy, Obtaining Annotations at run time by use of reflection, Annotated element Interface, Using Default values, Marker Annotations, Single Member annotations, Built-In annotations

Application:

choices on a menu, rounding modes, command line flags, etc.

Autoboxing & Auto unboxing:

Annotations

Video Link: https://www.youtube.com/watch?v=vJ-Zn4fo0MQ&t=608s

Module-2	**L1,L2,L3**	**12 Hours**

Syllabus Content:

The collections and Framework: Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, Why Generic Collections, The legacy Classes and Interfaces,

Parting Thoughts on Collections.

Application: Writing an application

Video Link:https://www.youtube.com/watch?v=Ma7u6KEKzPE

Module-3	**L1,L2,L3**	**12 Hours**

Syllabus Content:

String Handling :The String Constructors, String Length, Special String Operations, String Literals, String Concatenation, String Concatenation with Other Data Types, String Conversion and toString( ) Character Extraction, charAt( ), getChars( ), getBytes( ) toCharArray(), String Comparison, equals( )

and equalsIgnoreCase( ), regionMatches( ) startsWith( ) and endsWith( ), equals( ) Versus == , compareTo( ) Searching Strings, Modifying a String, substring( ), concat( ), replace( ), trim( ), Data Conversion Using valueOf( ), Changing the Case of Characters Within a String, Additional String Methods, StringBuffer , StringBuffer Constructors, length( ) and capacity( ), ensureCapacity( ), setLength( ), charAt( ) and setCharAt( ), getChars( ),append( ), insert( ), reverse( ), delete( ) and deleteCharAt( ), replace( ), substring( ), Additional StringBuffer Methods, StringBuilder

Application: Datatype

Video Link: https://www.youtube.com/watch?v=N63JCXwdd14

Module-4	**L1,L2,L3**	**12 Hours**

Syllabus Content:

Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking. Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects

Application: java-based web application.

Video Link: https://www.youtube.com/watch?v=ewiOaDitBBw

Module-5	**L1,L2,L3**	**12 Hours**

Syllabus Content:

JDBC Overview – JDBC implementation – Connection class – Statements - Catching Database Results, handling database Queries. Networking– InetAddress class – URL class- TCP sockets - UDP sockets, Java Beans –RMI.

Application: Connecting, storing, retrieving data between program and any database.

Video Link: https://www.youtube.com/watch?v=Cq4lwVE2Fzk

Practical Experiments:

1. Program to demonstrate working of Inet Address class and the methods of the InetAddress class for Java Networking

2. Program to demonstrate how to apply event handling mechanism to JCheckBox Swing Components :
3. Program to demonstrate JDBC
4. Program to demonstrate RMI
5. Program to demonstrate SERVLETS
6. Program to demonstrate JSP

Program to demonstrate JAVA BEANS

Course outcomes:

CO1	Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs
CO2	Build client-server applications and TCP/IP socket programs
CO3	Illustrate database access and details for managing information using the JDBC API
CO4	Describe how servlets fit into Java-based web application architecture
CO5	Develop reusable software components using Java Beans

Text/Reference Books:

1.	Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007.
2.	Jim Keogh: J2EE-TheCompleteReference, McGraw Hill, 2007.
3.	Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education,2004.
4.	Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015.
5.	Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007.

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covering the whole syllabus.

Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

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CO2		3	3	2	2	2		2				2
CO3		3	3	2	2	2		2				3
CO4		3	3	2	2	2		2				2
CO5		3	3	2	2	2		2				3

High-3, Medium-2, Low-1

Course Title	**Database Management System**	**Semester**	**VI**
Course Code	**MVJ21CD624**	**CIE**	**50**
Total No. of Contact Hours	**40**	**SEE**	**50**
No. of Contact Hours/week	**4 (L : T : P :: 2 : 1 : 0)**	**Total**	**100**
Credits	**3**	**Exam. Duration**	**3 Hours**

Course objective is to:

- Provide Key Knowledge in database system concepts, applications and advantages.
- To get knowledge about SQL programming
- Design a database as redundant and error free
- Students can build a database application for real world problems
- Can derive the knowledge or pattern from real world data

Module-1	**L1,L2,L3**	**12 Hours**

Introduction: Database-System Applications – Purpose of Database – View of Data – Database Languages – Relational Databases – Database Design – Data Storage and Querying – Transaction Management – Database Architecture – Data mining and Information Retrieval – Specialty

Databases – Database Users and Administrators.

Introduction to Relational Model: Structure of Relational Database – Database Schema – Keys – Schema Diagrams – Relational Query Languages – Relational Operations – Relational Algebra.

Application: This module will give basic knowledge of database and SQL.

Video Link: https://www.youtube.com/watch?v=X9bQsAoqmfI

Module-2	**L1,L2,L3**	**12 Hours**

Introduction to SQL: Overview of the SQL Query Languages – SQL Definition – Basic Structure of SQL Queries – Additional Basic Operations – Set Operations – Null Values – Aggregate Functions - Nested Subqueries – Modification of Database.

Intermediate SQL: Join Expressions – Views – Integrity Constraints – SQL Data types and Schemas – Authorization.

Advanced SQL: Functions and Procedures – Triggers.

Application: Students can learn more complex queries and can design error free database using constraints.

Video Link: https://www.youtube.com/watch?v=fRMv14j5XJU

Module-3	**L1,L2,L3**	**12 Hours**

Relational Database Design: Features of Good Relational Designs – Atomic Domains and First Normal Form – Decomposition Using Functional Dependencies – Functional-Dependency Theory – Algorithm for Decomposition – 2nd Normal Form, 3rd Normal Form, Boyce Codd Normal Form Decomposition using Multivalued Dependencies – 4th Normal Form and domain Key Normal Form.

Application: Students can learn how to divide the table without any data lose and can execute queries without any anomalies.

Video Link**:** https://www.youtube.com/watch?v=Ko_LE3TNO64&t=1s

https://www.youtube.com/watch?v=p62he-WUp9E

Module-4	**L1,L2,L3**	**12 Hours**

Transaction: Transaction Concept – A Simple Transaction Model – Transaction Atomicity and Durability – Transaction Isolation – Serializability – Isolation Levels – Implementation of Isolation Level –

Concurrency Control: Lock-Based Protocol – Timestamp-Based Protocols – Validation-Based Protocol.

Advanced SQL: Accessing SQL From a Programming Language. Application design and Development: Application Programs and User Interfaces – Web Fundamentals – Servlet and JSP Application: Students can develop a web-based application for accessing database. Video Link: https://www.youtube.com/watch?v=w83Ug6IwVTw https://www.youtube.com/watch?v=Thm0xW9oTow https://www.youtube.com/watch?v=C_J6K8DodS8		
Module-5	**L1,L2,L3**	**12 Hours**
Data Warehousing, Data Mining, and Information Retrieval: Data Warehousing and Mining – Data Warehousing – Data Mining – Classification – Association Rules – Data mining algorithms using Weka Tools. Application: Students can develop an application using JAVA with Weka for data mining operations. Video Link: https://www.youtube.com/watch?v=XlbM9ibjUuM		
Practical Experiments Accessing Database through JDBC (Hands-On) Clustering – Using Weka tool (Hands-On) Classification using Weka tool (Hands-On) Machine Learning algorithms using Weka tool (Hands-On)		

Course outcomes:	
CO1	Understand the database requirements of real-world problems
CO2	Querying the data according to different requirements
CO3	Design database for real world problems like bank, commercial shops
CO4	Develop application program to real world problems
CO5	Database mining to derive pattern among different data sets

Text/Reference Books:	
1.	Database System Concepts, Sixth Edition, by Abraham Silberschatz, Henery F. Korth, S. Sundarshan
2.	Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition,

	2017, Pearson.
3.	Database Management System, Ramakrishnan and Gehrke, 3rd Edition, Mc-GrawHill, 2013.
4.	Data Mining Concepts and Techniques, Second Edition, by Jiawei Han and Micheline Kamber, Elsevier.

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CO3	2	3	3	2	2	3	2	2	1	1	2	2
CO4	2	3	3	2	2	2	2	1	1	1	2	2
CO5	2	3	2	3	1	1	2	2	1	2	2	1

High-3, Medium-2, Low-1

Course Title	**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**	**Semester**	VI
Course Code	MVJ21CD63	**CIE**	50
Total No. of Contact Hours	40 L : T : P :: 40 : 0 : 0	**SEE**	50
No. of Contact Hours/week	3	**Total**	100
Credits	4	**Exam. Duration**	3 Hours

Course objective is to: ***This course will enable students to***

- Describe the basic principles, techniques, and applications of Artificial Intelligence
- Analyze and explain different AI learning methods.
- Define machine learning and problems relevant to machine learning.
- Differentiate supervised, unsupervised and reinforcement learning

Module-1	**RBT Level** L1,L2	**Hours 8**

INTRODUCTION: What Is AI? The Foundations of Artificial Intelligence ,The History of Artificial Intelligence, The State of the Art .

Intelligent Agents : Agents and Environments ,Good Behavior: The Concept of Rationality ,The Nature of Environments, The Structure of Agents.Knowledge Representation Issues, Using Predicate Logic, Representing knowledge using Rules.

Experimental Learning: Implementation of Relational and Inheritable Knowledge

Video Links

- https://www.youtube.com/watch?v=3MW3ICnkQ9k

Module-2	**RBT Level** L1,L2 , L3	**Hours 8**

PROLOG- The natural Language of Artificial Intelligence: Introduction, Converting English to Prolog Facts and Rules, Goals, Prolog Terminology, Variables, Control Structures, Arithmetic operators, Matching in Prolog, Backtracking, Cuts, Recursion, Lists, Dynamic databases, Input/Output and Streams

Using Predicate Logic: Representing simple facts in logic, representing instance and ISA relationships, Computable Functions and Predicates, Resolution, Natural Deduction.

Experimental Learning:

Implementing programs in PROLOG to solve problems of Predicate Logic

Video Links:

- https://www.youtube.com/watch?v=pzUBrJLIESU

- https://www.youtube.com/watch?v=2juspgYR7as
- https://www.youtube.com/watch?v=h9jLWM2lFr0
- https://www.youtube.com/watch?v=-v1K9AnkAeM

Module-3	**RBT Level** L1,L2 , L3	**Hours 8**

Syllabus Content:

Introduction: well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning. Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

Application:

Designing Supervised Learning Problems

Video Link:

http://web4.cs.ucl.ac.uk/staff/D.Barber/textbook/091117.pdf

http://www.cs.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

Module-4	**RBT Level** L1,L2 ,L3	**Hours 8**

Syllabus Content

Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

Application:

Designing Supervised Learning Problems

Video Link:

http://web4.cs.ucl.ac.uk/staff/D.Barber/textbook/091117.pdf

http://www.cs.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

Module-5	**RBT Level** L1,L2 ,L3	**Hours 8**

Syllabus Content:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptron's,

Backpropagation algorithm

Application: Solving real time problems like Automatic Vehicle Design etc. Video Link: https://becominghuman.ai/understanding-decision-trees-43032111380f https://onlinecourses.science.psu.edu/stat507/node/59/

Course outcomes:	
CO1	Identify AI based problems and understand Intelligent agents
CO2	Apply predicate logic and heuristic techniques to solve AI problems.
CO3	Identify the problems for machine learning. And select the either supervised, unsupervised or reinforcement learning.
CO4	Explain theory of probability and statistics related to machine learning
CO5	Investigate concept learning, ANN, Bayes classifier, k nearest neighbor, Q, Question

Text/Reference Books:	
1	Artificial Intelligence: A Modern Approach, Stuart Rusell, Peter Norving, Pearson Education 2nd Edition.
2	Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.
3	Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics.
4	EthemAlpaydın, Introduction to machine learning, second edition, MIT press
5	E. Rich , K. Knight & S. B. Nair - Artificial Intelligence, 3/e, McGraw Hill.
6	Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems – Prentice Hal of India.
7	G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem Solving”, Fourth Edition, Pearson Education, 2002.
8	N.P. Padhy “Artificial Intelligence and Intelligent Systems” , Oxford University Press-2015

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests Quizzes/mini tests (4 marks) Mini Project / Case Studies (8 Marks) Activities/Experimentations related to courses (8 Marks)
SEE Assessment:
Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		3	3	3							
CO2	3		3		3							
CO3	3	3	3	3								
CO4	3	3	3									
CO5	3	3	3	3								

High-3, Medium-2, Low-1

Course Title	**Machine Learning Laboratory**	**Semester**	**VI**
Course Code	**MVJ21CD63**	**CIE**	**50**
Total No. of Contact Hours	**30**	**SEE**	**50**
No. of Contact Hours/week	**3 (L : T : P :: 0 : 1 : 2)**	**Total**	**100**
Credits	**4**	**Exam. Duration**	**3 Hours**

Course objective is to:

This course will enable students to

Make use of data sets in implementing the machine learning algorithms

Implementing the machine learning concepts and algorithms in any suitable language of choice.

Sl No	Experiment Name	RBT Level	Hours
1	Implementation of FIND-Algorithm	L3	4
2	Implementation of Candidate-Elimination algorithm	L3	4
3	Implementation of ID3 algorithm	L3	4
4	Implementation of Backpropagation algorithm	L3	4
5	Implementation of naïve Bayesian Classifier	L3	4
6	Implementation of Bayesian network	L3	4
7	Implementation of EM algorithm	L3	4
8	Implementation of *k*-Means algorithm	L3	4
9	Implementation of *k*-Nearest Neighbour algorithm	L3	4
10	Implementation of Locally Weighted Regression algorithm	L3	4

Course outcomes:

CO1	Understand the implementation procedures for the machine learning algorithms.
CO2	Design Java/Python programs for various Learning algorithms
CO3	Apply appropriate data sets to the Machine Learning algorithms
CO4	Identify and apply Machine Learning algorithms to solve real world problems
CO5	Perform statistical analysis of machine learning techniques.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3								
CO2	3	3		3	3							
CO3	3		3	3	3							
CO4	3	3		3								
CO5	3	3	3	3								

Course Title	DATA ANALYTICS	**Semester**	VI
Course Code	MVJ21CD64	**CIE**	50
Total No. of Contact Hours	50 L : T : P :: 40 : 10 : 0	**SEE**	50
No. of Contact Hours/week	4	**Total**	100
Credits	4	**Exam. Duration**	3 Hours

Course objective is to: ***This course will enable students to***

- The purpose of this course is to provide the students with the knowledge of data Analytics principles and techniques.
- This course is also designed to give an exposure of the frontiers of data Analytics
- Ability to explain the foundations, definitions, and challenges of Data and various Analytical tools.
- Ability to program using HADOOP and Map reduce, NOSQL
- Ability to understand the importance of Data in Social Media and Mining.

Module-1	**RBT Level** L1,L2 , L3	**Hours 10**

Introduction to Big Data: Big Data and its Importance – Four V's of Big Data – Drivers for Big Data – **Introduction to Big Data Analytics – Big Data Analytics applications.**

Video link / Additional online information (related to module if any):

- https://www.youtube.com/watch?v=yZvFH7B6gKI

Module-2	**RBT Level** L2 , L3	**Hours 10**

Big Data Technologies: Hadoop's Parallel World – Data discovery – Open source technology for Big, Data Analytics – cloud and Big Data –Predictive Analytics – Mobile Business Intelligence and Big Data

Video link: https://www.youtube.com/watch?v=Vs9k3FThNic

Module-3	**RBT Level** L2,L3 , L4	**Hours 10**

Introduction Hadoop: Big Data – Apache Hadoop & Hadoop Eco System – Moving Data in and out

of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization. **Video link / Additional online information (related to module if any):** • https://www.youtube.com/watch?v=aReuLtY0YMI		
Module-4	**RBT Level** L3,L4 , L6	**Hours 10**
Hadoop Architecture: Hadoop: RDBMS Vs Hadoop, Hadoop Overview, Hadoop distributors, HDFS, HDFS Daemons, Anatomy of File Write and Read., Name Node, Secondary Name Node, and Data Node, HDFS Architecture, Hadoop Configuration, Map Reduce Framework, Role of HBase in Big Data processing, HIVE, PIG. **Video link / Additional online information (related to module if any):** • https://www.youtube.com/watch?v=cSE5m5Q78bE		
Module-5	**RBT Level** L4,L5 ,L6	**Hours 10**

Data Analytics with R Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering, Social Media Analytics, Mobile Analytics, Big Data Analytics with BigR. **Video link / Additional online information (related to module if any):** • https://www.youtube.com/watch?v=Zi0cfo5CHRM	
Course outcomes:	
CO1	The purpose of this course is to provide the students with the knowledge of data Analytics principles and techniques.
CO2	This course is also designed to give an exposure of the frontiers of data Analytics
CO3	Ability to explain the foundations, definitions, and challenges of Data and various Analytical tools.
CO4	Ability to program using HADOOP and Map reduce, NOSQL
CO5	Ability to understand the importance of Data in Social Media and Mining.

Text/Reference Books:	
1	Big Data Analytics, Seema Acharya, Subhasini Chellappan, Wiley 2015.
2	Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiely CIO

	Series, 2013.
3	Hadoop: The Definitive Guide, Tom White, 3rd Edition, O"Reilly Media, 2012.
4	Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

CO-PO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	1	-	2	-	-	2	2
CO2	2	3	2	1	-	-	-	-	-	2	-	1	1	2
CO3	1	2	2	3	-	2	1	1	-	1	-	1	1	1
CO4	2	3	1	2	-	2	-	-	-	-	2	1	1	2
CO5	1	2	2	2	-	1	2	1	2	-	1	2	2	2

High-3, Medium-2, Low-1

Course Title	**DATA ANALYTICS LAB**	**Semester**	**VI**
Course Code	**MVJ21CD64**	**CIE**	**50**
Total No. of Contact Hours	**30**	**SEE**	**50**
No. of Contact Hours/week	**3 (L : T : P :: 0 : 1 : 2)**	**Total**	**100**
Credits	**4**	**Exam. Duration**	**3 Hours**

Course Outcomes:

- Provide the students with the knowledge of Big data Analytics principles and techniques.
- This course is also designed to give an exposure of the frontiers of Big data Analytics
- Use Excel as an Analytical tool and visualization tool.
- Ability to program using HADOOP and Map reduce.
- Ability to perform data analytics using ML in R. Use cassandra to perform social media analytics.

Sl No	**Experiment Name**	**RBT Level**	**Hours**
1	Implement a simple map-reduce job that builds an inverted index on the set of input documents (Hadoop)	L3	4
2	Process big data in HBase	L3	4

3	Store and retrieve data in Pig	L3	4
4	Perform Social media analysis using cassandra	L3	4
5	Buyer event analytics using Cassandra on suitable product sales data.	L3	4
6	Using Power Pivot (Excel) Perform the following on any dataset a) Big Data Analytics b) Big Data Charting	L3	4
7	Use R-Project to carry out statistical analysis of big data	L3	4
8	Use R-Project for data visualization of social media data	L3	4

Course outcomes:

CO1	Provide the students with the knowledge of Big data Analytics principles and techniques.
CO2	This course is also designed to give an exposure of the frontiers of Big data Analytics
CO3	Use Excel as an Analytical tool and visualization tool.
CO4	Ability to program using HADOOP and Map reduce.
CO5	Ability to perform data analytics using ML in R. Use cassandra to perform social media analytics.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	3						1		
CO2	3	2		3	2						2	
CO3	2		3	2	3							
CO4	3	2		3						1		
CO5	3	2	3	2							2	

High-3, Medium-2, Low-1