

BUSINESS ANALYTICS – III Semester

1	21MBA531	Predictive Analytics using R
2	21MBA532	Big Data Analytics
3	21MBA533	Descriptive Analytics and Data Visualization
4	21MBA534	Analytics Applications in Functional Areas
5	21MBA536	Data Warehousing and Data Mining
6	21MBA535	Business Intelligence

BUSINESS ANALYTICS – IV Semester

1	21MBA541	Emerging technologies
2	21MBA542	Machine Learning using Python
3	21MBA544	Analytics for E-Commerce and Retail
4	21MBA543	IT Risk Management and Data Security

III Semester

Course Title	PREDICTIVE ANALYTICS USING R
Term/Semester	III
Course ID	21MBA531
Credits	3

Introduction:

The amount of data in the world is increasing exponentially as time passes. It is estimated that the total amount of data produced in 2020 will be 20 zettabytes (Kotov, 2014), that is, 20 billion terabytes. Many businesses invest lots of money and efforts for collecting the data and most of it is not analysed fully and / or not analysed appropriately. The main reason to analyse the data is to predict the future i.e. to construct actionable knowledge. This course will help and allows the students to do data analysis and build models while learning various tools & techniques. The prerequisite of the course is students must have undergone basic courses on Statistical modelling.

Course Outcomes (COs):

At the successful completion of this course the students should be able to;

CO1: Understand the predictive analytics in present scenario and R Software

CO2: Examine the data for model fitness, ETL and discover the data visualization

CO3: Understand and evaluate the prediction by using time series analysis

CO4: Apply predictive analytics techniques in decision making process

CO5: Understand the concept of neural network using R programming

Course content and Structure:

(36 hours)

Module 1: Introduction to R Programming

3 Hours

- Introduction R Software, installation of R software, R studio and different basic packages
- Background of R programming languages and its importance.

Module 2: Data Cleaning & Data Visualization

10 Hours

- Organizing and processing of data with R,
- Generating of normal distribution data, Data Cleaning (Load data by specifying formats for different columns exclusively to help with formatting while loading data itself.)
- Missing values, Outlier treatment, Pre-processing and cleaning.
- Data visualization Basic high-level plots, Modifications of scatter plots, Modifications of histograms, parallel box plots.

Module 3: Time Series Data Analysis:

10 Hours

- Uni-variate Analysis, Scenarios for using OLS regression,
- Checking the basic eligibility for linear regression, ARMA model for forecasting, Introduction to ARIMA model for forecasting (expected only the introduction).
- Computing the significance of the coefficient, intercept and slope coefficient, obtaining the residuals, Correlation & R^2 ,
- Multiple Linear Regression in R, Model building.

Module 4: Predictive Analytics Techniques

8 Hours

- Introduction to Decision trees & its importance,
- Decision tree Vs. Logistic regression,
- Data pre-processing, Model building in R, Model comparison.
- Introduction to Logistic Regression: Interpreting the model parameters and assessing the impact of predictors on the probability of outcome and variable importance can be used to understand drivers of the predicted variable and limitations.
- K Nearest Neighbour Algorithm
- Naive Bayes Algorithm

Module 5: Introduction to Neural Networks

5 Hours

- Introduction, Structure of neural networks, Information flow, Types of layers, Training a neural network, Back propagation.
- Neural networks in R (expected only introduction and a visit to Tensor flow)

Pedagogy:

- 1) Classroom Discussions
- 2) Activity Based Learning
- 3) Practice Based Learning
- 4) Project Based Learning
- 5) Experiential Learning
- 6) Software Based Learning - Python
- 7) Hackathons

Teaching Learning Resources:

Essential readings-

1. Jeffrey S. Strickland, Simulation Educators (2014) Predictive Analytics using R
2. Evans, J. R. (2013). Business Analytics: Methods, Models, and Decisions

3. Robert Stine, Dean Foster, "Statistics for Business: Decision Making and Analysis", Pearson Education, 2nd edition, 2013.
4. Robert Kabacoff, Second Edition (2015), Manning publications: R in Action Data analysis and graphics with R
5. Dr. Umesh R. Hodeghatta and Umesha Nayak, A press publication : Business Analytics Using R - A Practical Approach
6. Subhashini Sharma Tripathi, Apress publication, Learn Business Analytics in Six Steps Using SAS and R
7. Wickham H., Grolemund G. (2016). R for Data Science: Import, Tidy, Transform, Visualize, and Model Data. O'Reilly Media.
8. Cotton, R. (2013). Learning R: A Step-by-Step Function Guide to Data Analysis 1st Edition [Kindle Version]. Retrieved from <http://www.amazon.in>.
9. Knell, R. (2013) Introductory R: A Beginner's Guide to Data Visualisation, Statistical
10. Analysis and Programming in R. [Kindle Version]. Retrieved from <http://www.amazon.in>.
Murray, S. (2013) Learn R in a Day. [Kindle Version]. Retrieved from <http://www.amazon.in>.

Supplementary Readings:

NPTEL Course: https://onlinecourses.swayam2.ac.in/aic20_sp35
 Coursera Course: <https://www.coursera.org/learn/jhu-getting-started-data-viz-r>
<https://www.coursera.org/specializations/data-science-foundations-r>
 Data Sources: Kaggle: <https://www.kaggle.com/>
 Data world: <https://data.world/>,
 Data.gov.in: <https://data.gov.in/>
 Databases: EBSCO: <https://www.ebsco.com/academic-libraries>,
 JGATE: <https://jgateplus.com>
 Pearson E library: <https://elibrary.in.pearson.com>

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	1	2	3	3	2	1	2
CO2	2	3	1	2	1	1	2	3	2	1	2
CO3	2	2	1	1	-	1	2	3	2	1	2
CO4	2	3	1	2	1	1	2	3	2	1	2
CO5	2	3	1	2	1	1	2	3	2	1	2

LEVEL 3-Substantial 2-Moderate 1-Slight - No Co-relation

Course Evaluation Plan:

Sl. No.	Evaluation Item	Unit of Evaluation	Marks Allotted
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1	Semester end Lab Exam	Individual	50 Execution/ Presentation 30 Viva-Voce 10 Lab Journal 10
2	Attendance and Class participation	Individual	10
3	Capstone project	Group	25
4	Mini Project	Individual	15

Course Title	BIG DATA ANALYTICS
Term/Semester	III
Course ID	21MBA532
Credits	3

Introduction:

This course will help students to make a data driven decision which is more effective and efficient than human generated decisions. Big Data Analytics allows students to detect trends and spot patterns that can be used for future benefit. Big data analytics helps students harness data and use it to identify new opportunities. Students will gain exposure to SQL and RDBMS which will help in creating and extracting data from databases. This course will help students to learn the usage of Hadoop to store and process big data in a more effective manner. Students will also get a practical exposure to Pig and Hive during the course which will help in their future career prospects.

Course Outcomes (COs):

Post Completion of this course students should be able to:

CO1: Interpret and analyze the Big Data Platform

CO2: Understand and apply concepts of database management systems

CO3: Illustrate and apply the architectural concepts of Hadoop and HDFS

CO4: Understand and analyze Hadoop Ecosystem and Map reduce

CO5: Understand the contemporary developments in the field of Big Data Analytics.

Course content and Structure:

(36 hours)

Module 1: Introduction to Big Data

4 Hours

- Introduction to Big Data: Types of Digital Data; 5Vs; Characteristics of Data
- Challenges with Big Data

- Business Intelligence vs. Big Data-Structured and Unstructured Data
- Applications of Big Data Analytics in: Marketing and Sales, Finance Analytics- Human Resource- Healthcare
- Product Design
- Service Design
- Customer Service and Support
- SCM
- Government operations

Module 2: Database Management Systems

10 Hours

- Introduction: What is database system; purpose of database system; view of data; relational databases
- Database architecture
- Database design: ER Model overview; Constraints; Diagrams; ERD Issues
- Weak entity sets- Codd's rules
- Relational Schemas
- RDBMS: Introduction to UML Relational database model; Logical view of data keys; Integrity rules.
- Relational Database design: features of good relational database design
- Atomic domain and Normalization (1NF- 2NF- 3NF- BCNF)
- Applications of Database Systems
- Database for Finance
- Database for Healthcare
- Database for Marketing

Module 3: Hadoop and HDFS

6 Hours

- Hadoop: History of Hadoop; the Hadoop Distributed File System
- Components of Hadoop Analysing the Data with Hadoop
- HDFS: Design of HDFS
- The Design of HDFS; HDFS Concepts; Command Line Interface
- Hadoop file system interfaces
- Java interfaces to HDFS
- Analytics using Hadoop
- Application of Hadoop as a Management Technique.

Module 4: Hadoop Ecosystem and Map Reduce

12 Hours

- Map Reduce: Anatomy of a Map Reduce Job Run; Failures
- Job Scheduling
- Shuffle and Sort
- Task Execution
- Map Reduce Types and Formats
- Map Reduce Features
- Pig: Introduction to PIG
- Execution Modes of Pig
- Comparison of Pig with Databases; Grunt; Pig Latin
- User Defined Functions
- Data Processing operators
- Hive: Hive Shell; Hive Services; Hive Metastore
- Comparison with Traditional Databases
- Hive QL; Tables

- Querying Data and User Defined Functions
- Big Data Analytics using Hadoop

Module 5: Contemporary development

4 Hours

- Pyspark and Rspark: Illustrative code notebooks
- Spark Basics
- Architecture RDDs
- Building blocks of Spark
- Spark Terminologies Pyspark
- Kafka: Zookeeper; API; Clusters; Brokers
- Analytics for the Future of Management.

Pedagogy:

- 1) Classroom Discussions
- 2) Activity Based Learning
- 3) Practice Based Learning
- 4) Project Based Learning
- 5) Experiential Learning
- 6) Software Based Learning - MySQL Workbench and Cloudera/Horton works/Hue
- 7) Case Based Learning

Teaching Learning Resources:

Essential Readings

1. Big Data Simplified ,First Edition , Pearson 18 July 2019
2. Ralph Kimball and Margy Ross- "The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling"- (Third Edition). John Wiley and Sons.ISBN-10 : 1118530802,ISBN-13 : 978-1118530801
3. J. Han and M. Kamber- "Data Mining: Concepts and Techniques"- Morgan Kaufman-3/E- 2011.ISBN-10 : 9780123814791,ISBN-13 : 978-9380931913
4. Vaisman- Alejandro; Zimanyi- Esteban- "Data Warehouse Systems"- Springer- 2014. ISBN-10 : 3642546544 ,ISBN-13 : 978-3642546549
5. by Sourabh Mukherjee (Author), Amit Kumar Das (Author), Sayan Goswami (Author) ISBN-10 : 9386263610,ISBN-13 : 978-9353435110

Reference

1. Kimball- Ralph- "The Data warehouse lifecycle toolkit: expert methods for designing- developing- and deploying data warehouses"- John Wiley & Sons- 1998.ISBN-10 : 0471255475, ISBN-13 : 978-0471255475
2. Alex Berson- Stephen J. Smith- "Data Warehousing- Data Mining- and OLAP"- MGH- 1998 ISBN-10 : 0070062722,ISBN-13 : 978-0070062726

Supplementary Readings:

NPTEL Course : <https://nptel.ac.in/courses/106/104/106104189/>

Coursera: <https://www.coursera.org/learn/hadoop> <https://www.coursera.org/learn/big-data-analysis>

Data Sources : Kaggle: <https://www.kaggle.com/> Data world: <https://data.world/> Data.gov.in: <https://data.gov.in/>

Databases: EBSCO: <https://www.ebsco.com/academic-libraries>,

JGATE: <https://jgateplus.com>

Pearson E library: <https://elibrary.in.pearson.com>

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	2	1	1	-	1	2	2	2	1	-
CO2	-	2	1	1	1	2	2	2	2	-	1
CO3	-	2	-	-	-	2	2	1	1	-	-
CO4	-	2	-	-	-	1	2	1	1	-	-
CO5	-	2	-	-	-	1	2	2	2	-	-

LEVEL 3-Substantial 2-Moderate 1-Slight - No Co-relation

Course Evaluation Plan:

Sl. No.	Evaluation Item	Unit of Evaluation	Marks Allotted	Timeline
1	End Term Exam	Individual	50	At the end of the semester
2	Mid – Term Test	Individual	20	After completion of 2-3 modules
3	Attendance and Class participation	Individual	5	At the end of the semester
4	Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.)	Individual	25	Full Semester

Course Title	DESCRIPTIVE ANALYTICS AND DATA VISUALIZATION
Term/Semester	III
Course ID	21MBA533
Credits	3

Introduction:

Tableau is a powerful and fast-growing data visualization tool. While Tableau is designed to be used by a range of business users and non-technical audiences, it also provides access to a deep computational ability for advanced data analytics. Tableau is flexible because it can deal with a lot of different data sources. Tableau is great because it's a single tool for problem framing, importing and cleaning data, analyzing and visualizing data; taking business decisions; and presenting insights. Organizations across the world and in various industries are using visualization and reporting through Tableau. Tableau alone has a market share of about 14.2% in the Business Intelligence category, making it the most popular BI tool among the others.

Course Outcomes (COs):

CO1: Understand the fundamental concepts and features of tableau.

CO2: Create data visualizations using tableau.

CO3: Analyse various features of modeling using tableau.

CO4: Create dashboards in tableau.

CO5: Construct stories in tableau.

Course content and Structure: (36 hours)

Module 1: Getting Started with Tableau 8 Hours

- Introduction to tableau
- Data Connection: connecting to data; loading data
- Navigating in tableau: Menu Commands; File Menu; Data Menu; Worksheet Menu; Dashboard Menu; Story Menu; Analysis Menu; Map Menu; Format Menu
- Loading workbooks
- Dimensions and measures
- first visualization
- building and improving visualizations

Module 2: Building and Customizing Visualizations 10 hours

- Creating Basic Visualizations: Bar chart ; Line chart; pie chart; crosstab; scatter plot; bubble chart; histogram ; waterfall charts
- Filtering: basic filters; quick filters; context filters; condition filters; Hierarchical filters; Collaborative filters; top filters
- Sorting; through selection; excluding multiple fields
- filtering for null values
- Top filters on tableau
- Aggregation
- Calculated fields: introduction; creating calculated fields

Module 3: Analysis through tableau 8 hours

- Mapping your data
- creating a symbol map
- working with dates
- visualizing dates in data: Drill down and roll up; date formatting options; date filters
- reference lines; Spread analysis using reference lines
- trend lines
- forecasting

Module 4: Presenting Your Data 6 hours

- Best practices for formatting your visualization
- Using color purposefully and readable fonts
- Use tooltips and adjust access as necessary
- Creating dashboards
- Customizing dashboards: Add a tiled textbox; add floating images and buttons
- Creating stories
- Customising stories: tailor your caption; adjust layout

Module 5: Creating Stories in Tableau 4 hours

- Concept: Introduction to Tableau Stories
- CXO level data story Vs Operational data story
- Demo: Creating a Data Story
- Demo: Formatting a Story
- Activity: What's the Story?

Pedagogy:

- 1) Software based teaching
- 2) Practice based learning
- 3) Activity based learning
- 4) classroom discussions
- 5) Project based learning

Teaching Learning Resources:

Essential Readings

- 1. Daniel G. Murray, Tableau Your Data!: Fast and Easy Visual Analysis with Tableau Software 2nd Edition, WILEY publication. ISBN: 978-1-119-00119-5
- 2. Ryan Lindy, visual data storytelling with Tableau, Pearson Publication. ISBN-10 : 9353063590

Reference

- 1. Ryan Sleeper, Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master 1st Edition, O'REILLY publication. ISBN-13 978-1491977316
- 2. Joshua N. Milligan, Learning Tableau: Tools for Business Intelligence, data prep, and visual analytics, 3rd Edition, Packt publication. ISBN-13 : 978-1784391164
- 3. Jane A Crofts, Tableau Desktop: A Practical Guide for Business Users. ISBN-13 : 978-1518675157
- 4. Alexander Loth ,Visual Analytics with Tableau 1st Edition, WILEY publication ISBN:9781119560203
- 5. Learning Tableau by Joshua Milligan. Packt Publication. ISBN-13 : 978-1800200364
- 6. Communicating Data with Tableau by Ben Jones. OREILLY publication ISBN-13 : 978-1449372026

Supplementary resources-

- 1. <https://jgateplus.com/home/>
- 2. <https://search.ebscohost.com/>
- 3. <https://elearning.tableau.com/tableau-fundamentals>
- 4. <https://www.coursera.org/specializations/data-visualization>
- 5. <https://elibrary.in.pearson.com>

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	3	1	3	1	-	3	3	1	-	-
CO2	-	2	-	2	1	-	3	3	1	-	-
CO3	-	3	-	1	1	-	3	3	1	-	-
CO4	-	3	1	3	2	1	3	3	2	-	2
CO5	-	2	-	1	1	2	3	3	1	-	-

LEVEL 3-Substantial 2-Moderate 1-Slight "-" No Correlation

Course Evaluation Plan:

Sl. No.	Evaluation Item	Unit of Evaluation	Marks Allotted
1	Semester end Lab Exam	Individual	50 Execution/ Presentation 30 Viva-Voce 10 Lab Journal 10
2	Attendance and Class participation	Individual	10
3	Capstone project	Group	25
4	Mini Project	Individual	15

Course Title	ANALYTICS APPLICATIONS IN FUNCTIONAL AREAS
Term/Semester	III
Course ID	21MBA534
Credits	3

Introduction:

This is a three-credit course offered to the students of Business Analytics. The course demonstrates how analytics as a horizontal can cut across many verticals called domains or functional areas. In this course, students get exposed to applications of analytics in business domains like marketing, finance, Human resources, Supply Chain/Operations and in other areas. This course also enables students well conversant with domain specific analytical concepts and hands on with data and tools. The objective of this course is to equip students with domain specific analytical skills and develop passion to solve business problems in various domains with the help of statistical models specific to domains. This course attempts to inculcate in the students the ability to conceptualize business problems in statistical terms and to enhance their understanding of statistical data analysis, so as to be able to create an ecosystem for its implementation, and use it for competitive advantage in business organizations.

Course Outcomes (COs):

At the successful completion of this course the students should be able to:

CO1: Ability to apply analytics (tools and algorithms) to solve problems in functional areas

CO2: Articulate the usage of business analytics in a variety of functional areas

CO3: Create a use case for analytics to solve business problems

CO4: Understand the importance of analytics in taking effective business decision

CO5: Analyse the use cases of Analytics in various functional areas

Course content and Structure: (36 hours)**Module 1: Analytics applications in Marketing 8 Hours**

- A case study on Customer churn prediction
- A case study on Market Basket Analysis
- A case study on Sales forecasting
- A case study on Customer Sentiment Analysis
- A case study on Recency, Frequency, Monetary (RFM)

Module 2: Analytics applications in Finance 7 Hours

- A case study on Customer Life Time Value Analysis
- A case study on Real time case study of credit card fraud
- A case study on Stock Market Prediction
- A case study on Credit Appraisal Process and Repayment of loan in the Bank

Module 3: Analytics applications in Human Resource Management 7 Hours

- A case study on Employee Attrition and Employee Retention
- A case study on Employee Sentiment Analysis
- A case study on Performance appraisal
- A case study on Talent Acquisition and Resume screening; Talent Management.

Module 4: Analytics applications in Supply Chain and Operations 7 Hours

- A case study on Real time analytics in Production optimization; and Quality assurance
- A case study of hospital optimal resource allocation
- A case study on Asset Performance Management
- A case study on Inventory Management Forecasting

Module 5: Analytics applications in other functional areas 7 Hours

- A case study on The Trend of COVID-19 at Bengaluru: Prediction to Continue the Better Epidemic Management
- A case study on Travel and Tourism in India - Focus on Innovation and Customer Experience
- A study on Role of higher education in economic development of the country.
- Transition to LPG for cooking: A case study from two states of India

Pedagogy:

1. Class room discussion
2. Case based teaching (Text and Multimedia)
3. Project based learning
4. Software linked Practice based Teaching
5. Industry expert interaction

Teaching Learning Resources:**Essential readings**

1. Tanushri Banerjee , Arindam Banerjee (2019), Business Analytics: Text and Cases, SAGE Publications, 1st Edition, ISBN: 978-9353287108
2. Winston, W.L. (2014), Marketing Analytics: Data-Driven Techniques with Microsoft Excel, Wiley, First Edition, ISBN: 978-1118373439.
3. Fitz-enz, J. (2001). How to Measure Human Resource Management, McGraw-Hill; 3 edition, ISBN: 978-0071369985
4. FIN sights – Technology Insights for the Financial Services Industry – Analytics in Financial Services – Special Edition in collaboration with FICO by Infosys,
5. “Operations Management”, Jay Heizer and Barry Render, Pearson Publications, ISBN: 0132921146
6. “Supply Chain Analytics with SAP NetWeaver Business Warehouse”, Amol Palekar and Shreekant Shiralkar, ISBN: 9781259006081,
7. “Analytics in Operations/Supply Chain Management”, Muthu Mathirajan and Chandrasekharan Rajendran, ISBN: 9789384588946
8. Winston, W.L. (2014). Marketing Analytics: Data-driven Techniques with Microsoft S. Russell and P. Norvig, Artificial Intelligence A Modern Approach, 2nd Edition. Pearson Education, (2007), ISBN: 9781118373439

References

1. Grigsby, M. (2015), Marketing Analytics: A practical guide to real marketing science, Kogan Page Limited. Venkatesan, R., Farris, P., Wilcox, R.T. (2014), Cutting Edge Marketing Analytics: Real World Cases and Data Sets for Hands On Learning, Pearson Education, ISBN: 978-0133552522
2. Tower Group Survey of Credit Card Issuers and Consumer Lenders: Connected Decision Making for Collections, Risk and Fraud Management in Turbulent Times, Theodore Iacobuzio, April 2008, page 17
3. Knapik, Jaroslaw “Using Technology to Combat Financial Crime in Retail Banking (Strategic Focus)”, Datamonitor, Dec 2008, ISBN: 0060161728
4. Bassi, L. (2011). Raging debates in HR analytics. People and Strategy, 34(2), 14, ISBN: 9035245105
5. GeradFeigin, Supply Chain planning and analytics – The right product in the right place at the right time, Business Expert Press, 2011, ASIN : B005QBF2ZQ
6. Makridakis, S., Wheelwright, S. C., & Hyndman, R. J. (1997). Forecasting methods and applications. John Wiley & Sons. Third Edition, ISBN: 978-0-471-53233-0

Supplementary Resources

- Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory and Impartus – LCS
 1. <https://www.enginius.biz/index.php/instructors/case-studies/>
 2. <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/human-capital/us-hc-enabling-business-results-with-hr-measures-that-matter.pdf>
 3. Loshin , David. “Customer Centricity, Master Data and the “360 Degree View”. A Datalux white paper.
 4. <https://jgateplus.com>
 5. <https://search.ebscohost.com>
 6. <https://capitaline.com/>
 7. <https://www.kaggle.com>
 8. <https://www.github.com>
 9. www.emeraldinsight.com (A renowned research journal database)
 10. www.ncaer.org (National Council of Applied Economic Research – Govt. of India data resource) and <https://www.12manage.com/>
 11. www.stattutorials.com (Statistics tutorials including worked examples using softwares like SPSS)
 12. <https://dmsretail.com/list-of-retail-articles-success-tips/>
 13. Coursera course on “ Case studies in business analytics with ACCENTURE” by “Nicolas Gladly” offered by the “ESSEC Business School”
 14. Coursera course on “Business Analytics Capstone” by Wharton Teaching Staff offered by the “Wharton School of the University of Pennsylvania”.
 15. <https://elibrary.in.pearson.com>

Cap-Stone project

Each group of 3 Students (max) assigned one case study for this; A report must be prepared outlining the following steps:

- a. Problem definition in the functional area
- b. Identify and use a standard dataset available for the problem
- c. Implement the tools and algorithms of choice.
- d. Interpret and visualize the results.

Lab Exercises

1. Market Basket Analysis
2. Customer Sentiment Analysis
3. Credit card fraud
4. Stock Market Prediction
5. Employee Attrition and Employee Retention
6. Performance appraisal
7. Real time analytics in Production optimization; and Quality assurance
8. hospital optimal resource allocation
9. The Trend of COVID-19 at Bengaluru: Prediction to Continue the Better Epidemic Management
10. Transition to LPG for cooking: A case study from two states of India

CO PO Mapping:

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

LEVEL 3-Substantial 2-Moderate 1-Slight - No Co-relation

Course Evaluation Plan:

Sl. No.	Evaluation Item	Unit of Evaluation	Marks Allotted	Timeline
1	End Term Exam	Individual	50	At the end of the semester
2	Mid – Term Test	Individual	20	After completion of 2-3 modules
3	Attendance and Class participation	Individual	5	At the end of the semester
4	Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.)	Individual	25	Full Semester

Course Title	DATA WAREHOUSING AND DATA MINING
Term/Semester	III
Course ID	21MBA536
Credits	3

Introduction:

Data mining is the computational process of discovering patterns from large data sets. This course discusses concepts and techniques of data warehousing and mining. Data mining is one of the most advanced tools used by IT industries. The topics covered include introduction to data warehousing, data pre-processing and foundational data mining techniques such as supervised learning including regression and classification, and unsupervised learning such as clustering and association rules. Students are

introduced to design data warehouse and perform data mining tasks with neural networks, as well as exposed to open-source data mining software.

Course Outcomes (COs):

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

CO1: Design a Data warehouse system and perform business analysis with OLAP tools

CO2: Understand Architecture of a Data Mining System.

CO3: Apply frequent pattern and association rule mining techniques for data analysis

CO4: Apply appropriate classification and clustering techniques for data analysis

CO5: Understand the latest trends in Data warehousing and data mining

Course content and Structure: (36 hours)

Module 1: Data Warehousing, Business Analysis and OLAP 12 Hours

- Basic Concepts: Data Warehousing Components; Building a Data Warehouse
- Database Architectures for Parallel Processing; DBMS Schemas for Decision Support
- Data Extraction; Cleanup and Transformation tools; Meta data; reporting
- Query tools and Applications
- Multidimensional Data Model
- Data Warehouse Schemas for Decision Support; Concept Hierarchies; Characteristics of OLAP Systems
- Typical OLAP Operations, OLAP and OLTP.
- Planning Data Warehouse and Key Issues
- Planning and Project Management in constructing Data warehouse
- Data Warehouse Project
- Data Warehouse Development Life Cycle, Kimball Lifecycle Diagram
- Requirements Gathering Approaches: Team organization; Roles; and Responsibilities
- Data Warehouse Architecture: MOLAP, ROLAP, HOLAP
- ETL Overview or Introduction to ETL: ETL requirements and Steps

Module 2: Introduction to WEKA and Applications 6 Hours

- Downloading and/or installation of WEKA data mining toolkit
- Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface, Experimenter, command-line interface.
- Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classify panel, Cluster panel, Associate panel and Visualize panel) Study the arff file format
- Explore the available data sets in WEKA.

Module 3: Introduction to Data Mining and Applications 4 Hours

- Introduction to Data Mining, Importance of Data Mining, Challenges in Data Mining, Data Mining functionalities
- Classification of Data mining systems, Data Mining architecture, Knowledge Discovery in Databases(KDD), CRISP- DM.
- Ethical issues in Data Mining and their Analysis; Global issues in Data Mining
- Data Mining Applications: Risk management and targeted marketing; Health Care Sector; Retail Sector; Financial Services and other sectors

Module 4: Data Mining Techniques: an Overview**10 Hours**

- **Classification and Prediction:** Issues Regarding Classification and Prediction; Classification by Decision Tree Introduction; Bayesian Classification – Rule Based Classification; Classification by Back propagation; Support Vector Machines; Associative Classification; Lazy Learners; Other Classification Methods; Prediction; Accuracy and Error Measures; Evaluating the Accuracy of a Classifier or Predictor; Model Section.
- **Cluster Analysis:** - Types of Data in Cluster Analysis; A Categorization of Major Clustering Methods; Partitioning Methods; Hierarchical methods; Density-Based Methods; Grid-Based Methods; Model-Based Clustering Methods; Clustering High-Dimensional Data; Constraint-Based Cluster Analysis; Outlier Analysis.

Module 5: Emerging Trends**4 Hours**

- Multimedia Data Mining
- Text Mining
- Web Mining
- Data Warehouse Services (e.g. Amazon Red Shift, Azure SQL Data Warehouse.).

Pedagogy:

- 1) Classroom discussion
- 2) Case based teaching (Text and Multimedia)
- 3) Project based teaching
- 4) Practice based learning
- 5) Software linked Practice based Teaching
- 6) Industry expert interaction

Teaching Learning Resources:**Essential readings-**

1. M.H. Dunham, "Data Mining Introductory and Advanced Topics", Pearson Education, ISBN : 978-8177587852
2. Ralph Kimball and Margy Ross, "The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling", (Third Edition). John Wiley and Sons, ISBN : 978-1118530801
3. J. Han and M. Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufman, 3/E, 2011, ISBN: 978-0-12-381479-1.
4. Vaisman, Alejandro; Zimanyi, Esteban, "Data Warehouse Systems", Springer, 2014, ISBN : 978-3-642-54655-6
5. Paulraj Ponniah, –Data Warehousing: Fundamentals for IT Professionalsl, Wiley India, ISBN : 0-471-41254-6
6. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 3rd edition, ISBN : 978-0-12-381479-1
7. Reema Theraja –Data warehousingl, Oxford University Press, ISBN : 978-0195699616
8. Introduction to data mining by Tan, Steinbach & Kumar, ISBN : 978-0133128901
9. Instant Weka : How to , Bostjan Kaluza, Packt Publishing Limited

References-

1. Vaisman, Alejandro; Zimanyi, Esteban, “Data Warehouse Systems”, Springer, 2014, ISBN : 978-3-642-54655-6
2. Golfarelli, Matteo; Rizzi, Stefano, “Data Warehouse Design : modern principles and methodologies”, McGraw Hill, 2009, ISBN : 978-0071610391
3. Jensen, Christian S; Pedersen, Torben Bach; Thomsen, Christian W, Morgan & Claypool, “Multidimensional Databases and Data warehousing”, cop. 2010, ISBN : 9781608456017
4. Kimball, Ralph, “The Data warehouse lifecycle toolkit: expert methods for designing, developing, and deploying data warehouses”, John Wiley & Sons, 1998, ISBN : 0471255475
5. Alex Berson, StephenJ. Smith, “Data Warehousing, Data Mining, and OLAP”, MGH, 1998. ISBN : 0-201-177-676
6. Learn By Examples – A Quick Guide to Data Mining with Rapidmlner and Weka, Eric Goh, SV Book Pte. Ltd.

Supplementary Resources

Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory and Impartus – LCS

1. <https://nptel.ac.in/courses/106/105/106105174/>
2. Andrew Moore’s Data Mining Tutorials (See tutorials on Decision Trees and Cross Validation)
3. Decision Trees (Source: Tan, MSU) Tom Mitchell’s book slides (See slides on Concept Learning and Decision Trees)
4. <https://www.cs.waikato.ac.nz>
5. <https://jgateplus.com>
6. <https://search.ebscohost.com>
7. <https://www.guru99.com>
8. <https://www.javapoint.com>
9. <https://www.kaggle.com>
10. <https://www.github.com>
11. Coursera course on “Data Warehousing for Business Intelligence Specialization” by Michael Mannino and Jahangir Karimi offered by the University of Colorado System
12. Coursera course on “Data Mining” by John C. Hart offered by the University of Illinois at Urbana-Champaign
13. <https://elibrary.in.pearson.com>

Capstone project:

Each group of 3 Students (max) assigned one topic for this; A Data Warehouse and Data Mining report must be prepared outlining the following steps:

- a) Problem definition, identifying which Data Warehouse and data mining task is needed.
- b) Identify and use a standard data mining dataset available for the problem
- c) Interpret and visualize the results.
- d) Provide clearly the Data Mining decision that is to be taken as a result of mining.

Lab Exercises

1. Explore and compare various data mining tools
2. Preparing data sets for WEKA.
3. Application of pre-processing methods on data sets using WEKA
4. Preprocessing on real and synthetic datasets.
5. Apply filters on the customer dataset using WEKA.
6. To predict with the smallest total error using rules based on One attribute
7. Apply classification technique to find association rules.
8. Demonstration of various classification algorithms.
9. Performance measurement of various classification algorithms
10. Demonstration of Clustering methods

Mapping of Course Outcomes to Program Outcomes:

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

LEVEL 3-Substantial 2-Moderate 1-Slight - No Co-relation

Course Evaluation Plan:

Sl. No.	Evaluation Item	Unit of Evaluation	Marks Allotted	Timeline
1	End Term Exam	Individual	50	At the end of the semester
2	Mid – Term Test	Individual	20	After completion of 2-3 modules
3	Attendance and Class participation	Individual	5	At the end of the semester
4	Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.)	Individual	25	Full Semester

Course Title	BUSINESS INTELLIGENCE
Term/Semester	III
Course ID	21MBA535
Credits	3

Introduction:

In the age of technological progression, digital advancements have completely revolutionized our everyday lives and the business world has been impacted to a maximum extent. It is prudent on the part of the companies to develop and invest in technologies, applications, strategies and practices to collect, analyze, integrate and present pertinent business information. The entire purpose of Business Intelligence is to support and facilitate better business decisions. Hence, it is essential for business management students to have knowledge on the process of business intelligence. This course entitled - Business Intelligence is introduced to orient a business professional regarding access to information, analyze and draw insights that is critical to the success of an enterprise.

Course Outcomes (COs):

- CO1:** Understand and describe the fundamentals of business intelligence
- CO2:** Implement the process of business intelligence to make better business decisions.
- CO3:** Explain the issues and challenges associated with business intelligence
- CO4:** Understand the nuances in implementing the Business Intelligence tools
- CO5:** Analyze the emerging trends in Business Intelligence

Course content and Structure: (36 hours)

Module 1: Business Intelligence: an Introduction 10 Hours

- Introduction; Definition; History and Evolution
- Business Intelligence Segments; Difference between Information and Intelligence
- Defining Business Intelligence Value Chain; Factors of Business Intelligence System
- Real time Business Intelligence; Business Intelligence Applications
- ETL Overview or Introduction to ETL: ETL requirements and Steps
- Creating Business Intelligence Environment
- Business Intelligence Landscape, Types of Business Intelligence
- Business Intelligence Platform, Dynamic roles in Business Intelligence
- Roles of Business Intelligence in Modern Business- Challenges of BI
- Business Intelligence Lifecycle: Enterprise Performance Life Cycle ;(EPLC) Framework Elements; Life Cycle Phases. Business Intelligence Architecture
- Human Factors in BI Implementation
- BI Strategy, Objectives and Deliverables
- Transformation Roadmap; Building a transformation roadmap
- BI Development Stages and Steps; Parallel Development Tracks; BI Framework

Module 2: Introduction to Power BI and Its applications**6 Hours**

- Introduction to Power BI
- Power BI query Editor
- Data Modelling
- DAX measures
- Data Visualization and Dashboards

Module 3: Business Intelligence Issues and Challenges**10 Hours**

- Critical Challenges for Business Intelligence success
- Cross-Organizational Partnership, Business Sponsors
- Dedicated Business Representation; Availability of Skilled Team Members
- Business Intelligence Application Development methodology
- Planning the BI Projects
- Business Analysis and Data Standardization; effect of Dirty Data on Business profitability
- Importance of Meta-Data; Silver Bullet Syndrome; Customer Pain Points,
- Creating Cost Effective Enterprise friendly BI solution

Module 4: Implementing Business Intelligence**6 Hours**

- Business Intelligence Platform; Business Intelligence Platform Capability Matrix
- BI Target Databases; Data Mart, BI Products and Vendor
- The Big Four Business Intelligence vendors

Module 5: Emerging Trends in Business Intelligence**4 Hours**

- Artificial Intelligence.
- Data Security.
- Data Discovery/Visualization.
- SaaS BI.
- Predictive and Prescriptive Analytics Tools.
- Real-time Data and Analytics.
- Collaborative Business Intelligence.
- Mobile BI

Pedagogy:

- 1) Class room discussion
- 2) Case based teaching (Text and Multimedia)
- 3) Project based teaching
- 4) Practice based learning
- 5) Software linked Practice based Teaching
- 6) Industry expert interaction

Teaching Learning Resources:**Essential readings-**

1. Business Intelligence and Analytics by Efraim Turban, Ramesh Sharda and Dursun Delen by Pearson Publications, ISBN: 978-0-13-305090-5
2. Business Intelligence (Data Mining & Optimization for Decision Making) by Carlo Vercellin by Wiley Publications, ISBN: 78-0-470-51138-1
3. "Mastering Microsoft Power BI: Expert techniques for effective data Analytics and business intelligence, Brett Powel.

4. Business Intelligence – Grundlagen und praktische Anwendungen: Eine Einführung in die IT” by Hans-Georg Kemper and Henning Baars, ISBN: 78-3-8348-9727-5
5. David Loshin Morgan, Kaufman, “Business Intelligence: The Savvy Manager’s Guide”, Second Edition, 2012, ISBN: 978-1-55860-916-7
6. Larissa T. Moss, S. Atre, “Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making”, Addison Wesley, 2003, ISBN: 9780201784206
7. Carlo Verzellis, “Business Intelligence: Data Mining and Optimization for Decision Making”, Wiley Publications, 2009, ISBN: 978-0-470-51138-1

References-

1. Business Intelligence for Dummies, Swain Scheps, Wiley Publication, ISBN: 978-1-118-05141-2
2. Successful Business Intelligence by Cindi Howson, McGraw Hill, ISBN: 978-0071809184
3. Business Intelligence by David Leshin, Elsevier, second edition, ISBN: 978-0123858900
4. Data mining for Business Intelligence, GalitShmueli, Nitin R Patel & Peter C Bruce, Wiley Publication, ISBN:0-978-0470-08485-4
5. Business Intelligence, Practices, Technologies and Management, Rajiv Sabherwal, Irma Becerra-Fernandes, Wiley Publication, ISBN: 9780470461709
6. Business Intelligence Guide book, Rick Sherman, Elsevier, ISBN: 9780124114616
7. Business Intelligence Strategy & Big data analytics, Steve Williams, Elsevier, ISBN: 978-0128091982
8. Microsoft Power BI Quick Start Guide: Build dashboards and visualizations to make your data come to life, Devin Knight, Brian Knight, Mitchell Pearson, Manuel Quintana

Supplementary Resources

Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory and Impartus – LCS

1. <https://docs.microsoft.com/en-us/learn/powerplatform/power-bi>
2. <https://www.edx.org/course/introduction-data-analysis-using-excel-microsoftdat205x-2>
3. <https://jgateplus.com>
4. [Pearson e-books](#)
5. <https://www.kaggle.com>
6. <https://www.github.com>
7. <https://search.ebscohost.com>
8. <https://nptel.ac.in/courses/110/104/110104086/>
9. <https://www.talend.com/resources/what-is-business-intelligence/>
10. [Coursera course on “ Business intelligence and data analytics: Generate insights” by David Pitt offered by the Macquarie University](#)
11. [Coursera course on “ Business Intelligence Concepts, Tools, and Applications” by Jahangir Karimi offered by the “University of Colorado System”](#)
12. <https://elibrary.in.pearson.com>

Cap-Stone project

Each group of 3 Students (max) assigned one case study for this; A Power BI report must be prepared outlining the following steps:

- Problem definition, identifying which data mining task is needed.
- Identify and use a standard data mining dataset available for the problem
- Implement the Knowledge discovery algorithm of choice.
- Interpret and visualize the results.
- Provide clearly the BI decision that is to be taken as a result of mining

Lab Exercises

- Demonstration of Exploring Excel Modelling capabilities to solve business problems
- Introduction to BI tools, their pros and cons and limitations.
- Demonstration of BI techniques ETL on Application Financial Analysis.
- Demonstration of BI techniques ETL on Application Student result pattern and ranking analysis
- Demonstration of Performance Dashboard: Measuring, Monitoring and management of Business
- Demonstration of KPIs and Enterprise dashboard, design of enterprise dashboards using Power BI tool.
- Demonstration of BI techniques ETL on Application HR Analysis
- Demonstration of BI techniques ETL on Application Operations Analysis
- Demonstration of BI techniques ETL on Application Finance Analysis
- Demonstration of BI techniques ETL on Application Marketing Analysis

CO-PO Mapping:

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

LEVEL 3-Substantial 2-Moderate 1-Slight - No Co-relation

Course Evaluation Plan:

Sl. No.	Evaluation Item	Unit of Evaluation	Marks Allotted	Timeline
1	End Term Exam	Individual	50	At the end of the semester
2	Mid – Term Test	Individual	20	After completion of 2-3 modules
3	Attendance and Class participation	Individual	5	At the end of the semester

4	Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.)	Individual	25	Full Semester
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BUSINESS ANALYTICS – IV Semester

Course Title	EMERGING TECHNOLOGIES
Term/Semester	IV
Course ID	21MBA541
Credits	3

Introduction:

Bill Gates said, “we’re only beginning to realize computing’s potential” and that “we’re entering an era when software will fundamentally transform almost everything we do,” ranging from the evolutionary to the revolutionary transformations disrupting previously adopted technologies and business models. These transformations should create intelligent real-time enterprises that would conduct business in a significantly more effective, efficient and agile manner, and that could adapt to the changing business conditions and grow “smarter” over time by leveraging the future generations of Information Technologies. These technologies can be the greatest friends or the worst foes in building such “smart businesses,” depending on how well they are adopted and deployed in the enterprises.

In this course, the students will study various principles of technological innovation driving major business transformations and leading to the creation of more intelligent and agile enterprises. Some of these principles include evolution and generations of emerging technologies, different types of technological trajectories, cycles and path dependencies of these technologies, business-pull and technology push. This course will use case studies to explore frameworks, tools, and strategies that are already proven in the real world and prepare ourselves and our organizations to have the tools needed to succeed in a fast and changing world.

Course Outcomes (COs):

After successfully completing the course the students will be able to:

CO1: Remember and understand various emerging technologies.

CO2: Understand and analyze various technologies in communication and virtual reality.

CO3: Understand the impact of emerging technologies in a global context.

CO4: Understand the impact of emerging technologies on society as a whole.

CO5: Understand and appreciate cutting edge technologies

Course content and Structure:

(36 hours)

Module 1: Overview of Basic Principles of Emerging Technologies 4 Hours

- How innovative technologies emerge, evolve and are adapted by businesses.
- How technical and business issues are intertwined in making certain business decisions

- Types of technological innovation and the value of emerging technologies.
- Digital Transformation: The Revolution, Hype and adoption
- Embrace the present and build the future
- How to get business and IT right?

Module 2: Virtual, Mixed and Augmented Reality

8 Hours

- Virtual, Mixed and Augmented Reality: Overview of Virtual, mixed and augmented reality, Application of AR and VR in business.
- Communication Technologies: Foundations of wireless technologies, different generations of wireless technologies (2G through 5G), and the corresponding standards (e.g., GSM, CDMA, and OFDM)

Module 3: Cloud Computing and Internet of Things

8 Hours

- Cloud Computing: Overview; Architectures of the cloud computing systems; Performance, security, reliability and economic viability issues, as pertaining to the cloud computing systems, How Cloud Computing is being used and its applications.
- Internet of things: What is Internet of Things?; Market trends and key companies and technologies; How real companies embrace IoT; How The Internet of Things Will Impact Customer Service; How The Internet Of Things Is Changing Online Marketing; The Value Of The Industrial Internet Of Things (IIoT) And Big Data In Manufacturing; Why IoT and Why Now; Applications and importance of IoT.

Module 4: Artificial Intelligence

6 Hours

- Concept of Data Science, AI and ML;
- Problem Spaces and Search Knowledge and Rationality
- AI vs. Machine Learning;
- Machine Learning - Types, Process and Applications
- Deep Learning: Introduction to Deep Learning / Neural Networks, Natural Language Processing; Modeling Concepts and Applications

Module 5: Emerging Technologies and Issues

10 Hours

- Blockchain: Building the foundations; The key concepts of Blockchain technology, Blockchain and black markets, applications
- Cryptocurrency: Introduction to Cryptocurrencies, Legal Aspects of Virtual Currency, Applications of Cryptocurrencies and Block chains in Traditional Finance, Applications
- Robotics: Types and Components of a Robot, Classification of Robots, Industrial Robot Applications, Robot Accuracy and Repeatability.
- Introduction to Quantum Computing
- Cyber Security and Data Privacy

Pedagogy:

- 1) Case based teaching
- 2) Classroom discussion
- 3) Activity based teaching
- 4) Talk by the industry experts and industry visits

Teaching Learning Resources:

Essential Readings

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall. ISBN: 9781537600314
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill. ISBN:9780070087705
3. Vijay Madiseti, Arshdeep Bahga, Internet of Things, "A Hands on Approach", University Press. ISBN:9780996025515
4. Jai Singh Arun, Jerry Cuomo, Nitin Gaur, "Blockchain for Business", Pearson publications, ISBN: 9789389588880
5. Thomas Erl, Zaigham Mahood, Ricardo Puttini, "Cloud Computing, Concept, Technology & Architecture", Prentice Hall, 2013. ISBN: 9789332535923

References

1. Trivedi, M.C., "A Classical Approach to Artificial Intelligence", Khanna Publishing House, Delhi. ISBN: 9788190698894
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press. ISBN: 9781351981927
3. Barrie Sosinsky, Cloud Computing Bible, Wiley India, 2011. ISBN: 9780470903568
4. Journal of Business Analytics – Taylor & Francis Online Journal ISSN : 2573-2358
5. <http://nifm.ac.in/business-analytics-and-statistics>
6. https://cloud.gov.in/services_da.php
7. <https://dst.gov.in/data-science-research-initiative>

Supplementary resources-

1. <https://jgateplus.com/home/>
2. <https://search.ebscohost.com/>
3. <https://www.coursera.org/specializations/emerging-technologies>
4. <https://elibrary.in.pearson.com>

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	3	-	2	2	-	3	1	-
CO2	-	1	2	3	-	2	2	1	3	1	-
CO3	-	-	2	3	-	2	2	1	3	3	-
CO4	-	-	-	3	-	1	2	-	3	3	-
CO5	-	1	2	3	-	1	2	1	3	3	-

LEVEL 3-Substantial 2-Moderate 1-Slight - No Co-relation

Course Evaluation Plan:

Sl. No.	Evaluation Item	Unit of Evaluation	Marks Allotted	Timeline
1	End Term Exam	Individual	50	At the end of the semester
2	Mid – Term Test	Individual	20	After completion of 2-3 modules

3	Attendance and Class participation	Individual	5	At the end of the semester
4	Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.)	Individual	25	Full Semester

Course Title	MACHINE LEARNING USING PYTHON
Term/Semester	IV
Course ID	21MBA542
Credits	3

Introduction:

This course provides a concise introduction to the fundamental concepts in machine learning and popular machine learning algorithms. Students will learn the standard and most popular supervised learning algorithms including linear regression, logistic regression, decision trees, k-nearest neighbor, an introduction to Bayesian learning and the naïve Bayes algorithm, support vector machines and kernels and neural networks with an introduction to Deep Learning. Students will cover the basic clustering and association algorithms. This course will make students industry ready and capable of analytical problem solving.

Course Outcomes (COs):

Post Completion of this course students should be able to:

CO1: understand and illustrate machine learning theories

CO2: design and implement supervised learning algorithms

CO3: design and implement unsupervised learning algorithms

CO4: design and implement deep learning algorithms

CO5: understand the contemporary developments in the field of machine learning.

Course content and Structure:

(36 hours)

Module 1: Introduction Machine Learning and Python

6 Hours

- Machine Learning: Extension of hypothesis testing
- Linear Algebra for Machine Learning
- Algorithms for learning
- Learning Classifiers
- Learning from heterogeneous; Distributed; Data and knowledge
- Gradient Descent
- Applications of Machine Learning as a Technique of Analytics in: Marketing and Sales; Finance Analytics; Human Resource; Healthcare;
- Product Design;
- Service Design- Customer Service and Support
- SCM- Government operations
- Introduction to Python , Installing and launching Jupiter Notebook

Module 2: Supervised Learning Algorithms**6 Hours**

- Independent Variables
- Bias Variance Tradeoff
- Linear Regression
- Regularization techniques: Lasso and R and Ridge Regression
- Optimization Techniques
- Gaussian Naive Bayes
- Random Forest (ensemble learning algorithms)
- Illustrative example of decision Trees
- Decision Tree as a foundation of Random Forest
- Application of Random Forest to facilitate Business Decision Making.

Module 3: Unsupervised Learning Algorithms**9 Hours**

- Introduction to Unstructured data
- What are clustering Algorithms; K-means clustering
- Metrics to understand the quality of clusters
- KNN (k-nearest neighbors)
- Hierarchical clustering
- Principal Component Analysis: Uses in dimensionality Reduction
- Illustrative Example of PCA
- Application of simple K means clustering in industry
- Application of Hierarchical Clustering in HR
- Application of Principle Component Analysis as a data reduction Technique
- Target and Walmart use cases.

Module 4: Deep Learning**12 Hours**

- Neural Networks
- Hidden Layers
- Back propagation
- Gradient Descent
- Convolutional Neural Networks
- Recurrent Neural Networks
- Application of Image Processing in the retail industry
- Application of Neural Networks in Banking Sector
- Neural Network as a Management Technique
- Illustrative example of Google ML platform and Tensor flow

Module 5: Contemporary development**3 Hours**

- Reinforcement Learning
- Applications of Reinforcement Learning in Error Reduction
- Real time decision making; traffic pattern analysis; assistance in ships direction
- Temporal Difference (TD)
- Q-Learning
- Deep Adversarial Networks-Deep Learning Algorithms
- Tensor flow-Torch-Caffe

Pedagogy:

- 1) Classroom Discussions
- 2) Activity Based Learning
- 3) Practice Based Learning
- 4) Project Based Learning
- 5) Experiential Learning
- 6) Software Based Learning - Python
- 7) Hackathons

Teaching Learning Resources:**Essential Readings**

1. Manaranjan Pradhan and U Dinesh Kumar “Machine Learning Using Python”, Wiley Publication, ISBN-108126579900
2. Max Kuhn and Kjell Johnson “Applied Predictive Modeling” Springer; 1st ed. 2013, Corr. 2nd printing 2018 edition (27 April 2018) ISBN-10: 1461468485, ISBN-13: 978-1461468486
3. Saikat Dutt ,Subramanian Chandramouli , Amit Kumar Das, “machine learning” - Pearson; First edition (1 October 2018) ISBN-10 : 9353066697, ISBN-13 : 978-9353066697

Reference Books:

1. Andrew NG “Machine Learning Yearning” ISBN-10: 199957950X,ISBN-13: 978-1999579500
2. 5.Andriy Burkov “The Hundred-Page Machine Learning Book”ISBN-10 : 1999579542, ISBN-13 : 978-1999579548

Supplementary Resources

1. MOOC on Machine Learning By NPTEL
<https://nptel.ac.in/courses/106/105/106105152/>
2. <https://nptel.ac.in/courses/106/106/106106202/>
3. <https://nptel.ac.in/courses/106/106/106106213/>
MOOC on Machine Learning By Coursera
4. <https://www.coursera.org/learn/machine-learning>
5. <https://www.coursera.org/learn/uol-machine-learning-for-all>
6. Kaggle: <https://www.kaggle.com/>
7. Data world: <https://data.world/>,
8. Data.gov.in: <https://data.gov.in/>
9. EBSCO: <https://www.ebsco.com/academic-libraries>,
10. JGATE : <https://jgateplus.com/>
11. <https://elibrary.in.pearson.com>

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	2	1	1	-	1	2	2	2	-	-
CO2	-	2	2	1	1	2	2	2	2	-	1
CO3	-	2	2	-	-	2	2	1	2	-	-
CO4	-	2	1	-	-	1	1	1	1	-	-
CO5	-	1	-	-	-	1	1	2	1	-	-

LEVEL 3-Substantial 2-Moderate 1-Slight - No Co-relation

Course Evaluation Plan:

Sl. No.	Evaluation Item	Unit of Evaluation	Marks Allotted
1	Semester end Lab Exam	Individual	50 Execution/ Presentation 30 Viva-Voce 10 Lab Journal 10
2	Attendance and Class participation	Individual	10
3	Capstone project	Group	25
4	Mini Project	Individual	15

Course Title	ANALYTICS FOR E-COMMERCE AND RETAIL
Term/Semester	IV
Course ID	21MBA544
Credits	3

Introduction:

E-commerce analytics is a system or tool that allows to understand user's behaviour. Although most e-commerce analytics tools focus on onsite behaviour, e-commerce analytics goes beyond that. In current scenario, many businesses are trying random tactic to succeed until something works. Real success happens when there are processes, trends, and concrete numbers that act as compass. And that's where ecommerce Analytics and the data supplied by it is powerful.

Good data helps us understand the world around us, it provides guidance and helps us make sound decisions, and this includes ecommerce data as well.

E-commerce analytics tells where users came from, how much time they spent looking at a particular product, where they spend most of their time, and much more.

The course would provide detailed knowledge about Google analytics and how informed decisions can be made with the data from websites. Students will also learn how to analyze market and retail data which would help in evolving the process of retailing and help in making better decisions. Students will learn to create advanced reports on Google analytics platform on shopping behaviour and buying patterns to increase business sales.

Course Outcomes (COs):

CO1: Understand basics of E-Commerce analytics

CO2: Apply different techniques in Google analytics.

CO3: Analyze E-Commerce Reports in Google Analytics.

CO4: Understand and appreciate application of analytics in retailing.

CO5: Apply various application tools and algorithms in retail analytics.

Course content and Structure:**(36 hours)****Module 1: E-commerce Analytics Basics****4 Hours**

- What is E-commerce Analytics
- Why do you need it
- AARRR for Ecommerce: Acquisition; Activation; Revenue; Retention; Referral

- Omni-channel impact on e-biz and vice-versa
- A/B testing
- Introduction to Google analytics.

Module 2: Settings in Google Analytics

12 Hours

- The Basics: How to set up Google Analytics
- Google Analytics views; ecommerce tracking
- Google Analytics settings :latest code; Ad Words time zone; View Settings; Ad Words Linking; Importing other paid traffic sources; Integrating Search Console; demographics and interests reporting; Create custom alerts
- What is UTM (Urchin Tracking Module) tagging for e-commerce and its important
- How to track competitors' prices and stock availability

Module 3: Customer Experience and analytics

6 Hours

- Buyer personas
- Audience Reports in Google Analytics
- GDPR laws; how they shape ad targeting; limitations
- How to use geographic and demographic data to optimize campaigns
- How to Use Facebook data Insights for Better Targeting; segmentation; retention; customer satisfaction
- Analytics through Ads: Google Ads Analytics; Facebook Ads Analytics; Display Ads Analytics

Module 4: Overview of Retailing Analytics

4 Hours

- Retailer Goodwill,
- The Inside Scoop: Retail Power Brokers, Retail Organization, Real Estate Marketing, Creative Advertising Marketing, Operations Marketing (Research), Direct Marketing, Strategic Marketing,
- Point of Sale versus Market Basket Data,
- Data as Revenue: The Price of Retail Data.
- POS data and its use cases
- Use cases on video analytics, shelf analytics

Module 5: Retail & Data Analytics

10 Hours

- Data Terms, Market Basket, Data Storage, Data without Use Is Overhead,
- Case Studies and Practical Examples of Data-Related Retail Projects,
- Competitor Threat Analytics,
- Combining Multiple Data Sources,
- E-Business: Clicks and Mortar,
- Merchandise Cross-Sell Case Study
- Market Basket Analysis: Examples,

Pedagogy:

- 1) Practice based teaching using Google Analytics
- 2) Classroom discussion
- 3) Case based teaching
- 4) Project based teaching.
- 5) Interaction with Industry experts

Teaching Learning Resources:

Essential readings-

1. Retail Analytics – The Secret Weapon, Emmett Cox. Wiley publications, ISBN-13: 9781118148327
2. The Ridiculously Simple Guide to Google Analytics, Scott La Counte. Diana La Counte Publications ISBN-13 : 978-1629178042
3. Introduction to Google Analytics, Todd Kelsey. Apress publications ISBN-13 : 978-1484228289
4. Consumer Behavior, Leon G. Schiffman, Joe Wisenblit, S. Ramesh Kumar, Pearson Education India. ISBN: 9789353943806
5. <https://www.conversific.com/blog/ecommerce-analytics/>

References

1. Google Analytics Breakthrough, Feras Alhlou. Wiley publications, ISBN-13: 9781119231691
2. Advanced Web Metrics with Google Analytics, Brian Clifton, Third edition. Wiley publications, ISBN-13: 9781118168448
3. Web Analytics 2.0, Avinash Kaushik, Wiley publications, ISBN-13: 9780470596449
4. B.king, A. (2008). Website Optimization. O'Reilly publication. ISBN-13:9780596515089
5. Sachs, A-L. (2014) Retail Analytics: Integrated Forecasting and Inventory Management for Perishable Products in Retailing, Springer. ISBN: ISBN 978-3-319-13305-8

Supplementary resources-

1. <https://jgateplus.com/home/>
2. <https://search.ebscohost.com/>
3. <https://www.coursera.org/professional-certificates/google-data-analytics>
4. <https://elibrary.in.pearson.com>

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	1	-	1	-	1	1	1	-	-	-
CO2	-	3	-	1	-	1	3	3	1	-	-
CO3	1	3	-	2	1	2	3	3	1	-	-
CO4	2	2	1	3	1	2	3	2	1	-	1
CO5	3	2	1	3	2	2	3	3	-	-	2

LEVEL 3-Substantial 2-Moderate 1-Slight - No Co-relation

Course Evaluation Plan:

Sl. No.	Evaluation Item	Unit of Evaluation	Marks Allotted	Timeline
1	End Term Exam	Individual	50	At the end of the semester
2	Mid – Term Test	Individual	20	After completion of 2-3 modules
3	Attendance and Class participation	Individual	5	At the end of the semester
4	Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.)	Individual	25	Full Semester

Course Title	IT RISK MANAGEMENT AND DATA SECURITY
Term/Semester	IV
Course ID	21MBA543
Credits	3

Introduction:

The purpose of this course is to provide understanding of the main issues related to security in modern networked computer systems. This covers underlying concepts and foundations of computer security, basic knowledge about security-relevant decisions in designing IT infrastructures, techniques to secure complex systems and practical skills in managing a range of systems, from personal laptop to large-scale infrastructures. On completion of this course, students should have gained a good understanding of the concepts and foundations of computer security, and identify vulnerabilities of IT systems. The students can use basic security tools to enhance system security and can develop basic security enhancements in stand-alone applications.

Course Outcomes (COs):

After successfully completing the course the students will be able to:

CO1: Understand the basics of cyber security and IT risk.

CO2: Analyse and assess the risk in the organization.

CO3: Apply the risk management tools and techniques.

CO4: Analyze and evaluate the risk mitigation techniques and frameworks within organization.

CO5: Analyze and assess management, data protection, security operations, etc.

Course content and Structure: (36 hours)

Module 1: Fundamentals of IT Risk and Cyber Security (CS) 10 Hours

- Introduction to IT Risk; Definitions of IT Risk; Four "A"s(Availability, access, accuracy, agility) ; IT Risk Disciplines; Cause of IT Risk.
- Cyber Security: Evolution; Principles; CIA – Confidentiality, Integrity, Availability
- Vulnerabilities : People-Process-Technology based vulnerabilities ;Zero-Day Vulnerability
- Threats : Actors ; Tools (Types of cyber-attacks (viruses, worms, Trojan, RAT, etc.) phishing, social engineering, ransom ware)
- Countermeasures : Cryptography, hashing, authentication, authorization, accountability

Module 2: Fundamentals of IT Risk Management 6 Hours

- IT Risk Management; IT Risk Management Issues; Failure of Risk Management in IT; Effective IT Risk Management
- General Risk Scenarios: Business-specific, industry-specific, region/location-specific scenarios
- Process of IT Risk management Step One: Identify; Step Two: Access; Step Three: Remediate IT Risks; Step Four: Manage;

Module 3: Risk Management Tools and Techniques 8 Hours

- IT Risk Management Cycle
- Technology and business drivers
- Risk Terms – Asset, Threat, Threat Agent, Threat Event, Vulnerability, Countermeasure, Risk, Residual Risk
- ISO 31000:2009 Overview
- IT Risk Management Initiative
- Integrating risk management concepts into cyber security risk assessments

Module 4: IT Risk Mitigation 5 Hours

- IT Risk Mitigation Options
- IT Risk Mitigation Strategy
- Controls' Identification and Analysis
- Calculating Residual Risk
- Applying ISO 31000 and Risk IT for Risk Mitigation
- Evaluation IT Risk Management Cycle: Project Evaluation; Learning from Selection and Execution techniques
- Integrating IT Risk Management with various frameworks and standards – BASEL II, ISO 20000, ITIL, COSO, COBIT, ISO 27001, BS 25999
- Risk Governance : Stages; advantages; challenges
- Complexity of cyber risk management :Legal ;Political; Technical; Economic; Social

Module 5: Emerging Technologies and Issues 7 Hours

- Data security: Control at the level of management: data control, data administration.

- Network security threats: spyware, search, denial of services, misrepresentation, playback and session hijacking, redirections, viruses, Trojan horses, and worms.
- Defining Privacy; Legislative Privacy
- Privacy and Data Collection
- Privacy Frameworks and policies
- Privacy-aware Access Control
- Privacy in Cloud infrastructure and Big Data

Pedagogy:

- 1) Classroom discussion
- 2) Case based teaching
- 3) Interaction with Industry experts
- 4) Seminar Based Teaching

Teaching Learning Resources:

Essential readings-

1. Information Security Principles and Practices By Mark S. Merkow, Jim Breithaupt · published by Pearson Education 9780133589634
2. Data Privacy and Security, David Salomon published by Springer New York. ISBN : 9780387217079
3. Data Privacy, Protection, and Security Law, Raymond T Nimmer, Holly K Towle, Published by LexisNexis. ISBN: 9780769889245
4. Information Technology Risk Management in Enterprise Environments A Review of Industry Practices and a Practical Guide to Risk Management Teams By Jake Kouns, Daniel Minoli, Published by Wiley, ISBN: 9781118211618

References

1. Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.
2. Anderson, James P., "Computer Security Threat Monitoring and Surveillance," Washing, PA, James P. Anderson Co., 1980.
3. B. Raghunathan, The Complete Book of Data Anonymization: From Planning to Implementation, Auerbach Pub, 2013.
4. L. Sweeney, Computational Disclosure Control: A Primer on Data Privacy Protection, MIT Computer Science, 2002.

Supplementary resources-

1. <https://jgateplus.com/home/>
2. <https://search.ebscohost.com/>
3. <https://elearning.tableau.com/tableau-fundamentals>
4. <https://www.coursera.org/learn/privacy-law-data-protection>
5. <https://www.coursera.org/learn/detect-mitigate-ethical-risks>
6. <https://elibrary.in.pearson.com>

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