Savitribai Phule Pune University
School of Open learning
(Distance Education Program)
Master of Business Administration
(*M.B.A.-Distance*)

Business Analytics & Statistical Methods using R
SEM-III, BA-MJ-32

1. **Business Analytics Basics:** Definition of analytics, Evolution of analytics, Need of Analytics, Business analytics vs business analysis, Business intelligence vs Data Science, Data Analyst Vs Business Analyst, Types of Analytics, Tools for
2. Analytics. Concept of insights. Importance of data in business analytics, Differences between data, information and knowledge, various stages of an organization in terms of data maturity, Options for organizations in the absence of good quality data.
3. **Analytical decision-making:** Analytical decision-making process, characteristics of the analytical decision-making process. Breaking down a business problem into key questions that can be answered through analytics, Characteristics of good questions, Skills of a good business analyst, Overview of Business analytics applications in - Marketing Analytics, HR Analytics, Supply Chain Analytics, Retail Industry, Sales Analytics, Web & Social Media Analytics, Healthcare Industry, Energy Analytics, Transportation Analytics, Lending Analytics, Sports Analytics. Future of Business Analytics.
4. **Fundamentals of R:** R environment, Downloading and Installing R, Using command line in R, Help, File operations in R -Reading from and Writing to a file, Writing your first code in R, Importing data from spreadsheets, text files, SAS, SPSS, Connect to RDBMS from R using ODBC, basic SQL queries in R, Exploration and transformation activities, basics of Web Scraping.
5. **Data types & Data Structures in R:** Data types in R and its appropriate uses, Program Structure in R, Flow Control: For loop, If

condition, While conditions and repeat loop, Debugging tools, Concatenation of Data, Combining Vars , cbind, rbind, Sapply, apply, tapply functions, Built-in functions in R like: seq(), cbind (), rbind(), merge(), knowledge on the various subsetting methods, summarize data by using functions like: str(), class(), length(), nrow(), ncol(), use of functions like head(), tail(), for inspecting data, summarize data, SQL join in R. Introduction to Data Structure in R, Vectors, Lists, Scalars, Data Frames, Matrices, Arrays, Factors, Use of data structures in different conditions, Advantage of using a particular approach.

6. **Data Visualization:** Concept of Data Visualization, Popular Data Visualization tools, Exploratory Data Analysis (EDA), Data Cleaning, Data Inspection, uses of the functions like grepl(), grep(), sub(), summarize(), llist(), Using graphical functions in R for data visualization, Line Plots, Bar Plots, Bar Plots for Population, Pie chart, tableplot, histogram, Plotting with base graphics, Plotting with Lattice graphics, Plotting and coloring in R. Customizing Graphical Parameters to improvise plots, understanding GUIs like Deducer and R Commander, introduction to Spatial Analysis.
7. **Statistics with R:** Computing basic statistics, Business Hypothesis Testing concepts, Basics of statistical modeling, Logistic Regression, Comparing means of two samples, Testing a correlation for significance, Testing a proportion, t test, z Test, F test, Basics of Analysis of variance (ANOVA), One way ANOVA, ANOVA with interaction effects, Two way ANOVA, Summarizing Data, Data Mining Basics, Cross tabulation. Case studies in different domains- using R.
8. **Linear Regression:** Concept of Linear regression, Dependency of variables, Ordinary Least Sum of Squares Model, Multiple Linear Regression, Obtaining the Best fit line, Assumptions and Evaluation, Outliers and Influential Observations, Multi-collinearity, Case studies in different domains- using R. Dimension Reduction Techniques – Concept of latent dimensions, need for dimension reduction, Principal Components Analysis, Factor Analysis. Case studies in different domains- using R.
9. **Probability:** Definition, Types of Probability, Mutually Exclusive events, Independent Events, Marginal Probability, Conditional Probability, Bayes Theorem. Probability Distributions – Continuous, Normal, Central Limit theorem, Discrete distribution, Poison distribution, Binomial distribution.

10. **Predictive Modeling:** (a) Multiple Linear Regression: Concept of Multiple Linear regression, Step wise Regression, Dummy Regression, Case studies in different domains- using R (b) Logistic regression: Concept of Logistic Regression, odds and probabilities, Log likelihood ratio test, Pseudo R square, ROC plot, Classification table, Logistic regression & classification problems, Case studies in different domainsusing R (c) Linear Discriminant Analysis: Discriminant Function, Linear Discriminant Analysis, Case studies in different domains- using R.
11. **Time Series:** Time Series objects in R, Trends and Seasonality Variation, Decomposition of Time Series, autocorrelation function (ACF) and partial autocorrelation (PACF) plots, Exponential Smoothing, holts Winter Method,
12. Autoregressive Moving Average Models (ARMA), Autoregressive Integrated Moving Average Models (ARIMA), Case studies in different domains- using R.

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Machine Learning & Cognitive intelligence using Python
SEM III BA -MJ-33

1. **Python Basics:** Overview, Python Features, Basic Syntax, Variable Types, Basic Operators, decision making, Loops, Python Data Structures - Lists and Tuples, Sets, Dictionaries, Date & time, Functions, Scope of Variables, Function overloading, Operator overloading, Objects and Classes.
2. **Working with Data in Python:** Reading files with Open, writing files with Open, loading data with Pandas, working with and saving with Pandas, Array oriented Programming with Numpy, Data cleaning and preparation, Plotting and Visualization, data Aggregation and Group Operations.
3. **Machine Learning and Cognitive Intelligence:** Introduction to Machine Learning- History and Evolution, Machine Learning categories: Supervised, Unsupervised and Reinforcement learning. Framework for building ML Systems-KDD process model, CRISP-DM & SEMMA, Machine learning Python packages, Machine Learning Core Libraries. Introduction to Cognitive Intelligence, Features of Cognitive Intelligence.
4. **Supervised Learning:** Introduction to classification, Linear Regression, Metrics for evaluating linear model, Multivariate regression, Non-Linear Regression, K-Nearest Neighbour, Decision Trees, Logistic Regression, Support Vector Machines, Model Evaluation, Applications of supervised learning in multiple domains.
5. **Unsupervised Learning:** Clustering, Hierarchical clustering, Partitioning Clustering- K-mean clustering, Applications of unsupervised learning in multiple domains.

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Software Project Management
SEM III BA -MN-34

1. **Introduction to Project Management**: What is a Project? What is Project management? Project phases and project life cycle Organizational Structure Qualities of Project Manager WBS.
2. **Project Scope Management Components**: Project Integration Management-Project plan development and execution Change controls CCB Configuration management, Strategic planning Scope planning, definition Verification and control.
3. **Time and Cost management**: Activity planning Schedule development and control GANTT Chart, Cost estimation and Control COCOMO model BASIC COCOMO NUMERICALS.
4. **Quality Management and Standards:** Quality planning and assurance, CMM levels, KPA's, PSP/TSP.
5. **Human Resource Management:** Organizational planning, Staff acquisition, Information distribution, reporting.
6. **Risk & Procurement Management:** Risk identification, Quantification and control, Solicitation management and control, Contract administration
7. **Software Metrics and Reliability:** The scope of software metrics, Size- oriented metrics, Function oriented, Software metrics data collection, Analyzing software data, Measurement and prediction, Resource measurement, Productivity, teams and tools.
8. **Planning a measurement program:** What is metrics plan? Developing goals, questions and metrics, Where and When: Mapping measures to activities, How: Measurement tools, Who: Measurers, analyst, tools revision plans.

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Ecommerce Analytics
SEM-III, BA -MN-35

1. **Ecommerce Analytics:** Role of Ecommerce Analytics in Creating Business Value and Driving Business Growth, The Ecommerce Analytics Value Chain, Identifying and Prioritizing Demand, Developing an Analytical Plan. Activating the Ecommerce Analytics Environment, Elements of an Ecommerce Analytics Environment, Collecting and Governing Data and Metadata. Preparing and Wrangling Data, Analyzing, Predicting, Optimizing, and Automating with Data, Socializing Analytics, Communicating the Economic Impact of Analytics.
2. **Methods and Techniques for Ecommerce Analysis:** Understanding the Calendar for Ecommerce Analysis, Storytelling, Tukey's Exploratory Data Analysis. Analyzing Ecommerce Data Using Statistics and Machine Learning. Key Performance Indicators for Ecommerce: KPI Metrics - Page or Screen Views, Visits or Sessions, Returns, Total Revenue and Revenue by N, Gross Margin, Lifetime Value, Repeat Visitors / Users / Customers. KPI Rate Metrics - Conversion Rate, Step Completion Rate, Abandoned Cart Rate; KPI Average Metrics - Average Order Value. KPI Derivative Metrics – Bounce Rate, Percentage of Orders with Promotions or Discounts, Inventory Turnover, Return on Investment, Loyalty—Time Since Last Visit (Recency), Retention—Time between Visits (Frequency). KPI Percentage Metrics - Percentage of X from Source N, Percentage of New Customers (or N Metric), KPI "Per" Metrics - Cost and/or Revenue per Visitor, Revenue per Customer, Cost per Customer Acquisition.
3. **Visualizing, Dashboarding, and Reporting Ecommerce Data and Analysis:** Understanding Reporting, Explaining the RASTA

Approach to Reporting, Understanding Dashboarding, Explaining the LIVEN Approach to Dashboarding, What Data Should I Start With in an Ecommerce Dashboard?, Understanding Data Visualization, The Process for Data Visualization, Maximizing Impact with Data Visualization: The SCREEN Approach and More, Why Use Data Visualizations?, Types of Data Visualization.

4. **Ecommerce Analytics Data Model and Technology:** Understanding the Ecommerce Analytics Data Model- Facts and Dimensions, Sample Ecommerce Data Model, Understanding the Inventory Fact, Understanding the Product Fact, Understanding the Order Fact, Understanding the Order Item Fact, Understanding the Customers Fact, Understanding the Customer Order Fact, Reviewing Common Dimensions and Measures in Ecommerce.
5. **Marketing and Advertising Analytics in Ecommerce:** Understanding the Shared Goals of Marketing and Advertising Analysis, Reviewing the Marketing Lifecycle, Understanding Types of Ecommerce Marketing, Analyzing Marketing and Advertising for Ecommerce, What Marketing Data Could You Begin to Analyze? Analyzing Behavioral Data: Answering Business Questions with Behavioral Analytics, Understanding Metrics and Key Performance Indicators for Behavioral Analysis, Reviewing Types of Ecommerce Behavioral Analysis, Behavioral Flow Analysis, Shopping Behavior Analysis, Content Analysis, In-Page or On-Screen Behavior Analysis.
6. **Optimizing for Ecommerce Conversion and User Experience:** The Importance of the Value Proposition in Conversion Optimization, Basics of Conversion Optimization: Persuasion, Psychology, Information Architecture, and Copywriting, Conversion Optimization Process: Ideation to Hypothesis to Post-Optimization Analysis, Data for Conversion Optimization: Analytics, Visualization, Research, Usability, Customer, and Technical Data, Science Behind Conversion Optimization, Succeeding with Conversion Optimization.
7. **Analyzing Ecommerce Customers:** Customer Record in Ecommerce, Types of Customer Data to Analyze. Questioning Customer Data with Analytical Thought, Ecommerce Customer Analytics Lifecycle. Defining the Types of Customers, Reviewing Types of Customer Analytics. Segmenting Customers, Performing Cohort Analysis. Calculating Customer Lifetime Value, Determining the Cost of Customer Acquisition, Analyzing Customer Churn. Understanding Voice-of-the-Customer

Analytics - Doing Recency, Frequency, and Monetary Analysis. Determining Share of Wallet, Scoring Customers, Predicting Customer Behavior, Clustering Customers, Predicting Customer Propensities, Personalizing Customer Experiences.

8. **Analyzing Products and Orders in Ecommerce:** Ecommerce Orders, Order Data to Analyze, Metrics and Key Performance Indicators Relevant for Ecommerce Orders. Approaches to Analyzing Orders and Products. – Financial Analysis, Product and Item Analysis, Promotional Analysis, Category and Brand Analysis, Event and Goal Analysis, Pathto-Purchase Analysis, Funnel Analysis, Cluster Analysis, Up-Sell and Cross-Sell Analysis, Next-Best-Action Analysis. Analyzing Products in Ecommerce, Useful Types of Product Analysis for Ecommerce - Product Brand Analysis, Product Category Analysis, Customer Service Analysis, Product Returns Analysis, Social Media Product Analysis. Analyzing Merchandising in Ecommerce - Testing Merchandising Creative, Performing Inventory Analysis, Analyzing Product Offers, Determining the Optimal Price via Pricing Analysis, Understanding the Sales Impact of Merchandising, Analyzing Suppliers and the Supply Chain, Determining Effective and Profitable Markdowns, Promotions, and Discounts.
9. **Attribution in Ecommerce Analytics:** Attributing Sources of Buyers, Conversion, Revenue, and Profit, Understanding Engagement Mapping and the Types of Attribution, The Difference between Top-Down and Bottom-Up Approaches to Attribution, A Framework for Assessing Attribution Software.
10. **Integrating Data and Analysis to Drive Ecommerce Strategy:** Defining the Types of Data. Single-Channel to Omni channel, Integrating Data from a Technical Perspective. Agile Versus Waterfall Delivery, Integration with Operational Data Stores, Integration with On-Premises Enterprise Data Warehouses. Integration with Cloud Data Sources, Integration with Data Lakes, Integration with Data Federation, Integration with Data Virtualization, Integrating Analytics Applications, Integrating Data from a Business Perspective.

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Data Science
SEM IV BA -MJ-42

1. **Introduction to Data Science**: Introduction to data science, the 3 V's: Volume, Velocity, Variety, why learn Data Science, Applications of Data Science, The Data Science Lifecycle, Data Scientist's Toolbox, Types of Data, Structured, semi-structured, Unstructured Data, Problems with unstructured data, Data sources, Open Data, Social Media Data, Multimodal Data, standard datasets, Data Formats, Integers, Floats, Text Data, Text Files, Dense Numerical Arrays, Compressed or Archived Data, CSV Files, JSON Files, XML Files, HTML Files , Tar Files, GZip Files, Zip Files, Image Files: Rasterized, Vectorized, and/or Compressed
2. **Statistical Data Analysis**: Role of statistics in data science, Descriptive statistics, Measuring the Frequency, Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion: Range, Standard deviation, Variance, Interquartile Range, Inferential statistics, Hypothesis testing, Multiple hypothesis testing, Parameter Estimation methods, Measuring Data Similarity and Dissimilarity, Data Matrix versus Dissimilarity Matrix, Proximity Measures for Nominal Attributes, Proximity Measures for Binary Attributes, Dissimilarity of Numeric Data: Euclidean, Manhattan, and Minkowski distances, Proximity Measures for Ordinal Attributes, Concept of Outlier, types of outliers, outlier detection methods.
3. **Data Preprocessing**: Data Objects and Attribute Types: What Is an Attribute? Nominal, Binary, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes, Data Quality: Why Preprocess the Data? Data munging/wrangling operations, Cleaning Data - Missing Values, Noisy Data (Duplicate Entries, Multiple Entries for a Single

Entity, Missing Entries, NULLs, Huge Outliers, Out-of- Date Data, Artificial Entries, Irregular Spacings, Formatting Issues - Irregular between Different Tables/Columns, Extra Whitespace, Irregular Capitalization, Inconsistent Delimiters, Irregular NULL Format, Invalid Characters, Incompatible Datetimes), Data Transformation – Rescaling, Normalizing, Binarizing, Standardizing, Label and One Hot Encoding, Data reduction, Data discretization.

4. **Data Visualization:** Introduction to Exploratory Data Analysis, Data visualization and visual encoding, Data visualization libraries, Basic data visualization tools, Histograms, Bar charts/graphs, Scatter plots, Line charts, Area plots, Pie charts, Donut charts, Specialized data visualization tools, Boxplots, Bubble plots, Heat map, Dendrogram, Venn diagram, Treemap, 3D scatter plots, Advanced data visualization tools- Wordclouds, Visualization of geospatial.

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Artificial Intelligence
SEM-IV BA MJ-43

1. **Introduction to Artificial Intelligence:** What is AI, AI and related fields, AI Techniques.
2. **Problems, Problem Spaces, and Search**: Defining AI problems as a State Space Search: example Production Systems, Search and Control Strategies, Problem Characteristics, Additional Problems (Water Jug, 8 puzzle, Missionaries and Cannibles and Block words problem)
3. **Heuristic Search Techniques:** Hill Climbing, Best First Search, Problem Reduction, Constraint Satisfaction, Mean-Ends Analysis.
4. **Knowledge Representation**: Approaches to Knowledge Representation, Knowledge representation using Propositional and Predicate logic, Conversion to clause form, Resolution in Propositional logic, Unification algorithm, Resolution in Predicate logic, Question answering, Procedural Vs Declarative knowledge, Forward and Backward chaining.
5. **Game Playing**: Overview, Minimax Search Procedures, Adding alpha-beta cutoffs.
6. **Statistical Reasoning**: Probability and Bayes' theorem, Certainty factor: Rule-based Systems, Bayesian Network, Dempster -Shafer Theory.

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Big Data Analytics
SEM IV BA -MN-44

1. **Introduction to Data Science**: Introduction to data science, The 3 V's: Volume, Velocity, Variety, Why learn Data Science?, Applications of Data Science, The Data Science Lifecycle, Data Scientist's Toolbox, Types of Data Structured, semi-structured, Unstructured Data, Problems with unstructured data, Data sources, Open Data, Social Media Data, Multimodal Data, standard datasets, Data Formats, Integers, Floats, Text Data, Text Files, Dense Numerical Arrays, Compressed or Archived Data, CSV Files, JSON Files, XML Files, HTML Files , Tar Files, GZip Files, Zip Files, Image Files: Rasterized, Vectorized, and/or Compressed.
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Entity, Missing Entries, NULLs, Huge Outliers, Out-of- Date Data, Artificial Entries, Irregular Spacings, Formatting Issues - Irregular between Different Tables/Columns, Extra Whitespace, Irregular Capitalization, Inconsistent Delimiters, Irregular NULL Format, Invalid Characters, Incompatible Datetimes), Data Transformation – Rescaling, Normalizing, Binarizing, Standardizing, Label and One Hot Encoding, Data reduction, Data discretization.

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Internet of Things (IoT)
SEM-IV, BA -MN-45

1. **Fundamentals of IoT**: Basic Concepts of IoT, Architecture, Interaction with the Internet, Major components of IoT devices, Control Units, Sensors, Communication Modules, Power Sources Communication Technologies Wireless Communication: Bluetooth, ZigBee, WiFi, RF Links, Mobile Internet, Wired Communication, Layered Protocol, Ethernet TCP/IP, Overview of each Layer, HTTP, IOT Protocol: MQTT, CoAP, XMPP, OSGi Architecture/Services.
2. **Microcontroller Fundamental and Programming**: System on Chip, Microcontrollers, Programming Microcontrollers, Arduino Platform, The Boards, The Anatomy of an Arduino Board, The Development Environment Arduino Software Setup the IDE, Writing Arduino Software, The Arduino Sketch, Some Basic Examples, Trying the code on an Arduino Emulator - Extending Arduino, Arduino Libraries 25 Programming & Interfacing. Programming Arduino for the Internet of Things, Using Timers, Threads, Adding Security to Sensor Readings, Authenticating and Encrypting Arduino Data, Introduction to Raspberry PI, Installation, GPIO, Interfacing, Programming. Features of Python.
3. **Introduction to Cloud Computing:** Introduction to Cloud Computing, Cloud based Architecture, SaaS, PaaS and IaaS, Benefits risk and challenges of cloud computing platforms and services, Introduction to cloud based IoT Platforms like IBM, Bluemix, Carriots etc.
4. **Sensor Fundamentals**: Sensor Fundamentals: How Sensors Work, Classification of Sensors, Analog and Digital Sensors, Pull-Up/Down resistors and Examples of sensors and working principles, Sensor

Networks, Actuators Types of Digital Sensors, Temperature, Humidity, LUX, Gas sensor, Water Level Sensors.

5. **Arduino Interface**: Arduino-Ethernet Interface Connect Arduino using the Ethernet, Arduino Ethernet Library, Simple Ethernet Client Example, Simple Ethernet Server Example Arduino using the WiFi : Connect Arduino using the WiFi, WiShield Library, WiFly Shield Library, Using the Arduino Library for Processing, IoT Privacy, Security and governance, Security issues at different layers.
6. **IoT Application and Case study**: Application of IoT and Case studies: Home Automation, Smart Parking, Water Management, Agriculture, Citizen Safety, Waste Management, Intelligent Transport System, Smart city.