PONDICHERRY UNIVERSITY
SCHOOL OF MANAGEMENT
DEPARTMENT OF MANAGEMENT STUDIES

MBA Business Analytics
Course Structure and Syllabi
2019-20
## COURSE STRUCTURE OF MBA Business Analytics PROGRAMME IN PONDICHERRY UNIVERSITY

### SEMESTER - I

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credit</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management Process and Organisational Behaviour</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Business Environment</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Accounting for Managers</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Database Management Systems</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Research Methodology</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Operations Research</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Business Analytics Lab - 1</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>R Programming Lab - 1</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Python Programming Lab- 1</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Spreadsheet for Managers Lab - 1</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Industry Interface Program-1</td>
<td>2</td>
<td>50</td>
</tr>
</tbody>
</table>

**Total** 28 850

### SEMESTER - II

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credit</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Management</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Marketing Management</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Operations Management</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Human Resources Management</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Strategic Management</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Introduction to Cloud</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Business Valuation Lab</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>R Programming Lab - 2</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Python Programming Lab - 2</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Industry Interface Program-2</td>
<td>2</td>
<td>50</td>
</tr>
</tbody>
</table>

**Total** 25 750

### SEMESTER - III

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credit</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Intelligence</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Machine Learning</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Design and Analysis of Algorithms</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Software Project Management</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Data Visualization Lab</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Project-1 (8 Weeks) (100 Marks for thesis + 50 Marks for Project Viva)</td>
<td>4</td>
<td>150</td>
</tr>
<tr>
<td>Elective-1</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Elective-2</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Elective-3</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Elective-4</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

**Total** 30 1000

### SEMESTER - IV

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credit</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Data Analytics</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>SAS and Hadoop Programming Lab</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Project-2 (8 Weeks) (100 Marks for thesis + 50 Marks for Project Viva)</td>
<td>4</td>
<td>150</td>
</tr>
<tr>
<td>Elective-5</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Elective-6</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Elective-7</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

**Total** 21 700

**Total Number of Credits**: 105
**Total Marks**: 3350
**Total Number of theory papers**: 25
**Total Number of Skills development workshop**: 9
**Total Number of Lab**: 10
**Total Number of Industry Interface Program**: 2
**Number of Projects**: 2
MBA Business Analytics
DEGREE PROGRAMME

REGULATIONS FOR THE MBA Business Analytics
PROGRAMME OFFERED IN THE UNIVERSITY DEPARTMENT

1. Duration of the Course: 2 Years [4 Semesters / Self Financing Mode]

2. Examinations: End semester examinations only under CBCS Scheme by the course teacher for each subject excepting in workshop based subjects; in the workshop-based subjects, the assessment is continuous and internal. For the revaluation / revaluation, the rules specified by the University, from time-to-time, will be applicable.

3. Proportion of marks between internal assessment and end-semester evaluation for subjects is 40:60 while it is internal for the workshop-based subjects.

4. Guidelines for awarding mark for project works:
   
a. Summer Project
      There will be a mid-term review after 4 weeks

      Marks for Project awarded by Guide 80 Marks
      Marks for Project in the Mid-Term Review 30 Marks
      Marks for Project awarded for Class Representation and evaluation by DMS faculty Members 40 Marks

5. Passing Requirement: The student should have a minimum of 40% marks in University Examination and minimum 50 % marks in Internal and University Examinations put together in theory subjects. Wherever there is no internal component, the student should have a minimum of 50% marks in the University Examination.

6. Industry Interface Program:
   Each semester in the first year, one-week workshop – Industry Interface Program will be conducted. Resource persons from Industry will train the students on the latest technology and deliver lectures on the contemporary topics.
7. **Question paper pattern:**
   
   Time: 3 Hours  
   Maximum Marks: 60

   **PART A:** \(5 \times 3 = 15\) Marks
   Answer ALL FIVE Questions
   Question 1 to Question 5

   **PART B:** \(5 \times 7 = 35\) Marks
   Question 6A or Question 6B
   Question 7A or Question 7B
   Question 8A or Question 8B
   Question 9A or Question 9B
   Question 10A or Question 10B

   **PART C (1 \times 10 = 10 Marks)**
   Question 11: COMPULSORY (Case/Problem depending upon the subject)

   Note: For answers, the following are the prescribed word limits.
   5 marks – maximum 50 words
   8 marks – maximum 200 words
   10 marks – maximum 300 words

8. **Maximum number of years permitted after completion of Semester IV to write arrear subjects:**
   a. Two years

9. **Guidelines to deal with attendance shortage of the students:**
   The students are permitted to proceed to the succeeding semesters without break. Under this scheme, the students should repeat the semester in which shortage occurred after completing the last semester (Semester-IV).
SEMESTER - I
## SEMESTER I

### LIST OF CORE PAPERS

<table>
<thead>
<tr>
<th>Title of the Paper</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANAGEMENT PROCESS AND ORGANISATIONAL BEHAVIOUR</td>
<td>MBAH012</td>
</tr>
<tr>
<td>BUSINESS ENVIRONMENT</td>
<td></td>
</tr>
<tr>
<td>ACCOUNTING FOR MANAGERS</td>
<td>MBAH014</td>
</tr>
<tr>
<td>DATABASE MANAGEMENT SYSTEMS</td>
<td></td>
</tr>
<tr>
<td>RESEARCH METHODOLOGY</td>
<td></td>
</tr>
<tr>
<td>OPERATIONS RESEARCH</td>
<td></td>
</tr>
<tr>
<td>BUSINESS ANALYTICS LAB - I</td>
<td>MBAH017</td>
</tr>
<tr>
<td>R PROGRAMMING LAB – I</td>
<td></td>
</tr>
<tr>
<td>PYTHON PROGRAMMING LAB – I</td>
<td></td>
</tr>
<tr>
<td>SPREADSHEET FOR MANAGERS LAB – I</td>
<td></td>
</tr>
<tr>
<td>INDUSTRY INTERFACE PROGRAM-1</td>
<td></td>
</tr>
</tbody>
</table>
MANAGEMENT PROCESSES AND ORGANISATIONAL BEHAVIOUR

OBJECTIVES:
➢ Providing conceptual understanding of management concepts
➢ Familiarizing the students with the contemporary issues in management
➢ Enable them to apply the concepts in the management organization
➢ Emphasizing behavioural concepts and its practical applications in the organisation.

METHODOLOGY:
Lectures, Case studies, Application exercises, Group or Class learning activities, Experiential Exercises

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V
Organization - Managing resistance to change - Organization Development: Meaning & Definition - OD Interventions - Organisational Culture - Characteristics of Organizational Culture - Creating and Sustaining Culture - Successful Organizational Culture - Organizational Behaviour responses to Global and Cultural diversity

TEXT BOOKS:

REFERENCES

WEB RESOURCES:
- https://open.umn.edu/opentextbooks/textbooks/principles-of-management
- https://libguides.library.curtin.edu.au/fundamentals-of-management
- www.bretlisimmons.com
- www.marinojdasmarinas.blogspot.com
- www.strategicagilityinstitute.com/blog

ILLUSTRATIVE EXERCISE:
The Internal mark is awarded based on the components.
BUSINESS ENVIRONMENT

COURSE OBJECTIVES:

1. To enable students, understand the opportunities and challenges of prevailing and desirable global business environment in which business has to operate.
2. Provide an understanding of the role of business in society.
3. To enable students read, research and discuss the issues through written papers, presentations, industrial visits and role plays in class seminars.

METHODOLOGY

Teaching and Learning involves multiple and varied pedagogical tools with an emphasis on interactivity, which include the following:
• Classroom Lectures, Group Discussion on selective Articles taken from Newspapers, Magazines, Journals, Online Sources, and Various Reports.
• Case Studies, Seminar Presentations, Written Assignments, Role Plays and Field Visits

SYLLABUS

UNIT-I: Micro Economic Environment

Relevance of demand analysis in Business Decision-making; Law of Demand; Elasticity of Demand; Determinants of Demand; Individual, firm and Market demand; Demand Curve and its nature; Demand Forecasting Techniques; Different Market Structures and Pricing under each structure; Cost concepts: Types of cost; Relationship between Average and Marginal Cost in Short run and long run; Production functions in short and long run; Wages and wage differentials.

Unit II: Macro Economic Environment

Inflation, poverty, unemployment and GDP. Role of government in business-Fiscal and Monetary Policies; Liberalization, Privatization and Globalization of Economy and its consequences; MNCs; World Trade Organization; FDI, FPI, Special Economic Zone - Environmental Issues Outsourcing and Collaboration - Inclusive and Sustainable Development

UNIT-III: Political and Legal Environment

Bureaucracy, Corruption Level, Societal Outlook and Orientation; Introduction to Companies Act, 1956: Definition, Characteristics and types of Companies; Formation and winding-up of Company; Appointment, powers and duties of Directors; Introduction to Consumer Protection Act, 1986: Rights of Consumers; Redressal Machinery under the Act. Introduction to Competition Act 2002: Anti-Competitive Agreements, Regulation of Combinations, Competition Commission of India. Introduction to Goods and Service Tax (GST): Registration under GST; Supply under GST and Valuation of Supply; Input Tax Credit under GST & Returns.
UNIT-IV: Socio-Cultural Environment


UNIT-V: Technological Environment


TEXT BOOKS:

2. A.C. Fernando, Business Environment, Pearson.
4. Shaikh Saleem, Business Environment, Pearson
7. Managerial Economics by R. Panneerselvam, P. Sivasankaran and P. Senthilkumar (2018); Cenage Learning India Pvt. Ltd.

REFERENCE BOOKS:

3. Managerial Economics: Principles and Worldwide Applications by Dominick Salvatore and Siddartha k rastogi (2016); Oxford Higher Education
4. Managerial Economics by D N Dwivedi (2015); Vikas Publishing House
5. Principles of Macroeconomics (7th Edition) by Karl E. Case, Ray C. Fair, Publisher: Prentice Hall
13. Macroeconomics and Active Graphs, Third Edition by Olivier Blanchard, Publisher: Prentice Hall
14. Macroeconomics: Theories, Policies, and International Applications by Roger LeRoy Miller, David D. VanHoose, Publisher: South-Western College
17. N.D Kapoor &Rajni Abbi-General Laws & Procedures (Sultan Chand & Sons)

Magazines & Other References:

1. Survey of Indian Industry – published every year
3. TV Programs on Business and Environment
4. Others: Various publications such as reports, surveys, studies on business and management.

Web Resources

4. www.wareseeker.com/free-managerial-economics-tutorials
5. www.managementstudyguide.com
6. www.managementparadise.com
7. www.referenceforbusiness.com
8. www.debunkingeconomics.com
9. www.economywatch.com
11. http://www.businessballs.com
15. http://www.rbi.org.in
17. http://www.businessdictionary.com
18. www.legalindia.in
19. www.legalserviceindia.com
20. www.supremecourtofindia.nic.in
Illustrative Exercises:

1. Study and analysis of prevailing business environment in the industry chosen/or given and recommendations for the creating more enabling environment to promote business activity.
2. Students shall be required to deliberate on various macro and micro economic problems at global and national level, and on issues having an impact on the functioning of any business.
3. Visit to an Industrial Estate / Other organizations and assess the infrastructural facilities such as appropriate roads, street lights, industrial waste treatment plants and other amenities, and submit a Written Report small team projects.
ACCOUNTING FOR MANAGERS

OBJECTIVES
• To acquaint the students with the fundamentals principles of financial, cost and management accounting.
• To enable the students to prepare, analyse and interpret financial statements.
• To enable the students to take decisions using management accounting tools.

METHODOLOGY FOR COVERING SYLLABUS
1) Class Room teaching of each of the units followed by regular exercises and surprise tests.
2) One practical assignment on ‘Accounting for SBEs” and its presentation by students.
3) Case Study - Analysis of Company Annual Report & application of marginal costing 4) Training on Tally Package

UNIT I

UNIT II

UNIT III

UNIT IV
Marginal costing – assumptions – Cost Volume Profit Analysis – Breakeven Analysis – Key Factor – Profit Planning (problem) – Decisions involving Alternative Choices: Determination of sales mix, exploring new markets and Make or Buy decisions (Problem for case study)

UNIT V
TEXT BOOKS:
1. N. Vinayakam & B. Charumathi: Financial Accounting, S. Chand
2. S.N. Maheswari: Management Accounting, Sultan Chand

REFERENCES
1. Hingorani, Ramanathan & Grewal: Management Accounting, Sultan Chand
2. R.N. Anthony: Management Accounting – Text and cases, Irwin
3. B.K. Bhar: Cost Accounting, Academic Publishers

WEB RESOURCES
1. www.accountingformanagement.com
3. www.icai.org
4. www.icsi.edu
5. www.icwai.org

ILLUSTRATED EXERCISES
1. Tally practical record and examination – 15 marks
2. Practical assignment on Accounting by Small Business Enterprises and presentation of the same in the class – 5 marks
3. Submission of assignment on IFRS and accounting standards – 5 marks
4. Brain storming session on Emerging Trends in Accounting – 5 marks
DATABASE MANAGEMENT SYSTEMS

OBJECTIVES:
The objective of the subject is to introduce the concepts of data modelling, database design, DBMS products and Database administration

METHODOLOGY:
Lectures supplemented with case studies and classroom exercises

UNIT-I:
Concept of system, Conventional file processing system, Drawbacks of conventional file processing system, Database system, Definition, Advantages, Components of Database Management System, Economic Justification of Database Approach, Terminologies of database systems, Data structure: Location methods, Types of pointers, Stack, Queue, Sorted list, Ring, Inverted list, Multi –List, Tree, Balanced tree.

UNIT-II:
Data model: Hierarchical data model, Network data model, Relational data model, E-R model. Database Design: Steps of database design, Normalization – 1NF, 2NF, 3NF, Case problems for design of conceptual data model, Data Volume and Usage Analysis.

UNIT-III:
Implementation design: guidelines for mapping conceptual data model into hierarchical data model, Network data model and Relational data model, Program design guidelines (DAD). Hierarchical Database Management Systems: DBD and DL/I of IMS and DDL and DML of PC-FOCUS. Examples with small programs. Network database management systems: DDL and DML of IDMS, Relational Database Management Systems: Relational Algebra and Relational calculus, DDL and DML of SQL.

UNIT-IV
Introduction, Overview, and History of NoSQL Databases Definition of the Four Types of NoSQL Database, Why NoSQL? The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points, Comparison of relational databases to new NoSQL stores, MongoDB, NoSQL Key/Value databases using MongoDB, Document Databases, What Features, Consistency, Transactions, Availability, Query Features, Scaling, Graph NoSQL databases using Neo4J

UNIT-V:

TEXT BOOK:
REFERENCES:
5. Dan Sullivan, NoSQL for Mere Mortals.
6. Gaurav Vaish, Getting Started with NoSQL.

WEB RESOURCES
1. www.sciencedirect.com
2. www.ebsco.com
3. www.googlescholar.com
4. www.scirp.org
5. www.springerlink.com

ILLUSTRATIVE EXERCISE:
The Internal mark is awarded based on the components.
RESEARCH METHODOLOGY
[3 credit paper]

OBJECTIVES
• To enable the students to know about the information needs of Management.
• To introduce the concept of Scientific Research and the methods of conducting Scientific ENquiry.
• To enable them to conduct a Business Research Study and prepare the report.

METHODOLOGY
The methodology is predominantly by lecture mode and case discussion, complemented with a mini-project work. The students have to undertake a project work in a topic of their interest and product, whereby apply the concepts studied in the course.

Unit-1
Research – Meaning – importance and definition, Research in business, manager’s role revisited, role of research, measures of a good research.
Research process – the manager-researcher relationship, defining research problem and formulation of hypothesis, feasibility study and research proposal

Unit-2
Research Design – types of research design-exploratory, descriptive and experimental studies. The sources and collection of data – primary and secondary data sources-Sampling design – sampling procedures, types of sampling plans, sample size determination, common sources of error in sampling and data collection

Unit-3
Attitudinal measurements and scales - Basic methods of collecting data – survey methods, personal interviewing, telephone interviewing and self-administered surveys, instruments for respondent communication – Questionnaire design.

Unit-4
Analysis and interpretation of data: editing, coding and analysis of collected data- an Introduction-Univariate [T-tests Z-Tests] / Bivariate [Correlation-Regression-Chi Square, ANOVA]/ Multivariate Data analysis [Factor Analysis- Cluster Analysis-Multiple Regression-Discriminate Analysis, - Conjoint Analysis]

UNIT-V
Presenting results, – written and oral reports – technical report, survey based report research report Criteria-Application of research in functional areas of business- Guidelines for reviewing draft, Report format – Typing instructions, oral presentation

Text Books:
1. Panneerselvam, R., RESEARCH METHODOLOGY, PHI Learning Pvt. Ltd., New Delhi, 2004

Reference Books:

MAGAZINES & OTHER REFERENCES
- www.emeraldinsight.com (A renowned research journal database)
- www.ficci.com (Official web site of Federation of Indian chambers, Commerce and Industry)
- www.ibef.org (Official web site of India Brand Equity foundation, a subsidy of CII)
- www.ncaer.org (National Council of Applied Economic Research – Govt. of India data resource)

WEB RESOURCES:
- www.statetutorials.com (Statistics tutorials including worked examples using softwares like SPSS)
- www.analyzemath.com/statistics.html (Statistics tutorials)
- www.burns-stat.com/pages/tutorials.html (Statistics tutorials)
- www.spss.com
- www.search.ebscohost.com
OPERATIONS RESEARCH (Using Software)

OBJECTIVES:
To introduce various optimization techniques of operations research
To facilitate the use of Quantitative Technique in various functional areas

METHODOLOGY
*The methodology is predominantly by Problem Solving, lecture mode and complemented with applications of case discussion.*

UNIT-I:

UNIT-II:
Transportation Problem, Assignment Problem, Inventory Control – Introduction to Inventory Management, Basic Deterministic Models, Purchase Models, Manufacturing Models without Shortages and with Shortages.

UNIT-III:
Shortest Path Problem, Floyd’s Algorithm, Minimum Spanning Tree Problem, CPM/PERT, Crashing of a Project network.

UNIT-IV:
Dynamic Programming, Capital Budgeting Problem, Shortest Path Problem, Reliability Problem, Optimal subdividing problems. Game Theory: Two Person Zero-sum Games, Graphical Solution of (2 × n) and (m × 2) Games.

UNIT-V
Introduction to Queuing Theory, Basic Waiting Line Models: (M/M/1) :(GD/α/α), (M/M/1):(GD/N/α), (M/M/C):(GD/α/α), (M/M/C):(GD/N/α), Introduction to queuing system simulation – Introduction to Basic Replacement Analysis: Economic Life of an Asset.

TEXT BOOKS:

REFERENCES:

MAGAZINES & OTHER REFERENCES
2. www.emeraldinsight.com (A renowned research journal database)
3. www.search.ebscohost.com (A renowned research journal database)

WEB RESOURCES:
1. www.universalteacherpublications.com (a website for OR Tutorial help)
5. www2.lib.udel.edu/subj/opre/internet.htm (internet resources for Operations Research)

ILLUSTRATIVE EXERCISE:
The Internal mark is awarded based on the components.
BUSINESS ANALYTICS LAB -I
[2-Credit Paper- Workshop Mode]

OBJECTIVES
- To enable the students to know about the information needs of Management
- To introduce the concepts of data analysis methods
- To have hands-on training of Statistical Data Analysis through R

METHODOLOGY
The methodology is predominantly by Problem Solving [using R], supplemented by lecture mode and case discussion. The students have to undertake a project work in a topic of their interest and product, whereby apply the concepts studied in the course as their course evaluation submission.

Unit-1

BASICS OF STATISTICS AND R
Basic Statistical Terms - Population and Sample (Theory), Understanding Data-Qualitative Vs Quantitative Data / Continuous vs Discrete (Theory) - Measurement Scales - Nominal, Ordinal, Interval & Ratio

Installation of software (R and R Studio) – Working with various data files – Data Cleaning – Data Manipulation

Descriptive Statistics – Summary statistics [Mean/Median/Mode/Quartiles, Percentiles / Standard Deviation / Coefficient of Variation/Measures of Skew ness & Kurtosis]

Importance of data visualization- types of charts - Bar/Pie Charts -Histogram -Box and Whisker Chart -Scatter Diagram – Introduction to ggplot

Unit-2

BASIC PROBABILITY CONCEPTS AND PROBABILITY DISTRIBUTIONS
Basic Probability Concepts – Types - Rules - Concept of Bayes’ theorem

Probability Distribution - Types (Discrete, continuous) -Random variable -Use of expected value in Decisions making - Binomial Distribution - Poison Distribution - Normal Distribution

Theory of Sampling-Types probability sampling, non-probability sampling - Introduction to Sampling Distribution (Concept of SE) - Sample Size Estimation

Theory of Estimation- Types - Interval Estimates and Confidence Interval - Calculation Interval Estimates (C.I) for small & large samples

HYPOTHESIS TESTING
Tests for Mean and Proportions –One Sample test)
[One Sample z Test - One Sample t Test- One Sample p Test]
Testing of Hypothesis (two sample test) - Test for differences between means (large, small samples) - Test for proportions (small, large samples)

Unit-3

Parametric Tests – Introduction to Univariate Analysis – one sample mean tests/one sample proportion tests/t-tests
Bivariate Analysis – two sample mean tests/two sample proportion tests / t-tests
Chi Square Analysis - Test of Independence - Test of Goodness of fit
Analysis of Variance - One-Way Classification - Two way Classification
Theory of Correlation - scattered diagram, Karl-Pearson & Spearman Rank Correlation -
Introduction to partial Correlation - Regression Analysis- Introduction to Time series and forecasting
Introduction to non-parametric tests – univariate and bivariate analysis

TEXT BOOKS:
1. Panneerselvam, R., RESEARCH METHODOLOGY, PHI Learning Pvt. Ltd., New Delhi, 2004

REFERENCES

MAGAZINES & OTHER REFERENCES
1. www.emeraldinsight.com (A renowned research journal database)
2. www.ficci.com (Official web site of Federation of Indian chambers, Commerce and Industry)
3. www.ibef.org (Official web site of India Brand Equity foundation, a subsidy of CII)
4. www.ncaer.org (National Council of Applied Economic Research – Govt. of India data resource)

WEB RESOURCES:
1. www.stattutorials.com (Statistics tutorials including worked examples using softwares like SPSS)
2. www.analyzemath.com/statistics.html (Statistics tutorials)
4. www.search.ebscohost.com

Mode of Evaluation:
Continuous Internal Assessments– based on lab exercises
R PROGRAMMING Lab -I
[2-Credit Paper- Workshop Mode]

OBJECTIVES
- To enable the students to know about the information needs of Management
- To introduce the concepts of data analysis methods
- To have hands-on training of Statistical Data Analysis through R Programming

METHODOLOGY
The methodology is predominantly by Problem Solving [using R Programming], supplemented by lecture mode and case discussion. The students have to undertake a project work in a topic of their interest and product, whereby apply the concepts studied in the course as their course evaluation submission.

Unit-1

INTRODUCTION


Unit-2

MATRICES, ARRAYS AND LISTS

Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Avoiding Dimension Reduction – Higher Dimensional arrays – lists – Creating lists – General list operations – Accessing list components and values – applying functions to lists – recursive lists

Unit-3

DATA FRAMES

Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames – Factors and Tables – factors and levels – Common functions used with factors – Working with tables - Other factors and table related functions - Control statements – Arithmetic and Boolean operators and values – Default values for arguments - Returning Boolean values – functions are objects – Environment and Scope issues – Writing Upstairs - Recursion – Replacement functions – Tools for composing function code – Math and Simulations in R

TEXT BOOKS:
1. “R Cookbook”, Paul Teetor
2. “R for Data Science”, Garrett Grolemund and Hadley Wickham
4. “An Introduction to Statistical Learning: With Applications in R”, Daniela Witten, Gareth James Robert Tibshirani, and Trevor Hastie

**WEB RESOURCES:**
1. https://www.rstudio.com/online-learning/
2. https://hackr.io/tutorials/learn-r

**Mode of Evaluation:**
Continuous Internal Assessments– based on lab exercises
PYTHON PROGRAMMING Lab -I
[2-Credit Paper- Workshop Mode]

OBJECTIVES
• To enable the students to know about the information needs of Management
• To introduce the concepts of data analysis methods
• To have hands-on training of Statistical Data Analysis through Python Programming

METHODOLOGY
The methodology is predominantly by Problem Solving [using Python Programming], supplemented by lecture mode and case discussion. The students have to undertake a project work in a topic of their interest and product, whereby apply the concepts studied in the course as their course evaluation submission.

Unit-1

Unit-2
Control Flow (if-then statements, looping) – Organizing code (functions, modules, packages) – Reading and writing data from local files (.txt,.csv,.xls,.json, etc) – Scraping tables from webpages (.html) –read_table method – Introduction to Numpy and 2D plotting – Understanding the N-dimensional data structure – Creating arrays – Indexing arrays by slicing or more generally with indices or masks – Basic operations and manipulations on N-dimensional arrays

Unit-3
Plotting with matplotlib (scatter plots, line plots, box plots, bar charts and histograms) – Working with Pandas data structures: Series and DataFrames – Accessing your data: indexing, slicing, fancy indexing, Boolean indexing – Data wrangling, including dealing with dates and times and missing data – Adding, dropping, selecting, creating and combining rows and columns – Pandas powerful groupby method – Reshaping, pivoting, and transforming your data – Simple and rolling statistics

TEXT BOOKS:
1. “Learning Python”, David Ascher and Mark Lutz
2. “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, Wes McKinney

WEB RESOURCES:
1. https://www.learnpython.org/

**Mode of Evaluation:**
Continuous Internal Assessments— based on lab exercises
SPREADSHEET FOR MANAGERS Lab-I
[2-Credit Paper- Workshop Mode]

OBJECTIVES
- To enable the students to know about the information needs of Management
- To introduce the concepts of data analysis methods
- To have hands-on training of Statistical Data Analysis through MS-EXCEL

METHODOLOGY
The methodology is predominantly by Problem Solving [using MS-EXCEL], supplemented by lecture mode and case discussion. The students have to undertake a project work in a topic of their interest and product, whereby apply the concepts studied in the course as their course evaluation submission.

Unit-1


Entering Data – Fonts, Fills, and Alignment – Cut, Copy, and Paste – Paste Special – Undo and Redo – Moving, Finding, and Replacing a Value – Cell Styles – Comments

Formatting Numbers – Introduction – Currency Format – Format Painter – Formatting Dates – Custom and Special Formats


Unit-2

Modifying Rows and Columns – Introduction – Inserting and Deleting Columns and Rows – Inserting and Deleting Cells – Inserting Multiple Columns and Rows – Modifying Cell Width and Height – Hiding and Unhiding Rows and Columns


Unit-3


TEXTBOOKS
1. “Excel 2016 Bible”, John Walkenbach

WEB RESOURCES
1. https://www.myonlinetraininghub.com/microsoft-excel-online-training-syllabus
2. https://excelexposure.com/
3. https://corporatefinanceinstitute.com/resources/excel/study/basic-excel-formulas-beginners/

Mode of Evaluation:
Continuous Internal Assessments– based on lab exercises
INDUSTRY INTERFACE PROGRAM-1
[2-Credit Paper- Workshop Mode]

OBJECTIVES

- To deliberate advancements in the field of Analytics and create awareness about the corporate needs about the information
- To introduce the latest concepts & technological advancements in the field of analytics

METHODOLOGY

*The methodology is predominantly through lecture series from eminent persons from academic and industry. A weeklong workshop on the topics identified will be deliberated and the students learning will be assessed on continuous basis.*

Unit-1

Advancement on Conditional Formatting with Rule – Pivot tables – Lookup Tables – Protecting Spread sheets – Linking External Resources – Sparkline, Inline Charts, data Charts - Recent Trends in MS Excel

Unit-2


Unit-3

# SEMESTER II

LIST OF CORE PAPERS

<table>
<thead>
<tr>
<th>Title of the Paper</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINANCIAL MANAGEMENT</td>
<td>MBAH020</td>
</tr>
<tr>
<td>MARKETING MANAGEMENT</td>
<td>MBAH021</td>
</tr>
<tr>
<td>OPERATIONS MANAGEMENT</td>
<td>MBAH022</td>
</tr>
<tr>
<td>HUMAN RESOURCES MANAGEMENT</td>
<td>MBAH023</td>
</tr>
<tr>
<td>STRATEGIC MANAGEMENT</td>
<td></td>
</tr>
<tr>
<td>INTRODUCTION TO CLOUD</td>
<td></td>
</tr>
<tr>
<td>R PROGRAMMING LAB – II</td>
<td></td>
</tr>
<tr>
<td>PYTHON PROGRAMMING LAB – II</td>
<td></td>
</tr>
<tr>
<td>BUSINESS VALUATION LAB – II</td>
<td></td>
</tr>
</tbody>
</table>
FINANCIAL MANAGEMENT

OBJECTIVES:
• To know the various concept and sources of finance.
• To understand the various uses of finance.
• To familiarize oneself with the techniques used in financial management.

METHODOLOGY:
Assignment, test after completion of each unit
Class room lectures for all units
To solve problem self-made with all features will be used
Importance should be given for solving problems in each unit.

UNIT-I: FINANCIAL MANAGEMENT

UNIT-II: FINANCIAL PLANNING
Meaning of Financial Planning; Pattern of Financing; Source of Finance; Security Financing; Convertible Debentures; Internal Financing; Loan Financing; Public Deposits; Bridge Financing; Loan Syndication, & Finance Decision, Leverage; Types of Leverage; Significance of Operating Leverage, Financial Leverage and Composite Leverage; Practical Problems.

UNIT-III: CAPITAL STRUCTURE
Meaning of Capital Structure; Capital Structure and Financial Structure; Pattern of Capital Structure; Optimum Capital Structure; Capital Structure Theories, Determination of Capital Structure; Financial Break Even Point and EPS Analysis, Capital Gearing and Trading on Equity, Cost of Capital, Importance of Cost of Capital; Classification of Cost of Capital; Determination of Cost of Capital, Capital Assets Pricing Model (CAPM) and Weighted Average Cost of Capital (WACC), Practical Problems.

UNIT-IV: WORKING CAPITAL MANAGEMENT

UNIT-V: CAPITAL BUDGETING

TEXT BOOKS:

REFERENCES:

WEB SOURCES:
1. www.reoprtiunction.ocm
2. www.investorindia.com
3. www.fms.org
4. www.fmsfindia.org
5. www.financialmanagement.in
MARKETING MANAGEMENT

SYLLABUS

Unit – I Understanding marketing and the marketing process
The importance and scope of marketing Evolution of marketing: From transaction-based to relationship marketing Fundamental marketing concepts Marketing and customer value The marketing environment (macro and micro), ethics and social responsibility Marketing management process

Unit – II Marketing planning, information and strategy
Strategic planning and the marketing process; Developing marketing plans Marketing research and Decision support systems Understanding consumer behaviour – marketing implications Market Segmentation, Targeting and Positioning Competitive strategies

Unit – III Developing the marketing mix: Product and Price
Product classifications, Product Mix Product management decisions, Product Life Cycle Strategies New Product Development Pricing considerations and approaches (cost-based, buyer based and competition-based), pricing strategies

Unit – IV Developing the marketing mix: Place and Promotion
Distribution channels and physical distribution – channel design decisions, channel management decisions Retailing and wholesaling – Retail classification, retailer marketing decisions, wholesaler marketing decisions Integrated marketing communication and promotion strategy, Promotion mix

Unit – V Marketing applied
Introduction to and the basic concepts of Industrial marketing, Services marketing, Rural marketing, International marketing, marketing for non-profit organizations, marketing in a connected world

Text books:

Reference books:
1. Cravens, Hills and Woodruff: MARKETING MANAGEMENT
4. Ramesh Kumar: MARKETING NUGGETS

NB: Latest editions of the books mentioned above are recommended.
OPERATIONS MANAGEMENT

OBJECTIVES
To understand the concepts and techniques of Operations Management.
To use the above for improving the Operational Productivity of Organizations.

UNIT-I

UNIT-II
Line Balancing: Concept of Mass Production system, Objective of Assembly Line Balancing, Rank Positional Weight Method.
Inventory Control: Review of Basic Models of Inventory, Quantity Discount Model, Implementation of Inventory Systems, Introduction to P & Q system of Inventory

UNIT-III

UNIT-IV
Quality Control: Introduction, need for Controlling Quality, Definition of a Quality System, Classification of Quality Control Techniques, Control Charts, Control Charts for Variable, Control Charts for Attributes, C-Chart, Acceptance Sampling: Operating Characteristic Curve (O.C. Curve), Single Sampling Plan.

UNIT-V

**TEXT BOOK:**

**REFERENCES**
HUMAN RESOURCES MANAGEMENT

OBJECTIVES:
• This subject provides the platform to the students of management to appreciate the critical managerial functions, processes and tasks of HRM in an organization.
• To become sensitive to the HR Management Processes and to adopt conceptual learning to real-life situations.
• To appreciate the methods and mechanics to bring out the best in people directing their energies towards corporate goals with personal satisfaction.
• The Class-room interaction is supplemented by Feel HRM Visits, Case Study presentation & Discussion and team oriented sharing of knowledge inputs via c-group.

METHODOLOGY:
Teaching methodology would be 'learning centric' and not necessarily ‘teaching centric'. This may mean, it would be consultative and participative involving role modelling and fieldwork, case studies, role-plays, simulation exercises, group discussions and structured and unstructured group work. Eminent competent professionals from HR and other industrial realms will interact with the students besides the faculty.

UNIT-I:
INTRODUCTION TO Human Resources Management: Context and Concept of People Management in a Systems Perspective – Organisation and Functions of the HR and Personnel Department – HR Structure and Strategy; Role of Government and Personnel Environment including that of MNCs.

UNIT-II:
HR PLANNING AND SELECTION: Human Resource Information System (HRIS), Manpower Planning – Selection System including Induction – Performance and Potential Appraisal; Coaching and Mentoring; HRM issues and practices in the context of Outsourcing as a strategy and MNCs.

UNIT-III:

UNIT-IV:

UNIT-V:
TEXT BOOKS:

REFERENCES:
1. Bohlander, Snell, Sherman: MANAGING HUMAN RESOURCES, Thomson – South Western

WEB RESOURCES:
4. www.citeHR.com

ILLUSTRATIVE EXERCISE:
- In this course, much of your time will be spent in group interaction. Groups will be created (by the instructor) and each group will participate in a different type of in-class exercise. The group will be given specific questions, either drawn from the textbook or provided by the instructor, and given approximately 24 hours to respond, in writing, to the assigned questions. Each assignment is worth 5% and the group grade will be shared equally by each member. Additional details will be provided in class. (Ex. Each group to pick an industry sector and present a case study of a company from the respective industry sector during class sessions (case study can either be selected by the group / provided by the moderator))
- Book Project or Organizational visit assignment to be done in teams
- Individual / team based role-play exercises to demonstrate the working of certain concepts

The Internal mark is awarded based on the components and displayed in the notice board before the commencement of the semester-end examinations.
STRATEGIC MANAGEMENT

OBJECTIVE:
To enable the students to apply the strategies studied in the foundation and fundamental courses, its specific strategic knowledge in different functional areas. This paper will enable the students to create, execute and evaluate different strategies in their everyday life as managers.

METHODOLOGY:
Students belonging to different functional areas form into groups, identify different organizations and study their strategies in depth and try to identify different strategies for the betterment of the organizations they chose.

UNIT-I:

UNIT-II:
Strategic management process – vision of the company – business vision models – objectives and goals. Business policies and strategies.

UNIT-III:
Environmental scanning and analysis – types: international, external, internal – characteristics – SWOT – approaches of the environmental scanning.

UNIT-IV:

UNIT-V:

TEXT BOOKS:

REFERENCES:
WEB RESOURCES:
1. www.businessweek.com
2. www.foxnews.com
3. www.atimes.com
4. www.brandweek.com
5. www.thenewstribune.com

ILLUSTRATIVE EXERCISE:
Choose a specific organization, study their strategies, critically analyse the performance and prepare a report.
INTRODUCTION TO CLOUD

OBJECTIVES
• To enable the students to know about the information needs of cloud
• To introduce the usage of various clouds
• To have hands-on training of Statistical Data Analysis through Google Cloud/ Amazon AWS/ Microsoft AZURE

METHODOLOGY
The methodology is predominantly by Problem Solving [using Cloud Softwares], supplemented by lecture mode and case discussion. The students have to undertake a project work in a topic of their interest and product, whereby apply the concepts studied in the course as their course evaluation submission.

Number Credits :2 Credit
Number of Contact hours :30 Hours [30 Sessions]
Maximum Marks :50
Evaluation: Continuous Internal Assessment only
Mid Term-1 (30%)
Mid Term-2(30%)
Assignment-1 (20%)
Assignment-2 (20%)

Unit-I GOOGLE CLOUD
Introduction to Cloud Computing – Linux Basics – Getting Started with Google Cloud Platform – Virtual Machines in the Cloud – Storage in the Cloud – Containers in the Cloud – Applications in the Cloud – Developing, Deploying and Monitoring in the Cloud – Big Data and Machine Learning in the Cloud

Unit-II AMAZON AWS

Unit-III MICROSOFT AZURE

Text Books:
2. Data Science on the Google Cloud Platform: The Definitive Reference, Valliappa Lakshmanan
4. Learning AWS: Design, build and deploy responsive applications using AWS Cloud components, Aurobindo Sarkar and Amit Shah
5. Pro PowerShell for Microsoft Azure, Sherif Talaat
6. Microsoft Azure, Marshall Copeland and Julian Soh
7. Azure Machine Learning, Jeff Barnes

WEB RESOURCES:
• https://cloud.google.com/
• https://cloud.google.com/docs/tutorials
• https://aws.amazon.com/
• https://aws.amazon.com/getting-started/tutorials/
• https://azure.microsoft.com/en-in/
• https://azure.microsoft.com/en-in/get-started
BUSINESS VALUATION LAB

OBJECTIVES

- An easy introduction to the concept of business valuation
- A complete overview of the existing business valuation models
- An understanding of the importance of various assumptions underlying the valuation models
- An easy-to-understand explanation of various business valuation techniques, with their pros and cons
- A discussion on valuation of assets and liabilities, whether tangible or intangible, apparent or contingent.
- Application of the concepts in real-life situations, with many examples.

UNIT I
Mergers- types of merger – theories of mergers- operating, financial and managerial synergy of mergers – value creation in horizontal, vertical and conglomerate mergers – internal and external change forces contributing to M & A activities - Impact of M & A on stakeholders.
M&A – A strategic perspective- industry life cycle and product life cycle analysis in M&A decision, strategic approaches to M&A- SWOT analysis, BCG matrix, Porter’s five forces model

UNIT II

UNIT III
Takeovers, types, takeover strategies, - Takeover defenses – financial defensive measures – methods of resistance – anti-takeover amendments – poison pills

UNIT IV
Methods of financing mergers – cash offer, share exchange ratio – mergers as a capital budgeting decision Synergies from M&A: Operating and Financial Synergy Accounting for amalgamation – amalgamation in the nature of merger and amalgamation in the nature of purchase- pooling of interest method, purchase method – procedure laid down under Indian companies act of 1956

UNIT V
Legal aspects of Mergers/amalgamations and acquisitions/takeovers- Combination and Competition Act- Competition Commission of India (CCI)- CCI Procedure in Regard to the transactions of Business Relating to combination of Regulations 2011- Scheme of Merger/Amalgamation-essential features of the scheme of Amalgamation-Approvals for the Scheme-Step wise procedure- Acquisitions/Takeovers- Listing agreement-The SEBI Substantial Acquisition of Shares and Takeover code.
PRACTICAL COMPONENT:
Pick up any latest M&A deal. Generate the details of the deal and then study the deal in the light of the following.
• Nature of the deal: merger, acquisition, or takeover. If it is a merger, what type of merger is it?
• Synergies likely to emerge to the combining and the combined firm(s) from the deal
• The valuation for the merger
• The basis for exchange rate determination

TEXTBOOK:

REFERENCES:
2. Business Valuation Management, The Institute of Cost and Works Accountants of India
R PROGRAMMING Lab - 2  
[2-Credit Paper- Workshop Mode]

OBJECTIVES
- To enable the students to know about the information needs of Management
- To introduce the concepts of data analysis methods
- To have hands-on training of Statistical Data Analysis through R Programming

METHODOLOGY
The methodology is predominantly by Problem Solving [using R Programming], supplemented by lecture mode and case discussion. The students have to undertake a project work in a topic of their interest and product, whereby apply the concepts studied in the course as their course evaluation submission.

Unit-1

STATISTICS
Descriptive Statistics (summary Measures) using R – Graphs and charts – Binomial distribution – Poisson distribution – Normal distribution – Correlation

Unit-2

STATISTICS AND RESEARCH

Unit-3

ADVANCED R PROGRAMMING
Interfacing R to Other Languages, Text mining, Neural Networks, Monte Carlo methods, Markov chains, classification, Market Basket Analysis

TEXT BOOKS:
1. “R Cookbook”, Paul Teetor
2. “R for Data Science”, Garrett Grolemund and Hadley Wickham
4. “An Introduction to Statistical Learning: With Applications in R”, Daniela Witten, Gareth James Robert Tibshirani, and Trevor Hastie

WEB RESOURCES:
1. https://www.rstudio.com/online-learning/
2. https://hackr.io/tutorials/learn-r

**Mode of Evaluation:**
Continuous Internal Assessments—based on lab exercises
PYTHON PROGRAMMING Lab - 2
[2-Credit Paper- Workshop Mode]

OBJECTIVES
- To enable the students to know about the information needs of Management
- To introduce the concepts of data analysis methods
- To have hands-on training of Statistical Data Analysis through Python Programming
- Understand and apply the design principles of HTML to create static and dynamic web pages.
- To able to create simple web pages using HTML and CSS
- To able to create simple web pages using Java Script

Unit-1

Unit-2
Introduction to Text Mining – Text Processing using Base Python and Pandas, Regular Expressions – Text Processing with specialized modules like NLTK, sklearn, etc – Sentiment Analysis – Word cloud analysis – Segmentation using K-Means/Hierarchical Clustering – Classification (Span/Not spam)

Unit-3

TEXT BOOKS:
1. “Learning Python”, David Ascher and Mark Lutz
2. “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, Wes McKinney
4. “Natural Language Processing with Python”, Edward Loper, Ewan Klein, and Steven Bird
6. “Learning from Data: A Short Course”, Yaser S. Abu-Mostafa, Malik Magdon-Ismail, Hsuan-Tien Lin
WEB RESOURCES:
1. https://www.learnpython.org/
4. https://work.caltech.edu/telecourse.html

Mode of Evaluation:
Continuous Internal Assessments— based on lab exercises
INDUSTRY INTERFACE PROGRAM-2
[2-Credit Paper- Workshop Mode]

OBJECTIVES

- To deliberate advancements in the field of Analytics and create awareness about the corporate needs about the information
- To introduce the latest concepts & technological advancements in the field of analytics

METHODOLOGY

The methodology is predominantly through lecture series from eminent persons from academic and industry. A weeklong workshop on the topics identified will be deliberated and the students learning will be assessed on continuous basis.

Unit-1

Introduction to VBA Macro – Variables in VBA – Looping in VBA – Mail functions – Protecting Sheets – Introduction to dashboards – Interacting with live data – Excel Add Ins - Recent Trends in MS Excel and Visualization

Unit-2

Functional Programming in R – Creating and Building packages in R – Accessing big data using R/R-Studio – Connecting to Relational Databases using RJDBC and RODBC - Types of classes – Writing user-defined classes – Creating and Customizing Shiny Apps - Recent Trends in R / R Studio

Unit-3

# SEMESTER III

**LIST OF CORE PAPERS**

<table>
<thead>
<tr>
<th>Title of the Paper</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUSINESS INTELLIGENCE</td>
<td></td>
</tr>
<tr>
<td>MACHINE LEARNING</td>
<td></td>
</tr>
<tr>
<td>DESIGN AND ANALYSIS OF ALGORITHMS</td>
<td></td>
</tr>
<tr>
<td>SOFTWARE PROJECT MANAGEMENT</td>
<td></td>
</tr>
<tr>
<td>DATA VISUALIZATION</td>
<td></td>
</tr>
<tr>
<td>SUMMER PROJECT</td>
<td></td>
</tr>
</tbody>
</table>
BUSINESS INTELLIGENCE

OBJECTIVES

- This subject aims to presents the importance of data and data warehouse
- It also gives different methods perform data mining to find useful patterns if any
- It focuses on Business performance measures

UNIT I
Business Intelligence – Introduction, Framework of Business Intelligence- Definition, History, Architecture of BI, benefits of BI, Intelligence creation and use of BI governance, Transaction processing versus analytic processing, BI implementation – Developing or acquiring BI, Justification and Cost-benefit analysis, Security and protection of privacy, Integration of systems and applications, BI tools and techniques, Major vendors.

UNIT II
Data Warehousing – Definition, and concepts, Characteristics, Data marts, Operational data stores, Enterprise data warehouse, metadata, Architectures. Data warehouse process overview. Data integration, ELT.
Data warehouse development – Vendors, Development approaches, Representation of data in data warehouse, OLAP Vs OLTP, OLAP operations Implementation issues of data warehouse, Administration, security and future trends of data warehouse.

UNIT III

UNIT IV

UNIT V
BI Implementation – Overview (BI implementation factors, managerial issues), BI and integration implementation, Connecting BI systems to databases and other systems, On demand BI, Issues of legality, privacy and ethics, Social networks and BI for collaborative decision making, RFID and new BI application opportunities.

TEXTBOOK:

REFERENCE:
MACHINE LEARNING

LEARNING OUTCOMES:
After successful completion of the course, students should be able to
• Understand a set of well-known supervised, unsupervised and semi-supervised learning algorithms
• Use a tool to implement typical clustering algorithms for different types of applications
• Identify applications suitable for different types of machine learning with suitable justification
• Implement probabilistic discriminative and generative algorithms for an application of your choice and analyse the results

SYLLABUS:

UNIT - I


Generative Models for discrete data: Introduction – Bayesian Concept Learning – Beta-binomial model – Dirichlet-multinomial model – Naïve Bayes Classifiers


UNIT - II

Linear Regression – Introduction – Model Specification – Maximum likelihood estimation (least square) – Ridge Regression – Bayesian Linear Regression

Logistic Regression: Introduction – Model Specification – Model Fitting – Bayesian Logistic Regression – Online Learning and Stochastic Optimization – Generative vs Discriminative Classifiers

Directed Graphical Models (Bayes nets): Introduction – Naïve Bayes Classifiers – Markov and hidden Markov Models – Directed Gaussian Graphical Models – Conditional Independence properties of DGMs


UNIT - III


Sparse Linear Models: Bayesian Variable Selection – l₁ regularization basics and algorithms – Non-convex regularizers - Automatic Relevance Determination (ARD) / Sparse Bayesian Learning (SBL) – Sparse Coding

Kernels: Kernal functions – Support Vector Machines (SVMs) – Comparison of discriminative Kernal methods – Kernels for building generative models

Gaussian Processes: GPs for regression – GPs for GLMs – GP latent variable model – Approximation methods for large datasets


Markov and Hidden Markov Models: Markov models – Hidden Markov models – Inference in HMMs – Learning for HMMs – Generalizations of HMMs

UNIT – IV

State Space Models: Introduction – Applications of SSMs – Inference in LG-SSM – Learning for LG-SSM – Approximate online inference for non-linear, non-Gaussian SSMs – Hybrid discrete/continuous SSMs

Undirected Graphical Models (Markov Random Fields): Conditional Independence properties of UGMs – Parameterization of MRFs – Learning – Conditional Random Fields (CRFs) – Structural SVMs
Exact Inference for Graphical Models: Belief Propagation for Trees – The variable elimination algorithm – The Junction Tree Algorithm – Computational Intractability of exact Inference in the worst case


Markov Chain Monte Carlo (MCMC) Inference: Gibbs Sampling – Metropolis Hastings algorithm – Speed and Accuracy of MCMC – Auxiliary variable MCMC – Annealing methods – Approximating the marginal likelihood

UNIT – V

Clustering: Introduction – Dirichlet process mixture models – Affinity propagation – Spectral Clustering – Hierarchical Clustering – Clustering datapoints and features


TEXTBOOKS:

REFERENCES:
2. “Introduction to Machine Learning with Python”, Andreas Muller, O’Reilly
3. “Learning from Data”, Yaser S. Abu-Mostafa
4. “Learning from Data: Artificial Intelligence and Statistics”, Doug Fisher
WEB RESOURCES:
2. https://www.youtube.com/watch?v=mbyG85GZ0Pl&list=PLD63A284B7615313A
4. https://www.youtube.com/watch?v=OGxgnH8y2NM&list=PLQVvva0QuDfKTo3Keq_kaG2P55YRn5v
6. https://www.youtube.com/playlist?list=PLZHQObOWTQDMsr9K-rj53DwVRMYO3t5Yr
DESIGN AND ANALYSIS OF ALGORITHMS

OBJECTIVES:

• To understand and apply the algorithm analysis techniques.
• To critically analyse the efficiency of alternative algorithmic solutions for the same problem
• To understand different algorithm design techniques.
• To understand the limitations of Algorithmic power.

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V
Benchmarking of Algorithms – Comparison of Algorithm using Optimal Solutions – Comparison of Algorithm in terms of Performance Measure of Another Algorithm – Comparison of GA-based Heuristic (GAH) with an existing Heuristic (H). Algorithms to Schedule Processor – Concept of Single Processor Scheduling – Algorithms to Schedule Jobs in Parallel Processors – Scheduling

TEXT BOOKS:

1. R. Panneerselvam, Design and Analysis of Algorithms, PHI Learning Private Limited

REFERENCES:

SOFTWARE PROJECT MANAGEMENT

OBJECTIVES:
• To understand the concept of software projects and steps in software project management.
• To enable the students to prepare business proposals for software management.
• To enable the students to evaluate the technical feasibility, financial viability, market acceptability and social desirability of software projects.
• To be effective as project managers and as part of software project teams.

METHODOLOGY:
Lectures, mini-projects, case studies, tutorials using Open Source software

UNIT-I: Software projects and metrics
Software Project Management – Concepts and 3 P’s (People, problem and process) Metrics in the process and project domains, Software measurement – size-oriented metrics, function-oriented metrics and extended function point metrics, Integrating metrics within the software process.

UNIT-II: Software project planning
Software Project planning – objectives, scoping, Resources – human resources, reusable software resources and environmental resources

UNIT-III: Software outsourcing and project scheduling
The Make-Buy decision – creating a decision tree, Software outsourcing – issues involved
Project Scheduling and tracking – relationship between people and effort – defining a task set for the software project.

UNIT-IV: Software risk management and configuration management

UNIT-V: Object-oriented software projects and CASE tools

TEXT BOOKS:
REFERENCES:
1. Ian Sommerville, Software Engineering, Pearson Education, 2010

WEB RESOURCES
1. http://softwareprojectmanager.org/
4. http://www.project.net/

ILLUSTRATIVE EXERCISE:
The Internal mark is awarded based on the components.
DATA VISUALIZATION LAB

OBJECTIVES:
To recognize the importance of Visualization tools
To have comprehensive knowledge of various graphs, charts and plots
To be familiar in various data visualization tools such as tableau, powerbi and plotly

UNIT-I TABLEAU

UNIT II POWERBI

UNIT III WEB VISUALIZATION
Introduction to Plotly – Using Plotly with R, Python and Javascript - Introduction to Chart.js, d3.js, ggplot – Building web apps in Python – Introduction to Shiny

TEXT BOOKS:
1. “Learning Tableau”, Joshua N. Milligan
2. “Practical Tableau”, Ryan Sleeper
3. “Mastering Microsoft Power BI”, Brett Powell
4. “Microsoft Power BI Cookbook”, Brett Powell
5. “R Graphics Cookbook”, Winston Chang, O’Reilly

WEB RESOURCES
1. https://www.tableau.com/learn/training
**SEMESTER IV**

**LIST OF CORE PAPERS**

<table>
<thead>
<tr>
<th>Title of the Paper</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIG DATA ANALYTICS</td>
<td></td>
</tr>
<tr>
<td>SAS AND HADOOP PROGRAMMING LAB</td>
<td></td>
</tr>
<tr>
<td>SUMMER PROJECT</td>
<td></td>
</tr>
</tbody>
</table>
BIG DATA ANALYTICS

OBJECTIVES:
- To optimize business decisions and create competitive advantage with Big Data analytics.
- To explore the fundamental concepts of big data analytics.
- To learn to analyse the big data using intelligent techniques.
- To understand the various search methods and visualization techniques.
- To learn to use various techniques for mining data stream.
- To understand the applications using Map Reduce Concepts.
- To introduce programming tools PIG & HIVE in Hadoop echo system.

UNIT I

UNIT II

UNIT III

UNIT IV
Frameworks: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams.

UNIT V

TEXTBOOK:

REFERENCES:
SAS AND HADOOP PROGRAMMING LAB
[2-Credit Paper- Workshop Mode]

OBJECTIVES
- To enable the students to know about the information needs of Management
- To introduce the concepts of data analysis methods
- To have hands-on training of Statistical Data Analysis through SAS and Hadoop Programming

METHODOLOGY
The methodology is predominantly by Problem Solving [using SAS Programming], supplemented by lecture mode and case discussion. The students have to undertake a project work in a topic of their interest and product, whereby apply the concepts studied in the course as their course evaluation submission.

Unit-1


Unit-2

Unit-3
Introduction to Hadoop – MapReduce – Hadoop Distributed Filesystem – Hadoop I/O – Developing a MapReduce Application – MapReduce Types and Formats – MapReduce Features – Setting Up a Hadoop Cluster – Administering Hadoop – Pig – Hbase
TEXT BOOKS:
2. “Big Data Analytics with SAS”, David Pope

WEB RESOURCES:
2. https://www.tutorialspoint.com/sas/

Mode of Evaluation:
Continuous Internal Assessments– based on lab exercises
<table>
<thead>
<tr>
<th>Title of the paper</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECISION SUPPORT SYSTEMS</td>
<td></td>
</tr>
<tr>
<td>ADVANCED EXCEL</td>
<td></td>
</tr>
<tr>
<td>INTRODUCTION TO CALCULUS</td>
<td></td>
</tr>
<tr>
<td>NATURAL LANGUAGE PROCESSING</td>
<td></td>
</tr>
<tr>
<td>SOCIAL &amp; WEB ANALYTICS</td>
<td></td>
</tr>
<tr>
<td>HR ANALYTICS</td>
<td></td>
</tr>
<tr>
<td>OPERATIONS AND SUPPLY CHAIN ANALYTICS</td>
<td></td>
</tr>
<tr>
<td>MARKETING ANALYTICS – I</td>
<td></td>
</tr>
<tr>
<td>RETAIL ANALYTICS – I</td>
<td></td>
</tr>
<tr>
<td>BUSINESS FORECASTING AND ECONOMETRICS (USING R)</td>
<td></td>
</tr>
</tbody>
</table>
DECISION SUPPORT SYSTEMS

OBJECTIVES:
• To help towards a career in Info. Systems Management.
• To introduce the basic concepts in Decision Support Systems, illustrating, how they facilitate efficient executive decision-making.

METHODOLOGY
The methodology of this subject includes lectures, application problem solving and case studies.

UNIT-I:
Decision Support Systems – Definition – Characteristics & capabilities of DSS – Components of DSS-database, Model base, Communication subsystem & User – Classes of DSS.

UNIT-II:
DSS hardware and software – Group DSS – components & typology – Constructing a DSS – development process.

UNIT-III:
DSS development tools – Yardsticks for choosing DSS software – Executive information and support systems.

UNIT-IV:

UNIT-V:

TEXT BOOK:
1. Efralm Turbon: DECISION SUPPORT SYSTEM AND EXPERT SYSTEMS, Macmillan.

REFERENCES:
2. Ralph H. Sprange, JR. & Huga, J. Watson (Eds.): DSS-PUTTING THEORY INTO PRACTICE, Prentice Hall.

WEB RESOURCES
1. www.sciencedirect.com
2. www.ebsco.com
3. www.googlescholar.com
4. www.scirp.org
5. www.springerlink.com
ILLUSTRATIVE EXERCISE:
The Internal mark is awarded based on the components.
ADVANCED EXCEL

OBJECTIVES
• To enable the students to know about the information needs of Management
• To introduce the concepts of Excel tools
• To have hands-on training of Statistical Data Analysis through MS-EXCEL

METHODOLOGY
The methodology is predominantly by Problem Solving [using MS-EXCEL], supplemented by lecture mode and case discussion. The students have to undertake a project work in a topic of their interest and product, whereby apply the concepts studied in the course as their course evaluation submission.

Number Credits : 2 Credit
Number of Contact hours : 30 Hours [30 Sessions]
Maximum Marks : 50
Evaluation: Continuous Internal Assessment only
Mid Term-1 (30%)
Mid Term-2 (30%)
Assignment-1 (20%)
Assignment-2 (20%)

Unit-I
Text Formulas – Introduction – Case Formulas – Fix Number Fields – Trim Spaces – Substitute Text

Unit-II
Introduction to Charts – Chart types – Instant Chart – Update Chart – Column Chart – Picture Fill – Line Chart – Scatter Chart – Chart Styles – Chart Layouts – Add Labels, Axis Options, Chart Title, Legends, Data Labels


Unit-III
PivotTables – Introduction – Creating PivotTables – Choosing Fields – PivotTable Layout – Filtering PivotTables – Modifying PivotTable Data – PivotCharts
Macros – Introduction and Macro Security – Recording a Macro – Assign a Macro to a Button or Shape – Run a Macro upon Opening a Workbook – Inspect and Modify a Macro

TEXTBOOKS
1. “Excel 2016 Bible”, John Walkenbach

WEB RESOURCES
1. https://www.myonlinetraininghub.com/microsoft-excel-online-training-syllabus
2. https://excelexposure.com/
3. https://corporatefinanceinstitute.com/resources/excel/study/basic-excel-formulas-beginners/

Mode of Evaluation:
Continuous Internal Assessments– based on lab exercises
INTRODUCTION TO CALCULUS

LEARNING OUTCOMES:
Upon completion of this course, students will be able to:
• Understand all basic fundamentals of Differentiation and Integration.
• Prepare him/her for finding Area and Volume.
• Apply mathematical formulas in various subjects of Management.

SYLLABUS:

UNIT – I

Matrices:

UNIT – II

Differential Calculus:
Review of the prerequisites such as limits of sequences and functions, continuity, uniform continuity and differentiability. Successive differentiation, Leibniz’s theorem (without proof), Taylor's & Maclaurin's expansions of single variable, Indeterminate forms.

UNIT – III

Partial differentiation and its applications:
Partial and total differential coefficient, Euler’s theorem, Transformations, Geometrical interpretation of partial derivatives, Tangent plane and Normal line, Jacobians, Taylor’s expansion for two variables, Errors and approximations, Maxima and Minima of functions of two variables, Lagrange method of undetermined multipliers to determine stationary values.

UNIT – IV

Integral Calculus:
Reduction Formulae: Reduction formulae of the type sinn\ \int \ x \ dx , \ \cosn\ \int \ x \ dx , \ \sin \ \cos \ m \ n \ \int \ x \ dx , \ tann\ \int \ x \ dx \ and \ cotn\ \int \ x \ dx . Beta & Gamma function, Error function, Elliptic integrals. Application of integrationLength of a curve, Area of a bounded region, volume & surface area of a solid of revolution for Cartesian, parametric & polar form.
UNIT – V

Multiple integrals:
Double integral, change of order of integration, transformation of variables by Jacobian only for double integration, change into polar coordinates in double integrals only, Triple integral, Application of multiple integration to find areas, volumes, C.G., M.I. and mean values.

TEXTBOOK:
1. “Higher Engineering Mathematics”, Dr. B. S. Grewal
2. “Calculus and analytical geometry”, G.B. Thomas and R.L. Finney

REFERENCES:
1. “Calculus: One-Variable Calculus with an Introduction to Linear Algebra”, Tom M. Apostol
2. “Calculus: Multi-Variable Calculus and Linear Algebra with Applications to Differential Equations and Probability”, Tom M. Apostol
3. “Introduction to Deep Learning: From Logical Calculus to Artificial Intelligence”, Sandro Skansi
NATURAL LANGUAGE PROCESSING

LEARNING OUTCOMES:
Upon Completion of the course, the students will be able to
- To Learn natural language processing and to learn how to apply basic algorithms in this field.
- To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics, discourse as well as the resources of natural language data – corpora

SYLLABUS:

UNIT – I
Introducing to Natural Language Processing
Rationalist and Empiricist Approaches to Language, Scientific Content, The Ambiguity of Language: Why NLP Is Difficult

Regular Expression and Automata
Regular Expressions, Finite-State Automata, Regular Languages and FSAs

UNIT – II
NLP Applications and Text Summary
Semantic Similarity, Thesaurus based word similarity methods, Vector Space Model, Dimensionality Reduction, NLP Applications

Context-Free Grammars and Parsing with Context-Free Grammars
Syntax, Parsing, Various parsing methods, Penn Treebank, statistical parsing, lexicalized parsing, Dependency Parsing

UNIT – III
Probabilistic Models of Pronunciation and Spelling
Dealing with Spelling Errors, Spelling Error Patterns, Detecting Non-Word Errors, Probabilistic Models, Applying the Bayesian method to spelling, Minimum Edit Distance

Language Modelling
UNIT – IV

Markov Models and Part of Speech Tagging

Noisy Channel Model, Part of Speech Tagging, Hidden Markov Model, Statistical POS tagging, Transformation-Based Tagging

Text Summarization

Summarization, Summarization Techniques, Summarization Evaluation, Sentence Simplification

UNIT – V

Collocations and Information Retrieval

Collocations, Introduction to Information Retrieval, Evaluation of IR, Text Classification, Text Clustering, IR toolkits

Text Categorization

Decision Trees, Maximum Entropy Modelling, Perceptrons, k Nearest Neighbor Classification

TEXTBOOK

1. “Speech and language process: An introduction to natural language processing”, Jurafsky
2. “Foundations of statistical natural language processing”, Manning, Christopher. D

REFERENCES

1. “Natural Language Processing with Python: Analyzing Text with Natural Language Toolkit”, Steven Bird and Ewan Klein, O’Reilly
2. “Python Natural Language Processing”, Jalaj Thanaki, Packt
SOCIAL & WEB ANALYTICS

OBJECTIVES:

• To understand the components of the social network.
• To model and visualize the social network.
• To mine the users in the social network.
• To understand the evolution of the social network.
• To mine the interest of the user.

UNIT I

UNIT II

UNIT III
Mining Communities- Aggregating and reasoning with social network data- Advanced Representations - Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.

UNIT IV
Text and Opinion Mining- Text Mining in Social Networks -Opinion extraction – Sentiment classification and clustering - Temporal sentiment analysis - Irony detection in opinion mining - Wish analysis - Product review mining – Review Classification – Tracking sentiments towards topics over time.

UNIT V

TEXTBOOK:
REFERENCES:
HR ANALYTICS

Course objective:
- To understand and improve the value of the Human resource
- To familiarize the use and application of workforce analytics, to maximize return on human capital.

Methodology:
- Lectures, Group Discussion, Case Studies
- Seminar Presentations, Laboratory assignments, Field works

Unit I: Introduction to HR analytics: Meaning of HR analytics, Definition of analytics, Need for HR Analytics, Leading Practices for Improved Organizational Performance, Contribution of HR Analytics, Approaches to HR Analytics, Human Resources analytics applications, Role of HR in building organizational capabilities.

Unit II: HR intelligence framework: Human Capital Maturity Framework- leadership practices; engagement practices; access to knowledge practices. People research & analytics practices; HR intelligence cycle; Organizational Intelligence Model (OIM); HR intelligence implementation, HR Scorecard; Workforce Scorecard; constructing HR scorecard.

Unit III: Staffing metrics: Recruiting tools and practices an overview, measure the quality of hire, measuring the quality of applicants. Measuring the costs of hiring. Recruitment Analytics and On Boarding Analytics Staffing Analytics Performance & Skill Gap Analytics Attrition metrics – techniques used to calculate attrition, manpower planning metrics – push and pull model.

Unit IV: Development metrics – Training ROI, Training evaluation models, tracking the value of career management, measurement, performance metrics, EFQM, and Baldridge criteria, The Intuitive, non-analytic framework for Performance Management; The Targeted Analytics to improve Talent Decisions

Unit V: Compensation metrics – Calculating various wage/salary related measures. Variable pay systems, types of executive compensation, quantitative application in compensation – percentiles, cost benefit analysis, and comp ratios. Mistakes in compensation designing. Employee benefits, Calculation of incentives, measuring the impact of weak incentives. Monitoring planned and unexpected absence, the cost impact of unplanned absences and staffing.

Text book:
Reference:

Web source:
2. www.ibm.com/gbs/intelligent-enterprise
3. ibm.com/gbs/business analytics
5. http://www.marshall.usc.edu/ceo
OPERATIONS AND SUPPLY CHAIN ANALYTICS

Course Objective:
• To provide foundational knowledge associated with the operations analytics
• To provide foundational knowledge associated with the supply chain analytics
• To describe the various tools and techniques for implementation of analytics based on the
  supply chain drivers such as location, logistics and inventory
• To describe the various techniques for analytics based on the Multi Attribute Decision
  Making (MADM) and risk
• To provide the applications of analytics in operations and supply chain

Unit I
Warehousing Decisions, Mathematical Programming Models, P-Median Methods, Guided LP
Approach, Balmer – Wolfe Method, Greedy Drop Heuristics, Dynamic Location Models, Space
Determination and Layout Methods

Unit II
Inventory Management, Inventory aggregation Models, Dynamic Lot sizing Methods,
MultiEchelon Inventory models, Aggregate Inventory system and LIMIT, Transportation Network
Models, Notion of Graphs, Minimal Spanning Tree

Unit III
Shortest Path Algorithms, Maximal Flow Problems, Multistage Transshipment and
Transportation Problems, Set covering and Set Partitioning Problems, Traveling Salesman
Algorithms, Advanced Vehicle Routing Problem Heuristics, Scheduling Algorithms-Deficit
Function Approach and Linking Algorithms

Unit IV
Analytic Hierarchy Process, Data Envelopment Analysis, Risk Analysis in Supply Chain,
Measuring transit risks, supply risks, delivering risks

Unit V
Risk pooling strategies, Fuzzy Logic and Techniques-Application in SCM

TEXTBOOK:
2. “Supply Chain Analytics with SAP NetWeaver Business Warehouse”, Amol Palekar and
   Shreekant Shiralkar
3. “Analytics in Operations/Supply Chain Management”, Muthu Mathirajan and
   Chandrasekharan Rajendran

REFERENCES:
1. GeradFeigin, Supply Chain planning and analytics – The right product in the right place at
   the right time, Business Expert Press, 2011
MARKETING ANALYTICS-I
[Workshop Mode/Skill based paper]

OBJECTIVES

- To enable the students to know about the information needs of Management.
- To introduce software packages like MS-EXCEL/SPSS/R for Marketing Analytics
- To introduce the students to many Excel tools that can be used to analyze marketing problems: PivotTables, charting and Excel statistical functions, including COUNTIF, COUNTIFS, SUMIF, SUMIFS, AVERAGEIF, and AVERAGEIFS functions
- To estimate demand curves and to determine profit maximizing prices, price bundling, nonlinear pricing strategies, and price-skimming strategies
- To introduce forecasting tools
- To analyse the consumer needs and product attributes choices that drives sales

METHODOLOGY

The methodology is predominantly by Case analysis and Computer based Problem Solving, complemented by lecture mode. The students have to undertake a project work in a topic of their interest and product, to apply the concepts studied in the course.

Unit-I

Using Excel to Summarize Marketing Data: Slicing and Dicing Marketing Data with PivotTables- Using Excel Charts to Summarize Marketing Data- Using Excel Functions to Summarize Marketing Data

Unit-II

Pricing: Estimating Demand Curves and Using Solver to Optimize Price- Price Bundling- Nonlinear Pricing- Price Skimming and Sales

Unit-III

Forecasting: Simple Linear Regression and Correlation- Using Multiple regression to forecast Sales

Unit-IV

Forecasting in the event of special Events-Modelling Trend and Seasonality & other forecasting methods [Ratio to Moving Average/Winter Method / Neural Networks]

Unit-V


TEXT BOOKS:

REFERENCES:
1. Hair, Andersen, Black and Tatham, Multivariate Data Analysis, Pearson India Ltd, New Delhi, 2008 (7th edition)
2. Paul W.Farris et al (2010), Marketing Metrics, Pearson Education

MAGAZINES & OTHER REFERENCES
1. www.emeraldinsight.com (A renowned research journal database)
2. www.ficci.com (Official web site of Federation of Indian chambers, Commerce and Industry)
3. www.ibef.org (Official web site of India Brand Equity foundation, a subsidy of CII)
4. www.ncaer.org (National Council of Applied Economic Research – Govt. of India data resource)

WEB RESOURCES:
1. www.stat tutorials.com (Statistics tutorials including worked examples using softwares like SPSS)
2. www.analyzemath.com/statistics.html (Statistics tutorials)
4. www.spss.com
5. www.search.ebscohost.com
RETAIL ANALYTICS-I
[Workshop Mode/Skill based paper]

OBJECTIVES

• To enable the students to know about the information needs of Management.
• To introduce software packages like MS-EXCEL/SPSS/R for Retail Analytics
• To introduce Promotion metrics, Web metrics and analysis
• To introduce forecasting tools
• To analyse the consumer needs and product attributes choices that drives sales

METHODOLOGY
The methodology is predominantly by Case analysis and Computer based Problem Solving, complemented by lecture mode. The students have to undertake a project work in a topic of their interest and product, to apply the concepts studied in the course.

Unit-I
Introduction to Retail Analytics – Overview of modern retailing marketplace and understanding technological aspects - Promotion metrics

Unit-II
Advertising/Web metrics – Promotion Analysis - Syndicated scanner data analysis – Retail POS data analysis

Unit-III
Consumer Insights with retail data – Overall Marketing Metrics – Introduction to R/R-Studio

Unit-IV
Brief tutorial of data access using R – Loading different types of data in R – Accessing Online data using R – Basic Statistical Analysis using R

Unit-V
Multivariate regressions – Machine Learning methods – Random coefficient logit models – Nonparametric models

TEXT BOOKS:
3. Hasty and Reardon: Retail Management, McGraw-Hill
REFERENCES:
1. Hair, Andersen, Black and Tatham, Multivariate Data Analysis, Pearson India Ltd, New Delhi, 2008 (7th edition)
2. Paul W. Farris et al (2010), Marketing Metrics, Pearson Education

MAGAZINES & OTHER REFERENCES
1. www.emeraldinsight.com (A renowned research journal database)
2. www.ficci.com (Official web site of Federation of Indian chambers, Commerce and Industry)
3. www.ibef.org (Official web site of India Brand Equity foundation, a subsidy of CII)
4. www.ncaer.org (National Council of Applied Economic Research – Govt. of India data resource)

WEB RESOURCES:
2. http://www.bizmove.com/marketing/m2c.htm
5. http://www.retailmarketingblog.com/list-growing/
BUSINESS FORECASTING AND ECONOMETRICS (USING R)

UNIT - I
The Importance of Forecasting-Time Series Data-Component Factors of the Time-Series Model

UNIT - II
Trend Analysis-Seasonal and Cyclical Behaviour-Smoothing of Annual Time Series: Moving averages, Exponential smoothing -Least-Squares Trend Fitting and Forecasting: Linear, quadratic and exponential models

UNIT - III
Autocorrelation and Auto regression-Autoregressive Models - ARIMA time-series Model

UNIT - IV
Time-Series Forecasting of Monthly or Quarterly Data-Accuracy Statistics and Forecast Model Selection-Families of Forecasting Models –Hierarchical Forecasting-Adjustments to Statistical Forecasts

UNIT - V
Event Variables-Outlier Variables and Other Model Inputs-Using Event Variables Based on Calendar Effects-Combined Model Forecasts-Honest Assessment

TEXTBOOKS

REFERENCES
## ELECTIVES (STREAM – 2)

<table>
<thead>
<tr>
<th>Title of the paper</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEEP LEARNING</td>
<td></td>
</tr>
<tr>
<td>SUPPLY CHAIN RISK ANALYTICS</td>
<td></td>
</tr>
<tr>
<td>SOCIAL MEDIA MARKETING</td>
<td></td>
</tr>
<tr>
<td>MARKETING ANALYTICS – II</td>
<td></td>
</tr>
<tr>
<td>RETAIL ANALYTICS – II</td>
<td></td>
</tr>
<tr>
<td>FINANCIAL RISK ANALYTICS</td>
<td></td>
</tr>
<tr>
<td>DATA WAREHOUSE &amp; MINING</td>
<td></td>
</tr>
<tr>
<td>COMPUTER SIMULATION</td>
<td></td>
</tr>
<tr>
<td>NEXT GENERATION DATABASES</td>
<td></td>
</tr>
<tr>
<td>IMAGE AND VIDEO ANALYTICS</td>
<td></td>
</tr>
<tr>
<td>HEALTHCARE DATA ANALYTICS</td>
<td></td>
</tr>
</tbody>
</table>
DEEP LEARNING

OBJECTIVES:
- To acquire knowledge on the basics of neural networks.
- To implement neural networks using computational tools for variety of problems.
- To explore various deep learning algorithms.

UNIT I


Numerical Computation: Overflow and Underflow – Poor Conditioning – Gradient-Based Optimization – Constrained Optimization – Linear Least Square

UNIT II


Deep Feedforward Networks: Learning XOR – Gradient-Based Learning – Hidden Units – Architecture Design – Back Propagation


UNIT III


Applications: Large-Scale Deep Learning – Computer Vision – Speech Recognition – Natural Language Processing

UNIT IV

Linear Factor Models: Probabilistic PCA and Factor Analysis – Independent Component Analysis (ICA) – Slow Feature Analysis – Sparse Coding – Manifold Interpretation of PCA


**Monte Carlo Methods:** Sampling and Monte Carlo Methods – Importance Sampling – Markov Chain Monte Carlo Methods – Gibbs Sampling – The Challenge of Mixing between Separated Modes

**UNIT V**


**Approximate Inference:** Inference as Optimization – Expectation Maximization – MAP Inference and Sparse Coding – Variational Inference and Learning – Learned Approximate Inference


**TEXTBOOK:**

**REFERENCE:**

**WEB RESOURCES:**
2. https://www.youtube.com/watch?v=mbyG85GZ0PI&list=PLD63A284B7615313A
4. https://www.youtube.com/watch?v=OGxgnH8y2NM&list=PLQVvvaao0QuDfKTOs3Keq_kaG2P55YRn5v
6. https://www.youtube.complaylist?list=PLZHQ0bOWTQDMsr9K-rj53DwVRMY03t5Yr
7. https://www.coursera.org/courses?languages=en&query=Algorithm%20design%20analysis
SUPPLY CHAIN RISK ANALYTICS

UNIT - I
MODULE 1: INTRODUCTION TO KEY CONCEPTS IN SCM AND RISK
· Typologies of risk · Quantifying risk · Risk measures

UNIT - II
· Risk models in SCM – operational risks vs. disruption risks

MODULE 2: CUSTOMER AND DEMAND SIDE ANALYTICS
· Models for demand uncertainty· Service level policies

UNIT - III
· Production-distribution model
· Risk mitigation strategies to manage disruptions

MODULE 3: SUPPLY SIDE ANALYTICS
· Supply chain network design

UNIT - IV
· Models accounting for resource availability uncertainty · Supply capacity extension
· Process flexibility · Supply chain preparedness for humanitarian and disaster management

UNIT - V
MODULE 4: INTEGRATED MODELS FOR MANAGING OPERATIONAL AND DISRUPTION RISKS
· Multi-objective models with alternative performance measures · Models for sourcing decisions
· Information management: models of information sharing.

TEXTBOOK

REFERENCES
SOCIAL MEDIA MARKETING

OBJECTIVES:
The objectives of this course are:
- To understand the foundations of Social media and its role in marketing
- To conceptualize Social media marketing strategy formulation
- To understand the typology of Social media platforms and their utility for marketers
- To become familiar with Social media analytics and metrics

METHODOLOGY:
The classroom methodology will include lectures, quizzes, lab sessions, comprehensive case analysis and discussions, brainstorming on industry news and latest developments, white papers and development of a Social media marketing plan.

UNIT-I FOUNDATIONS OF SOCIAL MEDIA MARKETING
Social media and its role within Marketing - The Social media environment – Social consumers – Social applications – Social business ecosystem – Network structure and group influences in Social media

UNIT-II SOCIAL MEDIA MARKETING STRATEGY AND PLANNING
Rules of engagement for Social media marketing Target audience – Influencers – Message/Content Developing a Social media marketing plan

UNIT-III SOCIAL MEDIA PLATFORMS: TYPOLOGY, SCOPE AND UTILITY
Scope and marketing utility of blogging, micro-blogging, social networks, social bookmarking, collaboration, video sharing, podcasts, picture sharing, live streaming, webinars

UNIT-IV SOCIAL MEDIA DATA MANAGEMENT AND MEASUREMENT
Social media analytics, social media metrics – Introduction to analytics tools for popular social media (Facebook, Twitter, LinkedIn, YouTube, Instagram) Social media monitoring and Online reputation management

UNIT-V USING POPULAR SOCIAL MEDIA PLATFORMS
Marketing through Facebook – Community building and engagement Marketing through LinkedIn – B2B lead generation and personal branding Marketing through Twitter – Driving traffic and conversations Marketing through YouTube – Viral marketing - Marketing through Instagram – Visual story telling Planning and creating multi-channel Social media strategy

TEXT BOOKS:
REFERENCE BOOKS:

WEB RESOURCES:
1. www.hubspot.com – offering in-bound marketing software, support and methodology
2. www.socialmediatoday.com – provides social media industry news and analysis
3. www.socialmediaexaminer.com – a popular social media marketing resource site
4. www.econsultancy.com – Internet marketing research and training company
MARKETING ANALYTICS-II
[Workshop Mode/Skill based paper]

OBJECTIVES
• To enable the students to know about the information needs of Management.
• To explore customer value analysis and value models
• To introduce the segmentation analysis
• To explore the retail analytics tools
• To analyse the advertising analytical tools
• To introduce Internet and social media analytics

METHODOLOGY
The methodology is predominantly by Case analysis and Computer based Problem Solving, complemented by lecture mode. The students have to undertake a project work in a topic of their interest and product, to apply the concepts studied in the course.

Unit-I
Customer Value: Calculating Lifetime Customer Value- Using Customer Value to Value a Business- Customer Value, Monte Carlo Simulation, and Marketing Decision Making- Allocating Marketing Resources between Customer Acquisition and Retention

Unit-II
Market Segment: Clustering- User-Based Collaborative Filtering-Using Classification Trees for Segmentation

Unit- III
Retail Analytics: Market Basket Analysis and Lift - Allocating Retail Space and Sales Resources-Identifying the Sales to Marketing Effort Relationship

Unit-IV
Advertising Analytics: Measuring the Effectiveness of Advertising -Media Selection Models- Pay per Click Advertising- Introduction to Internet and Social Marketing

Unit-V
Introduction to dashboard – Need for Visualization – various visualization tools – Using Visualization tools for Marketing data – Creating dashboards

TEXT BOOKS:
REFERENCES:
1. Hair, Andersen, Black and Tatham, Multivariate Data Analysis, Pearson India Ltd, New Delhi, 2008 (7th edition)
2. Paul W.Farris et al (2010), Marketing Metrics, Pearson Education

MAGAZINES & OTHER REFERENCES
1. www.emeraldinsight.com (A renowned research journal database)
2. www.ficci.com (Official web site of Federation of Indian chambers, Commerce and Industry)
3. www.ibef.org (Official web site of India Brand Equity foundation, a subsidy of CII)
4. www.ncaer.org (National Council of Applied Economic Research – Govt. of India data resource)

WEB RESOURCES:
1. www.stat tutorials.com (Statistics tutorials including worked examples using softwares like SPSS)
2. www.analyzemath.com/statistics.html (Statistics tutorials)
4. www.spss.com
5. www.search.ebscohost.com
RETAIL ANALYTICS-II
[Workshop Mode/Skill based paper]

OBJECTIVES
- To enable the students to know about the information needs of Management.
- To introduce software packages like MS-EXCEL/SPSS/R for Retail Analytics
- To introduce Promotion metrics, Web metrics and analysis
- To introduce forecasting tools
- To analyse the consumer needs and product attributes choices that drives sales

METHODOLOGY
The methodology is predominantly by Case analysis and Computer based Problem Solving, complemented by lecture mode. The students have to undertake a project work in a topic of their interest and product, to apply the concepts studied in the course.

Unit-I
Measuring price and promotion response in retailing – Location strategy in retailing – Retailer’s site location decision – Retail Assortment Decisions: Consumer Choice, Private Labels, Assortment Planning

Unit-II
Retailer’s expansion, contraction, and franchising decisions – Omni-channel in retailing - Retail Trends: Online Retailing

Unit-III
Retail Trends: Internationalization, hard Discounters – Future of retailing - Spatial analysis: descriptive

Unit-IV
Spatial analysis: spatial regressions – Probit model – Nonlinear model – Difference-in-differences (DID) models

Unit-V
Introduction to dashboard – Need for Visualization – various visualization tools – Using Visualization tools for Retail data – Creating dashboards

TEXT BOOKS:
3. Hasty and Reardon: Retail Management, McGraw-Hill
REFERENCES:
1. Hair, Andersen, Black and Tatham, Multivariate Data Analysis, Pearson India Ltd, New Delhi, 2008 (7th edition)
2. Paul W.Farris et al (2010), Marketing Metrics, Pearson Education

MAGAZINES & OTHER REFERENCES
1. www.emeraldinsight.com (A renowned research journal database)
2. www.ficci.com (Official web site of Federation of Indian chambers, Commerce and Industry)
3. www.ibef.org (Official web site of India Brand Equity foundation, a subsidy of CII)
4. www.ncaer.org (National Council of Applied Economic Research – Govt. of India data resource)

WEB RESOURCES:
2. http://www.bizmove.com/marketing/m2c.htm
5. http://www.retailmarketingblog.com/list-growing/
FINANCIAL RISK ANALYTICS

OBJECTIVES
Financial Risk Analytics involves the use of Quantitative Models, Statistical Methods, Numerical Algorithms, and software to address the challenging and important issues associated with Big Financial Data.

UNIT I CREDIT RISK FOUNDATION & RISK MODELING
Credit Risk Foundation - Overview of Consumer Credit Products - Credit Risk Fundamentals - Credit Rating Agencies - External Analysis for Credit Information - Verification Frameworks - Risk modeling – Fundamentals - Different approaches for risk modeling - Binomial Logistic, Multinomial Logistic, Survival Analysis, Penalized Models, Hazard Models, ARIMA

UNIT II RISK MODELING: DEEP DIVE
Decision Trees – Clustering - Build Model to Predict Probability of Default (PD) - Rare Event Modeling - Business case studies using industry relevant datasets on almost all the models - Advanced Modeling Techniques – Neural Networks (Pros/Cons), Support Vector Machines and how they are used in Risk Analytics

UNIT III CREDIT RISK REGULATIONS (GLOBAL)
BASEL II Concepts – Pillar 1, 2 and 3 - BASEL II vs BASEL III - IFRS9 standards - Comparison between requirements by FSA and APRA - Comparison between IFRS9 standard and CECL (FASB) - CCAR - Regulation and calculation overview - Asset Classes - Business case studies

UNIT IV MODEL VALIDATION – REGULATIONS’ CONTEXT
Data Cleaning & Model Diagnostics, Variable Selection, Candidate Models, Residual Diagnostics, Holdout / OOT Sample Testings - SR 11-7 Requirements – Detailed understanding (Conceptual Soundness, Outcome Analysis, and Model Monitoring) - Model Documentation

UNIT V ADVANCED CREDIT RISK MODELS – SETTING UP LGD, EAD MODELS
Economic LGD Calculations - Selection of “Discount” Factor in creating Economic LGD - Conversion of model LGD to “Downturn LGD” - How EAD is calculated for Loan Products vs Products with Limits - EAD Modeling options for / approach comparison

TEXT BOOKS:

REFERENCES:
DATA WAREHOUSE & MINING

Learning Outcomes:
Upon Completion of the course, the students will be able to
• Pre-process the data for mining applications
• Understand supervised and unsupervised mining
• Apply various frequent pattern mining techniques on market basket data
• Understand the importance of Attribute Selection (Curse of Dimensionality)
• Differentiate problems related to classification or clustering
• Design and deploy appropriate classification or clustering techniques
• Measure the quality of extracted patterns and knowledge using various evaluation methods

Syllabus

UNIT – I Introduction

Introduction to Data Mining, Importance of Data Mining, Data Mining functionalities, Classification of Data mining systems, Data mining architecture, Major Issues in Data Mining, Data mining metrics, Applications of Data Mining, Social impacts of data, Data Mining from a Database Perspective

UNIT – II Data Pre-processing

Introduction, Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization

UNIT – III Classification and Prediction

Basic issues regarding classification and predication, Classification by Decision Tree, Bayesian classification, classification by back propagation, Associative classification, Prediction, Statistical-Based Algorithms, Decision Tree -Based Algorithms, Neural Network -Based Algorithms, Rule-Based Algorithms, Other Classification Methods, Combining Techniques, Classifier Accuracy and Error Measures

UNIT – IV Clustering

Similarity and Distance Measures, Hierarchical Algorithms, Partitioned Algorithms, Clustering Large Databases, Clustering with Categorical Attributes

UNIT – V Association Rules

Basic Algorithms, Advanced Association Rule Techniques, Measuring the Quality of Rules
TEXTBOOK
1. “Data Mining: Concepts and Techniques”, J. Han and M. Kambar, Morgan Kaufman
2. “Data Warehousing, Data Mining”, Alex Berson and Stephen J. Smith

REFERENCES
1. “Data Mining and Predictive Analytics”, Daniel T. Larose and Chantal D. Larose
COMPUTER SIMULATION

OBJECTIVES

• To understand stochastic models
• To know the various aspects of simulation
• To use high level languages and GPSS etc. In a stochastic environment

UNIT-I
System concept, Need for simulation, Types of model, Major steps of simulation, Types of simulation, Advantages of simulation, Monte-Carlo simulation, Methods of random number generation- Mid-square method, Multiplicative Congruential method, Testing of randomness of random numbers- Chi-square method, Kolmogorov-Smirnov Test, Run test

UNIT-II
Random variate formulas for Uniform distribution, Exponential distribution, Poisson distribution, Methods of Random variate generation for Normal distribution, Gamma distribution. Introduction to simulation languages – GPSS, SIMULA I, SIMSCRIPT, GASP, SIMAN, DYNAMO.

UNIT III
Simulation using high level language- Single server model with single queue, Parallel server model with single queue, Single server queueing system with two queues with alternate service, Single server queueing system with balkung and with reneging, Single server queueing model with single queue with bulk arrivals, Inventory system, Assembly line system

UNIT IV
GPSS Preliminary blocks- GENERATE, QUEUE, DEPART, TERMINATE, SEIZE, RELEASE, ADVANCE, TABLE OF DEFINITION, ENTER, LEAVE, STOEAG, TRANSFER BLOCKS, SAMPLING PROBABILITY DISTRIBUTION

UNIT V

TEXT BOOKS:
1. R. PANNEERSELVAM and P. SENTHILKUMAR, SYSTEM SIMULATION, MODELLING AND LANGUAGES, PHI Learning, Delhi.

REFERENCES:
5. R. Panneerselvam, OPERATIONS RESEARCH, PHI Learning, Delhi.
NEXT GENERATION DATABASES

OBJECTIVES:
- To explore the concepts of NoSQL Databases.
- To understand and use columnar and distributed database patterns.
- To learn to use various Data models for a variety of databases.

UNIT I
Database Revolutions- System Architecture- Relational Database- Database Design - Data Storage- Transaction Management- Data warehouse and Data Mining- Information Retrieval.

UNIT II

UNIT III
Column Databases— Data Warehousing Schemes- Columnar Alternative- Sybase IQ- CStore and Vertica- Column Database Architectures- SSD and In-Memory Databases— InMemory Databases- Berkeley Analytics Data Stack and Spark.

UNIT IV
Distributed Database Patterns— Distributed Relational Databases- Non-relational Distributed Databases- MongoDB - Sharing and Replication- HBase- Cassandra Consistency Models— Types of Consistency- Consistency MongoDB- HBase Consistency- Cassandra Consistency.

UNIT V

TEXTBOOK:

REFERENCES:
IMAGE AND VIDEO ANALYTICS

OBJECTIVES:
• To teach the fundamentals of digital image processing, image and video analysis.
• To understand the real time use of image and video analytics.
• To demonstrate real time image and video analytics applications and others.

UNIT I

UNIT II

UNIT III

UNIT IV
Object detection and recognition in image and video-Texture models Image and Video classification models- Object tracking in Video.

UNIT V
Applications and Case studies- Industrial- Retail- Transportation & Travel- Remote sensing-Video Analytics in WSN: IoT Video Analytics Architectures.

TEXTBOOK:

REFERENCES:
HEALTHCARE DATA ANALYTICS

OBJECTIVES:
- To explore the various forms of electronic health care information.
- To learn the techniques adopted to analyse health care data.
- To understand the predictive models for clinical data

UNIT I

UNIT II
Analysis: Biomedical Image Analysis- Mining of Sensor Data in Healthcare- Biomedical Signal Analysis- Genomic Data Analysis for Personalized Medicine.

UNIT III
Analytics: Natural Language Processing and Data Mining for Clinical Text- Mining the Biomedical - Social Media Analytics for Healthcare.

UNIT IV

UNIT V

TEXTBOOK:

REFERENCES:
1. “Healthcare Analytics Made Simple”, Vikas Kumar, Packt
2. “Competing on Healthcare Analytics: The Foundational Approach to Population Health Analytics”, J. Bennett