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			SEMESTER - II		
Subject	**Credit**	**Marks**	**Subject**	**Credit**	**Marks**
Management Process and Organisational Behaviour	3	100	Financial Management	3	100
Business Environment	3	100	Marketing Management	3	100
Accounting for Managers	3	100	Operations Management	3	100
Database Management Systems	3	100	Human Resources Management	3	100
Research Methodology	3	100	Strategic Management	3	100
Operations Research	3	100	Introduction to Cloud	2	50
Business Analytics Lab - 1	2	50	Business Valuation Lab	2	50
R Programming Lab - 1	2	50	R Programming Lab - 2	2	50
Python Programming Lab- 1	2	50	Python Programming Lab - 2	2	50
Spreadsheet for Managers Lab - 1	2	50	Industry Interface Program-2	2	50
Industry Interface Program-1	2	50			
Total	**28**	**850**	**Total**	**25**	**750**

SEMESTER - III			SEMESTER - IV		
Subject	**Credit**	**Marks**	**Subject**	**Credit**	**Marks**
Business Intelligence	3	100	Big Data Analytics	3	100
Machine Learning	3	100	SAS and Hadoop Programming Lab	2	50
Design and Analysis of Algorithms	3	100	Project-2 (8 Weeks) (100 Marks for thesis + 50 Marks for Project Viva)	4	150
Software Project Management	3	100	Elective-5	3	100
Data Visualization Lab	2	50	Elective-6	3	100
Project-1 (8 Weeks) (100 Marks for thesis + 50 Marks for Project Viva)	4	150	Elective-7	3	100
Elective-1	3	100	Elective-8	3	100
Elective-2	3	100			
Elective-3	3	100			
Elective-4	3	100			
Total	**30**	**1000**	**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× 3 = 15 Marks
Answer ALL FIVE Questions
Question 1 to Question 5

PART B: 5 × 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 × 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

Title of the Paper	**Code**
MANAGEMENT PROCESS AND ORGANISATIONAL BEHAVIOUR	
BUSINESS ENVIRONMENT	MBAH012
ACCOUNTING FOR MANAGERS	MBAH014
DATABASE MANAGEMENT SYSTEMS	
RESEARCH METHODOLOGY	
OPERATIONS RESEARCH	
BUSINESS ANALYTICS LAB - I	MBAH017
R PROGRAMMING LAB – I	
PYTHON PROGRAMMING LAB – I	
SPREADSHEET FOR MANAGERS LAB – 1	
INDUSTRY INTERFACE PROGRAM-1	

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

Nature of Management: Meaning and Definition, Management: Science, Theory and Practice - The Evolution of Management Thought and the Patterns of Management Analysis- Approach to Management – Levels in Management – Managerial Skills - Functions of Management-The Nature and Purpose of Planning - Objectives - Strategies, Policies and Planning Premises, . Management by Objective (MBO)

UNIT II

The Nature of Organizing - Organizational Structure: Departmentation - Line/Staff Authority and Decentralization, Co-ordination functions in Organisation, Emerging Trends in corporate Structure- Authority Relationships – Delegation of Authority and Decentralisation- Human Factors and Motivation- Leadership – Meaning, Importance, styles and theories of leadership. Committees and group- Decision Making- Techniques and processes.

UNIT III

An overview of staffing function: Elements of staffing- Recruitment sources- Selection process- The System and Process of Controlling- Methods, Tools and Techniques of Control and Information Technology – Design of techniques – Choices in Control. Best Management Practices across the world – Select cases of Domestic & International Corporations.

UNIT IV

Organisational Behaviour: Meaning & Definition- Management functions and relevance to Organisation Behaviour. Personality - Determinants, structure, behaviour, assessment, theories of personality- Emotions and Emotional Intelligence as a managerial tool. Attitudes - relationship with behaviour, Perception - Process, Managerial implications of perception. Learning - classical, operant and social cognitive approaches. Implications of learning on managerial performance.

UNIT V

Foundation of Group Behaviour- Definition of Groups, Reasons for forming Groups- Stages of Group Development-Characteristics of Groups, Group Structure-Understanding Work Teams- Organisational Change-Managing Change In the Organisational Context- Forces for Change In

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:

1. Koontz & Weirich, "Essentials of Management: An International perspective", 8th Edn. Tata McGraw-Hill, New Delhi, 2009.
2. Stephen P. Robbins, Mary A. Coulter and David A. De Cenzo, "Fundamentals of Management - 10th edition Pearson Education, New Delhi, 2017.
3. Peter F. Drucker, "The Practice of Management", Harper Business; Reissue edition, 2006.
4. Gareth Jones "Essentials of Contemporary Management" - 7th edition. Tata McGraw-Hill, New Delhi, 2017.
5. Stephen P. Robbins, "Organizational Behavior, 16/e"; Sixteenth edition, Pearson Education, 2016.
6. Schermerhorn, Osborn, Uhl-Bien and Hunt, "Organizational Behavior", Twelfth edition, Wiley, 2013.
7. Stephen P. Robbins, Timothy A. Judge and Neharika Vohra, "Organizational Behaviour" Eighteenth edition, Pearson Education, 2018.

REFERENCES

1. Sarah cook, Practical Bench Marking: A manager's guide to creating competitive advantage, London, Kogan Page 1995
2. Heracleous.L and Devoge, S., "Bridging the gap the of relevance: strategic management and organizational development, Long Range planning 31(5), 1998
3. Bateman Snell, "Management: Competing in the new era", McGraw Hill Irwin, 2002.
4. Peter Eichhorn & Ian Towers, Principles of Management: Efficiency and Effectiveness in the Private and Public Sector, Springer International Publishing. 2018.

WEB RESOURCES:

- https://open.umn.edu/opentextbooks/textbooks/principles-of-management
- https://bdpad.files.wordpress.com/2015/05/fred-luthans-organizational-behavior-_-an-evidence-based-approach-twelfth-edition-mcgraw-hill_irwin-2010.pdf
- https://libguides.library.curtin.edu.au/fundamentals-of-management
- www.bretlsimmons.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 GDP3. 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

Population & its Growth Rate, Education Levels, Age Distribution and Life Expectancy Rates Family Size and Structures, Gender Distribution, Religion, Nationality and Beliefs and Minorities Social classes and Lifestyle, Average Disposable Income - Attitude towards Product Quality and Customer Service, Buying Habits, Environmental Consciousness, Work and Leisure, Health Consciousness, Risk Taking Ability.

UNIT-V: Technological Environment

Basic Infrastructure Level - Energy, Transport, Communication, Science and Technology. Research and Development, Product and Process Innovation, Rate of Technological Change and Penetration Levels, Protection of Intellectual Property Rights - Technological Leadership and Followers, Technology and Competitive Advantage, Time Lags in Technology Introduction, Adaptation, Transfer of Technology - Internet Infrastructure

TEXT BOOKS:

1. Francis Cherunilam: Business Environment – Text and Cases, Himalaya Publishing House, New Delhi.
2. A.C. Fernando, Business Environment, Pearson.
3. Ian Worthington and Chris Britton: The Business Environment, Prentice Hall
4. Shaikh Saleem, Business Environment, Pearson
5. Gupta G.S., MANAGERIAL ECONOMICS, Tata McGraw-Hill, New Delhi.
6. Varshnavy and Maheashwary, MANAGERIAL ECONOMICS, Sultan and Chand, New Delhi.
7. Managerial Economics by R. Panneerselvam, P. Sivasankaran and P. Senthilkumar (2018); Cenage Learning India Pvt. Ltd.

REFERENCE BOOKS:

1. Rudder Dutt and Sundharam, K.P.M.: Indian Economy, S. Chand & Company Limited, New Delhi.
2. Managerial Economics and Business Strategy by Michael R Baye and Jeff Prince (2017); McGraw Hill Education, Eighth Edition
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
6. Macroeconomics: Principles and Tools (3rd Edition) by Arthur O'Sullivan, Steven M. Sheffrin, Publisher: Prentice Hall
7. Peterson, HC and W.C.Lewis, MANAGERIAL ECONOMICS, Prentice-Hall of India, New Delhi.
8. Kapoor, N.D. "Elements of mercantile law", Sultan Chand & Sons, New Delhi, 2014
9. Sen &Mitra, "Commercial Law" The World Press Pvt. Ltd., Calcutta, 2018

10. Riggs, J.L. MANAGERIAL ECONOMICS, McGraw-Hill, New Delhi.
11. Stiglitz J., PRINCIPLES OF MICROECONOMICS, Norton Publishers 2nd Edition.
12. Joel Dean, Managerial Economics, Himalaya Publishing house, New Delhi.
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
15. Misra, S.K. and Puri, V.K.: Economic Environment of Business, Himalaya Publishing House, New Delhi.
16. Gulshan S.S. - Business Law Including Company Law (Excel Books)
17. N.D Kapoor &Rajni Abbi-General Laws & Procedures (Sultan Chand & Sons)
18. Misra, S.K. and Puri, V.K.: Indian Economy, Himalaya Publishing House, New Delhi.

Magazines & Other References:

1. Survey of Indian Industry – published every year
2. Magazines & Journals – The Economist, The Week, Harvard Business Review, Indian Management, Economic and Political Weekly, India Today, Business Today, Business World, Outlook, Computers Today, Daily Business and General News Papers, Etc.
3. TV Programs on Business and Environment
4. Others: Various publications such as reports, surveys, studies on business and management.

Web Resources

1. http://www.wikipedia.org
2. http://www.allbusiness.com
3. http://www.ehow.com
4. ww.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
10. http://www.quickmba.com
11. http://www.businessballs.com
12. http://www.earth.columbia.edu
13. http://www.sustdev.org
14. http://data.worldbank.org
15. http://www.rbi.org.in
16. http://www.goidirectory.gov.in
17. http://www.businessdictionary.com
18. www.legalindia.in
19. www.legalserviceindia.com
20. www.supremecourtofindia.nic.in
21. http://www.business-definition.info

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

Book-keeping and Accounting – Meaning – Definition – Objectives of Financial Accounting – Branches of Accounting: Financial, Cost and Management Accounting – Accounting Concepts and conventions – journal – Ledger – Trial Balance – Preparation of Final Accounts: Trading, Profit and Loss Account and Balance Sheet (problems) – Accounting Standards – Groups interested in Accounting Information – An Introduction to Tally Package – salient features – types of vouchers – reports generated by Tally.

UNIT-II

Capital and Revenue Expenditure – Deferred Revenue Expenditure – Capital and Revenue Receipts – Depreciation – Definition – Causes – Necessity of providing for depreciation – Methods of Calculating Depreciation: Straight Line Method and Written Down Value Method – Problems.

UNIT-III

Financial Statements – Meaning – Types of financial Analysis – Techniques of Financial Analysis – Ratio Analysis – Profitability Ratios – Coverage Ratios – Turnover Ratios – Financial Ratios – Ratios to Financial Statement (problems) – uses and limitations of Ratio Analysis – Funds Flow Analysis (simple problems) – uses and limitations – Cash Flow Analysis (simple problems) – uses and limitations – Difference between funds flow and cash flow analysis.

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

Concept of cost – Elements of Cost – Cost Accounting – Objectives – Cost Sheet (Problems) – classification of cost – Cost Unit and Cost Centre – Methods of Costing – Techniques of Costing.

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
4. H.G. Guthman: Analysis of Financial Statements, Prentice Hall

WEB RESOURCES

1. www.accountingformanagement.com
2. http://www.business.com/directory/accounting/software/
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:
Database Administration: Functions of DBA, Security Mechanism: Authorization, Encryption, Concurrency control, Problem of concurrency control, Resource locking, deadlock/Deadly embrace, Database recovery: Restore/Return, backward recovery, Forward recovery.

TEXT BOOK:
1. Panneerselvam, R., Database Management Systems PHI Learning Pvt. Ltd., New Delhi, 2011.

REFERENCES:

1. James martin, Principles of Database Management, Prentice-Hall of India, 1998.

2. Silberschatz., A., et.al., Database Management Concepts, McGraw Hill International Edition, New York, 1997.

3. Date, C.J., An Introduction to Database Systems, Narosa Publishing House, New Delhi, 1987.

4. Everest, Gorden, C., Database Management, McGraw-Hill, New York, 1986.

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

6. http://nosql.mypopescu.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
2. Donald R, Cooper and Pamela S. Schindler, Business Research Methods, 6th edition, Irwin/ McGraw Hill, 1998, New Delhi.

Reference Books:

1. Harper W. Boyd Jr., Ralph Westfall & Stanley F. Stasch, Marketing Research, Text and Cases, 7th edition (AITBS, 1998), New Delhi.

2. Paul E.Green, Donald S. Tull, Gerald Albaum,, Research for Marketing Decisions, 5th edition, PHI, 1998, New Delhi.

3. Kothari C.R., Research Methodology, Methods & Techniques, New Delhi.

4. Aaker, David A Marketing research / David A Aaker, V Kumar and George S Day - 6th ed - New York: Wiley, 1998.

5. Malhotra, Naresh K Marketing research: an applied orientation - Englewood Cliffs: Prentice Hall

6. Panneerselvam, R. (2012). Design and Analysis of Experiments, PHI, New Delhi

7. Wayne, Winston (2014). Microsoft Excel 2013: Data Analysis and Business Modelling, Micro soft Press, Washington

8. Christian Albright and Wayne L. Winston (2011). Business Analytics: Data Analysis and Decision Making, Cengage Learning, New Delhi [5th Edition]

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.stattutorials.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:
Stages of Development of Operations Research, Applications of Operations Research, Limitations of Operations, Introduction to Linear Programming, Graphical Method, Simplex Method, Duality.

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 $(2 \times n)$ and $(m \times 2)$ 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:
1. Panneerselvam, R., OPERATIONS RESEARCH, PHI Learning Pvt. Ltd., New Delhi, 2006.
2. Hillier and Lieberman, Introduction to Operations Research, Tata McGraw Hill, New Delhi, 2009 (8th Edition).

REFERENCES:
1. Hamdy A. Taha, OPERATIONS RESEARCH – AN INTRODUCTION, Prentice

Hall of India, New Delhi, 2004.
2. Frank S. Budrick, Dennis McLeay & Richard Mojena, PRINCIPLES OF

OPERATIONS RESEARCH FOR MANAGEMETN; II Ed., Richard D. Irwin Inc., 1988.

3. Hillier and Hillier, Introduction to Management Science, McGraw Hill International, New York, 2005. (2nd Edition)

4. Wagner, Harvey M. Principles of Operations Research, Prentice Hall of India, New Delhi, 2004. (2nd Edition)

5. Kanti Swarup, et al, Operations Research, Sultan Chand and Sons, New Delhi.

MAGAZINES & OTHER REFERENCES

1. www.or.pubs.informs.org ***(Popular Operations Research Journal)***
2. www.emeraldinsight.com ***(A renowned research journal database)***
3. www.search.ebscohost.com ***(A renowned research journal database)***
4. www.springer.com ***(European Journal of Operations Research)***

WEB RESOURCES:

1. www.universalteacherpublications.com ***(a website for OR Tutorial help)***
2. http://www.mhhe.com/engcs/industrial/hillier/iortutorial/install/iordownload.html ***(text book Publisher help site for students)***
3. www.rosemaryroad.org/brady/oss_ieor.html ***(Open source softwares for Operations Research)***
4. http://ocw.mit.edu/courses/sloan-school-of-management/ ***(Open source courseware for OR, From MIT).***
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
2. Levin R., and Rubin D, Statistics for Managers, Prentice Hall of India, New Delhi, 2006 (7th Edition)

REFERENCES

1. Panneerselvam, R. (2012). Design and Analysis of Experiments, PHI, New Delhi
2. Wayne, Winston (2014). Microsoft Excel 2013: Data Analysis and Business Modelling, Micro soft Press, Washington
3. Christian Albright and Wayne L. Winston (2011). Business Analytics: Data Analysis and Decision Making, Cengage Learning, New Delhi [5th Edition]

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)***
3. www.burns-stat.com/pages/tutorials.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

Introducing to R – R Data Structures – Help functions in R – Vectors – Scalars – Declarations – recycling – Common Vector operations – Using all and any – Vectorised operations – NA and NULL values – Filtering – Vectorised if-then else – Vector Equality – Vector Element names

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
3. "Hands-On Programming with R", Garrett Grolemund

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
3. https://www.statmethods.net/r-tutorial/index.html
4. https://www.tutorialspoint.com/r/index.htm

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

Introducing to Python – Installing Python and Anaconda – Introduction to Jupyter(IPython) notebook - Environment setup – Datatypes – Variables and Types – Installing libraries – Strings – Lists – Tuples – Dictionaries – List Comprehensions – Dictionary Comprehensions – Regular Expressions

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
3. "Introduction to Machine Learning with Python: A Guide for Data Scientists", Andreas C. Muller and Sarah Guido

WEB RESOURCES:

1. https://www.learnpython.org/
2. https://www.tutorialspoint.com/python/

3. https://www.codecademy.com/learn/learn-python-3
4. https://www.kaggle.com/

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

Introduction – Interface – Tabs and Ribbons – Document Windows – Navigation Tips – Office Button and Save

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

Managing Worksheets – Introduction – Naming and Moving Worksheets – Copying Worksheets – Adding, Deleting and Hiding Worksheets – Grouping Worksheets – Moving, Copying, Deleting and Hiding Grouped Worksheets

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

Understanding Formulas – Introduction – Using Operations – Creating Formulas – AutoSum – Common Formulas – Searching for Formulas – Copying Formulas – Using Relative and Absolute References

AutoFill and Custom Lists – Introduction – AutoFill a Series – AutoFill Non-Adjacent Cells – AutoFill on Multiple Sheets – Creating Custom Lists – Series Formatting

Conditional Formatting – Introduction – Highlight Cell Rules – Top/Bottom Rules – Data Bars – Color Scales – Custom Formatting Rule

Unit-3

Tables – Introduction – Insert a Table and Style Options – Add Rows and Columns – Perform a Function in a Table – Summarise with Pivot Table - Data Tools – Introduction – Data Validation – Drop-Down Lists – Removing Duplicates – Text to Columns – Goal Seek – Scenario Manager – Referencing Formulas – Introduction – Multiple Sheet References – Consolidating Data – With or Without Links – Trace the Precedents and Dependents – Using the Watch Window

Ranges and Dates – Introduction – Cell Names – Named Ranges – Formulas with Cell Names – Date Formulas – Lookups – Introduction – VLOOKUP – VLOOKUP Exact Match – HLOOKUP – HLOOKUP Exact Match

TEXTBOOKS

1. "Excel 2016 Bible", John Walkenbach
2. "Excel 2016 Power Programming with VBA", Dick Kusleika and Michael Alexander
3. "Advanced Excel Essentials", Jordan Goldmeier

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

R Studio Professional Drivers – Professional version Installation & Advantages – Working with Multiple Versions – Debugging – Multiple User Sharing of Projects – Recent Trends in R / R Studio

Unit-3

System Programming in Python – Introduction to pygraph – Introduction to NetworkX – Introduction into Text Classification using Naïve Bayes – Introduction into using database interfaces in Python for SQL, MySQL, SQLite and MonjoDB – Introduction to Flask framework in python.

SEMESTER II

LIST OF CORE PAPERS

Title of the Paper	**Code**
FINANCIAL MANAGEMENT	MBAH020
MARKETING MANAGEMENT	MBAH021
OPERATIONS MANAGEMENT	MBAH022
HUMAN RESOURCES MANAGEMENT	MBAH023
STRATEGIC MANAGEMENT	
INTRODUCTION TO CLOUD	
R PROGRAMMING LAB – II	
PYTHON PROGRAMMING LAB – II	
BUSINESS VALUATION LAB – II	

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

Importance of Finance; Meaning of Business Finance; Meaning of Financial Management; Objectives of Financial Management; Scope of Financial management, Role of Financial Manager in the Changing Scenario; Method of Financial Management; Organisation of the Finance Function; Importance of Financial Management. Tools of Financial Management and Financial Forecasting, Financial Statement, Analysis and Interpretation; Practical Problems.

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.

UINT-IV: WORKING CAPITAL MANAGEMENT

Concept of Working Capital Management; Need for Working Capital; Types of Working Capital; Management of Working Capital, Projection of Working Capital, Conservative Asset Policy, Aggressive Asset Policy, Risk Return Trade Off, Source of Working Capital; Management of Cash, Tools of Cash Management, Cash budget, Playing on Float, Lock Box System; Management of Inventory, Tools of Inventory Management, ABC Analysis, VED Analysis, EOQ Analysis, Perpetual Inventory System, Different Stock Level and Management of Receivable and Factoring Management; Practical Problems

UNIT-V: CAPITAL BUDGETING

Concept of Capital Budgeting, Importance of Capital Budgeting,
Characteristic of Capital Budgeting Decisions; Limitations of Capital Budgeting Decisions; Capital Budgeting Process; Capital Rationing. Capital Budgeting Techniques- Accounting

Rate of Return- ARR Method of Evaluation & Its Analysis; Payback Method of Evaluation & Its Analysis; Internal Rate of Return- IRR Method of Evaluation & Its Analysis; Net Present Value- NPV Method of Evaluation & Its Analysis; Profitability Index- PI Method of Evaluation & Its Analysis, Dividend, Bonus, Right Shares, Theories of Dividend, Types of Dividend, Determination of Dividend, Inflation; Inflation Accounting; Capital Market and Money Market, Practical Problems.

TEXT BOOKS:

1. Kapil Sheeba and Kapil Kanwal Nayan, FINANCIAL MANAGEMENT, STRATEGY, IMPLEMENTATION & CONTROL, Pragati Prakashan Publishers, Meeruti.

2. Khan MN. and Jain P.K: FINANCIAL MANAGEMENT, Tata McGraw-Hill co. Ltd, New Delhi.

3. Pandey I.M.: FINANCIAL MANAGEMENT, Vikas Publishing House Pvt. Ltd, New Delhi.

4. Prasanna Chandra: FINANCIAL MANAGEMENT, The McGraw-Hill Education Ltd., New Delhi.

5. Maheshwari S.N.: FINANCIAL MANAGEMENT-PRINCIPLE AND PRACTICE, Sultan Chand & Sons Pvt. Ltd., New Delhi.

REFERENCES:

1. Abdelsamad, M.: A GUIDE TO CAPITAL EXPENDITURE ANALYSIS, New York, American Management Association, 1973

2. Beranack, W.: WORKING CAPITAL MANAGEMENT, Belmont, Wadsworth, 1968.

3. Bolten, S.E.: MANAGERIAL FINANCE, Boston, Houghton Mifflin co., 1976.

4. Heifert, E.H.: TECHNIQUES FOR FINANCIAL ANALYSIS, Homewood, Irwin, 1967.

WEB SOURCES:

l. 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:
1. Kotler and Keller: Marketing Management 15th Edition (2017) Pearson Education ISBN:9789332587403
2. Ramaswamy and Namakumari: Marketing Management: Global Perspective Indian Context 5th Edition (2013) McGraw-Hill Education India Pvt. Ltd.

Reference books:
1. Cravens, Hills and Woodruff: MARKETING MANEGEMENT
2. Pride and Ferrell: Marketing – Concepts and strategies (Indian adaptation) (Wiley-DreamTech)
3. Stanton: Fundamentals of Marketing (McGraw-Hill)
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

Systems Concept of Production, Types of Production System, Productivity, World Class Manufacturing. Process Planning & Design, Value Analysis/ Value Engineering, Make or Buy Decision. Capacity Planning, Forecasting: Demand Patterns, Measures of forecasting, Forecasting Models: Simple Moving Average Method, Weighted Moving Average, Simple(single) Exponential Smoothing, Linear Regression, Delphi Method.

UNIT-II

Facility Location: Factors influencing Plant Location, Break Even Analysis. Plant Layout & Materials Handling: Classification of Layout, Advantages and Limitations of Process Layout, Advantages and Limitations of Product Layout, Advantages and Limitations of Group Technology Layout. Layout Design Procedures: Introduction to CRAFT, ALDEP & CORELAP, Material Handling System, Unit Load Concept, Material Handling Principles, Classification of Materials Handling Equipment's.
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

Nature of Aggregate Planning Decisions, Aggregate Planning Strategies, Aggregate Planning Methods: Heuristic Method, Transportation Model for Aggregate Planning.
Material Requirement Planning: Product Structure/Bill of Materials(BOM), MRP Concept
Single Machine Scheduling: Types of Scheduling, Concept of Single Machine Scheduling, SPT Rule to Minimize Mean Flow Time, Minimizing Weighted Mean Flow Time, EDD Rule to Minimize Maximum Lateness, Flow Shop Scheduling: Introduction, Johnson's Problem, Extension of Johnson's Rule.

UNIT-IV

Work Study: Method Study – Recording Techniques, Steps in Method Study, Principles of Motion Economy, Time Study.
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

Maintenance Planning and Control: Maintenance Objectives, Types of Maintenance, Basic Reasons for Replacement (Need for Replacement), Group Replacement Vs Individual Replacement – Trade-off.

Reliability: Reliability Improvement, Reliability Calculations for systems in series and parallel, Just-in-Time Manufacturing: Introduction-Overview of JIT, Kanban Systems.

TEXT BOOK:

Panneerselvam. R, PRODUCTION AND OPERATIONS MANAGEMENT, 3rd Edition, PHI Learning, Delhi, 2013.

REFERENCES

Joseph G. Monks: OPERATIONS MANAGEMENT - THEORY AND PROBLEMS, (McGraw Hill).
Everett E. Adam & Ronald J. Ebert: PRODUCTION AND OPERATIONS MANAGEMENT, (Prentice Hall, 1994).
William J. Stevenson: PRODUCTION/OPERATIONS MANAGEMENT, Richard Irwin.
Norman Gaither: PRODUCTION AND OPERATIONS MANAGEMENT, (The Dryden Press).
Jack R. Meredith, THE MANAGEMENT OF OPERATION, (John Wiley & Sons).
S.N. Chary, PRODUCTION AND OPERATIONS MANAGEMENT, (Tata McGraw Hill).
Jay Heizer & Barry Render: OPERATIONS MANAGEMENT, Prentice Hall International, Inc. 2001, International Edition.

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:

PERSONNEL DEVELOPMENT AND RETIREMENT: Training and Development – Methods, Design & Evaluation of T & D Programmes; Career Development – Promotions and Transfers – Personnel Empowerment including Delegation – Retirement and Other Separation Processes.

UNIT-IV:

FINANCIAL COMPENSATION, PRODUCTIVITY AND MORALE: - Principal Compensation Issues & Management – Job Evaluation – Productivity, Employee Morale and Motivation; Stress Management and Quality of Work Life.

UNIT-V:

BUILDING RELATIONSHIPS AND FACILITATING LEGISLATIVE FRAMEWORK: Trade Unions – Managing Conflicts – Disciplinary Process- Collective Bargaining – Workers and Managerial Decision Making – A Discussion on Concept, Mechanics and Experience.

TEXT BOOKS:

1. Pramod Verma: PERSONNEL MANAGEMENT IN INDIAN ORGANISATIONS, Oxford & IBM Publishing Co. Ltd.

2. Venkata Ratnam C.S. & Srivastava B.K.: PERSONNEL MANAGEMENT AND HUMAN RESOURCES, Tata Mc-Graw Hill.

REFERENCES:

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

2. Monappa, Arun & Sayiadain, Mirza (1979) Personal Management, New Delhi: Tata McGraw Hill.

3. Beardwell, Ian & Holden, Len (1986) Human Resource Management: A Contemporary Prospective, New Delhi: McMillan.

4. Jeffrey Pfeffer, The Human Equation: Building Profits by Putting People First, Boston, MA: Harvard Business School Press, 1998.

5. Reichheld, Frederick F., The Loyalty Effect, Harvard Business School Press, 1996.

6. Pfeffer, Jeffrey. Competitive Advantage Through People, Harvard Business School Press, 1994.

7. Management by Consciousness in 21st Century, "Gupta G.P.", Excel Books,2009

WEB RESOURCES:

1. http://forum.hrdiscussion.com/

2. http://network.hrmtoday.com/forum

3. http://www.citeman.com/11853-evolution-of-the-concept-of-hrm/

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:
Strategic management – definition, need, dimensions – strategic planning – strategic decision making process – benefit and risks of strategic management – ethics and social responsibility.

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:
Generic competitive strategies – integration strategies – outsourcing strategies – offensive and defensive strategies – strategic alliances and collaborative partnerships – merger and acquisition – diversifications – tailoring strategies to fit specific industry and company situations.

UNIT-V:
Building resource strengths and organizational capabilities – frame work for executing strategy – strategy execution process – organizational structure – managing internal operations corporate culture of leadership – designing strategic control system, key success factors – monitoring success and evaluating deviation.

TEXT BOOKS:
1. Arthur A.Thomson, A.J. Strick land III, John E. Cambel, Crafting and Executing Strategy, Pearson Education, New Delhi.
2. Charles W.L..Hill, Gareth R.Jones. Strategic Management An integrated approach, Cengage Learning New Delhi

REFERENCES:
1. Vipin Gupta, Kamala Gollakota, R. Srinivasan, Business policy and strategic management concept and application, Oxford University Press, Chennai.
2. Sukul Lomesh, P.K.P.K. Mishra, Business policy and Strategic Management, Tata Mc Graw Hill, New Delhi.

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

Introduction to AWS Services – Introduction to AWS – Elastic Compute Cloud (EC2) Essentials – EC2 Instances – Elastic Block Store (EBS) – Elastic Load Balancer (ELB) – Auto Scaling – Simple Storage Service (S3) – Glacier Storage – Identity and Access Management (IAM) – Virtual Private Cloud (VPS) – Route 53 – Cloud Watch – Simple Notification Services (SNS) – Simple Queue Service (SQS) – Simple Email Services (SES) – Elastic Beanstalk – Relational Database Service (RDS) – Cloud Front – ElasticAche – Cloud Formation – Use Cases

Unit-III MICROSOFT AZURE

Getting Started with Microsoft Azure – Microsoft Azure Management Tools – Virtual Machines in Microsoft Azure – Web Apps and Cloud Services – Creating and Configuring Virtual Networks – Cloud Storage – Microsoft Azure Databases – Creating and Managing Azure AD

Text Books:

1. Cloud Computing: Concepts, Technology & Architecture, Erl

2. Data Science on the Google Cloud Platform: The Definitive Reference, Valliappa Lakshmanan

3. Google Cloud Platform for Developers: Build highly scalable cloud solutions with the power of Google Cloud Platform
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

Corporate restructuring – significance - forms of restructuring – joint ventures – sell off and spin off – divestitures – equity carve out – leveraged buy outs (LBO) – management buy outs –master limited partnerships – Limited Liability Partnership (LLP) in India: Nature and incorporation of LLP-De merger- strategic alliance- buyback of shares-employee stockownership plans (ESOP)

UNIT III

Merger Process: Dynamics of M&A process - identification of targets – negotiation – closing the deal. Five-stage model – Due diligence – Types - due diligence strategy and process – due diligence challenges. Process of merger integration – organizational and human aspects – managerial challenges of M & A

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:

1. Business Analysis and Valuation, Krishna G. Palepu, Paul M. Healy, Cengage Publications

REFERENCES:

1. Business Valuation: An Integrated Theory, Z. Christopher Mercer, Travis W. Harms, Wiley Publications
2. Business Valuation Management, The Institute of Cost and Works Accountants of India
3. Mergers and Acquisitions: Strategy, Valuation and Integration, Kamal Ghosh Ray, PHI Publications

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

Hypothesis Testing – I (Parametric) – Hypothesis Testing – II (Non-Parametric) – Analysis of Variance (One way ANOVA, Two way ANOVA) – Simple and Multiple Linear Regression Analysis – Logistic Regression – Time Series Analysis – Factor Analysis – Cluster Analysis - Reproducible Research using R and Rstudio (knitr, rmarkdown, bookdown, interactive document, shiny presentation, shiny web application)

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
3. "Hands-On Programming with R", Garrett Grolemund
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
3. https://www.statmethods.net/r-tutorial/index.html
4. https://www.tutorialspoint.com/r/index.htm

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

Introduction to Machine Learning & AI – ML Concepts – Learning algorithms – Supervised learning – Linear Regression – Logistic Regression – Decision Trees – Ensemble Learning – KNN – Bayesian Techniques – Support Vector Machines – Time Series Analysis – Neural Networks – Unsupervised learning – Cluster analysis

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

Basics of deep learning and neural networks – Optimizing a neural network with backward propagation – Building deep learning models with keras – Fine-tuning keras models – Introduction to TensorFlow – Convolutional Neural Networks(CNN) – Recurrent Neural Networks(RNN) – Unsupervised Learning - Autoencoders

TEXT BOOKS:

1. "Learning Python", David Ascher and Mark Lutz
2. "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", Wes McKinney
3. "Introduction to Machine Learning with Python: A Guide for Data Scientists", Andreas C. Muller and Sarah Guido
4. "Natural Language Processing with Python", Edward Loper, Ewan Klein, and Steven Bird
5. "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", Aurelien Geron
6. "Learning from Data: A Short Course", Yaser S. Abu-Mostafa, Malik Magdon-Ismail, Hsuan-Tien Lin

WEB RESOURCES:

1. https://www.learnpython.org/
2. https://www.tutorialspoint.com/python/
3. https://www.codecademy.com/learn/learn-python-3
4. https://work.caltech.edu/telecourse.html
5. https://angularfirebase.com/lessons/tensorflow-js-quick-start/
6. https://www.kaggle.com/

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

Optimisation techniques in OR – Sensitivity Analysis – NP hard problems and heuristics – Exploring various cloud platforms – Amazon EC2 – Google Cloud – Microsoft Azure - Recent trends in Big Data Analytics

SEMESTER III

LIST OF CORE PAPERS

Title of the Paper	**Code**
BUSINESS INTELLIGENCE	
MACHINE LEARNING	
DESIGN AND ANALYSIS OF ALGORITHMS	
SOFTWARE PROJECT MANAGEMENT	
DATA VISUALIZATION	
SUMMER PROJECT	

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

Business performance management (BPM) – Overview, Definition, BPM Vs BI, Strategize, Plan, Monitor, Act and Adjust of BPM, Performance management, BPM methodologies, technologies and applications, Performance dashboards and scoreboards.

UNIT IV

Data mining for business intelligence – concepts, definitions, applications, process, methods, Clustering methods, meta heuristics, Artificial neural networks for data mining, data mining software tools.

UNIT V

Text mining – concepts and definitions, Natural language processing, Applications, Process, Tools. Web mining – overview, web content mining, Web structure mining, Web usage mining. 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:

Turban, E., Sharda, R., Delen, D. and King, D., Business Intelligence- A Managerial Approach, Pearson Education, New Delhi, 2012.

REFERENCE:

Sonar, R.M., Next generation Business Intelligence – A Knowledge Based Approach, VIKAS Publications, New Delhi, 2011.

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

Introduction: Machine Learning – Types – Supervised Learning – Unsupervised Learning

Probability: Introduction – Probability theory – Discrete Distributions – Continuous Distributions – Joint Probability Distributions – Transformations of Random Variables – Monte Carlo Approximation – Information Theory

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

Gaussian Models: Introduction – Gaussian discriminant analysis – Inference in jointly Gaussian distributions – Linear Gaussian systems – Digression: The Wishart distribution – Inferring the parameters of an MVN

Bayesian Statistics: Introduction – Summarizing posterior distributions – Bayesian Model Selection – Priors – Hierarchical Bayes – Empirical Bayes – Bayesian Decision Theory

Frequentist Statistics: Introduction – Sampling distribution of an estimator – Frequent decision theory – Desirable properties of estimators – Empirical Risk Minimization – Pathologies of frequentist statistics

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

Generalized Linear Models and the Exponential Family: Introduction – The Exponential family – Generalized Liner Models (GLMs) – Probit Regression – Multi-task Learning – Generalized Linear Mixed Models – Learning to Rank

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

Mixture Models and the EM Algorithm: Latent variable models – Mixture Models – Parameter Estimation for Mixture Models – The EM Algorithm – Model Selection for Latent Variable Models – Fitting models with missing data

UNIT - III

Latent Liner Models: Factor Analysis – Principal Components Analysis (PCA) – PCA for categorical data – PCA for paired and multi-view data – Independent Component Analysis (ICA)

Sparse Linear Models: Bayesian Variable Selection – l_1 regularization basics and algorithms – Non-convex regularizers - Automatic Relevance Determination (ARD) / Sparse Bayesian Learning (SBL) – Sparse Coding

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

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

Adaptive basis function models: Introduction – Classification and Regression Trees (CART) – Generalized Additive Models – Boosting – Feedforward neural networks (multilayer perceptrons) – Ensemble Learning – Experimentation Comparison

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

Variational Inference: Introduction – The mean field method – Structured mean field – Variational Bayes – Variational Bayes EM – Variational message passing and VIBES – Local variational bounds

Monte Carlo Inference: Introduction – Sampling from Standard Distributions – Rejection Sampling – Importance Sampling – Particle Filtering – Rao-Blackwellised particle filtering (RBPF)

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

Graphical Model Structure Learning: Introduction – Structure Learning for Knowledge Discovery – Learning Tree Structures – Learning DAG Structures – Learning DAG Structures with Latent variables – Learning Causal DAGs – Learning Undirected Gaussian Graphical Models – Learning undirected discrete graphical models

Latent Variable Models for Discrete Data: Distributed state LVMs for discrete data – Latent Dirichlet Allocation (LDA) – Extensions of LDA – LVMs for graph-structured data – LVMs for relational data – Restricted Boltzmann machines (RBMs)

Deep Learning: Introduction – Deep Generative Models – Deep Neural Networks – Applications of Deep Networks

TEXTBOOKS:

1. "Pattern Recognition and Machine Learning", Christopher Bishop, Springer, 2007
2. "Machine Learning: A Probabilistic Perspective", Kevin P. Murphy, MIT Press,2012
3. "Introduction to Machine Learning", Ethem Alpaydin, MIT Press, 2014

REFERENCES:

1. "Hands-On Machine Learning with Scikit-Learn and Tensor Flow", AurElien Geron, O'Reilly
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:

1. https://www.kaggle.com/kanncaa1/machine-learning-tutorial-for-beginners
2. https://www.youtube.com/watch?v=mbyG85GZ0PI&list=PLD63A284B7615313A
3. https://www.python-course.eu/machine_learning.php
4. https://www.youtube.com/watch?v=OGxgnH8y2NM&list=PLQVvvaa0QuDfKTOs3Keq_kaG2P55YRn5v
5. https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/
6. https://www.youtube.com/playlist?list=PLZHQObOWTQDMsr9K-rj53DwVRMYO3t5Yr
7. https://www.coursera.org/courses?languages=en&query=Algorithm%20design%20and%20analysis
8. http://course.fast.ai/

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

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. Analysis Framework – Amortized analysis – Mathematical analysis for Recursive and Non-recursive algorithms – Types of Solution Procedure/Algorithm

UNIT II

Introduction – Terminologies of Graph – Network – Tree. Data Structure – Stack – Queue – Linked List – Binary Tree – Balanced Tree – Matrix Algorithms – Magic Square Problem – Tower of Hanoi – String Matching – Hashing. Network Algorithms – Dijkstra's Algorithm – Floyd's Algorithm – Minimum Spanning Tree – Maximal Flow Problem

UNIT III

Sorting Algorithms – Insertion Sort – Bubble Sort – Heap Sort – Quick Sort – Merge Sort – PARSORT – Radix Sort – Selection Sort – Topological Sort. Backtracking Algorithms – n-Queen Problem – Hamiltonian Circuit Problem – Subset Sum Problem – Graph Colouring Problem. Search Algorithms – Increment Search – Binary Search – Fibonacci Search – Brand and Bound Algorithms – Heuristics – Travelling Salesman Problem – Simple Heuristic to Minimize Total Tardiness in Single Machine Scheduling Problem – Heuristic for Total Covering Problem – Huffman Code – Transportation Problem – Heuristics for Scheduling.

UNIT IV

Dynamic Programming – Terminologies – Knapsack Problem – Shortest Path Problem – Minimizing total tardiness in a Single Machine Scheduling Problem – Reliability Problem – Travelling Salesman Problem – Chained Matrix Multiplication – Binomial Coefficients. Meta-Heuristics – Simulated Annealing Algorithm – Genetic Algorithm – Tabu Search – Ant Colony Optimization Algorithm. Cryptography – Substitution Algorithms – Transposition Methods – Public-key Cryptography. Probabilistic Algorithms – Construction of Cumulative Probability Distribution – Methods of Random Number Generation – Discrete Event Simulation

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

of Pre-emptible Dependent Jobs on Parallel Processors to Minimize Makespan. Complexity of Algorithms – Intractability of Problem – Problems with Polynomial Time Algorithms – Exponential Time Algorithms – Problems for those neither Intractability is Proved nor Polynomial Time Algorithm Exist till now. P, NP, NP-Complete, NP-Hard and NP-Easy Problems

TEXT BOOKS:

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

REFERENCES:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, ―Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2007.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, ―Data Structures and Algorithms, Pearson Education, Reprint 2006.
4. Harsh Bhasin, ―Algorithms Design and Analysis, Oxford university press, 2016.
5. S. Sridhar, ―Design and Analysis of Algorithms, Oxford university press, 2014.

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

Software project estimation – Popular decomposition techniques – problem-based, process-based and empirical estimation (COCOMO model).

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

Risk Management – Reactive and Proactive risk strategies, Risk identification, projection, mitigation and monitoring – RMMM Plan Software configuration management – process and standards

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

Management of Object-oriented software projects – process framework, metrics, estimation and scheduling approach, Computer-aided Software Engineering (CASE) – CASE tools – their building blocks and taxonomy.

TEXT BOOKS:

1. Roger Pressman, Software Engineering: A Practitioner's Approach, Tata McGraw-Hill,

2005

2. Robert T. Futrell, Donald F. Shafer, and Linda I. Safer, Quality Software Project Management, Pearson Education, 2002

REFERENCES:

1. Ian Sommerville, Software Engineering, Pearson Education, 2010
2. Bob Hughes and Mike Cotterell, Software Project Management,McGraw-Hill, 2009

WEB RESOURCES

1. http://softwareprojectmanager.org/
2. http://www.softwareprojects.org/
3. http://www.rspa.com/spi/project-mgmt.html
4. http://www.project.net/
5. http://www.wrike.com/

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

Introduction to Tableau – Installation – Tableau Interface – Data Importing (live vs extract) – Continuous and discrete data – Different kinds of plots and their usage (bar chart, line chart, scatter plot, histogram, dual axis) – Parameters – Functions and calculated field – Row and aggregate calculations – Time series analysis – Bin & group – Forecast & clusters – Joins and blends – Dashboard and interactive plots – Data interpretation – Connecting to real time database

UNIT II POWERBI

Introduction to PowerBI – Working with data – Importing from flat files, excel files, other sources – PowerPivot data types – Column operations - Table relationship – PowerPivot data analysis – PivotTable and PivotChart – Slicers – Dashboard Implementation – Dates, hierarchies, and perspectives – Data Analysis Expressions – Introduction to Power Query – Introduction to Power View – Power View visualizations – Power View filtering options – Introduction to Power Map – Preparing geospatial data – Publish from Power BI desktop – Publish Dashboard to Web

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
2. https://docs.microsoft.com/en-us/power-bi/guided-learning/
3. https://help.plot.ly/tutorials/
4. https://code.tutsplus.com/tutorials/getting-started-with-chartjs-introduction--cms-28278

SEMESTER IV

LIST OF CORE PAPERS

Title of the Paper	**Code**
BIG DATA ANALYTICS	
SAS AND HADOOP PROGRAMMING LAB	
SUMMER PROJECT	

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

Introduction to big data: Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting.

UNIT II

Mining data streams: Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams - Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications – Case Studies - Real Time Sentiment Analysis- Stock Market Predictions.

UNIT III

Hadoop: History of Hadoop- the Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features - Hadoop environment.

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

Predictive Analytics- Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.

TEXTBOOK:

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Tom White “Hadoop: The Definitive Guide” Third Edition, O’reilly Media, 2012.

3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.

REFERENCES:

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP, 2012.
2. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons, 2012.
3. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007.
4. Pete Warden, "Big Data Glossary", O'Reilly, 2011.
5. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", 2nd Edition, Elsevier, Reprinted 2008.
6. Da Ruan, Guoquing Chen, Etienne E.Kerre, Geert Wets, "Intelligent Data Mining",
1. Springer, 2007.
2. 7.Paul Zikopoulos, Dirkde Roos, Krishnan Parasuraman, Thomas Deutsch, James Giles , David Corrigan, "Harness the Power of Big Data The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
7. Arshdeep Bahga, Vijay Madisetti, "Big Data Science & Analytics: A HandsOn Approach", VPT, 2016
8. Bart Baesens "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons,2014

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

Introduction to SAS System & Architecture – Features – Variables & SAS Syntax Rules – SAS Data Sets – Data Set Options – Operators – Reading Raw Data – Infile Statement with Options – Working with External Files & Options – Multiple Observations – Input Styles – Select Statement – Leave and Continuous Statements – Creating & Redefining Variables – Where Statement – If-Then Else Statement – Goto, Stop and Error Statements – Output Statements, Put Statements – Do Loops – Modifying and Combining Data Sets – Updating Master Data Set – Display Master Commands – SAS Functions – An Introduction to Arrays and Array Processing – Overview of Methods For Combining SAS Data Sets

Proc Sort – Proc Print – Proc Means – Proc Freq – Proc Plot – Proc Chart – Proc Copy – Proc Summary – Proc Append – Proc Datasets – Proc Contents – Proc Delete – Proc Format – Proc Import – Proc Export – Intoduction to SAS/SQL – Data Types, Keywords & Operators – Functions – Predicates – Joins – Constraints – Views – Creating RTF File – Creating HTML File – Creating PDF File – Chart Procedure – Vertical, Horizontal, Pie – Group, Subgroups – Plot Procedure – Multiple Plots & Overlay – Symbol Statement – Title & Footnote Statements

Unit-2

Frequency Report – One-Wat Frequency Report – Cross Tabular Frequency Report – Summary Statistics – Creating a List Report – Define Statement – Order Usage and Group – Printing Grand Totals – Tabulate Procedure – One-Dimensional Tables – Two-Dimensional Tables – Obtaining a Total – Analysis Variables with options – Summary Statistics – Proc Univariate – Proc Corr – Proc Reg – Proc Anova

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:

1. “SAS Essentials: A Guide to Mastering SAS for Research”, Alan C. Elliott and Wayne A. Woodward
2. “Big Data Analytics with SAS”, David Pope

WEB RESOURCES:

1. https://www.sas.com/en_us/learn/academic-programs/resources/free-sas-e-learning.html
2. https://www.tutorialspoint.com/sas/

Mode of Evaluation:

Continuous Internal Assessments– based on lab exercises

ELECTIVES (STREAM – 1)

Title of the paper	Code
DECISION SUPPORT SYSTEMS	
ADVANCED EXCEL	
INTRODUCTION TO CALCULUS	
NATURAL LANGUAGE PROCESSING	
SOCIAL & WEB ANALYTICS	
HR ANALYTICS	
OPERATIONS AND SUPPLY CHAIN ANALYTICS	
MARKETING ANALYTICS – I	
RETAIL ANALYTICS – I	
BUSINESS FORECASTING AND ECONOMETRICS (USING R)	

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:

Illustrative DSS applications – Portfolio Management – Human Resource Management, Marketing Decision Support System, Small Business Application, Manufacturing DSS.

UNIT-V:

Expert Systems – fundamentals – Types of expert systems – Developing ES – Problems & Limitations of ES.

TEXT BOOK:

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

REFERENCES:

1. Ralph H. Sprange, Jr. and Eric. D.Carlson: BUILDING EFFECTIVE ESS, Prentice Hall.
2. Ralph H. Sprange, JR. & Huga, J. Watson (Eds.): DSS-PUTTING THEORY INTO PRACTICE, Prentice Hall.
3. R. Jayshankar: DECISION SUPPORT SYSTEMS, Tata McGraw Hill.
4. Janakiraman and Sarukesi, Decision Support Systems, Prentice Hall of India, New Delhi.

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

Conditional Logic – Introduction – IF Statement – Nested IF – AND – OR – NOT – IFERROR – SUMIF – AVERAGEIF – COUNTIF & COUNTIFS – SUMIF – AVERAGEIFS
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

Outline, Sort, Filter and Subtotal – Introduction – Group and Ungroup – Sort Data – Sort Multiple Levels – Filter Data – Advanced Filter – Conditional Sorting and Filtering – Sorting with Custom Lists – Subtotal

Unit-III

PivotTables – Introduction – Creating PivotTables – Choosing Fields – PivotTable Layout – Filtering PivotTables – Modifying PivotTable Data – PivotCharts
Protecting Data – Introduction – Workbook Passwords – Protecting Workbooks – Unlocking Cells
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
2. “Excel 2016 Power Programming with VBA”, Dick Kusleika and Michael Alexander

3. “Advanced Excel Essentials”, Jordan Goldmeier

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:

Introduction, Defining a Matrix, Matrix Arithmetic, Matrix-Matrix Multiplication(Dot Product), Matrix-Vector Multiplication, Matrix-Scalar Multiplication, Generalization of the Jacobian, Derivatives of vector element-wise binary operators, Derivatives involving scalar expansion, Vector sum reduction, The Chain Rules

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 $\sin^n \int x\,dx$, $\cos^n \int x\,dx$, $\sin^m \cos^n \int x\,dx$, $\tan^n \int x\,dx$ and $\cot^n \int x\,dx$. 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

N-gram Models, Maximum Likelihood Estimation, Smoothing, Backoff, Interpolation, Evaluation of LM: Perplexity & Word Error Rate, Issues with language models and solutions, Word Sense Disambiguation

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
3. "Neural Network Methods for Natural Language Processing", Yoav Goldberg and Graeme Hirst, Morgan & Claypool Publishers

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

Introduction- Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Statistical Properties of Social Networks -Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Discussion networks - Blogs and online communities - Web-based networks.

UNIT II

Modelling and Visualization- Visualizing Online Social Networks - A Taxonomy of visualizations - Graph Representation - Centrality- Clustering - Node-Edge Diagrams - visualizing Social Networks with Matrix-Based Representations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data – Random Walks and their Applications –Use of Hadoop and Map Reduce – Ontological representation of social individuals and relationships.

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

Tools for Social Network Analysis- UCINET – PAJEK – ETDRAW – StOCNET – Splus – R – NodeXL – SIENA and RSIENA – Real world Social Networks (Facebook- Twitteretc.)

TEXTBOOK:

1. Charu C. Aggarwal, “Social Network Data Analytics”, Springer; 2011.
2. Peter Mika, “Social Networks and the Semantic Web”, 1st edition, Springer, 2007.
3. BorkoFurht, “Handbook of Social Network Technologies and Applications”, 1st edition, Springer, 2010.

REFERENCES:

1. GuandongXu, Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, 1st edition, Springer, 2011.
2. Giles, Mark Smith, John Yen, “Advances in Social Network Mining and Analysis”, Springer, 2010.
3. Ajith Abraham, Aboul Ella Hassanien, VáclavSnáel, “Computational Social Network Analysis: Trends, Tools and Research Advances”, Springer, 2009.
4. Toby Segaran, “Programming Collective Intelligence”, O’Reilly, 2012.
5. Sule Gündüz-Ogüdücü, A. Şima Etaner-Uyar, “Social Networks: Analysis and Case Studies”, Springer, 2014.

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:

1. Fitz-enz, J. (2001). How to Measure Human Resource Management, McGraw-Hill; 3 edition

2. Fitz-enz, J. (2009). The ROI of Human Capital: Measuring the Economic Value of Employee Performance, AMACOM; Second Edition

3. Fitz-enz. J & John R. Mattox, II (2014), Predictive Analytics for Human Resources, John Wiley & Sons, Inc., Hoboken, New Jersey.

Reference:

1. Lawler, E. E. & Mohrman, S. A. (2003). Creating a Strategic Human Resources Organization: An Assessment of Trends and New Directions. Stanford: Stanford University Press (a).

2. Fitz-enz, J. (2010). The New HR Analytics: Predicting the Economic Value of Your Company's Human Capital Investments, AMACOM

3. Boudreau, J.W. (2010). Retooling HR: Using Proven Business Tools to Make Better Decisions about Talent, Harvard Business Press

4. Martin R. Edwards & Kirsten Edwards, (2016). Predictive HR Analytics: Mastering the HR Metric, First Edition, Kogan Page. ISBN-10: 0749473916, ISBN-13: 978-0749473914

Web source:

1. http://sloanreview.mit.edu/feature/report-analytics-the-new-path-to-value-executive- summary

2. www.ibm.com/gbs/intelligent-enterprise

3. ibm.com/gbs/business analytics

4. www.infohrm.com/ research.

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:

1. "Operations Management", Jay Heizer and Barry Render, Pearson Publications
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

2. Peter Bolstorff, Robert G. Rosenbaum, Supply Chain Excellence: A Handbook for Dramatic Improvement Using the SCOR Model, AMACOM Div American MgmtAssn, 2007
3. Robert Penn Burrows, Lora Cecere, Gregory P. Hackett, The Market-Driven Supply Chain: A Revolutionary Model for Sales and Operations Planning in the New OnDemand Economy, AMACOM Div American MgmtAssn, 201

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

Product related decision: Product Attribute Analysis [Conjoint]- Logistic Regression –Discrete Choice Analysis & Random Utility Theory

TEXT BOOKS:

1. Wayne L. Winston (2014). Marketing Analytics-Data-Driven Techniques with Microsoft® Excel, John Wiley & Sons, Inc., Indianapolis, Indiana

2. Stephen Sorger (2013), Marketing Analytics: Strategic Models and Metrics, Atlantic Publishers and Distributors.
3. Gary L. Lilien and Arvind Rangaswamy (2005), Marketing Engineering: Computer-Assisted Marketing Analysis and Planning, Pearson Education

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.stattutorials.com *(**Statistics tutorials** including worked examples using softwares like SPSS)*
2. www.analyzemath.com/statistics.html (***Statistics tutorials)***
3. www.burns-stat.com/pages/tutorials.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:

1. Wayne L. Winston (2014). Marketing Analytics-Data-Driven Techniques with Microsoft® Excel, John Wiley & Sons, Inc., Indianapolis, Indiana

2. Stephen Sorger (2013), Marketing Analytics: Strategic Models and Metrics, Atlantic Publishers and Distributors.

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

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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. http://www.dmsretail.com/
2. http://www.bizmove.com/marketing/m2c.htm
3. http://www.12manage.com
4. http://www.buzzle.com/articles/marketing-ideas-for-retail-stores.html
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

1. "Business Forecasting", Hanke/Wichern, Pearson Publications
2. "Business Forecasting: A Practical Approach", A. Reza Hoshmand
3. "Introduction to Econometrics", H Stock James and W. Watson Mark
4. "Applied Econometric Time Series", Walter Enders and Fourth

REFERENCES

1. Damodar Gujarati & Dawn Porter, Sangeetha Gunasekar, "*Basic Econometrics*", 5th Edition McGraw Hill Education (India) Private Limited.
2. Peter Kennedy, "*A Guide to Econometrics*", 6th Edition -Wiley.

ELECTIVES (STREAM – 2)

Title of the paper	Code
DEEP LEARNING	
SUPPLY CHAIN RISK ANALYTICS	
SOCIAL MEDIA MARKETING	
MARKETING ANALYTICS – II	
RETAIL ANALYTICS – II	
FINANCIAL RISK ANALYTICS	
DATA WAREHOUSE & MINING	
COMPUTER SIMULATION	
NEXT GENERATION DATABASES	
IMAGE AND VIDEO ANALYTICS	
HEALTHCARE DATA ANALYTICS	

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

Linear Algebra: Scalars, Vectors, Matrices and Tensors – Multiplying Matrices and Vectors – Identity and Inverse Matrices – Linear Dependence and Span – Norms – Special Kinds of Matrices and Vectors – Eigen decomposition – Singular Value Decomposition – The Moore-Penrose Pseudoinverse – The Trace Operator – The Determinant – Principal Components Analysis

Probability and Information Theory: Random Variables – Probability Distributions – Marginal Probability – Conditional Probability – The Chain Rule of Conditional Probabilities – Independence and Conditional Independence – Expectation, Variance and Covariance – Common Probability Distributions – Bayes Rule – Information Theory – Structured Probabilistic Models

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

UNIT II

Machine Learning Basics: Learning Algorithms – Capacity, Overfitting and Underfitting – Hyperparameters and Validation Sets – Estimators, Bias and Variance – Maximum Likelihood Estimation – Bayesian Statistics – Supervised Learning Algorithms – Unsupervised Learning Algorithms – Stochastic Gradient Descent – Building a Machine Learning Algorithm – Challenges Motivating Deep Learning

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

Regularization for Deep Learning: Parameter Norm Penalties – Norm Penalties as Constrained Optimization – Regularization and Under-Constrained Problems – Dataset Augmentation – Noise Robustness – Semi-Supervised Learning – Multi-Task Learning – Early Stopping – Parameter Tying and Parameter Sharing – Sparse Representations – Bagging and Other Ensemble Methods – Dropout – Adversarial Training – Tangent Distance, Tangent Prop, and Manifold Tangent Classifier

Optmization for Training Deep Models: Challenges in Neural Network Optimization – Basic Algorithms – Parameter Initialization Strategies – Algorithms with Adaptive Learning Rates – Approximate Second-Order Methods – Optimization Strategies and Meta-Algorithms

Convolutional Networks: The Convolution Operation – Pooling – Convolution and Pooling as an Infinitely Strong Prior – Variants of the Basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Random or Unsupervised Features – The Neuroscientific Basic for Convolutional Networks – Convolution Networks and the History of Deep Learning

UNIT III

Sequence Modelling - Recurrent and Recursive Nets: Unfolding Computational Graphs – Recurrent Neural Networks – Bidirectional RNNs – Encoder-Decoder Sequence-to-Sequence Architectures – Deep Recurrent Networks – Recursive Neural Networks – The Challenge of Long-Term Dependencies – Echo State Networks – Optimization for Long-Term Dependencies – Explicit Memory

Practical Methodology: Performance Metrics – Default Baseline Models – Selecting Hyper parameters – Debugging Strategies – Multi-Digit Number Recognition

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

Autoencoders: Undercomplete Autoencoders – Regularized Autotencoders – Representational Power, Layer Size and Depth – Stochastic Encoders and Decoders – Denoising Autoencoders – Learning Manifolds with Autoencoders – Contractive Autoencoders – Predictive Sparse Decomposition – Applications of Autoencoders

Representation Learning: Greedy Later-Wise Unsupervised Pretraining – Transfer Learning and Domain Adaptation – Semi-Supervised Disentangling of Causal Factors – Distributed Representation – Exponential Gains from Depth – Providing Clues to Discover Underlying Causes

Structured Probabilistic Models for Deep Learning: The Challenge of Unstructured Modelling – Using Graphs to Describe Model Structure – Sampling from Graphical Models – Advantages of Structured Modeling – Learning about Dependencies – Inference and Approximate Inference – The Deep Learning Approach to Structured Probabilistic Models

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

Confronting the Partition Function: The Log-Likelihood Gradient – Stochastic Maximum Likelihood and Contrastive Divergence – Pseudolikelihood – Score Matching and Ratio Matching – Denoising Score Matching – Noise-Contrastive Estimation – Estimating the Partition Function

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

Deep Generative Models: Boltzmann Machines – Restricted Boltzmann Machines – Deep Belief Networks – Deep Boltzmann Machines – Boltzmann Machines for Real-Valued Data – Convolutional Boltzmann Machines – Boltzmann Machines for Structured or Sequential Outputs – Other Boltzmann Machines – Back-Propagation through Random Operations – Directed Generative Nets – Drawing Samples from Autoencoders – Generative Stochastic Networks – Other Generation Schemes – Evaluating Generative Models

TEXTBOOK:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ”Deep Learning (Adaptive Computation and Machine Learning series”, MIT Press, 2017.
2. Josh Patterson and Adam Gibson, “Deep Learning: A Practitioner’s Approach”

REFERENCE:

1. Nikhil Buduma, Nicholas Locascio, “Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms”, O'Reilly Media, 2017.
2. Reza Zadeh and Bharath Ramsundar, “TensorFlow for Deep Learning”, O’Reilly
3. Nikhil Buduma and Nichola Locascio, “Fundamentals of Deep Learning: Designing Next-Generation Machine Learning Algorithms”, O’Reilly

WEB RESOURCES:

1. https://www.kaggle.com/kanncaa1/machine-learning-tutorial-for-beginners
2. https://www.youtube.com/watch?v=mbyG85GZ0PI&list=PLD63A284B7615313A
3. https://www.python-course.eu/machine_learning.php
4. https://www.youtube.com/watch?v=OGxgnH8y2NM&list=PLQVvvaa0QuDfKTOs3Keq_kaG2P55YRn5v
5. https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/
6. https://www.youtube.com/playlist?list=PLZHQObOWTQDMsr9K-rj53DwVRMYO3t5Yr
7. https://www.coursera.org/courses?languages=en&query=Algorithm%20design%20and%20analysis
8. http://course.fast.ai/

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

1. Basu G., Ben-Hamida M., Butner K., Cope E., Dao H., Deleris L., Dong J., Helander M., Katircioglu K., Ray B., Torpy J., "*Supply Chain Risk Management: A Delicate Balancing Act",* White Paper, IBM Global Business Services 2008.

REFERENCES

1. Kirkwood C.W., Slaven M.P., Maltz A., "*Improving Supply-Chain- Reconfiguration Decisions at IBM*". *Interfaces* 35, 460-473 2005.
2. Sashihara S., "*The Optimization Edge"* Reinventing Decision Making to Maximize All Your Company's Assets. McGraw-Hill 2011.

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:
1. Social Media Marketing: A Strategic Approach (2e). Barker, Barker, Bormann, Zahay and Roberts, 2017, Cengage Learning(https://www.cengage.com/c/socialmedia-marketing-a-strategic-approach-2e-barker#overview)
2. Social Media Marketing (3e), Tuten and Solomon, 2018, Sage (https://in.sagepub.com/en-in/sas/social-media-marketing/book257852)

REFERENCE BOOKS:

1. Social Media Marketing For Dummies (3e). Singh and Diamond, 2014, Wiley (https://www.wiley.com/enus/Social+Media+Marketing+For+Dummies%2C+3rd+Edition-p9781118985533)
2. Social Media Marketing: Next generation of business engagement, Evans and McKee, 2010, Wiley (https://www.pauladaunt.com/books/Social%20Media%20Marketing.pdf)

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:

1. Wayne L. Winston (2014). Marketing Analytics-Data-Driven Techniques with Microsoft® Excel, John Wiley & Sons, Inc., Indianapolis, Indiana

2. Stephen Sorger (2013), Marketing Analytics: Strategic Models and Metrics, Atlantic Publishers and Distributors.

3. Gary L. Lilien and Arvind Rangaswamy (2005), Marketing Engineering: Computer-Assisted Marketing Analysis and Planning, Pearson Education

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 re**source)

WEB RESOURCES:

1. www.stattutorials.com *(Statistics tutorials including worked examples using softwares like SPSS)*
2. www.analyzemath.com/statistics.html (*Statistics tutorials)*
3. www.burns-stat.com/pages/tutorials.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:

1. Wayne L. Winston (2014). Marketing Analytics-Data-Driven Techniques with Microsoft® Excel, John Wiley & Sons, Inc., Indianapolis, Indiana

2. Stephen Sorger (2013), Marketing Analytics: Strategic Models and Metrics, Atlantic Publishers and Distributors.

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

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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. http://www.dmsretail.com/
2. http://www.bizmove.com/marketing/m2c.htm
3. http://www.12manage.com
4. http://www.buzzle.com/articles/marketing-ideas-for-retail-stores.html
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:

1. Jimmy Skoglund, Weichen, Financial Risk Management, John Wiley & Sons Inc.

REFERENCES:

1. Richard Apostolik, Foundations of Financial Risk: An Overview of Financial Risk and Risk-based Financial Regulation
2. Victoria Lemieuz, Financial Analysis and Risk Management, Springer Publication
3. Bart Baesens, Daniel Roesch, Harald Scheule, Credit Risk Analytics: Measurement Techniques, Applications, and Examples in SAS, Wiley and SAS Business Series

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
2. “The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling”, Ralph Kimball and Margy Ross

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 varitae 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 balking 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

GPSS- Standard Numerical attributes (SNAs), Transaction parameters, Priority block, Select Block, Equivalence Declaration, Table Entity. ARENA Modules - Basic Process Modules, Advanced Process Module Panel, Data Modules Simulation case Studies in Manufacturing and Service organizations.

TEXT BOOKS:

1. R. PANNEERSELVAM and P. SENTHILKUMAR, SYSTEM SIMULATION, MODELLING AND LANGUAGES, PHI Learning, Delhi.
2. J. Banks, J.S. Carson B.L. Nelson, D.M. Nicol, S. Shah and P. Shahabudeen, DISCRETE EVENT SYSTEM SIMULATION, Pearson Education, 2011, New Delhi.

REFERENCES:

1. G. Gordon, System Simulation, Prentice- Hall.
2. T.H. Naylor, et.al., COMPUTER SIMULATION TECHNIQUES, John Wiley.

3. Michael Pidd, COMPUTER SIMULATION IN MANAGEMENT SCIENCE, John Wiley.
4. R.E. Shannon, SYSTEM SIMULATION: THE ART OF SCIENCE, Prentice-Hall.
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

Big Data Revolution- CAP Theorem- Birth of NoSQL- Document Database-XML Databases- JSON Document Databases- Graph Databases.

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

Data Models and Storage- SQL- NoSQL APIs- Return SQL- Advance Databases - PostgreSQL- Riak- CouchDB- NEO4J- Redis- Future Databases — Revolution Revisited - Counter revolutionaries- Oracle HQ- Other Convergent Databases- Disruptive Database Technologies.

TEXTBOOK:

1. Guy Harrison, “Next Generation Databases”, Apress, 2015.

REFERENCES:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, Sixth Edition, McGrawHill.
2. Eric Redmond, Jim R Wilson, “Seven Databases in Seven Weeks”, LLC. 2012.
3. Dan Sullivan, “NoSQL for Mere Mortals”, Addison-Wesley, 2015.
4. Adam Fowler, “NoSQL for Dummies “, John Wiley & Sons, 2015

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

Digital image representation- Visual Perception- Sampling and Quantization- Basic Relations between Pixels- Mathematical Tools Used in Digital Image Processing: Fundamental Operations –Vector and Matric Operations- Image Transforms (DFT, DCT, DWT, Hadamard).

UNIT II

Fundamentals of spatial filtering: spatial correlation and convolution-smoothing blurring-sharpening- edge detection - Basics of filtering in the frequency domain: smoothing-blurring-sharpening--Histograms and basic statistical models of image.

UNIT III

Colour models and Transformations – Image and Video segmentation-Image and video demonising- Image and Video enhancement- Image and Video compression.

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:

1. R.C. Gonzalez and R.E. Woods.” Digital Image Processing”. 3rd Edition. Addison Wesley, 2007.
2. W. Härdle, M. Müller, S. Sperlich, A. Werwatz, “Nonparametric and Semiparametric Models”, Springer, 2004.
3. Rick Szelisk, “Computer Vision: Algorithms and Applications”, Springer 2011.

REFERENCES:

1. Jean-Yves Dufour, “Intelligent Video Surveillance Systems”, Wiley, 2013.
2. Caifeng Shan, Fatih Porikli, Tao Xiang, Shaogang Gong, “Video Analytics for Business Intelligence”, Springer, 2012.
3. AsierPerallos, Unai Hernandez-Jayo, Enrique Onieva, Ignacio Julio García Zuazola, “Intelligent Transport Systems: Technologies and Applications”, Wiley, 2015.
4. Basudeb Bhatta, “Analysis of Urban Growth and Sprawl from Remote Sensing data”, Springer, 2010

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

Introduction: Introduction to Healthcare Data Analytics- Electronic Health Records– Components of EHR- Coding Systems- Benefits of EHR- Barrier to Adopting EHRChallenges- Phenotyping Algorithms.

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

Advanced Data Analytics: Advanced Data Analytics for Healthcare– Review of Clinical Prediction Models- Temporal Data Mining for Healthcare Data- Visual Analytics for Healthcare- Predictive Models for Integrating Clinical and Genomic Data- Information Retrieval for Healthcare- Privacy-Preserving Data Publishing Methods in Healthcare.

UNIT V

Applications: Applications and Practical Systems for Healthcare– Data Analytics for Pervasive Health- Fraud Detection in Healthcare- Data Analytics for Pharmaceutical Discoveries- Clinical Decision Support Systems- Computer-Assisted Medical Image Analysis Systems- Mobile Imaging and Analytics for Biomedical Data.

TEXTBOOK:

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

REFERENCES:

1. “Healthcare Analytics Made Simple”, Vikas Kumar, Packt
2. “Competing on Healthcare Analytics: The Foundational Approach to Population Health Analytics”, J. Bennett
3. “Machine Learning for Healthcare Analytics Projects”, Eduonix Learning Solutions