

SEMESTER I

DATA MODELLING

Course No. MAN801

Course Credit: 04(2-2-0)

Max. Marks: 100(30I+70E)

Course Objective

The aim of the course is to make students learn and practice about data modelling using the entity relationship and developing database designs.

Learning Outcomes

Understand the fundamentals of a database systems

1. Design and draw ER and EER diagram for the real life problem
2. Apply normalization techniques to normalize the database
3. Understand the needs of database processing and learn techniques for controlling the consequences of concurrent data access.
4. Convert conceptual model to relational model and formulate relational algebra queries

| Unit | Topics |
|--------------|---|
| I (LO 1,2) | Data Modelling – meaning and concept – Data modelling objects – data modelling development cycle – Steps to create a data model – Data modeller role – model versioning – modelling standards – Data modelling reports – data modelling relationships – types. |
| II (LO 2,3) | The Entity-Relationship Model; Data Modelling As Part of Database Design; Identifying Data Objects; Developing the Basic Schema; Refining the Entity-Relationship Diagram; Primary and Foreign Keys; Adding Attributes to the Model; Generalization Hierarchies; Adding Integrity Rules |
| III (LO 3,4) | Overview of the Relational Model: Data Structure and Terminology; Notation; Properties of Relational Tables; Relationships and Keys; Data Integrity; Relational Data Manipulation; Normalization; Advanced Normalization |
| IV (LO 2,4) | MS-Access Database- Screen Layouts; Creating Tables; Database Records; Table Relationship; Queries; Introduction to expression; Window Control and expression; Time series based functions; Forms; Reports; Importing, Exporting, and Linking |
| V (LO 4,5) | Transforming a logical data model into a physical model, including designing database-specific features and constraints. Explore the process of data modeling on modern development projects, including planning, continuous delivery, test driven development, continuous integration. |

Recommended Books

1. Michel Berry and Gordon Linoff, Mastering Data mining, John Wiley and Sons Inc 2nd Edition, 2011
2. Michel Berry and Gordon Linoff, Data mining techniques for Marketing, Sales and Customer support, John Wiley, 2011
3. G. K. Gupta, Introduction to Data mining with Case Studies, Prentice hall of India, 2011.

STATISTICAL ANALYSIS

Course No. MAN802

Course Credit: 04(3-1-0)
Max. Marks: 100(30I+70E)

Course Objective

The basic aim of this course is to impart knowledge of basic statistical tools & techniques with emphasis on their application in Business decision process and Management

Learning Outcomes

1. To classify the distribution of data spread.
2. To enhance knowledge in probability theory
3. To understand normality and its distribution concepts.
4. To stress the need for collection of data and its dispersion techniques.
5. To draw conclusions over the hypothetical situations.
6. To determine the relationship between dependent and independent variables.
7. To apply time series analysis in market prediction rates.
8. To measure the trend setting factors for projection of sales and demand curves.
9. To extract the variance among the factors of study concerned.

| Unit | Topics |
|----------------|--|
| I (LO 1,2,3) | Introduction to Statistics - Collection of Data - Measures of Central Tendency & Dispersion in Frequency Distribution; Probability Theory- Addition, Multiplication & Baye's Theorem. Test for Normality. Skewness & Kurtosis; Clean Data; z-scores, measuring performance |
| II (LO 3,4) | Distributions and confidence intervals; One sample tests and Bivariate Analysis; Visually represent descriptive statistics; Hypothesis Testing -Test for Single Mean & Two Mean- Chi-Square test, F test - ANOVA |
| III (LO 4,5,6) | Chi-square test for single sample standard deviation. Chi-square tests for independence of attributes and goodness of fit. Sign test for paired data. Rank sum test. Kolmogorov-Smirnov - test for goodness of fit, comparing two populations. Mann - Whitney U test and Kruskal Wallis test. One sample run test, rank correlation. |
| IV (LO 6,7) | Linear and Logistic Regression; Dummy Variable; Bivariate analysis; Selecting the best model and reporting results; Multivariate analysis |
| V (LO 8,9) | Time Series Analysis , Components Business Forecasting - Objectives of forecasting in business - Prediction, projection and forecasting - Characteristics of business forecasting - Steps in forecasting , Methods of Business Forecasting. |

Recommended Books

1. R.S.N. Pillai, V. Bagavathi," Statistics", S.Chand Limited, 7th Ed, 2008
2. N.D. Vohra, "Business Statistics", Tata McGraw-Hill Education, 2nd Ed,2013
3. G. V. Shenoy, Uma K. Srivastava, S. C. Sharma," Business Statistics", New Age International,2nd Ed, 2005
4. Beri," Business Statistics" TataMcGraw Hill,2nd Ed,2009
5. Keller. G," Statistics for Management", Cengage Learning, 1st Ed, 2009.
6. J. K Sharma, "Business Statistics", Pearson, 2nd Ed,2010.
7. Arora PN &others," Complete Statistical Methods", S. Chand, 3rd Ed, 2010

ACCOUNTING AND FINANCIAL MANAGEMENT

Course No. MFM805

Course Credit: 04(3-1-0)

Max. Marks: 100(30I+70E)

Course Objectives:

The basic purpose of this course is to develop a strategic and policy perspective with respect to the principles of accounting and utilization of accounting information for general purpose decision making in an organisation. The emphasis is on core ideas and techniques with reinforced understanding using practical examples.

Learning Outcomes:

1. Understanding how accounting decisions affect real company practices.
2. Understand the concepts of Depreciation, Inventory valuation and the methods employed by Indian Companies.
3. Strengthening the foundations of the analytical approach to Managerial decision-making.
4. Understanding the production problem and how managers make input purchase decisions.

| Unit | Topics |
|----------------|---|
| I (LO 1) | Accounting Theory: Concept, Importance, Scope of Accounting, Generally Accepted Principles of Accounting, Indian Accounting Standards, IFRS, Preparation of Financial Statements, Corporate Balance Sheet – Terms, Contents, Format and Analysis. |
| II (LO 2,3) | Presentation and Disclosure of Accounting Information: Presentation of Financial Position. Financial Statements of Companies, Analysis of Accounting Information: Financial Statement Analysis. Interpretation of Accounting information, |
| III (LO 1,3,4) | Cash Flow Statement, Preparing a statement of Cash Flows. Responsibility Accounting and Divisional Performance Measurement, Transfer Pricing: Definition, Objectives and Methods of Transfer Pricing, Recent developments in the field of Accounting. |
| IV (LO 3,4) | Introduction to Financial Management: Meaning & Scope. Long term sources of funds, cost of capital and its computation, leverage, EBIT & EPs Analysis; Capital Structure – Theories & Determinants. |
| V (LO 3,4) | Investment Decisions: Conventional and DLF Methods, Risk Analysis and Capital Budgeting, Introduction to Financial Analysis. Walter Model, Gordon Model, MM Approach. Factors affecting Dividend Policy, Forms of Dividend. |

Recommended Readings:

1. Anthony, R.N., Hawkins, F.D., & Merchant, K.A. (2013). Accounting: Text and Cases (13th ed.). Tata McGraw Hill.
2. Needles B.E., Powers, M., & Crosson, S.V. (2013). Principles of Financial Accounting (12th ed.). South-Western College/West.
3. Hilton, R.W., & Platt, D.E. (2017). Managerial Accounting (10th ed.). **Tata McGraw Hill.**

MANAGERIAL ECONOMICS

Course No. MAN803

Course Credit: 4 (3-1-0)
Maximum Marks: 100 (30I + 70E)

Course Objective:

The objective of this course is to familiarize the students with the concepts and techniques used in micro-economic theory and to develop managerial capabilities for effective decision-making in a variety of different business situations and market conditions. Managerial Economics provide the students with the basic tools to fundamentally deal with achieving a set of goals in a situation where resources are limited and choices must involve trade-offs, taking into account the external environment. This course provides the foundation for a variety of other courses, like finance, marketing and strategy.

Learning Outcomes:

1. Strengthening the foundations of the analytical approach to Managerial decision-making.
2. Understanding Consumer Behaviour.
3. Understanding the production problem and how managers make input purchase Decisions.
4. Understanding the various market structure and how supply is determined in each.
5. Understanding the external environment, common information problems faced/created by managers.

| Unit | Topics |
|--------------|---|
| I (LO 1, 2) | Introduction to Microeconomics. Objectives, Marginal Analysis and its uses in the Business Decision- Making. |
| II (LO 2,3) | Theories of Demand: Preference, Utility Function, Indifference Curve, Revealed Preference Approach, Income and Substitution effects, Demand functions, Demand Forecasting; Managerial Applications. |
| III (LO 3,4) | Production and Cost: The Production Function, Returns to Scale, Profit Maximization Constrained Optimization Approach to Developing Optimal Input Combination, Relationships, Input Demand Function. |
| IV (LO 4,5) | Market Structure: Profit Maximization under Different Market Structures, Perfect Competition, Monopoly, Price Discrimination, Other Pricing Strategies of Firms, Monopolistic Competition, Game Theory, |
| V (LO 4,5) | Models of oligopoly, economics of information. |

Suggested Readings:

1. Allen, W. B., Doherty N. A., Weigelt, K., & Mansfield E. (2009). *Managerial Economics: Theory, Applications and Cases* (7th ed.). W. W. Norton & Company.
2. Bernheim, B. D., Winston, M., & Sen, A. (2008). *Microeconomics*. McGraw Hill Education.
3. Geetika, Ghosh P., & Roy Chowdhury, P. (2017). *Managerial Economics* (3rd ed.). McGraw Hill Education.
4. Hirschey, M. (2009). *Managerial Economics: An Integrative Approach*. Cengage Learning.
5. Koutsoyiannis, A. (2008). *Modern Microeconomics* (2nd ed.). Palgrave, McMillan.
6. Mark, H. (2009). *Fundamentals of Managerial Economics* (9th ed.). Cengage Learning.
7. Paul, K., Philip, K. Y., Steve, E., Dickinson, C., & Banerjee S. (2017). *Managerial Economics* (7th ed.). Pearson.
8. Salvatore, D. (2016). *Managerial Economics* (8th ed.). Oxford University Press.

9. Thomas C. R., & Maurice, S.C. (2010). *Managerial Economics: Foundations of Business Analysis and Strategy* (10th ed.). McGraw Hill Education.
10. Varian, H. R. (2010). *Intermediate Microeconomics* (8th ed.). East-West Press Pvt. Ltd.

VIVA-VOCE

Course No. AEC80

Course Credit: 02(0-2-0)
Max. Marks: 100(50I+50E)

FUNDAMENTALS OF MANAGEMENT & ORGANIZATIONAL BEHAVIOUR

Course No. MGM801

Course Credit: 04(3-1-0)
Max. Marks: 100(30I+70E)

Course Objectives:

The objective of the course is to help students develop an understanding of the basic management concepts and behavioural processes in organizations which are important for them to adapt to the changing corporate environment.

Learning Outcomes:

1. Understanding the concept of organizational behavior
2. Developing an understanding of managerial functions, skills and roles
3. Strengthening the foundations of individual behavior with an understanding of human
4. personality, perception, learning and emotions
5. Understanding the basic process of interpersonal relationship
6. Understanding how managers can use the models to enhance motivational levels of
7. employees
8. Understand the concept of stress and learn to manage it
9. Understanding the behavioural approach to Managerial decision-making
10. Develop an understanding of teams and groups in organizations
11. Understanding the process of leadership
12. Understanding the various organization structures and their usefulness

| Unit | Topic |
|-----------------------|---|
| I (LO 1,2,3) | Basics of Management: Concept, nature, process and significance of management; Managerial levels, skills, functions and roles (with special reference to BFSI); Management Vs. Administration; Contingency Management theories by - F. W. Taylor, Henry Fayol and Elton Mayo. |
| II (LO 3,4,5) | Managerial Skill and Functions: Level of Management- Functions of Management; Centralization – Decentralization; Managerial Planning; Organising and Organization structures - Line & Staff – functions, Leading and Staffing; Controlling – Definition, Nature, Importance, Steps, Techniques |
| III (LO 6,7,8) | Organisation Behaviour: Definition, Scope, Importance, Concepts of Organisation Behaviour; Values, Attitude and Perception; Perceptual Process, Social perception (stereotyping and halo effect). |

| | |
|---------------------|---|
| IV (LO 9,10) | Motivation- Definition, Theories of motivation, Mc Gregor, A.H. Maslow, Herzberg; Learning- Meaning & Theories. |
| V (LO 11,12) | Leadership & Team Building –Definition, Importance, qualities of leaders, types of leaders; Success stories of today’s Global and Indian leaders ; Interpersonal and Group Dynamics; Team Building; Personality- Attributes of personality, Type, Ego state, Johari window. |

Books Recommended

Text Books

1. Management by Stomen and Jane
2. Organisational behaviour by Stephen Robbins

Reference Books

1. Principles and Practices of management by Shejwalkar
2. Essential of management by Koontz H and Weitrich
3. Principles and Practices of Management by T. N. Chabra
4. Organisational behaviour by Keith & Davis
5. Organisational behaviour by Fred and Luthans
6. Organisational behaviour by K. Ashwatthapa

Web Links

- <https://www.swayamprabha.gov.in/index.php/program/archive/16>
<https://www.swayamprabha.gov.in/index.php/program/archive/5>
<http://cec.nic.in/E-Content/Pages/default.aspx>

PROFESSIONAL COMMUNICATION

Course No. MGM804

**Course Credit: 04(3-1-0)
Max. Marks: 100(30I+70E)**

Course Objectives:

The aim of the course is to develop skills and competencies in participants to be able to communicate effectively through written, oral and social medium. This course will make students conversant with the basic forms, formats and techniques of business writing so that they would be thoroughly prepared to communicate effectively in all contexts. Sensitivity towards cross-cultural communication will be developed with familiarity with global business etiquette and protocols. The pedagogical focus of the course will be lecture cum workshop-based format with emphasis on practice and skills development.

Learning Outcomes:

1. Understanding the role of communication in the organizational and Global Context
2. Understanding the basics of effective written and verbal communication
3. Understanding the theoretical models of communication and development in communication research
4. Analyzing one’s own communication style in different contexts and mediums
5. Exposure and training of technical writing, responsibilities of a communicator, Ethical Issues and Legal Issues

| Unit | Topics |
|---------------------|--|
| I (LO 1,2) | Concepts of Communication in Business: Introduction to Business Communication, Components of Communication (7Cs), Listening Skills, Verbal and Non-Verbal Skills and Presentation Skills., Legal issues in Communication |
| II (LO 2,3) | Formal Communication: Planning and executing different types of messages, writing reports, proposals and Business plans, Improving personal writing skills |
| III (LO 3,4) | Interpersonal Communication Skills: Communicating in teams, Negotiation Skills, Communication skills during a conflict, Mentoring and Appraisals, Communication in Social Media and Digital Communication |
| IV (LO 4,5) | Cross Cultural Communication: Theoretical Framework of Cross-Cultural Communication, Communication across cultures through different mediums, Business Etiquettes across cultures |
| V (LO 4,5) | Communication for career: Resume writing and cover letters, Group Discussions and Interviews, Communication during Exit Interviews, Ethics and Communication |

Recommended Readings:

- Lehman, C. M., Dufrene D. D.,&Sinha, M. (2016). *BCOM: The South Asian Perspective on Business Communication* (2nd ed.). New Delhi: Cengage Learning.
- Murphy, H. A., Hildebrandt, H.W.,& Thomas, J.P. (1997). *Effective Business Communication* (7th Revised ed.). Boston: McGraw-Hill Companies.
- Bovee, C., & Thill, J.V., & Raina, R.L. (2016). *Business Communication Today* (11thed.). Pearson
- Mukerjee, H. S. (2012). *Business Communication* (2nded.). New-Delhi: Oxford University Press
- Post Emily. (2005). *The Etiquette Advantage in Business* (2nd ed.). New York: Collins.
- Sandra, M. O. (2004). *Handbook of Corporate Communication and Strategic Public Relations: Pure and Applied*. Routledge.

MARKETING MANAGEMENT

Course No. MMK804

Course Credit: 04(3-1-0)
Max. Marks: 100(30I+70E)

Course Objective:

To introduce the students to the concepts, strategies and contemporary issues involved in the marketing of products and services.

Course Learning Outcomes:

1. Understanding the nature and scope of marketing
2. Develop an understanding of various marketing philosophies
3. Understanding the marketing mix and marketing environment
4. Understanding segmentation, targeting and positioning
5. Understanding consumer behavior and its application in marketing
6. Develop an understanding of decisions concerning 4 P's – product, price, place and promotion
7. Understanding contemporary issues in marketing

| Unit | Topics |
|---------------------|---|
| I (LO 1,2,3) | Introduction to Marketing: Nature and Scope of Marketing, Marketing Concepts, Marketing Philosophies, Customer Value, Holistic Marketing, Marketing Environment: Environmental monitoring, Understanding the impact of Macro and Micro environment on Marketing, Global Marketing. |
| II (LO 3,4) | Identifying and Selecting Markets: Consumer Buying Behaviour, Organizational Buying Behaviour, Market Segmentation, Targeting and Positioning, Marketing Research and Market Information, Strategic Marketing Planning Process: Competitor analysis, Marketing Warfare Strategies, Marketing Planning Process |
| III (LO 4,5) | Product Mix Strategies: Product, Planning and Development, Product Life Cycle, New Product development, Brands, Packaging and Labelling, Developing Pricing Strategies: Setting Price, Factors influencing Price Determination |
| IV (LO 5,6) | Channels of Distribution: Designing Distribution Channels, Managing Conflicts and Controls in Channels, Retailing, Wholesaling and Logistics, Marketing Communication: Role of Promotion in Marketing, Integrated Marketing Communication, Determining Promotional Mix, Advertising, Sales Promotion Public Relations, Personal Selling and Sales Management. |
| V (LO 6,7) | Trends in Marketing: Service Marketing, Social Media Marketing, Green Marketing, Customer Relationship Management, Rural marketing, other emerging trends. |

Recommended Readings:

- Etzel, M. J., Bruce, J. W., Stanton, W. J., & Pandit, A. (2011). *Marketing* (14thed.). New Delhi: Tata McGraw-Hill.
- Kotler, P. & Armstrong, G. (2017). *Principles of Marketing* (17th ed.). Pearson.
- Kotler, P., Keller, K., Koshy, L., & Jha, M. (2012). *Marketing Management: A South Asian Perspective* (14thed.). New Delhi: Pearson.
- Perrault, W.D (Jr.), Cannon, J.P., & McCarthy, E.J. (2010). *Basic Marketing*. New Delhi: Tata McGraw-Hill.
- Ramaswamy, V. S. & Namakumari, S. (2010). *Marketing Management: Global perspective Indian context* (4thed). New Delhi: Macmillan.
- Saxena, R. (2009). *Marketing Management* (4th ed.). New Delhi: Tata McGraw Hill.

SEMESTER II

INTRODUCTION TO DATA SCIENCE

Course No. MAN804

Course Credit: 03(1-2-0)
Max. Marks: 100(30I+70E)

Course Objectives

- To understand the basic concepts of Data science
- Classification and clustering process
- Data Visualization Techniques

Learning Outcome

1. Ability to analyse the data and carry out supervised, un-supervised Learning processes
2. Ability implement Data Visualization Techniques
3. Ability to do regression, correlation and knowledge discovery of the data
4. Explore the fundamental concepts of data science
5. Understand data analysis techniques for applications handling large data

| Unit | Topics |
|--------------|--|
| I (LO 1,2) | Introduction and Data Pre-processing: Why Data Mining? What Is Data Mining? What Kinds of Data Can Be Mined? What Kinds of Patterns Can Be Mined? Which Technologies Are Used? Which Kinds of Applications Are Targeted?, Major Issues in Data Mining, Data Pre-processing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization |
| II (LO 2,3) | Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and Methods Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting? — Pattern Evaluation Methods, Advanced Pattern Mining: Pattern Mining: A Road Map, Pattern Mining in Multilevel, Multidimensional Space, Constraint-Based Frequent Pattern Mining, Mining High-Dimensional Data and Colossal Patterns, Mining Compressed or Approximate Patterns |
| III (LO 2,4) | Classification Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy, Support Vector Machines, Lazy Learners (or Learning from Your Neighbors) |
| IV (LO 3,4) | Cluster Analysis: Basic Concept and Methods Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering, Clustering High-Dimensional Data, Clustering Graph and Network Data |
| V (LO 4,5) | Data Mining Trends and Research Frontiers Mining Complex Data Types, Other Methodologies of Data, Mining, Data Mining Applications, Data Mining and Society, Data Mining Trends |

Recommended Books:

- Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann, 2011.
- Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Person Education, 2007.
- K.P. Soman, Shyam Diwakar and V. Ajay ", Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2016.
- Gupta, " Introduction to Data Mining with Case Studies", EasterEconomyEdition, Prentice Hall of India, 2006.
- IEEE Resources on Data Science

BUSINESS ANALYTICS

Course No. MAN805

Course Credit: 03(1-2-0)
Max. Marks: 100(30I+70E)

Course Objective

The course is to understand the management and administration, functions of management, formal and informal organization, staffing, creativity and innovation, process of communication. The objective of the course is partly to give an introduction to the software R and how to write elementary programs and partly to demonstrate how statistical models are implemented and applied.

Learning Outcomes

1. Evaluate the key concepts of business analytics
2. To integrate very large data sets to make business decisions
3. Recognise and make appropriate use of different types of data structures
4. Outline the relationship of the business analytics process within the organisation's
5. Decision-making process.
6. Examine and apply appropriate business analytic techniques and methods
7. To critically analyse the predictive analysis methods.
8. Design and write functions in R and implement simple iterative algorithms
9. Outlines the application of R in real world situations

| Unit | Topics |
|---------------|--|
| I (LO 1,2) | Definition of Business Analytics, Categories of Business Analytical methods and models, Business Analytics in practice, Big Data - Overview of using Data, Types of Data. |
| II (LO 2,3) | Over view of Description Statistics (Central Tendency, Variability), Data Visualization-Definition, Visualization Techniques – Tables, Cross Tabulations, charts, Data Dashboards using Ms-Excel or SPSS. |
| III (LO 3,4) | Predictive Analytics- Trend Lines, Regression Analysis –Linear & Multiple, Forecasting Techniques, Data Mining -Definition, Approaches in Data Mining-Data Exploration & Reduction, Classification, Association, Cause Effect Modelling. |
| IV (LO 5,6,7) | Prescriptive Analytics-Overview of Linear Optimization, Non Linear Programming Integer Optimization, Cutting Plane algorithm and other methods, Decision Analysis – Risk and uncertainty methods. |
| V (LO 8,9) | R Environment, R packages, Reading and Writing data in R, R functions, Control Statements, Frames and Subsets, Managing and Manipulating data in R. |

Recommended Books

1. Camm, Cochran, Fry, Ohlmann, Anderson, Sweeney, Williams- Essentials of Business Analytics, Cengage Learning.
2. James Evans, Business Analytics, Pearson, Second Edition, 2017.
3. Albright Winston, Business Analytics- Data Analysis-Data Analysis and Decision Making, Cengage Learning, Reprint 2016.
4. Sahil Raj, Business Analytics, Cengage Learning.

ECONOMETRICS

Course No. MAN806

Course Credit: 03(1-2-0)
Max. Marks: 100(30I+70E)

Course Objectives:

To provide the basic knowledge of econometrics. While the course is ambitious in terms of its coverage of technical topics, equal importance is attached to the development of an intuitive understanding of the material that will allow these skills to be utilised effectively and creatively, and to give participants the foundation for understanding specialized applications through self-study with confidence when needed.

Learning Outcomes

Students who successfully complete the course:

1. Should be comfortable with basic statistics and probability.
2. Able to use a statistical/econometric computer package to estimate an econometric model and be able to report the results of their work in a non-technical and literate manner.
3. Able to estimate and interpret linear regression models and be able to distinguish between economic and statistical importance.
4. Able to critique reported regression results in applied academic papers and interpret the results for someone who is not trained as an economist.

| Unit | Topics |
|------------|--|
| I (LO 1) | Introduction: Nature and scope of Econometrics. Data-Types of data |
| II (LO 2) | Statistical Inference Normal distribution; chi-sq, t- and F-distributions- Estimation of parameters-Testing of hypotheses-Defining statistical hypotheses-Distributions of test statistics-Testing hypotheses related to population parameters Type-I and Type-II errors; Power of a test Tests for comparing parameters from two samples. |
| III (LO 3) | Simple Linear Regression Model: Two Variable Case Estimation of model by method of ordinary least squares-Properties of estimators Goodness of fit-Testing of Hypotheses-Scaling and units of measurement-Confidence intervals-Gauss Markov Theorem-Forecasting |
| IV (LO 3) | Multiple Linear Regression Model Estimation of parameters-Properties of OLS estimators-Goodness of fit- R^2 and Adjusted R^2 -Partial regression coefficients-Testing Hypotheses: Individual and Joint-Functional Forms of Regression Models-Qualitative (dummy) independent variables |
| V (LO 4) | Violations of Classical Assumptions: Consequences, Detection and Remedies Multicollinearity-Heteroscedasticity-Serial Correlation-Omission of a relevant variable Inclusion of irrelevant variable-Tests of specification |

Recommended Books:

- D. N. Gujarati and D.C.Porter, Essentials of Econometrics, 4th Edition, McGraw Hill International Edition, 2010.
- Christopher Dougherty, Introduction to Econometrics, 4th edition, OUP, Indian edition, 2011.
- Jay L. Devore, Probability and Statistics for Engineers, Cengage Learning, 2010.
- John E. Freund, Mathematical Statistics, Prentice Hall, 2011.
- Irwin Miller and Marylees Miller, John E. Freund's Mathematical Statistics with Applications, 8th edition, Pearson.

INDUSTRY PROJECT

Course No. AEC

Course Credit: 07(0-7-0)
Max. Marks: 200(100I+100E)

ENTREPRENEURSHIP

Course No: OMS802

Course Credits: 02(2-0-0)
Max. Marks: 100(30I+70E)

Course Objectives: The objective of this course is to expose the learner to the fields of entrepreneurship development. Focus will be to train the students to develop new projects and encouraging them to start their own ventures.

| Units | Topics | Learning outcomes |
|--------|---|--|
| Unit-1 | Introduction to Entrepreneurship | Introduction to Entrepreneurship, , Entrepreneurial Mindset, Characteristic of an Entrepreneur, Advantages and disadvantages of Entrepreneurship |
| | Recognise Opportunity | Purpose of all businesses, Types of Entrepreneurial organizations, Types of Enterprises |
| | Creativity & Innovation | Marketing, 4Ps of Marketing, Process of Marketing, Marketing Mix, 7Ps of Marketing |
| | Conception & Ideation | Business Plan and its elements, Application of Business Plan |
| | Are you a risk taker? | Entrepreneurs, types of Entrepreneurs, Roles and Responsibilities of Entrepreneurs, Qualities of an Entrepreneur |
| | Identify Your Customer | Customer segmentation, Criteria for selling customer value proposition, Customer Lifecycle |
| Unit-2 | Self Confidence and Resilience | 4 Ps of Entrepreneurship, Qualities of successful entrepreneur, Self-confidence, Positive attitude, Overcoming the fears, Recover from Failure |
| | Success and Failure Stories of Famous Entrepreneurs – 1 | Steve Jobs Success Story, Mumbai Dabbawala delivery success Story |
| | Never Give Up | Importance of Focusing energy on Business, Importance of Business Networking and its advantages |
| | Competition Analysis | Competition Analysis, Factors affecting competition strategies, Prerequisites of successful enterprise |
| | Risks – Identification and Mitigation | Business Risk, Types of Business Risks, Risk Identification, Risk Mitigation, |
| | Getting Money for Business | Concept Of Funding, Basics terms of Accounting, Types of Funding, |
| Unit-3 | Dream and Achieve | Vision, Mission and Goals, Business Ethics, SMART goals, entrepreneurial work ethics |
| | Leadership and Team Spirit | Lead by example, Importance of Embracing diversity, Role of Emotional Intelligence to be a leader. |

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|--------|--|--|
| | Success and Failure Stories of Famous Entrepreneurs – 2 | |
| | Serving the Society | Roles of Entrepreneurs in society, Selfless Entrepreneurship, |
| | Taking Ownership | Taking complete ownership, taking control over the business |
| | Adapt to Change | Porters competition strategies, Factors affecting business, |
| | Discover Yourself | Qualities of the successful entrepreneur |
| Unit-4 | Problem Solving: Introduction to Critical Thinking | Critical Thinking, Applying critical thinking, REASON Model of Critical Thinking |
| | Problem Solving: Introduction to Creative Thinking | Creative thinking, Importance and benefits of Creative thinking, Creative thinking in problem solving |
| | Problem Solving: Introduction to Decision Making | Decision making, Effective decision making process |
| Unit-5 | 4Ps of Marketing - PDF | 4Ps- Product, Place, Price, Promotion, Apply 4Ps to marketing Strategy into action |
| | Costs in Entrepreneurship - PDF | Cost, types of Costs, Introduction to Accounting Basics, main methods of Accounting, Financial Documents, P&L statements, Working capital |
| | Applicable Sources of funding and Regulatory and Statutory rules - PDF | Regulatory and statutory rules for an Entrepreneur, Business Loans for startups and MSMEs by Indian Government |
| | Analysis of success and failure stories - PDF | Analysis of success and failure stories, Key skills involved in the successes of entrepreneurs |
| | Identification of one's entrepreneurial skills and knowledge - PDF | Identify various skills and characteristics o be an entrepreneur, Effective Ways to Build Entrepreneurial Skills, Develop or Improve your Entrepreneurial Skills , |
| | Legal Issues | Intellectual Property Rights, patents, trademarks, copyrights, trade secrets, licensing, franchising |

Books Recommended

1. NVR Naidu and T.Krishna Rao, Management and Entrepreneurship, JK Int Pub House, New Delhi
2. S Anil Kumar, Small Business and Entrepreneurship, IK Int Pub House, New Delhi
3. Balraj Singh, Entrepreneurship Development, Wisdom, New Delhi
4. Timmons and Spinelli, New Venture Creation:Entrepreneurship for 21st Century,Tata McGRaw Hill Publishing Company New Delhi
5. C.V. Bakshi, Entrepreneurship Development, Excel Publications.
6. Vasant Desai, Dynamics of Entrepreneurial Development and Management,Himalaya Publishing House, Mumbai.
7. Arora M., Natarajan K. and Gordan E., Entrepreneurship Development, 1st ed; Himalaya Publishing House Pvt Ltd, 2009.

Reference Books

1. Hisrich, Robert D., Michael Peters and Dean Shepherd, Entrepreneurship, Tata McGraw Hill, New Delhi
2. Barringer, Brace R., and R. Duane Ireland, Entrepreneurship, Pearson Prentice Hall, New Jersey (USA)
3. Lall, Madhurima, and Shikha Sahai, Entrepreneurship, Excel Books, New Delhi
4. Charantimath, Poornima, Entrepreneurship Development and Small Business Enterprises, Pearson Education, New Delhi.
5. Forbat John, "Entrepreneurship" 1st Edition, New Age International, 2008.
6. Havinal, Veerbhadrappa, "Management and Entrepreneurship", 1st Edition, New Age International Publishers, 2008.
7. John S.M., rural women Entrepreneurship, 6th ed; Discovery Publishing House, 2004. Janakiram B., Management & Entrepreneurship, Excel Books India, 2009.
8. Prahlad, CK., Fortune at the Bottom of the Pyramid: Eradicating Poverty Through Profits, 1st Edition; Dorling Kindersley Ltd, 2006.

Web Links

1. https://www.tutorialspoint.com/entrepreneurship_development/entrepreneurship_development_tutorial.pdf
2. <https://www.bing.com/videos/search?q=entrepreneurship+development+videos&qpvt=entrepreneurship+development+videos&view=detail&mid=2F136B2E6941D1F8DB4E2F136B2E6941D1F8DB4E&&FORM=VRDGAR>
3. <https://www.bing.com/videos/search?q=entrepreneurship+development+videos&qpvt=entrepreneurship+development+videos&view=detail&mid=01D578B93003F888E6DF01D578B93003F888E6DF&&FORM=VRDGAR>

OPTIMIZATION ANALYTICS

Course No. MGM905

**Course Credit: 4(2-2-0)
Max. Marks: 100(30I+70E)**

Course Objective

The objective of this course is to acquaint the learner with the applications of some important Operations Research techniques. Focus will be on understanding the use of these techniques in solving business problems.

Learning Outcomes

After successful completion of this course, students shall be able to;

1. Are exposed to the various issues related to qualitative and quantitative techniques of optimization.
2. Develop skills to formulate and apply the techniques of optimization and simulation to solve problems of business world.
3. Able to formulate decision models to solve real life problem and proficiently allocating scarce resources to optimize the objective function.
4. Are exposed to the strategies to be played to compete in competitive business world.

| Unit | Topics |
|--------------------|---|
| I (LO 1,2) | Linear programming: general structure, formulation of product mix problems. Graphical and Simplex algorithm application for optimum solutions, Duality & Sensitivity analysis. Marketing applications, financial applications, production management applications, Data Envelopment Analysis. Transportation models and optimum solution: Transshipment Problems, Assignment models: Hungarian algorithm. |
| II (LO 2,3) | Non-Linear Programming, Optimization Models: Quadratic Programming. Integer Linear Programming-problems & applications. Goal Programming, Weighted and |

| | |
|---------------------|--|
| | pre-emptive goal programming, Formulation of Goal programming problem and solutions. Queuing system and introduction to stochastic processes, Measures of performance, Arrival and Service processes, Single server and multi-server models, channels in parallel with limited applications of Simple Queuing Decision Models. |
| III (LO 3,4) | Network Models: Shortest Path Models Project Scheduling Models, Minimum Spanning Tree Model, Maximal Flow Problem. Decision Analysis: Decision-making process, types of decision making environment: under certainty, under risk, under uncertainty, criteria of decision-making under uncertainty: criteria of decision-making under risk; Decision tree; Precision Tree, Add-in Decision making under risk; Expected value, multistage decision problems. |
| IV (LO 4,5) | Game theory: two-person zero sum and constant sum games, saddle point, probability, nature as a player, two-person zero sum games: mixed or randomized strategy equilibria, domination, Graphical solution, Strategic form of prisoner's dilemma. Simulation and Optimization and applications. Simulation, Nature of simulation, simulation process, random number generation, applications of process to business related problems, decision noise and biasness. |
| V (LO 4,5) | Dynamic Programming: Production and Inventory control Problems, Shortest route problems and applications, multistage decision processes, Bellman's principle of optimality, Selective dynamic programming applications. Inventory Models: Economic order quantity and Economic production lot size. Forecasting Models: Overview of Time Series Models, Moving Averages Models, Delphi Method, Expert Judgment Method, Exponential Smoothing Models, Econometric forecasting modeling. |

Recommended Books

- Anderson, D.R. Sweeney, D.J. and Williams, T.A. An Introduction to Management Science, Thomson Publisher
- Ravindran, D. T. Phillips and James J. Solberg, Operations Research- Principles and Practice, John Wiley & Sons.
- Hamdy A. Taha, Operations Research-An Introduction, Prentice Hall,
- F.S. Hillier. G.J. Lieberman, Introduction to Operations Research- Concepts and Cases, Tata McGraw Hill.
- Vohra N.D, Quantitative Techniques in Management, Tata McGraw Hill
- Wayne Winston and Chris, Albright Practical Management Science.
- Stephen G. Powell, Kenneth R. Baker, Management Science, The Art of Modeling with Spreadsheets, John Wiley and Sons Inc.
- S. Chandra, Jayadeva, Aparna Mehra, Numerical Optimization with Application, Narosa Publishing House.

RESEARCH METHODOLOGY

Course No. MGM902

Course Credit: 04 (3-1-0)
Max. Marks: 100 (30I+70E)

Objective

To equip the students with the basic understanding of research methodology and to provide insight into the application of modern analytical tools and techniques for the purpose of management decision making.

Learning Outcome

1. Understand the various aspects of research methods.
2. Ability to collect the data from primary and secondary source.
3. Application of various tools to conduct research.
4. Ability to prepare a research report.
5. Demonstrate familiarity with major concepts, theoretical perspectives, empirical findings, and historical trends
6. Understand and apply basic research methods including research design, data analysis, and interpretation.
7. Development of testable hypotheses, differentiate research design and/or statistics, evaluate aptness of research conclusions, and generalize them appropriately.
8. Use research data to formulate or evaluate new research questions, using reason and persuasion in a logical argument.

| Unit | Topic |
|--------------|--|
| I (LO 1) | Introduction: Meaning of research; Types of research- Exploratory research, Conclusive research; The process of research; Research applications in social and business sciences; Features of a Good research study, Research Problem and Formulation of Research Hypotheses, Writing a research proposal- Contents of a research proposal and types of research proposals. |
| II (LO 2, 3) | Primary and Secondary Data: Classification of Data; Secondary Data: Uses, Advantages, Disadvantages, Types and sources; Primary Data Collection: Observation method, Focus Group Discussion, Personal Interview method. Attitude Measurement and Scaling, Criteria for Good Measurement. |
| III (LO 4,5) | Questionnaire Design and Sampling: Types of Questionnaires; Process of Questionnaire Designing; Advantages and Disadvantages of Questionnaire Method., Sampling concepts- Sample vs Census, Sampling vs Non Sampling error; Sampling Design- Probability and Non Probability Sampling design; Determination of Sample size- Sample size for estimating population mean, Determination of sample size for estimating the population proportion, Data Processing. |
| IV (LO 6,7) | Univariate and Bivariate Analysis of Data: Descriptive Analysis of Univariate data- Analysis of Nominal scale data, Analysis of Ordinal Scaled Questions, Measures of Central Tendency, Measures of Dispersion; Descriptive Analysis of Bivariate data, Correlation and Regression Analysis, Testing of Hypotheses |
| V (LO 4,8) | Chi-square Analysis & Report Writing: Chi square test for the Goodness of Fit; Chi square test for the independence of variables; Chi square test for the equality of more than two population proportions, Analysis of Variance, Research Report Writing, Ethics in Research |

Books Recommended

1. Mark Saunders, Philip Lewis, Adrian Thornbill, Research Methods for Business Students, Pearson,ND
2. Churchill, Iacobucci & Israel, Marketing Research: A South Asian Perspective, Cengage, New Delhi
3. C.R. Kothari, Research Methodology, New Age International.
4. Carver & Nash, Data Analysis with SPSS, Cengage, New Delhi
5. Alan Bryman & Emma Bell, Business Research Methods, Oxford University Press.
6. Donald R. Cooper & Pamela S. Schindler, Business Research Methods 8th Edition, Tata McGraw Hill.
7. K.V.S. Sarma, Statistics made sample, do it yourself on PC, Prentice Hall.
8. V P Michael, Research Methodology in Management, Himalaya, Mumbai

HUMAN RESOURCE MANAGEMENT

Course No. MHR803

Course Credit: 04 (2-2-0)
Max. Marks: 100 (30I+70E)

Objectives

To introduce the concepts, theoretical frameworks, issues in HRM and make participants understand the role of HRM in organizations.

Learning Outcomes

1. The students will be able to develop their interpersonal skills.
2. The students will be able to understand the effectiveness of work as managers or professionals in a team.
3. Will be able to manage their work to meet requirements.

| Unit | Topic |
|-----------------|--|
| I (LO 1) | Introduction: Understanding the nature and scope of Human resource management, Functions and objectives of HRM, Role of HR, HR department structure & HR strategy |
| II (LO 2) | HRP, Recruitment & Selection: Nature and importance of Human resource planning, Recruitment & Selection process in BPS, Meaning and importance placement and induction |
| III (LO 2) | Training, Development & Job Analysis: Training & human resource development, Performance appraisal, career development and planning, Job analysis, job description and job design, job specification, job simplification and quality of work life (QWL). |
| IV (LO 1, 2, 3) | Remunerations & Benefits: Managing basic remunerations, Basic concepts & Importance of compensation plan, fringe benefits, incentives, and social security schemes. |
| V (LO 1, 2, 3) | Job Evaluation & Ethical Issues: Significance of Job evaluation, Methods of Job evaluation, managing ethical issues in human resource management |

Books Recommended

1. Armstrong, M. & S. Taylor. (2017). Armstrong's Handbook of Human Resource Management Practice (14th ed.). London: Kogan Page.
2. Aswathappa, K. (2017) Human Resource Management: Text and Cases. (8th ed.) New Delhi: McGraw Hill.
3. Bohlander, G.W., & Snell, S.A. (2016) Principles of Human Resource Management (16th ed.). New Delhi: Cengage India.
4. Carbonara, S. (2013) Manager's Guide to Employee Engagement. New York: McGraw Hill.
5. Cascio, W. (2015). Managing Human Resources: Productivity, Quality of Work Life, Profits (10th ed.). New York: McGraw Hill.
6. DeCenzo, D.A., Robbins, S.P., & Verhulst, S.L. (2016) Human Resource Management (12th ed.). Wiley.
7. Dessler, G. & Varkkey, B. (2015). Human Resource Management (14th ed.). New Delhi: Pearson.
8. Espinoza, C. & Ukleja, M. (2016). Managing the Millennials: Discover the Core Competencies for Managing Today's Workforce (2nd Ed.). New Jersey: Wiley.
9. Gomez-Mejia, L.R., Balkin, D.B., & Cardy, R.L. (2016). Managing Human Resources (8th ed.). Essex: Pearson.
10. Ivancevich, J.M. (2017). Human Resource Management (11th ed.). New York: McGraw Hill.
11. Muller-Camen, M., Croucher, R., & Leigh, S. (2016). Human Resource Management: A Case Study Approach. CIPD. New Delhi: Viva Books.
12. Sharma, R.C. (2016). Industrial Relations and Labour Legislation. New Delhi: Prentice Hall.
13. Venkat Ratnam, C.S., & Dhal, M. (2017). Industrial Relations (2nd ed.). New Delhi: Oxford University Press.

Web Links

<https://www.swayamprabha.gov.in/index.php/program/archive/16>

<https://www.swayamprabha.gov.in/index.php/program/archive/5>

<http://cec.nic.in/E-Content/Pages/default.aspx>

<https://www.youtube.com/watch?v=f60dheI4ARg>

<https://www.youtube.com/watch?v=7wnpfZRPkNU>

SEMESTER III

BUSINESS DATA MINING

Course No. MAN902

Course Credit: 04 (2-2-0)
Max. Marks: 100 (30I+70E)

Objective

The aim of the course is to make the students proficient in the data mining knowledge and techniques and its application in the business environment. This course will equip the students with abilities to solve the business problem by uncovering the usable information from the big datasets.

Learning Outcomes

L01: Understand the fundamentals of a data-mining

L02: Practical application of “classification, clustering, association analysis & abnormality sensing”.

L03: Hands-on experience on applying data mining concepts to the real business problem

L04: Understanding Risk involved & ethical consideration related to data mining.

L05: Data Mining application in detection & prevention of the intrusion.

| Unit | Topic |
|-----------------|---|
| Unit I L01 | Data Mining: Meaning and concept; Requirement for Data Mining; Parameters & Functionalities of Data Mining; Data Mining system & its classification; advantages & disadvantages of data mining; |
| Unit II L02 | Data Mining: Statistical Perspective; Data processing and pre-processing; Data Cleaning: Missing data, Noisy Data; Process of Data Mining; Application of data mining to business; Introduction of Data Mining Tasks- Classification, Clustering, Association, Abnormality Detection |
| Unit III L03 | Data Mining Classification: Decision Tree based, Rule based, Instance-based approaches and application on predication & recommend-er system; Clustering: Partitional & Hierarchical Methods, Graph-based Methods, Density-based Methods; Validation Applications to Business. |
| Unit IV L04 | Data Mining Association: “Apriori Algorithm & Extensions-Association Pattern Evaluation- Sequential Patterns and Frequent Subgraph Mining, Parallel & distributed algorithm, understanding results, Business Applications. |
| Unit V L05 | Abnormality: Uncovering using statistical & Density based techniques; Risk involved & ethical consideration in Data Mining, privacy “what can/do firms know”? Big Data Analytics in “Mobile Environments”, “Detecting & preventing Fraud using Data Mining Techniques”. |

Tools: DB Miner /WEKA/DTREG DM Tools

Recommended Books

Text Books

1. Michel. B., Gordon L., *Mastering Datamining*, John Wiley and Sons Inc (Latest Edition)

Reference Books

1. Shmueli P. Bruce, Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner, John Wiley & Sons, (Latest Edition)
2. Miche.B, Gordon L., Data mining techniques for Marketing, Sales and Customer support, John Wiley, (Latest Edition)
3. G. K. Gupta, Introduction to Data mining with Case Studies, Prentice hall of India, (Latest Edition)
4. Pang-Ning T., Michael S., Vipin K., Introduction to Data Mining, Pearson Education India, (Latest Edition).

SIMULATION MODELING

Course No. MAN903

Course Credit: 04 (2-2-0)
Max. Marks: 100 (30I+70E)

Objective

The aim of the course is to study and develop and understand various aspects, techniques, tools for modeling and simulation models.

Learning Outcomes

- LO1. To define basic concepts in modeling and simulation
LO2. To develop various simulation models with understanding of their methodology.
LO3. To understand the methods, principle and techniques adopted to generate the random numbers and apply them to develop simulation models
LO4. To construct a model for a given set of data and analyze its output and test its validity.
LO5. To classify and verify various simulation models with practical examples.

| Unit | Topic |
|------------|--|
| I LO1 | Introduction: Introduction to simulation – Discrete and Continuous simulation – Simulation models – Types of Models– Steps in Simulation study. |
| II LO2 | Random Numbers: Properties of Random Numbers – Generation of Random number – Testing for Random numbers – Techniques for generating Random Numbers – Random Variate Generation. |
| III LO3 | Input & Output Modeling Analysis: Input modeling – Data collection – Identifying the distribution with data – Parameter estimation –Goodness of fit tests – Output analysis for a Single model. |
| IV LO4 | Verification & Validation Analysis: Model Building – Verification of Simulation Models – Validation of Simulation Models. |
| V LO5 | Languages & Applications: Simulation Languages and Simulators – Simulation of Queuing system – Simulation of Inventory system –Simulation of Manufacturing |

Books Recommended

Text Books

1. Banks, J., Carson, J. S. and Nelson, B. L., Discrete Event System Simulation, (Latest Edition), Pearson Education Asia.

Reference Books

1. Averill, M. L. and David, W. K., Simulation Modeling and Analysis, (Latest Edition), McGrawHill.
2. David W. K., Sadowski, R. P. and Sasowski, D. A., Simulation with ARENA, McGrawHill, (Latest Edition).
3. Gordon, G., Systems Simulation, Prentice Hall, (Latest Edition).

ADVANCED STATISTICAL METHODS

Course No. MAN904

Course Credit: 04 (2-2-0)
Max. Marks: 100 (30I+70E)

Objective

This course aims to develop the understand and analyzing ability among the students so that they can make use of advance statistical applications that help them to solve problems faced by managers.

Learning Outcomes

LO1: Approach a scientific problem from a statistical view point

LO2: Able to evaluate and analyze simple linear regression, multiple linear regression, and timeseries analysis.

LO3: Make use of dummy variable, mediation and moderation models

LO4: Evaluate model description, and testing of various assumptions of time series data.

LO5: Provide inferences on basis of analysis

| Unit | Topic |
|-----------------|--|
| I LO1, LO2 | Testing: Comparing 2 means (t-tests)- Comparing Several Means: ANOVA- Analysis of Covariance (ANCOVA)- Chi-square goodness of fit and tests of independence |
| II LO2, LO3 | Regression Models: Intro to Simple Linear Regression (Estimation)- Autocorrelation- Inference for Slope- Estimation/Prediction- Introduction to Multiple Regression- Test Overall Model- Hierarchical Regression Models |
| III LO2, LO3 | Testing Individual Terms- Testing Portion of Model- Dummy Variables- Quadratic Models- Transformations- Simple Mediation and Moderation Models |
| IV LO3, LO4 | Collinearity- Model Building- Smoothing Time Series- L.S. Trend Fitting- Autoregressive Models- Model Selection- Seasonal Data Forecasts |
| V LO4 | Application: Logistic Regression- Discriminant analysis- Tobit Model-Factor Analysis, Cluster Analysis, Multidimensional Scaling- Path analysis- Multivariate Analysis of Variance- Nonparametric techniques of data analysis |

Software: PHSTAT (EXCEL add on that comes with text)

Text Book

1. *Statistics for Managers (3rd /4th Ed)*, Levine, et al.

Reference Books

1. Field, A., Miles, J., & Field, Z. (Latest Edition). *Discovering Statistics Using R*. Thousand Oaks, CA: Sage.
2. *Understanding Advanced Statistical Methods (Latest Edition)*, by Peter Westfall , Kevin S. S. Henning , CRC Press
3. *Advanced Statistics in Research: Reading, Understanding, and Writing Up Data Analysis Results* by Larry Hatcher, (Latest Edition).
4. *Statistical Methods for the Social Sciences*, by Alan Agresti. (Latest Edition)
5. *Statistical Techniques in Business and Economics, (Latest Edition)* by Douglas Lind , William Marchal , Samuel Wathen (Author), Mcgraw-hill

INDUSTRY PROJECT -SUMMER INTERNSHIP

Course No.: AEC903

Course Credit: 06 (0-6-0)
Max. Marks: 200 (100I+100E)

PROJECT MANAGEMENT

Course No.:

**Course Credit: 04 (2-2-0)
Max. Marks: 100 (30I+70E)**

Course Objectives: The aim is to provide a suitable framework for looking insight into the process of preparation, appraisal, monitoring and control of a project. The course provides an understanding of the role of project management technique.

Learning Outcomes:

LO1: Strengthen the foundations of the analytical approach to Project Planning & Management.

LO2: Understand project preparation.

LO3: Understand the history, approaches, framework and processes of projects.

LO4: Understand the project appraisal techniques.

LO5: Understand the project financing and implementation.

Contents:

Unit I (LO1)

Concept of Project Preparation: Meaning and importance of Project; Types of project; Project life cycle; Project planning & implementation; Management action; Investment returns; Corporate strategy; Objectives of Project Planning, monitoring and control of investment projects. Project Preparation: Technical feasibility, estimation of costs, demand analysis and commercial viability, risk analysis, collaboration arrangements, Project management tools, process, plans and project planning tips; balanced scorecard, design project management; Project Management Templates.

Unit II (LO2)

History of project management; Project management approaches: Traditional Approach, Critical Chain Project Management, Extreme Project Management, Event Chain Methodology; Process-based management; Project development stages; Project control systems.

Unit III (LO3)

Project Management Framework; International Project Management Standards; Project Planning Strategies and Tools; Project Management Frameworks; Project Phases and Milestones; Project Goals; Project Processes.

Unit IV (LO4)

Project Appraisal: Business criterion of growth, liquidity and profitability, social cost benefit analysis in public and private sectors, investment criterion and choice of techniques: Estimation of shadow prices and social discount rate. Financial evaluation: Project rating index; Time Value of Money; Investment Criteria; Project Cash Flows; Cost of Capital; Project Risk Analysis; Project Rate of Return; Special Decisions Situations.

Unit V (LO5)

Project Financing and Implementation: Judgmental, Behavioral, Strategic and organizational Considerations; Financing of Project: Raising finance in domestic market and international market; Infrastructure financing; Tax planning while financing for projects; Implementation.

Suggested Readings:

1. Shenhar, A. J., & Dvir, D. (2007). *Reinventing Project Management: The Diamond Approach to Successful Growth and Innovation*. Harvard Business School Publishing.
2. Chandra, P. (2014). *Projects: Planning analysis, selection, financing, implementation and review* (8thed.). McGrawHill.
3. Clifford, F. G., & Larson, E. W. (2018). *Project management the managerial process*. (7thed.). McGraw-Hill.
4. Clifford, F. G., & Larson, E. W. *Project management the managerial process with MS Project* (6thed.). McGraw-Hill.
5. Mantel, S. J., Meredith, J. R., Shafer, S. M., & Sutton, M. M. (2011). *Project management* (4thed.). John Wiley & Sons.

SEMESTER-IV

INDUSTRY PROJECT

Course No.: AEC

Course Credit: 18 (0-18-0)
Max. Marks: 400 (200I+200E)

SEMINAR RESEARCH

Course No.: AEC

Course Credit: 4 (0-4-0)
Max. Marks: 200 (100I+100E)

HUMAN VALUES & PROFESSIONAL ETHICS

Course No: OAE101

Course Credit: 02 (2-0-0)
Max. Marks: 100 (30I+70E)

Objectives

It is practice to introduce this topic with western perspective. The normal practice is to define, as Human values are the virtues that guide us to take into account the human element when we interact with other human beings. Human values are, for example, respect, acceptance, consideration, appreciation, listening, openness, affection, empathy and love towards other human beings.

Learning Outcomes

LO1: Understanding of Human values for self (NiYama), and for interaction with outer world (Yama).

LO2: Ability to exhibit Professional Ethics in performing a professional task with excellence – □□□: □□□□□ □□□□□

LO3: Understanding of Professional Ethics that demands to see the unseen with emphasis on Sustainable development / eco-friendly implementation of the task.

LO4: Ability to work in team with human values and professional ethics.

| Unit | Topics |
|----------|--|
| I LO1 | Human Value-1: Morals, Values (Niyam): -Understanding values, Types of values, Role of tracking values for individual & social wellbeing. And Ethics (Yama): Integrity: - Understanding integrity and role of integrity in social harmony – Trustworthiness Work Ethics – Service-Learning – Civic Virtue – Respect for others – Living Peacefully –Caring – Sharing. Honesty: -Understanding honesty and its role in personal and social – Courage – Value Time. Cooperation: -Understanding cooperation and significance of cooperation its family, work team and social cohesiveness, wellbeing and development – Commitment. Tutorial Module: Rational Behaviour versus Ethical Behaviour: Case Studies (from Yoga-Sutra, BhagwatGeeta, Panchatantra, Autobiography of Mahatma Gandhi) or any other literatures. |

| | |
|-------------------------------|---|
| <p>II LO 1</p> | <p>Human Value-2: Empathy: Basic Concept on Empathy– Self- confidence – Spirituality- Character. Truthfulness: - Understanding truthfulness, need for truthfulness and role of truthfulness in relationship, social interaction, integrity, faiths & dependence – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties – Aspirations and Harmony (I, We & Nature) – Gender Bias – Emotional Intelligence– Emotional Competencies – Conscientiousness. Being, body, brain & mind: - Effective & efficient use of body, brain and mind is personal and social well being Value Judgments, Facts & Values, how values are justified, Aesthetics, Selection of Values, Universal Values, Human Values, Value Education Tutorial Module: Empathy and its types: Case Studies from Yoga-Sutra, BhagwatGeeta, Panchatantra, Autobiography of Mahatma Gandhi or any other literature.</p> |
| <p>III LO2 LO3</p> | <p>Professional Ethics aiming at excellence and Harmony: Value Based Life and Profession, Professional Ethics and Right Understanding, Competence in Professional Ethics, Issues in Professional Ethics – The Current scenario. Positive and constructive dynamism of power, politics and leadership. Tutorial Module: Ethical decision making: Case Studies (from Yoga-Sutra, BhagwatGeeta, Panchatantra, Autobiography of Mahatma Gandhi or any other literature)</p> |
| <p>IV LO 4</p> | <p>Professional Ethics: Global Prospective. Globalization and MNCs – Cross Culture Issues – Business Ethics – Media Ethics – Environmental Ethics – Endangering Lives – Bio Ethics – Computer Ethics – War Ethics Tutorial Module: Ethics and Social Networks: Case Studies (from Yoga- Sutra, BhagwatGeeta, Panchatantra, Autobiography of Mahatma Gandhi or any other literature)</p> |
| <p>V LO4</p> | <p>Duties and Rights in Profession Concept of Duty – Professional Duties – Collegiality – Techniques for Achieving Collegiality – Senses of Loyalty – Consensus and Controversy – Professional and Individual Rights – Confidential and Proprietary Information – Conflict of Interest-Ethical egoism – Collective Bargaining – Confidentiality – Gifts and Bribes, Plagiarism Tutorial Module: Ethics in Corporate: Case Studies (from Yoga-Sutra, BhagwatGeeta, Panchatantra, Autobiography of Mahatma Gandhi or any other literature)</p> |

References:

1. New Approaches in Ethics for the Caring Professions: Taking Account of Change for Caring Professions 2005 Edition, by Richard Hugman Publisher: Red Globe Press; 2005 edition (9 July 2018)
2. Rethinking Values and Ethics in Social Work 1st ed. 2017 Edition, Kindle Edition by Richard Hugman (Author), Jan Carter (Author) Publisher: Red Globe Press; 1st ed. 2017 edition (16 September 2017)
3. Professional Ethics and Human Values Paperback – 2015 by A. Alavudeen (Author), R. KalilRahman (Author), M. Jayakumaran (Author) Publisher: Laxmi Publications; First edition (2015)
4. A Foundation Course in Human Values and Professional Ethics Paperback – 30 Apr 2010 by R.R. Gaur (Author), R. Sangal (Author), G.P. Bagaria (Author) Publisher: Excel Books (30 April 2010)
5. Living Issues in Philosophy (9th Edition) (1995) By: Titus, Smith and Nolan Publisher: Oxford University Press, New York
6. Foundation of Ethics and Management By: B P Banerjee Publisher: Excel Books, 2005

Assessment Methodology

- Self-Assessment
- Peer Learning
- Assessment Rubrics for Behavioral Skills
- Pedagogy:
- Case study based & Group Discussion.

Recommended reading:

1. Case Study: <https://whitneyhess.com/blog/2012/08/21/on-empathy-and-apathy-two-casestudies/>Book: De Gruyter - Speaking of Emotions: Conceptualisation and Expression (edited by Angeliki Athanasiadou, Elzbieta Tabakowska)
2. Book: To Kill a Mockingbird - Lee Harper
3. Book: Take A Walk In Someone Else's Shoes by Bethany Morlan
4. A paper on 'University Students' Value Priorities and Emotional Empathy': [file:///C:/Users/Dell/Desktop/University Students Value Priorities and Emotiona.pdf](file:///C:/Users/Dell/Desktop/University%20Students%20Value%20Priorities%20and%20Emotiona.pdf)
5. Research paper on 'Empathy as Added Value in Predicting Donation Behavior': file:///C:/Users/Dell/Desktop/wp_10_692.pdf
6. Decety J and Jackson PL. 2004. The functional architecture of human empathy. Behavioral and cognitive neuroscience reviews 3(2):71-100.
7. Klimecki OM1, Leiberg S2, Ricard M2, Singer T3. Differential pattern of functional brain plasticity after compassion and empathy training. SocCogn Affect Neurosci. 2014 Jun; 9 (6): 873-9.
8. A paper on 'The Science of Empathy' - <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5513638/>
9. A paper on 'The Psychology of Emotional and Cognitive Empathy' - <https://lesley.edu/article/the-psychology-of-emotional-and-cognitive-empathy>.

Electives (Semester III)

BUSINESS INTELLIGENCE

Course Credit: 04(2-2-0)
Max. Marks: 100 (30I+70E)

Course No.

Objective

The objective of business intelligence in a business is to help executives, business managers, and other operational workers make better and more informed business decisions.

Learning Outcomes

LO1: Students will understand the major framework of Business intelligence (BI)

LO2: Students will understand the major frameworks of decision support systems (DSS)

LO3: Will understand how data and information can be used for decision making

LO4: Will understand the concepts and architectures of data warehousing.

LO5: Will understand the concept of business reporting and information visualization

| Unit | Topics |
|--------------------------------|--|
| I (L01) | Introduction of Business Intelligence: Introduction of BI, Difference between Information and Intelligence, Factors of Business Intelligence System, Real time Business Intelligence, Business Intelligence Lifecycle. |
| II (L03,L04) | Architecting the Data: Introduction, Types of Data, Difference between Data and Information, Distributed Database, Data Modeling, ER Model, Data Normalization, Data Reporting and Query Tools, Data Partitioning, Metadata |
| III (L02,L05) | Business Intelligence Applications: Roles of Business Intelligence in Modern Business, Challenges of BI, Business Intelligence Tools, DSS (Decision Support System), steps in constructing a DSS, Role in business, Group decision support system. |
| IV (L06,L07) | Introduction to Data Warehousing: Introduction of Data Warehousing, Advantages and Disadvantages of Data Warehousing, Data Mart, Aspects of Data Mart, Online Analytical Processing, OLAP, OLTP, OLAP Tools, OLAP Data Modeling, Difference between OLAP and OLTP, Multidimensional Data Model, Data Modeling using Star Schema and Snowflake Schema. |
| V (L01-7) | Case study: Analyze a BI strategy for an emergency healthcare company ; Analysis of BI implementation for a US-based machinery maintenance entity with 25K employees |

Books Recommended

1. "Successful Business Intelligence, Second Edition: Unlock The Value Of BI & Big Data" by Cindi Howson. (Latest Edition)
2. "Business Intelligence Roadmap: The Complete Project Lifecycle For Decision-Support Applications" by Larissa T. Moss & Shaku Atre. (Latest Edition)
3. "Business Intelligence Guidebook: From Data Integration To Analytics" by Rick Sherman. (Latest Edition)

FINANCIAL ANALYTICS

Course Credit: 04 (2-2-0)
Max. Marks: 100 (30I+70E)

Course No.

Objective

The objective of this course is to provide knowledge of advanced quantitative tools to analyse financial data. The course is expected to assist in the decision making process that may relate to the performance of company, industry and economy, for forecasting future financial performance and to present suitable valuations. It is expected that after this course the students should be able to build spreadsheet financial models using software packages. This will assist in solving business management problems in the area of Equity Research, Portfolio Construction, Investment Banking, Business Valuation, Project Finance, Market and Credit Risk Analysis and make sound Financial Decisions

Learning Outcomes

LO1: Understand the fundamentals of data and software to be used for analyzing the same

LO2: Develop the ability to use regression and volatility models for forecasting

LO3: Understand equity and bond valuation in context of the implication on portfolio risk and return

LO4: Understanding market risk and value at risk

LO5: Develop the ability to use selective other market risk models

| Unit | Topic |
|-------------------------------|---|
| Unit I LO1 | Introduction of Software @ Risk and EViews, Introduction to financial data Analysis Using EViews and @Risk, Simulation, Decision making, Uncertainty (<i>Faculty may consider using any other two software in addition to MS Excel which are relevant to the present syllabus</i>) Techniques of Financial Data Analysis and Forecasting, Types of Data, Cross-section Data, Panel Data, Time series analysis, Exponential Smoothing, Classical Linear Regression Model. |
| Unit II LO2 | Multiple Regression models for financial data, Multiple Regression models for financial data, Cointegration, Vector Auto regression, Vector Error Correction Model, Logit and Probit models Modelling asset return volatility, ARCH, GARCH and EGARCH models for estimating asset price volatility and volatility forecasting. (Using MS-Excel, @Risk and EViews). |
| Unit III LO3 | Equity Research and Portfolio Models, Measuring systematic and nonsystematic risk of assets using regression and Simulation, spread sheet models for the construction of a portfolio of equity, Portfolio performance, Equity and Bond Valuation. Valuation using Black-Sholes- Merton option pricing model |
| Unit IV LO4 | Financial Risk Models, Spread sheets for Measuring Market risk, Value at Risk (VaR), Calculation of Market risk using Historical and Monte Carlo simulation |
| Unit V LO5 | Stress-testing, Back-testing. Altman Z score model, calculation of the probability of default using equity prices, Discriminant Analysis |

Recommended Books

Text Books

1. Brooks Chris, (2002). Introductory Econometrics for Finance, Cambridge Brooks, C. Introductory Econometrics for Finance. Cambridge. (Latest Edition)

Reference Books

1. Albright, S.C, Zappe, C.J & Winston, W.L. Data analysis, Optimization, and Simulation modelling. South-Western: Cengage Learning. (Latest Edition)
2. Cambell, J.Y, Andrew, W. L.O & Mackinlay, A.C. (1996). The Econometrics of Financial Markets. Princeton, NJ: Princeton University Press. (Latest Edition)
3. Damodaran, A. Investment Valuation. John Wiley. (Latest Edition)

4. Dowd, K. Measuring Market Risk. John Wiley. (Latest Edition)
5. Elton, E.J, Gruber, M.J & Brown, S.J. Modern Portfolio Theory and Investment Analysis. John Wiley. (Latest Edition)
6. Enders, W. Applied Econometric Time Series. John Wiley. (Latest Edition)
7. Hull, J.C. Risk Management and Financial Institution. John Wiley. (Latest Edition)
8. Koop, G. Analysis of Financial Data. John Wiley. (Latest Edition)
9. Tsay, R.S. Analysis of Financial Time Series. (3rd ed.). New York, NY: John Wiley. (Latest Edition)

HR ANALYTICS

Course No.

Course Credit: 04 (2-2-0)
Max. Marks: 100 (30I+70E)

Course Objective

The course aims to comprehend as to how HR and business leaders can take decisions about their people based on deep analysis of facts and data.

Learning Outcomes

LO1. Develop an understanding of the role and importance of HR analytics, and the ability to track, store, retrieve, analyse and interpret HR data to support decision making.

LO2. Use applicable benchmarks/metrics to conduct research and statistical analyses related to Human Resource Management

LO3. Employ appropriate software to record, maintain, retrieve and analyse human resources information (e.g., staffing, skills, performance ratings and compensation information).

LO4. Apply quantitative and qualitative analysis to understand trends and indicators in human resource data; understand and apply various statistical analysis methods.

| Unit | Contents |
|----------------------|---|
| I (LO1) | Introduction to HR Analytics: Evolution of HR Analytics, HR information systems and data sources, Introduction to HR Analytics, People Analytics & Workforce Analytics; HR Analytics & the Organizational Structure; Types of Data; HR Analytics and Metrics, Case Discussion |
| II (LO1) | Diversity Analysis: Equality, diversity and inclusion; Workforce segmentation and search for critical job roles; Sentiment and trend analysis; Cost modelling; HR data warehousing; Decision tree; Case discussion - Heroes of the Taj |
| III (LO2) | Recruitment and Talent Acquisition, Talent Acquisition and Analytics Trend; Analytics for Efficiency; Analytics for Effectiveness; Metrics, segmentation and impact; Case Discussion; HRP & Resource Planning; Manpower Planning; Optimization of workforce; Lead Time Analysis |
| IV (LO3) | Predicting employee performance; Training requirements; evaluating training and development; Optimizing selection and promotion decisions; KPI vs metrics; Creating metrics |
| V (LO4) | Tracking impact interventions; Evaluating stress levels and value-change; Formulating evidence based practices and responsible investment; Evaluation mediation process, moderation and interaction analysis |

Reference

- Edwards Martin R, Edwards Kirsten (Latest Edition), "Predictive HR Analytics: Mastering the HR Metric", Kogan Page Publishers, ISBN-0749473924
- Fitz-enz Jac (Latest Edition), "The new HR analytics: predicting the economic value of your company's human capital investments", AMACOM, ISBN-13: 978-0-8144-1643-3

- Fitz-enz Jac, Mattox II John (Latest Edition), "Predictive Analytics for Human Resources", Wiley, ISBN- 1118940709 Session Plan (please add rows and columns as per your course)
- Predictive HR Analytics-Mastering the HR Metric, By: Martin R. Edwards & Kristen Edwards, Kogan Page, Latest Edition.
- Predictive Analytics for HR , By: Jac Fitz-Enz & John R. Mattox II, Wiley Publication, Latest Edition

BANKING ANALYTICS

Course No.

Course Credit: 04 (2-2-0)
Max. Marks: 100 (30I+70E)

Objectives

This course is designed to introduce students to decision making with insights from analytics in banking industry. Banks are the financial backbone and analytics can support to define, identify and ascertain the patterns both for structured and unstructured data.

Learning Outcomes

- LO1. Understand and Monitor data for regulatory compliance.
- LO2. Risk Management in financial sector using analytics.
- LO3. Measure profitability for customer through different products.
- LO4. Making informed decisions for good governance.
- LO5. Reporting the insights from the data

| Unit | Topic |
|--------------------|---|
| I LO1 | Regulatory compliance in banks, Statistical Methods and Techniques and importance for testing credit score, Relative Frequency, Populations, financial analysis and predictions in the banking sector |
| II LO1,2 | Statistical Processes Design for fraud design, Heuristic Models, Attributes and Responses, Experimental Approach for financial management in banks, pattern analysis on banking dataset |
| III LO2,3,4 | Hypothesis Testing, Identifying Distributions, time-series analysis and use in banking processes and systems including account management, loan approval |
| IV LO3 | Budgeting in bank and use of Predictive Analytics, Likelihood ratio tests for fraud analysis |
| V LO3,4,5 | Customer relationship management using analytics, Loyalty Management Risk Scoring, Report writing |

Recommended Books

1. Advanced Statistics in Research: Reading, Understanding, and Writing Up Data Analysis Results by Larry Hatcher. (Latest Edition)
2. Artificial Intelligence and Machine Learning Solutions for Banking Domain: Business Security Risk analytics for Banking Industry (Anugraha Sinha). (Latest Edition)
3. Business Analytics for Banking by Jovan Pehcevski. (Latest Edition)

MARKETING ANALYTICS

Course Credit: 04 (2-2-0)
Max. Marks: 100 (30I+70E)

Course No.

Objective

The aim of the course is to make the students proficient in the marketing analysis and techniques and its application in the business environment. The course explores customer data analysis techniques and their theoretical foundations to help students acquire analytic skills that can be applied to real world marketing problems.

Learning Outcomes

- L01 Overview of advances in marketing analytics.
- L02 Determine appropriate data sources and analytical tools
- L03 Use advanced data tools
- L04 Transform and translate data into insights
- L05 Apply the insights for business actions

| Unit | Topic |
|------------|--|
| I L01 | Introduction: marketing analytics, Segmentation and targeting , positioning , customer life time value |
| II L02 | Introduction to Various Tools : statistical distribution, t-test, ANOVA, and linear regression |
| III L03 | Data Analysis: Conjoint analysis, text analytics, search analytics , cluster analysis |
| IV L04 | Data Insights: Data visualization and business Insight |
| V L05 | Business Applications: Use of various insights for business decision making. Select business cases can be used for the overall discussion and formulation of business actions |

Tools: SPSS/Watson/Tableau

Recommended Books

Text Books

1. Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie or Die (2016) – ISBN 978-1119145677 – Author: Eric Siegel

Reference Books

1. Gandomi, Amir and Murtaza Haider (2015). “Beyond the hype: Big data concepts, methods, and analytics”
Allenby & Brazell, Seven Summits of Marketing Research: Decision-Based Analytics for Marketing’s Toughest Problems, 2015

SUPPLY CHAIN ANALYTICS

Course Credit: 04 (2-2-0)
Max. Marks: 100 (30I+70E)

Course No.

Objective

The aim of the course is to make the students proficient in the data mining knowledge and techniques and its application in the business environment. This course will equip the students with abilities to solve the business problem by uncovering the usable information from the big datasets.

Learning Outcomes

- L01: To provide foundational knowledge associated with the operations analysis
- L02: To describe the various tools and techniques for implementation of analytics based on the

supply chain drivers such as location, logistics and inventory

L03: Be able to use statistical techniques to incorporate historical data with other business and environmental variables to prepare dynamic forecasts.

L04: To describe the various techniques for analytics based on the Multi Attribute Decision Making (MADM) and risk

L05: To provide the applications of analytics in operations and supply chain

| Unit | Topic |
|-------------------------|--|
| I L01 | Introduction: 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 |
| II L02, L03 | Inventory Management, Inventory aggregation Models, Dynamic Lot sizing Methods, Multi Echelon Inventory models, Aggregate Inventory system and LIMIT, Transportation Network Models, Notion of Graphs, Minimal Spanning Tree |
| III L02, L03 | Use of discrete event simulation. Stochastic inventory models. Forecasting. Hierarchical Forecasting Models Top-Down, Bottom-Up, and Middle-Out Approaches to Forecasting Reliability and maintenance of the production line. Review of Multiple Regression and Stepwise Selection of Predictive Variables |
| IV L03, L04 | Risk Analysis: Analytic Hierarchy Process, Data Envelopment Analysis, Risk Analysis in Supply Chain, Measuring transit risks, supply risks, delivering risks |
| V L04, L05 | Application in SCM: Risk pooling strategies, Fuzzy Logic and Techniques-Application in SCM |

Text Books

1. “Operations Management”, Jay Heizer and Barry Render, Pearson Publications. (Latest Edition)
2. “Supply Chain Analytics with SAP NetWeaver Business Warehouse”, Amol Palekar and Shreekant Shiralkar. (Latest Edition)
3. “Analytics in Operations/Supply Chain Management”, Muthu Mathirajan and Chandra Sekharan Rajendran. (Latest Edition)

Reference Books

1. Gerad Feigin, Supply Chain planning and analytics – The right product in the right place at the right time, Business Expert Press.
2. Peter Bolstorff, Robert G. Rosenbaum, Supply Chain Excellence: A Handbook for Dramatic Improvement Using the SCOR Model, AMACOM Div American Mgmt Assn, (Latest Edition)
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 On Demand Economy, AMACOM Div American Mgmt Assn, (Latest Edition)

PERSPECTIVE ANALYTICS

Course No.

Course Credit: 04 (2-2-0)
Max. Marks: 100 (30I+70E)

Course Objective

The aim of the course is to enhance students’ ability to obtain actionable decisions in business employing mathematical modeling and simulation in Prescriptive Analytics

Learning Outcomes

L01: Understand how various models are constructed and how prescriptive models can improve business decision making

L02: Exposed to a variety of practical business cases in various fields such as operations, supply chain, marketing, human resource, and finance

L03: Analyze solutions applying mathematical modeling and simulation to look beyond simple solutions of models

L04: Identify typical and new problems in different business settings.

L05: Use state-of-the-art mathematical programming tools in conducting business analysis.

| Unit | Topic |
|------------------------------------|---|
| I L01, L02, L05 | Introduction to Perspective Analytics; Introduction to Operations Research/Management Science/Business Analytics, An Introduction to Linear Programming: Graphical method; Linear Programming (Sensitivity Analysis, Budget Allocation, Scheduling, DEA); Application of LPP models using Excel Solver. |
| II L01, L02, L05 | Nonlinear Programming (Pricing, Facility Location, Portfolio Selection); Integer Programming (Logical constraints, Project Selection, Set Covering) |
| III L01, L02, L05 | Network Models (Transportation, Logistic, Supply Chain, Bidding, Shortest Path); Decision Tree analysis; Dynamic Programming; Markov Processes |
| IV L01, L03, L05 | Multi-criteria decision making (MCDM) techniques: Goal Programming (GP) and analytic hierarchy process (AHP) and applications of GP and AHP in solving problems with multiple objectives. |
| V L03, L04, L05 | Simulation Modelling; Game theory; Machine Learning integrated with Modelling; Review of Data Partitioning, Dimension Reduction, Over Fitting, Over Sampling; Logistic Regression and Artificial Neural Networks; Classification (K-NN, DA) and Clustering (K-means) |

Software used will include Excel, SAS; Lingo, Management Scientist and IBM CPLEX.

References

1. Business Analytics: Data Analysis & Decision Making, 6E, Cengage Publication, Author(s): S. Christian Albright | Wayne L. Winston
2. H.P. Williams (2013). Model Building in Mathematical Programming, fifth edition, Wiley.
3. Bertsimas, D., & Tsitsiklis, J. N. (1997). Introduction to linear optimization. Belmont, MA: Athena Scientific.
4. Chen, D. S., Batson, R. G., & Dang, Y. (2011). Applied integer programming: modeling and solution. John Wiley & Sons.
5. S. P. Bradley, A. C. Hax, and T. L. Magnanti (1977). Applied Mathematical Programming, Addison-Wesley.
6. Ragsdale, C. T. (2015). Spreadsheet modeling & decision analysis: A practical introduction to business analytics (7th ed.). Stamford, CT: Cengage Learning. (ISBN-10: 1-285-41868-9; ISBN-13: 978-1-285-41868-1)

Other Reference

- <https://www.coursera.org/lecture/wharton-operations-analytics/optimizing-with-solver-bG1hh>
- http://www.studentsystems.is.ed.ac.uk/staff/Support/User_Guides/CCAM//Teaching_Learning

OPERATIONS ANALYTICS

Course No.

Course Credit: 04 (2-2-0)
Max. Marks: 100 (30I+70E)

Course Objective

The objective of the course is to make the students proficient in the field of operations analytics for formulating effective operations management strategies and decisions that serve the needs of the customers whilst maximizing overall profitability of an enterprise.

Learning Outcomes

After successful completion of this course, the students shall be able to

L01: Formulate, implement, and interpret practical operational analytics models in a computing environment.

L02: Describe common concepts and tools used to support operational decision-making

L03: Identify risks in operations and address the same using appropriate models

L04: Develop a multi-dimensional approach to problem solving/decision making

L05: Hone analytical skills for effective critical appraisal of operations analytics

| Unit | Topic |
|------------------------------|---|
| I L01, L02 | Fundamentals of Operations Analytics Definition of Operations Analytics, Evolution of Operations Analytics, Operations Management Strategy, Operations Management Drivers, Operations Planning. Analytics in Operations Management, importance of Operations analytics in the flows involving material, money, information and ownership, Decision Domains in supply chain analytics, Application of Descriptive Analytics, Predictive Analytics and Prescriptive Analytics in a Supply Chain: An overview |
| II L01, L03, L04, L05 | Descriptive Analytics in Operations Management Data aggregation and data mining, insights regarding the company's production, financials, operations, sales, finance, inventory and customers. Applications of Bullwhip Effect and Time Series Analysis, Transportation problems and waiting line theory based problems in Operations. |
| III L01, L03, L04, L05 | Predictive Analytics Predictive Analytics and related technologies: Introduction to machine learning and cloud-based inventory management solutions, Applications in inventory management, pricing and maintenance, Forecasting using multiple characteristics in Demand Data and Inventory Management. |
| IV L01, L03, L04, L05 | Prescriptive Analytics Prescriptive analytics and scenario planning, scenario writing, Design of Logistics Network using Heuristics/optimization, Optimal Level of Product Availability in Supply chain, Using Excel Solver for Network Optimization, Network Design in Uncertain environment and Flexibility. |
| V L01, L03, L04, L05 | Modelling and Operations Analytics Introduction to Modelling, Approaches for Optimization and Simulation, Modelling software, Basics of Modelling, Supply chain applications using R, Trends, Challenges and Future of Supply Chain |

Text Books

- Drake, M. J. *The Applied Business Analytics Casebook: Applications in Supply Chain Management, Operations Management, and Operations Research*. Pearson Education.
- Laursen, G. H., & Thorlund, J. *Business Analytics for Managers: Taking Business Intelligence Beyond Reporting*. John Wiley & Sons.

Reference Books

- Feigin, G. *Supply Chain Planning and Analytics: The Right Product in the Right Place at the Right Time*. Business Expert Press.
- Barlow, M. *Learning to Love Data Science: Explorations of Emerging Technologies and Platforms for Predictive Analytics, Machine Learning, Digital Manufacturing and Supply Chain Optimization*. O'Reilly Media, Inc.

- Plenert, G. *Supply chain optimization through segmentation and analytics*. CRC Press.

PREDICTIVE ANALYTICS

Course No.

Course Credit: 04 (2-2-0)
Max. Marks: 100 (30I+70E)

Objective

This course focuses on Predictive Analytics, which is of particular importance for business because it helps decision makers evaluate possible outcomes based on other historical data. The process of analytics involves specifying a question, problem, or decision, and finding the right answers using data. In this course, students are introduced to predictive modeling methods, approaches and tools.

Learning Outcomes

LO1: The students will be able to analyse current and historical factsto make predictions aboutfuture, or otherwise unknown, events.

LO2: To understand and exploit patterns in historical and transactional data

LO3: Compare the underlying predictive Methods techniques.

LO4: Select appropriate predictive modeling approaches to identify cases to progress with.

LO5: To understand the Model Evolution concept.

| Unit | Topic |
|--------------------------|--|
| I LO1 | Concept of Predictive Analytics: Introduction, business intelligence, predictive analytics in relation to business intelligence, Data Mining Introduction, Concepts of Data mining, Technologies Used, Data Mining Process, KDD Process Model, target variable and measures of success for predictive modelling; Methodology of predictive modelling. |
| II LO1 LO2 | Data Understanding and Preparation: Introduction, various sources of data reading, Data visualization, Distributions and summary statistics, Relationships among variables, Extent of Missing Data. Segmentation, Outlier detection, Automated Data Preparation, Combining data files, Aggregate Data, Duplicate Removal, Sampling DATA, Data Caching, Partitioning data, Missing Values. |
| III LO1 LO3 LO4 | Prediction Methods: Classification Models- Introduction , Binomial Logistic Regression, Multinomial Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Bayesian Networks, Decision Trees, Regression Trees, Growing Trees, Regression Tree Issues, Classification Trees, Pruning Trees, Bootstrap Aggregation (Bagging), Random Forest Models |
| IV LO3 | Cluster Analysis- hierarchical methods, optimization and the k-means algorithm, similarity measures, other distance measures. |
| V LO1 LO4 LO5 | Model Evaluation and Deployment Introduction, Model Validation, Rule Induction Using CHAID, Automating Models for Categorical and Continuous targets, Comparing and Combining Models, Evaluation Charts for Model Comparison, MetaLevel Modeling, Deploying Model, Assessing Model Performance, Updating a Model. |

Books Recommended

Text Books

1. Predictive & Advanced Analytics (IBM ICE Publication). (Latest Edition)

Reference Books

1. Miller Thomas W. Modelling Techniques in Predictive Analytics with Python and R, Pearson

- Education. (Latest Edition)
2. Maisel L. and Cokins G. Predictive Business Analytics: Forward Looking Capabilities to Improve Business Performance. Wiley. (Latest Edition)
 3. Marketing Data Science: Modelling Technique in Predictive Analytics with R and Python, Pearson Education. (Latest Edition)
 4. Siegel E. Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die. Wiley. (Latest Edition)

Electives (Semester IV)

MACHINE LEARNING FOR DATA SCIENCE

Course No.

Course Credit: 03 (2-1-0)
Max. Marks: 100 (30I+70E)

Objective

The objective of the course is to introduce various methods from the domains of machine learning and optimization that will be useful to make business decisions when faced with large amount of data

Learning Outcomes

- LO1. To handle both small and large amount of data using Python and R
 LO2. To perform task of classification and predictive modeling
 LO3. To understand the use of important data analysis and optimization libraries
 LO4. To construct a solutions using models for business decision making
 LO5. To classify and solve challenging problems using machines

| Unit | Topic |
|-----------------------------|--|
| I LO1 LO2 | Introduction to Python: Data structures in python; Control structures & functions- Pandas basics -Indexing and selecting data- Grouping and summarizing data frames - Reading delimited and relational databases - Reading data from websites- Getting data from API's- Numpy basics - Creating numpy arrays - Structure and content of arrays - Introducing Scientific Computing with Python SciPy- Basics of visualization- Plotting categorical and time-series data - Plotting data distributions- Hand on practice |
| II LO1 LO2 | Basics of R: Data structures and programming constructs in R- Introduction to packages in R -Data frame manipulation in R-Data cleaning in R- Fundamentals of Data Visualization with ggplot2- Hands-on practice |
| III LO3 | Introduction: Machine Learning Foundations –Overview –applications - Types of machine Learning- Descriptive statistics -Linear Models for Regression - Linear Basis Function Models - The Bias-Variance Decomposition – Bayesian Linear Regression - Bayesian Model Comparison |
| IV LO4 | Supervised and Unsupervised Learning: Discriminant Functions-Logistic Regression. Decision Trees- Neural Networks -Feed-forward Network Functions - Error Backpropagation -Clustering- K-means - Expectation Maximization - Mixtures of Gaussians -Model selection for latent variable models - high dimensional spaces - The Curse of Dimensionality – Dimensionality Reduction -Factor analysis – Independent components analysis- Bagging-Boosting |
| V LO5 | Reinforcement Learning: Naive Bayes Classifiers-Markov Models – Hidden Markov Models – Inference – Learning Generalization –Conditional random fields - Structural Support vector machines- K-Armed Bandit- Elements – Model Based Learning Value Iteration- Policy Iteration. Temporal Difference Learning-Computational Learning – Text Mining |

Books Recommended Text Books

1. Machine Learning (in Python and R) For Dummies. John Paul Mueller, Luca Massaron, Wiley. (Latest Edition)

Reference Books

1. Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas C. Mueller, Sarah Guido, O'Reilly Publishers. (Latest Edition)
2. Machine Learning using Python by U Dinesh Kumar Manaranjan Pradhan, Wiley. (Latest Edition)

Web links

1. <https://www.youtube.com/watch?v=rfscVS0vtbw>
2. <https://www.youtube.com/watch?v=WGJJlRtnfpk>
3. <https://www.youtube.com/watch?v=TGo9F0QyBuE>

ADVANCED FINANCIAL MODELING

Course No.

Course Credit: 03 (2-1-0)
Max. Marks: 100 (30I+70E)

Objectives

In the course, the participants will learn the model building skills required to build powerful models in finance. In the course we will also emphasise on the different model building skills that one should have irrespective of the final use that one is going to make of it.

Learning Outcomes

- L01. Understand the basic and advanced features of excel
 L02. Understand how to build models in excel to suit one's purpose
 L03. Building models in different areas of finance including investments, corporate finance and derivatives
 L04. Identifying and controlling the key sensitivities with advanced spreadsheet simulation
 L05. Understand how risk can be built into the model to enhance decision making process

| Unit | Topic |
|------------|---|
| I L01,2 | Introduction to Modelling: understanding Finance Functions present in Excel, Creating Dynamic Models, Forecasting Financial Statements using Excel, Analysing Financial Statements by using Spreadsheet Model. |
| II L02,3,4 | Sensitivity Analysis using Excel: Scenario Manager, Other Sensitivity Analysis Features |
| III L03 | Simulation using Excel: Different Statistical Distributions used in Simulation, Generating Random Numbers that follow a particular distribution, Building Models in Finance using Simulation |
| IV L03 | Excel in Project Appraisal: Determining Project Viability, Risk Analysis in Project Appraisal, Simulation in Project Appraisal |
| V L04,5 | Excel in Valuation: Determination of Value Drivers, DCF Valuation, Risk Analysis in Valuation, Excel in Portfolio Theory, Determining Efficient Portfolio, Creating Dynamic Portfolios, Portfolio Insurance Excel in Derivatives: Black and Scholes Model in Excel, Greeks in Excel, Real Options Valuation |

Recommended Books

1. Advanced Financial Accounting, TAN, McGraw Hill. (Latest Edition)
2. Financial Modelling, Simon Benninga. (Latest Edition)
3. Financial Analysis and Modeling using Excel and VBA, Chandan Sengupta. (Latest Edition)

DATA VISUALIZATION

Course Credit: 03 (2-1-0)
Max. Marks: 100 (30I+70E)

Course No.

Course Objective

This course aims to provide the necessary inputs required on various techniques and methodology of Data Visualizations

Learning Outcomes

LO1: Understand the process involved in data visualization

LO2: Able to make Presentation with data graphics and Tell stories with data graphics that will resonate with the audience.

LO3: Design and use various methodologies present in data visualization

LO4: Exposure to common data domains and corresponding analysis

| Unit | Contents |
|---|---|
| I Introduction to Data Visualisation (L01) | Introduction to data visualization; Methodology, Types of data visualisation; Stages and methods of data visualization, Exploratory vs. explanatory analysis; Tables, Frequency distributions, Types of charts - Bar/Pie Charts -Histogram -Box and Whisker Chart -Scatter Diagram - Introduction to ggplot |
| II Data Visualisation Tools (L02) | Telling Stories with Data; Data Visualisation Handling; Introduction to data Visualisation Tools; Google Spreadsheet, Google Fusion Tables, Excel/Tableau/R/SAPLumira/COGNOS. |
| III Visualisation Infrastructure (L03) | Visualisation Infrastructure: Animation and Interactivity; Visualising Relationship; Visualizing categories Design principles; Visualizing time Building and using metrics |
| IV Visualisation Infrastructure (L03) | Setting the Business Perspective Five Visual BI Artifacts, Scorecards: Visualizing Performance Improvement, Analytic Patterns: From Time-series to Correlations and beyond, Rules for Visual Insight Designers, Collaborative Analytics. |
| V Data Visualisation Application (L04) | Data Visualisation applications using Excel, R, Tebula |

Software

- R and RStudio (additional libraries required): <http://www.r-project.org/>, <http://www.rstudio.com/> (FREE)
- Microsoft Excel, PowerPoint (Mac users are encouraged to use KeyNote), and a basic text editor such as Notepad or TextEdit.
- Tableau Desktop. • Download the latest version of Tableau Desktop from <https://www.tableau.com/tft/activation>

References:

1. Scott Murray, "Interactive data visualization for the web", O'Reilly Media, Inc., 2013.
2. Ben Fry, "Visualizing Data", O'Reilly Media, Inc., 2007.
3. John Walkenbach, Excel 2012 Bible, Wiley
4. Microsoft Business Intelligence Tools for Excel Analysts (WILEY), by Michael Alexander, Jared Decker & Bernard Wehbe, 2016
5. Alexander, M., & Walkenbach, J. (2013). Excel dashboards and reports (Vol. 17). John Wiley & Sons.

Other Resources

- Few, S. (2012). Show me the numbers: Designing tables and graphs to enlighten. Burlingame, CA: Analytics Press.
- Few, S. (2006). Information dashboard design: The effective visual communication of data. Sebastopol: O'Reilly.
- Ware, C & Kaufman, M. (2008). Visual thinking for design. Burlington: Morgan Kaufmann Publishers.
- Wong, D. (2011). The Wall Street Journal guide to information graphics: The dos and don'ts of presenting data, facts and figures. New York: W.W. Norton & Company.
- Yau, N. (2011). Visualize This: The FlowingData Guide to Design, Visualization, and Statistics. Indianapolis: O'Reilly.
- Yau, N. (2013). Data Points: Visualization that means something. Indianapolis: O'Reilly
- Sosulski, K. (2018). The Practice of Becoming Visual. Bookdown: New York. (FREE)

MARKETING MODELS

Course No.

Course Credit: 03 (2-1-0)
Max. Marks: 100 (30I+70E)

Objective

The aim of the course is to make the students proficient in the model and tool application in the marketing environment. This course surveys quantitative marketing methodology with marketing applications. The emphasis is on the selection and use of models to support managerial decisions concerning marketing strategy.

Learning Outcomes

LO1 Understand the concepts and framework of marketing modelling

LO2 Diagnose Marketing Mix Modeling projects, initiatives, organizations, businesses and processes using accepted diagnostic standards and practices.

LO3 Integrate recent advances in Marketing Mix Modeling and process design strategies into practice according to best practice guidelines.

LO4 Develop Marketing Mix Modeling Scorecard

LO5 Analysis and outcome analysis

| Unit | Topic |
|--------------------|---|
| I LO1 | Introduction: Decoding the marketing models; Project charter; Shareholder analysis matrix; scope management plan |
| II LO2 | Market mix model: Customer mix, product mix, price mix, place mix, promotion mix modelling |
| III LO3 | Process design: Process Improvement Plan: Marketing Mix Modeling, Probability and Impact Assessment: Marketing Mix Modeling, Project Schedule: Marketing Mix Modeling |
| IV LO4 | Marketing mix balanced scorecard: Creation of balanced scorecard, dash boarding, data visualization |
| V LO5 | Analysis and Outcome: Analysis of the outcome and action planning, including the auditing and control |

Tools: As mentioned above

Recommended Books

Text Books

Marketing Mix Modeling A Complete Guide - 2019 Edition, By Gerardus Blokdyk

Reference Books

1. Marketing Models Paperback, Lilien G L , 19988, prentice hall of India

TEXT ANALYTICS

Course Credit: 03 (2-1-0)
Max. Marks: 100 (30I+70E)

Course No.

Objective

This course aims to provide students the knowledge and information related to the methods used for text analysis.

Learning Outcomes:

LO1: Understanding basic concepts Text analytics

LO2: Understand nature of text as: data source, knowledge discovery, relevancy for business needs

LO3: Hands-on exposure to the text analytical tools and techniques

LO4: Perform sentiment analysis, social network & social media analysis, text modelling & visualization.

LO5: Strengthening the foundations of the analytical approach to business intelligence & decision making.

| Unit | Topic |
|--------------------|---|
| I LO1,LO2 | Overview: Analytics vs text analytics, definition, requirement, benefits; Understanding Text, methods, process, Language analysis & its problems, Parts of speech-Noun vs. Verb, Words: senses- effect on analytics; 'Nyms': homonyms-synonyms, troponyms- meronyms-, Stopwords- dictionaries - taxonomies; Stemming; Lemmas; Dealing with contractions and other specialized forms |
| II LO2,LO3 | Textual: meaning Extraction, Understand textual complexity, Text preparation for analysis. The process of text analysis, natural language processing Data Formats, Cleaning Data Sets, Duplicate Detection, Tagging Text, Indexing and Search, Tokenization, Dictionary creation; chunking, selection & syntax Parsing, named entity recognition (NER)-Lesk Algorithm & Word Sense Disambiguation, Unstructured text representation |
| III LO2,LO3,LO4 | NLP toolkits: Overview- Vector generation for prediction- Feature generation, Text categorization - text categorization algorithms (Naive Bayes)- k Nearest Neighbor (kNN), Logistic Regression-Support Vector Machines- Decision Trees. |
| IV LO4 | Text clustering: word association mining i.e.paradigmatic relations-syntagmatic relations- Retrieval - Clustering of Documents-Measuring similarity for retrieval-Web-based document search- link analysis, Document matching- Clustering by similarity-k-means clustering-Hierarchical clustering, The EM algorithm for clustering Evaluation of clustering, N-grams: individual words vs. multi-word phrases and context, Query Expansion :synonyms-metonyms-hypernyms; Narrow vs. broad queries , Finding patterns and entities |
| V LO5 | Models for Text: Probabilistic Latent Semantic Indexing (PLSI) and Latent Dirichlet Allocation (LDA), application scenarios: classification, image annotation, collaborative filtering, hierarchical topical structure modeling. Social media and network analysis- characteristic inter-connectivity, Google's winning algorithm Page Rank- social influence analysis & social media analysis; Sentiment Analysis : polarity prediction- review mining- aspect identification, Text visualization; Applications of Text analytic in Business |

Books Recommended

1. Mining Text Data. Charu C. Aggarwal and ChengXiangZhai, Springer, (Latest Edition).
2. Speech & Language Processing. Dan Jurafsky and James H Martin, Pearson Education India, (Latest Edition).
3. Introduction to Information Retrieval. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schuetze, Cambridge University Press, (Latest Edition).
4. The NLTK book: <http://www.nltk.org/book/>
5. Srinivasa-Desikan, Bhargav, Natural Language Processing and Computational Linguistics, Pakt

(Latest Edition).

6. Munzert, S., Rubba, C., Meißner, P., and Nyhuist, D. (Latest Edition). Automated Data Collection with R: A practical guide to web scraping and text mining. John Wiley & Sons. (E- book).

CLOUD COMPUTING

Course No.

Course Credit: 03 (2-1-0)
Max. Marks: 100 (30I+70E)

Course Objective

The aim of the course is to understand the current trend and basics of cloud computing which will help students to cloud services from different providers and ways of collaborations.

Learning Outcome

LO1: Remember and technologies in cloud computing

LO2: Knowledge about the services and security of cloud computing

LO3: Design and Implementing cloud computing for the corporation.

LO4: Understand and able to collaborate the cloud services to any device.

| Unit | Topic |
|---|---|
| I Introduction L01 | Cloud Computing; Advantages of Cloud Computing ; Disadvantages of Cloud Computing; Companies in the Cloud Today; Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds |
| II Models for cloud computing L02 | Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS); Cloud Deployment Models: Public, Community, Private & Hybrid Models |
| III Cloud Computing for Business L03 | Organisational Readiness for Cloud, Components of a cloud computing architecture; Collaborating on Calendars, Schedules, Event Management, Word Processing, Storing and Sharing Files; Designing Cloud Based Business Solutions |
| IV Trends and Collaborations L04 | Emergent trends in cloud computing; Collaborating via Web-Based Communication Tools; Evaluating Web Mail Services; Web Conference Tools; Collaborating via Social Networks and Groupware; Collaborating via Blogs and Wikis |
| V Security in Cloud Computing L01, L02 | Cyber Threats in Cloud Computing, Application Security Web Application, Attack methods, Web Application Security, Application Security Layer, Security Solutions |

Suggested Readings

1. Mulholland, Andy, Pyke, Jon, and Finger, Peter; Enterprise Cloud Computing: a strategy guide for business and technology leaders; Meghan Kiffer Press
2. Linthicum, David S.; Cloud Computing and SOA Convergence in your Enterprise: A StepbyStep Guide; Addison Wesley Information Technology Series
3. Rhoton, John; Cloud Computing Explained: Implementation Handbook for Enterprises; Kindle Edition
4. Reese, George; Cloud Application Architectures: Building Applications and Infrastructure in the Cloud; O'reilly publication
5. Cloud Computing : Principles and Paradigm-RajkumarBuyya, James Broberg, AndrzejGoscinski (Wiley)
6. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.

7. Kumar Saurabh, "Cloud Computing – Insights into New Era Infrastructure", Wiley Indian Edition, 2011.
8. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

INTERNET OF THINGS

Course No.

Course Credit: 03 (2-1-0)
Max. Marks: 100 (30I+70E)

Objective

The objective of Internet of Things (IOT) is to understand about the new paradigm of objects interacting with people, with information systems, and with other objects. It will focus on creative thinking and on hands-on project development.

Learning Outcomes

LO1: Students will learn IOT concepts and standards

LO2: Students will learn about the components of IOT System. LO3: Will understand Scope of IOT in future.

LO4: Will learn IOT Applications.

LO5: Will understand the challenges in IOT implementation.

| Unit | Topic |
|-----------------|--|
| I LO1 | IOT concepts: Technologies that led to evolution of IOT, IOT and SCADA, IOT and M2M, IOT and Big Data |
| II LO2 | IOT Standards and Components: Standards in practice, Operating platforms /systems, Components of IOT System, Design of IOT systems, Development of prototypes |
| III LO3, LO4 | IOT Applications: IOT in everyday life, Internet of Everything, IOT and Individual Privacy, IOT for health services, IOT for rural empowerment, IOT for smart cities. |
| IV LO5 | Challenges in IOT implementation: Big Data Management challenge, Connectivity challenges, Mission critical applications. |
| V LO1-5 | Case study: Intelligent Traffic systems; Smart water management; Smart Parking |

Books Recommended Reference Books

1. "Getting started with Internet of Things" by Cuno Pfister. (Latest Edition)
2. "Precision: Principles, Practices and Solutions for the Internet of Things" by Timothy Chou. (Latest Edition)
3. "The Internet of Things" by Samuel Greengard. (Latest Edition)

BIG DATA ANALYTICS

Course No.

Course Credit: 03 (2-1-0)
Max. Marks: 100 (30I+70E)

Objective

The main aim of large data analysis is to help students to understand how to help companies make better business decisions by allowing scientists and other data users to analyze large volumes of transactional data.

Learning Outcomes

LO1: To describe big data and use cases from selected business domains
LO2: To explain NoSQL big data management

LO3: To install, configure, and run Hadoop and HDFS
LO4: To understand eco-system of Hadoop

LO5: To perform map-reduce analytics using Hadoop

| Unit | Topic |
|---------|--|
| I LO1 | Big Data Overview: Definition of big data, Evolution of big data, Characterististics of big data, Data Storage and Analysis, Rational Database Management System, Grid Computing, Volunteer Computing, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data |
| II LO2 | NOSQL Data Management: Introduction to NoSQL; Aggregate, key- volume and document data models , relationships, graph databases, schema less databases, materialized views, distribution models , shading , version, map reduce, partitioning and combining , composing map-reduce calculations. |
| III LO3 | Basics of HADOOP: Data format: Analyzing data with Hadoop, History of Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop; Distributed file system (HDFS): HDFS concepts, Java interface, data flow; Hadoop I/O : data integrity, compression, serialization , Avro, file based data structures. |
| IV LO4 | HADOOP Eco System: Hive: Architecture, data type, File format, HQL, SerDe, User defined functions; Pig: Features, Anatomy, Pig on Hadoop, Pig Philosophy, Pig Latin overview, Data types, Running pig, Execution modes of Pig, HDFS commands, Relational operators, Eval Functions, Complex data type, Piggy Bank, User defined Functions, Parameter substitution, Diagnostic operator; Jasper Report: Introduction, Connecting to Mongo DB, Connecting to Cassandra; Introduction to Machine learning: Linear Regression, Clustering, Collaborative filtering, Association rule mining, Decision tree. |
| V LO5 | MapReduce Application: MapReduce workflows: Unit tests with MRUnit, test data and local tests, anatomy of MapReduce, job run; Classic Map-reduce: YARN, failures in classic Map-reduce and YARN; Job scheduling: huffle and sort, task execution; MapReduce types: input formats, output formats |

Books Recommended

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", O'Reilley, (Latest Edition).
2. Eric Sammer, "Hadoop Operations", O'Reilley, (Latest Edition).

Reference Books:

1. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD (Latest Edition).
2. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, (Latest Edition).
3. Lars George, "HBase: The Definitive Guide", O'Reilley, (Latest Edition)
4. Alan Gates, "Programming Pig", O'Reilley, (Latest Edition)