SRM UNIVERSITY
(Under Section 3 of UGC Act, 1956)

MMS - BUSINESS ANALYTICS
FULL TIME
SYLLABUS - 2015

FACULTY OF MANAGEMENT
&
TIMES CENTRE FOR LEARNING LTD.
KATTANKULATHUR – 603 203

Course Code No	SEMESTER –I	L	T	P	C
MS15C101	Management Concepts	3	0	0	3
MS15C102	Managerial Economics	3	0	0	3
MS15C103	Organizational Behavior	3	0	0	3
MS15C104	Production and Operations Management	3	0	0	3
MS15A105	Accounting for Analytics	3	0	0	3
MS15A106	Statistics for Analytics	2	0	2	3
MS15A107	LAB 1: MS Access and Excelling MS Excel (VBA Programming)	1	0	2	2
MS15A108	LAB 2: Data Management -1	1	0	2	2
	Total Credits	**22**			

Course Code No	Semester –II	L	T	P	C
MS15C201	Entrepreneurship	2	0	2	3
MS15A201	Data Warehousing for Analytics	2	0	2	3
MS15A202	Data Visualization for Analytics	2	0	4	4
MS15A203	Marketing Metrics for Analytics	2	0	2	3
MS15A204	Stochastic Foundations: Probability Models	3	0	2	4
MS15A205	Decision and Risk Analytics	2	0	2	3
MS15A206	Lab 3 – Data Mining Techniques – Predictive Modeling and Pattern Discovery- using R	0	0	2	1
MS15A207	Lab 4 – Data Visualization for Analytics	0	0	2	1
MS15A208	Lab 5 – Data Analytics using SAS	0	0	2	1
	Total Credits	**23**			

Course Code No	SEMESTER –III	L	T	P	C
MS15A301	Big Data, Text Analytics & Web Analytics	2	0	2	3
MS15A302	Cloud Computing , Hadoop and Map Reduce	2	0	2	3
MS15A303	Operations Research (using Excel Solver)	2	0	2	3
MS15A304	Business Forecasting and Econometrics (using R)	2	0	2	3
	Elective 1	2	0	2	3
	Elective 2	2	0	2	3
MS15A305	LAB 6: Enterprise Resource Planning (ERP)	0	0	2	1
MS15A306	LAB 7: Multivariate Data Analysis	0	0	2	1
	Total Credits	**20**			

Course Code No	SEMESTER –IV	L	T	P	C
MS15C401	Project Work 5 + 2(for the projects done in the previous semesters)	0	0	0	7
	Overall Credits	**72**			

Course Code No	MMS- FUNCTIONAL ELECTIVE- 2015-17 Business Analytics	L	T	P	C
MS15AE01	Investment Analysis and Portfolio Management	2	0	2	3
MS15AE02	Supply Chain Risk Analytics	2	0	2	3
MS15AE03	Pricing and Revenue Management	2	0	2	3
MS15AE04	Social Network Analytics	2	0	2	3
MS15AE05	Business Process Analytics	2	0	2	3
MS15AE06	Sports Analytics	2	0	2	3

1 credit = 15 sessions

1 session = 50 minutes

Total credits = 72

Total number of sessions = 1080

Course Code No	SEMESTER –I	L	T	P	C
MS15C101	Management Concepts	3	0	0	3
MS15C102	Managerial Economics	3	0	0	3
MS15C103	Organizational Behavior	3	0	0	3
MS15C104	Production and Operations Management	3	0	0	3
MS15A105	Accounting for Analytics	3	0	0	3
MS15A106	Statistics for Analytics	2	0	2	3
MS15A107	LAB 1: MS Access and Excelling MS Excel (VBA Programming)	1	0	2	2
MS15A108	LAB 2: Data Management -1	1	0	2	2
	Total Credits	**22**			

Course Code No	Semester –II	L	T	P	C
MS15C201	Entrepreneurship	2	0	2	3
MS15A201	Data Warehousing for Analytics	2	0	2	3
MS15A202	Data Visualization for Analytics	2	0	4	4
MS15A203	Marketing Metrics for Analytics	2	0	2	3
MS15A204	Stochastic Foundations: Probability Models	3	0	2	4
MS15A205	Decision and Risk Analytics	2	0	2	3
MS15A206	Lab 3 – Data Mining Techniques – Predictive Modeling and Pattern Discovery- using R	0	0	2	1
MS15A207	Lab 4 – Data Visualization for Analytics	0	0	2	1
MS15A208	Lab 5 – Data Analytics using SAS	0	0	2	1
	Total Credits	**23**			

Semester No	Certificate Courses and Internship – Non Credit
1	1.Business Orientation Service Competencies 2.Certifications on VBA and R
2	1. Introduction to Other BA Tools (Tableau, Python etc.) 2.Internship : Data analytics Program – 15 days
3	1.Machine Learning (using R) 2. HADOOP + APACHE PIG 3.Internship : Industry Verticals – 15 days

SEMESTER I

MS15C101	MANAGEMENT CONCEPTS	L	T	P	C
		3	0	0	3

COURSE RATIONALE

This course is specially designed to familiarize the students with the broad arena of management. They are introduced to the functions of management emphasizing on the inter-links between various functions.

COURSE OBJECTIVES

1. To familiarize the students with basic building blocks of a Business Organization – Forms of Business & Incorporation, etc.
2. To have an overview of Basic Functions of Management.

UNIT - I **(9 Hours)**

Introduction - Understanding Management and Administration - Managerial Skills - Roles of a Manager - Levels of Management - Development of Management Thought Early Classical Approaches - Scientific Management - Contribution and limitation of Scientific Management - Administrative Management: Bureaucracy - Neo-Classical Approaches - Human Relations Movement - Behavioral Approach – Douglas – McGregor - Abraham Maslow - Chester Barnard - Mary parker Approach - Modern Approaches - Quantitative Approach - Social System Approach - Decision Theory Approach - Contingency Approach - Business Ethics and Social Responsibility

UNIT - II **(9 Hours)**

Planning Definition of Planning - Nature of Planning - Importance of Planning - Types of plans - Types of Planning - Process of Planning - Steps in Planning - Decision Making – Concept - Significance and Types of Decision - Organizing Concept

UNIT - III **(9 Hours)**

Process of Organizing - Forms of Organizational Structure - Formal and informal organization - Line and staff structure Functional structure - Span of Control – Authority – Responsibility – Accountability - Delegation of authority – Departmentation - Decentralization.

UNIT - IV **(9 Hours)**

Staffing Concept - Manpower Planning - Job Design - Recruitment & Selection - Training & Development - Performance Appraisal

UNIT - V – Case studies

REFERENCES

1. Dr. Prasad L.M.,"*Principles & Practice of Management"* - Sultan Chand & Sons.
2. Pagare &Dinkar .,"*Principles of Management"* - Sultan Chand & Sons.
3. Dr. Gupta C.B.,"*Management - Theory & Practice"* - Sultan Chand & Co.
4. Hampton ., *"Management"* - Tata McGraw Hill.
5. Tripathi ., "*Principles and Practice of Management"* - Tata McGraw Hill.

MS15C102	MANAGERIAL ECONOMICS	L	T	P	C
		3	0	0	3

COURSE RATIONALE

The course is designed to equip the students apply theoretical knowledge into practical decision making in management.

COURSE OBJECTIVES

1. To understand the role and importance of principles of economics – micro and macro - for any business operation.
2. To have sufficient grounding in the most frequently and widely used micro as well as macro-economic concepts relevant for decision making.

UNIT - I **(9 Hours)**

Introduction: A Simple Economy - Central Problems of an Economy - Organization of Economic Activities - The Centrally Planned Economy - The Market Economy - Positive and Normative Economics - Micro-economics and Macroeconomics - Plan of the Book

UNIT - II **(9 Hours)**

Theory of Consumer Behavior - The Consumer's Budget - Budget Set - Budget Line - Changes in the Budget Set - Preferences of the Consumer - Monotonic Preferences - Substitution between Goods - Diminishing Rate of Substitution - Indifference Curve - Shape of the Indifference Curve - Indifference Map - Utility - Optimal Choice of the Consumer – Demand -Demand Curve and the Law of Demand - Normal and Inferior Goods - Substitutes and Complements - Shifts in the Demand Curve - Movements along the Demand Curve and Shifts in the Demand Curve - Market Demand - Elasticity of Demand - Elasticity along a Linear Demand Curve - Factors Determining Price Elasticity of Demand for a Good - Elasticity and Expenditure - Production and Costs: Production Function - The Short Run and the Long Run - Total Product - Average Product and Marginal Product - Total Product - Average Product - Marginal Product - The Law of Diminishing Marginal Product and the Law of Variable Proportions - Shapes of

Total Product - Marginal Product and Average Product Curves - Returns to Scale – Costs - Short Run Costs - Long Run Costs

UNIT - III **(9 Hours)**

The Theory of the Firm Under Perfect Competition - Perfect competition - Defining Features - Revenue - Profit Maximization – Condition – Condition – Condition - The Profit Maximization Problem - Graphical Representation - Supply Curve of a Firm - Short Run Supply Curve of a Firm -Long Run Supply Curve of a Firm - The Shut Down Point - The Normal Profit and Break-even Point - Determinants of a Firm's Supply Curve - Technological Progress - Input Prices - Unit Tax - Market Supply Curve - Price Elasticity of Supply - The Geometric Method - Market Equilibrium – Equilibrium - Excess Demand - Excess Supply - Market Equilibrium - Fixed Number of Firms - Market Equilibrium - Free Entry and Exit – Applications - Price Ceiling - Price Floor - Non-Competitive Markets - Simple Monopoly in the Commodity Market - Market Demand Curve is the Average Revenue Curve – Total - Average and Marginal Revenues - Marginal Revenue and Price Elasticity of Demand - Short Run Equilibrium of the Monopoly Firm - Other Non-perfectly Competitive Markets - Monopolistic Competition - How do Firms behave in Oligopoly?

UNIT - IV **(9 Hours)**

Introduction - Emergence of Macroeconomics - National Income Accounting - Some Basic Concepts of Macroeconomics - Circular Flow of Income and Methods of Calculating National Income - The Product or Value Added Method - Expenditure Method - Income Method - Some Macroeconomic Identities- Goods and Prices - GDP and Welfare - Money and Banking - Functions of Money - Demand for Money - The Transaction Motive - The Speculative Motive - The Supply of Money - Legal Definitions - Narrow and Broad Money - Money Creation by the Banking System - Instruments of Monetary Policy and the Reserve Bank of India

UNIT - V **(9 Hours)**

Income Determination - Ex Ante and Ex Post - Movement Along a Curve Versus Shift of a Curve - The Short Run Fixed Price Analysis of the Product Market - A Point on the Aggregate Demand Curve - Effects of an Autonomous Change on Equilibrium Demand in the Product Market - The Multiplier Mechanism -The Government - Functions and Scope - Components of the Government Budget - The Revenue Account - The Capital Account - Measures of Government Deficit - Fiscal Policy - Changes in Government Expenditure - Changes in Taxes – Debt - Open Economy Macro-Economics - The Balance of Payments -BoP Surplus and Deficit

REFERENCES

1. Justin Paul, Leena Kaushal and Sebastin., "*Managerial Economics*", Cengage Publications (2012).
2. Suma Damodaran.,"*Managerial Economics*", Oxford Press (2010).

MS15C103	ORGANIZATION BEHAVIOUR	L	T	P	C
		3	0	0	3

COURSE RATIONALE

The course is designed to equip the students to develop their interpersonal skills, and to make them effectively work as managers or professionals in a team.

COURSE OBJECTIVES

1. To familiarize the participants with important behavioral underpinnings of their corporate careers
2. To have an overview of how the primary and secondary or internal and external forces drive
   i. An individual behavior
   ii. A team's behavior, and
   iii. How individuals' behavior and teams' behavior collectively shape an organizational behavior
3. To understand the influencing factors for high performance individuals and high performance teams and therefore the high performing organizations

UNIT - I **(9 Hours)**

MANAGEMENT THOUGHT AND OB: Definition of Management - Approaches to Management – Classical – Behavioral – Quantitative -Management Principles of Taylor – Weber – Fayol - Hawthorne Studies - fields contributing to OB - Managers' roles and functions - OB in the context of globalization - workforce diversity -Definition of Learning -Theoretical process of learning - application of the learning theories for behavior modification -The Nature and Dimensions of Attitudes - Components of Attitude - Sources and types - Cognitive dissonance theory - Values - Measuring job satisfaction - The effect of job satisfaction on employee performance.

UNIT - II **(9 Hours)**

PERCEPTION: Factors Influencing Perception - Perceptual Selectivity rational decision making model - bounded rationality - Linkage between Perception and Individual Decision Making - ethics in decision making -**Personality:** The Meaning of Personality - Personality Determinants - Personality Traits - The big five model, emotional labor -**Emotional Intelligence**: Definition – self-awareness - self-regulation -social skills - social awareness -**Motivation:** Meaning of Motivation –

Primary - General Motives and Secondary Motives - Motivation and Productivity - Content and process theories of Motivation.

UNIT - III **(9 Hours)**

GROUP AND TEAMS: Types of Groups – Stages of Group Development - The Five-Stage Model - The Punctuated Equilibrium Model – The Dynamics of Informal Groups - Norms and Roles in Informal Groups – Nature - Significance and Management of Informal Organizations – Dynamics of Formal Work Groups - Teams in the Modern Workplace - Teams vs Groups - Types of Teams - Quality Circles - Group decision-making, **Communication:** Role of Communication – Objectives - Barriers & Effective Communication – Communication Process - Types of communication – Interactive Communication in Organizations – Cross cultural communication **-Leadership:** Understanding Leadership – Leadership Theories Trait Theories Behavioral Theories - Contingency Theories - Leadership Styles Leadership Skills Determinants of Leadership - Challenges to leaderships in virtual teams.

UNIT - IV **(9 Hours)**

LEVEL 5 LEADERSHIP - Difference between a Leader and a Manager –Power - Authority & Politics - Definitions of Power - Distinction Between Power and Authority - Bases of Power - Power Structure and Blocks - impression management - political behavior in organizations -Conflict & Collaboration - Sources of Conflict - Intra-individual Conflict – Interpersonal Conflict – Inter group Behavior and Conflict - Organizational Conflict Negotiations Approaches to Conflict Management Collaboration.

Stress Management: Causes of Stress - Organizational and Extra Organizational Stressors - Group Stressors – Individual Stressors - Coping Strategy for Stress.

Unit V **(9 Hours)**

ORGANIZATIONAL STRUCTURE: Understanding Organizational Structure Centralization - Decentralization, Flat and Tall Structures – Departmentalization - Behavioral Implications of different organizational designs.

ORGANIZATIONAL CULTURE: Meaning -creating and sustaining culture - culture as a liability - employee acculturation process - countries and culture - organizational climate.

ORGANIZATIONAL CHANGE: Forces for Change - Managing Planned Changes - Resistance to Change Approaches to Managing Organizational Change - technology and change - Organizational Development -concept and action research.

REFERENCE

1. Stephen P Robbins., "*Organizational Behavior."*

MS15C104	PRODUCTIONS AND OPERATIONS MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE RATIONALE

The purpose of learning this course on Production & Operations Management is to expose the students to the concepts and techniques of shop floor management practiced in various industries.

COURSE OBJECTIVES

After studying this course the learner will be able to explain the nature, importance and scope of production and operations management and understand the nuances of concepts and applications involved in production and operations management.

UNIT - I **(9 Hours)**

Introduction – Basic Concepts – Classification of production Systems – Product design – Process planning – Make or Buy decisions – Productivity

Delivery Mode: Lectures, Numerical Problems and Case study.

UNIT – II **(9 Hours)**

Plant location (Qualitative & Quantitative aspects) – Plant Layout (Principles, Types & Applications) – Capacity Planning and Strategies

Delivery Mode: Lectures, Numerical Problems, Case study and Mini project in plant layout design.

UNIT - III **(9 Hours)**

Material Handling Principles &Equipments – Production Planning and control (Theory & problems)

Delivery Mode: Lectures, Numerical Problems and examples from shop floor situation.

UNIT – IV **(9 Hours)**

Basic Inventory Management & Selective inventory control techniques (EOQ & EBQ Models, Quantity discount, P&Q Systems, MRP-I and ABC analysis) – Maintenance management (Theory & Replacement decisions (Individual & Group Replacement))

Delivery Mode: Lectures, Numerical Problems and Case study.

UNIT – V **(9 Hours)**

Work study – Method study (Diagrams & Charts) and Time study (Rating, Allowances) – Quality control (Statistical quality control charts for variables and attributes) – Purchase and Stores Management (Principles, Functions, Types, Documentation and Accounting)

Delivery Mode: Lectures, Numerical Problems and Case study.
Note: The subject will be taught on 50% theory and 50% problems and Cases.

REFERENCES

1. Panneerselvam R.,"*Production & operations management",* Prentice Hall India private limited, 2012.
2. Mahapatra.,"*Operations Management",* Prentice Hall India private limited, 2010.
3. Mukherjee P.N., "*Operations Management and Productivity techniques"* Prentice Hall India private limited, 2009.
4. Richard B Chase.,"*Operations Management",* McGraw-Hill Education private limited, 2010.
5. Saxena J.P.,"*Production and Operations Management",* McGraw-Hill Education private limited, 2008.

MS15A105	ACCOUNTING FOR ANALYTICS	L	T	P	C
		3	0	0	3

COURSE RATIONALE

As decision makers, managers have to be familiar with the basics of accounting. This course aims to impart the basics of preparation and analysis of financial statements. It also aims to equip the future managers with decision making fundamentals when faced with alternate choices. As objectives can be achieved only through fixing targets, a basic knowledge about preparations of budgets, and fine tuning of current operations to achieve the budgets is sought to be taught.

COURSE OBJECTIVE

1. To gain hands on application of cost budgeting and accounts; rationalize the best option available through comparative financial analysis
2. To be able to analyze financial statements, prepare budgets and optimize operations to work within the budget

UNIT – I **(9 Hours)**

Financial statements - positional and activity statement - financial statements prepared at the end of the year - conclusions that you tend to make by reading the financial statements of a company.

UNIT – II **(9 Hours)**

Financial position of a company using ratios - common size statements, comparative statements, and trend analysis - working capital - funds flow and cash flow statements and comment on the liquidity, profitability, solvency and activity levels of the firms

UNIT – III **(9 Hours)**

Time value of money in financial decisions - compounding and discounting – Equated Monthly Installments 1` - project appraisal techniques - Internal Rate of Return and Cost of Capital - Discounted Cash flows - capital rationing - mutually exclusive and mutually inclusive projects. – Factors that underpin the decisions involving alternative choices.

UNIT – IV **(9 Hours)**

Significance of Budgetary control - steps in preparing various budgets - cash budgets with the given information - Zero Base Budgeting – application of budgeting techniques in practical scenario.

UNIT – V **(9 Hours)**

Reading the financial statement of a bank/public utility and comment on its financial position – financial statements of real estate companies - necessity to standardize reporting practices.

REFERENCES

1. Anthony, Merchant and Howkins., "*Accounting – Text and Cases"*, 12th Edition, Tata McGrawhill, 2011.
2. William J. Bruns, Jr.,"*Financial Reporting and Management Accounting"*, Pearson Publication, 6th edition, 2010.
3. Maheshwari S.N, Maheshwari S.K.,"*Financial Accounting*", Vikas Publication, 4th edition – 2011.
4. Pandey I.M.,"*Management Accounting",* Vikas Publication-3rd edition - 2010.
5. Bhattacharyya S.K., John Dearden.,"*Accounting for Management Text and Cases"*,Vikas publication , 6th edition– Reprint 2011.
6. Charles H.Gibson.,"*Financial Statement Analysis",* Cengage Publication – 12th edition - 2011.

MS15A106	STATISTICS FOR ANALYTICS	L	T	P	C
		2	0	2	3

COURSE RATIONALE

This course is designed to provide prospective management studies students with the skills necessary to generate reports, analyses and decisions based on a study of relevant data. This course provides the set of skills that are most frequently used in the work place to generate and critically analyze reports.

COURSE OBJECTIVE

After learning this course the learners will be able to understand the relevance of statistics in the functional areas of business- Accounting, Finance, Information systems, Marketing &Management and gain knowledge on how to use excel spread sheets and focus on interpretation of results.

UNIT – I **(9 Hours)**

Statistical Thinking and Definition of Statistics - Basic Statistical Terms - Variable Type and Data Measurement Scales

UNIT – II **(9 Hours)**

Overview of Statistical Methods - Sampling and Sampling Methods - Presenting Data in Tables and Charts

UNIT – III **(9 Hours)**

Measures of Central Tendency - Measures of Dispersion - Measures of Shape - Examining Data Distribution

UNIT – IV **(9 Hours)**

Types of Probability - Rules / Conditions of Probability - Probability Distributions

UNIT – V **(9 Hours)**

The Normal Distribution - Normality check - Using Excel for Statistical Analysis - Using R for Descriptive Analysis

REFERENCES

1. Levine, Stephan, Krehbiel and Berenson., "*Statistics for Managers using Microsoft excel"*, PHI Learning Private Limited, 2010.
2. Dr. Deepak Chawla, Dr. Neena Sondhi., "*Research Methodology Concepts and Cases*", Vikas Publishing House Private Limited, 2011.
3. Gerald Keller., "*Managerial Statistics*", Cengage Learning, 2011.
4. Arora P.N., "*Managerial Statistics*", S.Chand Limited, 2009.
5. Dr. Srivastava T.N., "*Statistics for Management*", Tata McGraw Hill Publishing Company, 2008.

MS15A107	LAB 1: MS ACCESS AND EXCELLING MS EXCEL (VBA PROGRAMMING)	L	T	P	C
		1	0	2	2

COURSE OBJECTIVES

1. To handle more volume of data in effective manner and to improve their analytical skills.
2. Data Maintenance and the ways to collect the data (Online Surveys & Business tools)
3. To make them understand about the role of data in a business.
4. To do online and offline Projects based on the tools in excel and access.
5. Presenting the data in structured way to arrive and support the business decisions.

UNIT – I **(6 Hours)**

EXCEL: Customer feedback analysis using Google Docs - Macros Functions in Excel - Hyperlinks - Protecting Worksheets - Duplication removing; Project - 1 & Project -2

UNIT - II **(6 Hours)**

INTRODUCTION TO ACCESS: Overview of Access - What is Access used for - Access Basics (New, Open, Close, Save)

UNIT – III **(6 Hours)**

DATA COMPILING IN ACCESS: Importing& Exporting the data to access - Creating Tables - Using the Wizards in Access

UNIT – IV **(6 Hours)**

QUERIES IN ACCESS: Join Function - Make Table query - Append Query - Update query - Cross tab query

Forms & Reports in Access: Designing forms - Using Queries in forms - Using Macros in forms - Generating report using forms

Project - 1 & Project - 2

UNIT V **(6 Hours)**

SPSS

REFERENCE

1. "*Microsoft Access 2010 VBA Programming*", Inside Out - Andrew Couch Materials from times Pro.

MS15A108	LAB 2: DATA MANAGEMENT -1	L	T	P	C
		1	0	2	2

UNIT - I **(6 Hours)**

Introduction to Business Analytics - Competing on Analytics - The New Science of Winning

Business Analytics – Definition, Market, Trends and People - The Paradigm Shift from Data to Insight and from Business Intelligence to Business Analytics – Descriptive - Predictive and Prescriptive Analytics

UNIT - II **(6 Hours)**

The Business Analytics Cycle

Information summary about Books – Tools – Blogs – Resources – Groups – Communities – Videos - Useful links - Sources of Data - Database Architecture and Data Gathering Process - Types of Data - Overview of an online survey/research project

UNIT - III **(6 Hours)**

Intro to R programs - Running R programs - Mastering Fundamental R concepts - How to diagnose and correct syntax errors - Getting familiar with R data sets

UNIT - IV **(6 Hours)**

Creating R data sets - Reading raw data files (column input/formatted input) - Assigning variable attributes - Changing variable attributes - Reading MS spread sheets in R

UNIT - V **(6 Hours)**

Reading R data sets and creating variables - Reading Delimited Raw Data Files - Using Excel for Data Management - Purpose of the Database - Relational Databases Entities - Relationships and Attributes - Specify Keys - Primary and Foreign - Create Relationships among Tables - Refinement and Normalization - Microsoft Access and R

REFERENCE

1. Times Pro full content.

MS15A109	CERTIFICATION COURSES 1. BUSINESS ORIENTATION SERVICE COMPETENCIES 2. CERTIFICATIONS ON VBA AND R	L	T	P	C
		0	0	0	0

Business Orientation Service Competencies

COURSE OBJECTIVES

To develop and demonstrate superior service mindset

SYLLABUS

Customer First Mindset - Positive Outlook - Professional Acumen - People Orientation - Basis Respect – Resourcefulness - Personalized Responsiveness – Reliability

Certifications on VBA and R

VBA Certification:

Programming in C# - Visual Studio - Exam 70-483 - Link: https://www.microsoft.com/learning/en-in/exam-70-483.aspx

R Certification:

In this course you will learn how to program in R and how to use R for effective data analysis. You will learn how to install and configure software necessary for a statistical programming environment and describe generic programming language concepts as they are implemented in a high-level statistical language. The course covers practical issues in statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, profiling R code, and organizing and commenting R code. Topics in statistical data analysis will provide working examples.

Please note: we are offering a Chinese version of this course starting March 2, re-running on a monthly basis and sharing the same schedule with the English version. If you are interested, please select from the drop-down list sessions marked as "(中文版)".

Course Syllabus

The course will cover the following material each week:

Week 1: Overview of R, R data types and objects, reading and writing data

Week 2: Control structures, functions, scoping rules, dates and times

Week 3: Loop functions, debugging tools

Week 4: Simulation, code profiling

Recommended Background
Some familiarity with programming concepts will be useful as well basic knowledge of statistical reasoning; Data Scientist's Toolbox

Suggested Readings
Software for Data Analysis: Programming with R (Statistics and Computing) by John M. Chambers (Springer)
S Programming (Statistics and Computing) Brian D. Ripley and William N. Venables (Springer)

Course Format
There will be weekly lecture videos, quizzes, and programming assignments.
As part of this class you will be required to set up a GitHub account. GitHub is a tool for collaborative code sharing and editing. During this course and other courses in the Specialization you will be submitting links to files you publicly place in your GitHub account as part of peer evaluation. If you are concerned about preserving your anonymity you will need to set up an anonymous GitHub account and be careful not to include any information you do not want made available to peer evaluators.

SEMESTER II

MS15C201	ENTREPRENEURSHIP	L	T	P	C
		2	0	2	3

COURSE RATIONALE

To achieve the objective of creating an entrepreneurial mind set. Encourage entrepreneurial thinking. This course provides learners a set of tools for experience finding and developing innovative alternatives to address value creation either for profit or for non profit or social enterprise.

COURSE OBJECTIVES

The major emphasis of the course will be on creating a learning system through which management students can acquaint themselves with the special challenges of starting new ventures and introducing new product and service ideas. This will involve working together to investigate, understand and internalize the process of founding a startup. Bootstrap and guerilla tactics to gather resources - the technology, team, finance and market - to give birth to entrepreneurial businesses will be discussed.

The course is designed primarily for those who at some point of their career want to start their own ventures, or run their own family businesses. But it is equally useful to those who plan to work in or with new ventures either as venture capitalists, consultants to new firms or in new business development units of larger corporate.

UNIT - I **(9 Hours)**

The Early Career Dilemmas of an Entrepreneur

The Entrepreneur's Role, Task and Personality-A Typology of Entrepreneurs: Defining Survival and Success-Entrepreneurship as a Style of Management-The Entrepreneurial Venture and the Entrepreneurial Organization

UNIT II **(9 Hours)**

Choosing a Direction

Opportunity recognition and entry strategies: New product, Franchising, Partial Momentum, Sponsorship and Acquisition-The Strategic Window of Opportunity: Scanning, Positioning and Analyzing-Intellectual Property: Creation and Protection

UNIT III **(9 Hours)**

Opening the Window: Gaining Commitment

The Business Plan as an Entrepreneurial Tool-Financial Projections: how to do them the right way -Debt, Venture Capital and other forms of Financing-Sources of External Support- Development Entrepreneurial Marketing: Competencies, Networks and Frameworks

UNIT IV **(9 Hours)**

Closing the Window: Sustaining Competitiveness

Maintaining Competitive Advantage-The Changing Role of the Entrepreneur: Mid-Career Dilemmas-Harvesting Strategies versus Go for Growth

UNIT V – Case Studies **(9 Hours)**

REFERENCES

1. Jayshree Suresh, "*Entrepreneurial Development"*, Margham Publishers, Chennai, 2011.
2. Shankar Raj, "*Entrepreneurship Theory And Practice*", Tata Mc-graw Hill Publishing Co.ltd.-new Delhi, 2010.
3. Jeffry A. Timmons, Stephen Spinelli., "*New venture creation"*, Tata Mcgrew Hill, 7th Edtion 2009.
4. Martin, Roger., "*The Design of Business",* Harvard Business Publishing, 2009.
5. Janszen, Felix and Degenaars, Grada.,"*A Practical Guide to Innovation Excellence"*–Stichting Centurumvorr Innovatie Management, Netherlands, 2011.
6. Drucker.F, Peter., "*Innovation and Entrepreneurship"*, Harper business, 2006.
7. Ambrose, Gavin and Harris Paul., "*Design Thinking"*, Ava Publishing, 2009.
8. Osterwalder, Alexander and Pigneur Yves., *"Business Model Generation"*, John Wiley and Sons Inc, 2010.
9. Chahal, Gurbaksh., "*The Dream: How I Learned the Risks and Rewards of Entrepreneurship and N Made Millions*", Palgrave Macmillan, 2008.
10. Hirsch, Robert, Peters Michael and Dean Shepherd., "*Entrepreneurship*". Tata McGraw Hill Education Private Limited, 2006.
11. Yuvnesh Modi, Rahul Kumar, Alok Kothari., "*The Game changers: 20 extraordinary success stories of entrepreneurs*" from IIT Kharagpur, Random House, 2012.
12. Rajiv rai, "*Entrepreneurship"*, Oxford University Press, 2011.

MS15A201	DATA WAREHOUSING FOR ANALYTICS	L	T	P	C
		2	0	2	3

COURSE RATIONALE

This course will focus on the design and management of data warehouse (DW) and business intelligence (BI) systems. The DW is the central element in collecting, integrating, and making sense – knowledge discovery – of an organization's data. BI concerns the full range of analytical applications and its delivery to the desktop of users. Each of these areas is fundamentally different in character – business, architectural, and technical – from traditional databases and applications. Together they form the basis of modern business analytics and decision making in organizations today.

UNIT - I **(9 Hours)**

What is a Data Warehouse? - Data Warehouse Architectures - Types of Systems - Data Mart – OLAP – OLTP - Data Movement (ETL-Extract, Transform and Load) - Data Querying and Reporting - Reading Hierarchical Raw Data Files

UNIT - II **(9 Hours)**

Conditional processing - Dropping and keeping variables - Reading Excel spread sheets in R that contains Date Fields - Data Cleaning - Manipulating Character Values - Manipulating Numeric Values - Manipulating Numeric Values Based on Dates

UNIT - III **(9 Hours)**

Converting Variable Type - Concatenating R Data Sets - Merging R Data Sets - Producing Summary Reports in R - Creating an Accumulating Total Variable - Accumulating Totals for a Group of Data

UNIT - IV **(9 Hours)**

DO Loop Processing - Array Processing - Using arrays in R - Match-Merging Two or More R Data Sets - Simple joins using SQL - Data Integrity - Data Enrichment

UNIT - V **(9 Hours)**

Data Quality - Data Quality Assurance - Data access - Data Privacy and Ethics - Data security - Overview of BI and Data Mining Technology

REFERENCES

1. Kimball,R., Ross,M., Thornthwaite, W.,Mundy,J. and Becker.,"*The Data Warehouse Lifecycle Toolkit"* Practical Techniques for Building Data Warehouse and Business Intelligence Systems. Second Edition. B. John Wiley & Sons, ISBN 978-0-470-14977-5 2008.
2. Morabito, J., Stohr, E., Genc, Y., *"Enterprise Intelligence: A Case Study and the Future of Business Intelligence",* International Journal of Business Intelligence Research. 2011.
3. Kimball, R. and Ross, M., "*The Data Warehouse Toolkit"* The Complete Guide to Dimensional Modeling Second Edition. John Wiley & Sons, 2006.
4. Kimball, R., and Caserta., "*The Data Warehouse ETL Toolkit",* Practical Techniques for Extracting, Cleaning, Conforming, and Delivering Data. J. John Wiley & Sons, 2004.

MS15A202	DATA VISUALIZATION FOR ANALYTICS	L	T	P	C
		2	0	4	4

UNIT - I **(12 Hours)**

Data Visualization - What and Why? Telling Stories with Data -Handling Data for Visualization

UNIT - II **(12 Hours)**

Replacing reporting in BI-Visualization Infrastructure-Animation and Interactivity

UNIT - III **(12 Hours)**

Introduction to Data Visualization Tools-Visualize Patterns over Time-Envision Proportions

Unit - IV **(12 Hours)**

Visualizing Relationships-Spotting Differences-Visualizing Spatial Relationships

UNIT - V **(12 Hours)**

Visualizing Unstructured Information-Data Visualization Using Excel-Data Visualization Using R

MS15A203	MARKETING METRICS FOR ANALYTICS	L	T	P	C
		2	0	2	3

COURSE RATIONALE

This course aims to cover topics in marketing analytics, an area that remains the decision enabler of utmost importance for many of the offline and online companies' marketing and merchandising divisions. The objective of the course is to give students a general understanding of this vital area in marketing while demonstrating critical application areas in online and offline marketing channels.

UNIT - I **(9 Hours)**

INTRODUCTION TO ANALYTICS - Marketing Analytics as an enabler of Marketing Strategy

STATISTICAL FOUNDATIONS OF MARKETING: Descriptive Statistics – Distributions - General Linear Models - Optimization

UNIT - II **(9 Hours)**

PRODUCT ANALYTICS

Pricing and Revenue Management: Point-of-sale Data - Deciding on the "Right" Pricing Approach, a.k.a Strategic Pricing - Implementing tools to support pricing strategy - Managing the prices to meet revenue goals, a.k.a. Tactical Pricing

Assortment Optimization: Panel and Point-of-Sale data - Customer meets product - A retailer's nightmare: shelf-space optimization - Site-to-store - Product meets customer

UNIT - III **(9 Hours)**

CUSTOMER ANALYTICS

Customer Lifetime Value: Loyalty Data - What is a customer's lifetime? - How can we predict it?

Market Basket Analysis: Market-Basket Data - Product Affinities

UNIT - IV **(9 Hours)**

CHANNEL ANALYTICS

Web Analytics: Online Data - Managing the online real estate - The "cloud"

Marketing Budget Optimization Across Channels: Search Engine Marketing versus Search Engine Optimization

UNIT - V **(9 Hours)**

MANAGING THE DELIVERY OF ANALYTICS PROJECTS: Client is always right

Future of Marketing Analytics

REFERENCES

1. Data, data everywhere, "*Special report on managing information, Economist"*, February 27th, 2010.
2. Liberatore and Luo, "*The Analytics Movement, Interfaces, Articles in Advance"*, pp. 1–12, 2010.
3. "*Using R for Data Analysis and Graphics*". Introduction, Code and Commentary, http://cran.rproject.org/doc/contrib/usingR.pdf?bcsi_scan_B318185731EFFDE3=0&bcsi_scan_filename=usingR.pdf
4. "*An Introduction to R*", http://cran.r-project.org/doc/manuals/R-intro.pdf
5. Fisher M. L., Raman A., McClelland A. S., "*Rocket Science Retailing Is Almost Here – Are You Ready*"?, HBR, July-August 2000 (follow up paper here: OPERATIONS RESEARCH Vol. 57, No. 3, May–June 2009, pp. 527–540, Rocket Science Retailing: The 2006 Philip McCord Morse Lecture).
6. Fishman, C. "*Which Price is Right?,"* Fast Company, pp. 92-101 (2003).
7. Geraghty, M. K. and Johnson E., "*Revenue Management Saves National Car Rental,*" Interfaces Vol. 27, No. 1, pp. 107-127 (1997).
8. Chris K. Anderson, *"Setting Prices on Priceline",* Vol. 39, No. 4, July–August 2009, pp. 307–315.
9. Kahn, B. E. and Lehmann D. R., *"Modeling Choice Among Assortments",* Journal of Retailing, 67(3), 1991, pp. 274-299.
10. Gupta et al., *"Modeling customer lifetime value",* Journal of Service Research, Volume 9, No. 2, November 2006 139-155.
11. Fader, P. and Hardie B., "*Probability Models for Customer-Base Analysis*", Journal of Interactive Marketing 23 (2009) 61–69.
12. Fader, P. and Hardie B., "*Counting Your Customers*" the Easy Way: An Alternative to the Pareto/NBD.
13. "*Model Marketing Science*", Volume 24 , Issue 2 (April 2005) Pages: 275 - 284.
14. http://www.sfbayacm.org/wp/wp-content/uploads/2010/01/amr-hadoop-acm-dm-sig-jan2010.pdf.

MS15A204	STOCHASTIC FOUNDATIONS: PROBABILITY MODELS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES

This is a first course on probability models with a strong emphasis on stochastic processes. Stochastic processes are used as models for many real-world phenomena where one needs to take into account the possibility of randomness. The course covers a variety of models, their properties and applications. The general list of topics is given in the Brief Description, where the particular choice of optional topics will be chosen based on audience backgrounds and interests.

The course aim is to enable students to approach real-world phenomena probabilistically and build effective models. As such this course may appeal to mathematically inclined students in fields such as biology, physics, computer science, engineering and economics as well as mathematics students who want to learn more about applications of probability. The course emphasizes models and their applications over the rigorous theoretical framework behind them, yet critical theory that is important for understanding the material is also covered.

UNIT - I (**12 Hours)**

Discrete Markov chains: These illustrate one of the simplest stochastic processes,but with a wide range of applications. A discrete Markov chain is amathematical system that at different discrete times can be in one of several possible states. It possesses the Markov property that given the present state, the future is independent of the past. The system can transition from one state to another according to transition probabilities. Various concepts related to Markov chains will be presented, including reducibility, periodicity and recurrence.*A branching process* will be presented as an example of the discreteMarkov chain. *Markov chain Monte Carlo methods* will be introduced.

UNIT - II **(12 Hours)**

A continuous-time Markov chain is the continuous time analog of a discrete Markov chain that also satisfies the Markov property. Birth-death processes will be presented as examples of continuous-time Markov chains. The concept of time reversibility will be discussed.

UNIT - III **(12 Hours)**

Poisson processes and ***renewal processes*** are also examples of continuous time Markov-chains. A Poisson process can be viewed as a counting process where the times between successive events are independent and exponentially distributed with the same mean. A renewal process is a generalization of the Poisson process for arbitrary holding times. More precisely, this is a

countingprocess for which the times between successive events are independent andequally distributed with an arbitrary distribution. Properties and applications of Poisson and renewal processes will be presented.

UNIT - IV **(12 Hours)**

Martingales are a model of a fair game where knowledge of past events does not help predict future winnings. More precisely, the expected value in the future is equal to the present observed value. An unbiased random walk and *gambler's fortune* are examples of martingales. Martingale stopping time theorem will be presented.

UNIT - V **(12 Hours)**

Optional topics include the following:

Queuing Theory deals with waiting line theory where customers arrive in some random manner. In queuing theory one is interested in limiting probabilities or quantities like the average number of customers in the waiting line or the average time a customer spends in the waiting line. Some special queuing models can be discussed.

Reliability Theory is concerned with determining the probability that a system will function. The system can consist of many components, mutually connected in different ways, e.g. a series system or a parallel system, where each component has a certain probability of working. The probability that the system will function depends on the probabilities that components work and the way components are connected. In reliability theory one is interested in a quantity like the mean lifetime of the system.

Brownian Motion is the motion exhibited by a small particle that is totally immersed in a liquid or gas, where the particle moves as a result of being bombarded by the fast-moving atoms or molecules in the gas or liquid. Since its discovery in 1827, it has been used in areas such as statistical testing of goodness of fit, analyzing the price levels of the stock market, and quantum mechanics.

Random Sampling Techniques

An important problem in applied probability and computational statistics is how to simulate random variables. Various random sampling techniques can be discussed: pseudo-random generators, the inverse transforming method, the rejection method and Monte Carlo simulations. The latter are especially useful for simulating phenomena with significant uncertainty in inputs and systems with large degrees of freedom. They have various applications in physics, engineering, biology and statistics.

REFERENCES

1. Sheldon M. Ross., "*Introduction to Probability Models*", Academic Press 10thedition (December 17, 2009), 800 pages.
2. Geoffrey R. Grimmett and David R. Stirzaker., "*Probability and Random Processes*",Oxford University Press, USA; 3rd edition (August 2, 2001), 608 pages.
3. Sidney I. Resnick, Birkhauser., "*Adventures in Stochastic Processes*", 1th edition (September, 1992), 638 pages.
4. Gregory F. Lawler, "*Introduction to Stochastic Processes*", Chapman and Hall/CRC; 2nd edition (May 16, 2006), 248 pages.
5. Sheldon M. Ross, Wiley., "*Stochastic Processes*, 2nd edition (January 1995), 510 pages.

MS15A205	DECISION AND RISK ANALYTICS	L	T	P	C
		2	0	2	3

COURSE RATIONALE

Course focus is predominantly on prescriptive analytics with some parts focused on predictive analytics. Topics include operations research techniques and their application to decision making such as mathematical optimization, networks modeling, stochastic modeling, and multi-objective modeling. Other topics such as PERT, CPM, computer simulation, decision analysis using decision trees and quantitative value functions, and heuristic methods are covered, as well as use of contemporary computer software for problem solving. In particular, the course will extensively use MS Excel for solving the decision making problems. Case-study approach to problem solving is used.

COURSE OBJECTIVE

1. Enable students to arrive at decisions based on analytical research
2. Use effectively analytical decision making tools for problem solving

UNIT - I **(9 Hours)**

Introduction: predictive and Prescriptive Analytics-Mathematical optimization

UNIT - II **(9 Hours)**

Networks modeling-Multi-objective optimization-Stochastic modeling

UNIT - III **(9 Hours)**

PERT, (performance evaluation and review technique)-CPM, (critical path method)-Computer simulation

UNIT - IV **(9 Hours)**

Decision and Risk analysis-Decision trees-Quantitative value function model

UNIT - V **(9 Hours)**

Forecasting models-Heuristic methods

REFERENCE

1. Stephen Powell and Ken Baker., "*The Art of Modeling with Spreadsheet."*

MS15A206	LAB 3 – DATA MINING TECHNIQUES – PREDICTIVE MODELING AND PATTERN DISCOVERY- USING R	L	T	P	C
		0	0	2	1

UNIT - I **(3 Hours)**

Supervised Learning and Unsupervised Learning - Preparing Data for predictive modeling - Data Exploration - Decision Trees - Cultivating Decision Trees

UNIT - II **(3 Hours)**

Optimizing the Complexity of Decision Trees - Interpreting Decision Trees - Logistic Regression - Simple and Multiple Logistic Regression - Selecting Regression Inputs

UNIT - III **(3 Hours)**

Optimizing Regression Complexity - Interpreting Regression Models - Transforming Inputs - Categorical Inputs Treatment - Categorical Input Consolidation

UNIT - IV **(3 Hours)**

Data Reduction/Selection Strategy - Introduction to Machine Learning Algorithms - Model Assessment - Model Fit Statistics - Statistical Graphics for Comparing and Assessing Models

UNIT - V **(3 Hours)**

Implementing Predictive Models-Ensemble Models-Clustering and Segmentation Analysis

K-Means Clustering-Profiling and Interpreting Clusters

REFERENCES

1. Materials from times Pro.

MS15A207	Lab 4 – DATA VISUALIZATION FOR ANALYTICS	L	T	P	C
		0	0	2	1

COURSE OBJECTIVE

1. Understanding the use of interactive content
2. Applying and implementing various tools for Data Visualizing

UNIT - I **(3 Hours)**

Data Visualization - What and Why?-Telling Stories with Data-Handling Data for Visualization

UNIT - II **(3 Hours)**

Replacing reporting in BI-Visualization Infrastructure-Animation and Interactivity

UNIT - III **(3 Hours)**

Introduction to Data Visualization Tools-Visualize Patterns over Time-Envision Proportions

UNIT - IV **(3 Hours)**

Visualizing Relationships-Spotting Differences-Visualizing Spatial Relationships

UNIT - V **(3 Hours)**

Visualizing Unstructured Information-Data Visualization Using Excel-Data Visualization Using R

MS15A208	Lab 5 – DATA ANALYTICS USING SAS	L	T	P	C
		0	0	2	1

COURSE RATIONAL AND OBJECTIVES

This course is designed to teach students how to manage and analyze data using the SAS software system. The SAS software system is a very powerful data management tool and statistical software used by 93% of the top 2011 FORTUNE Global 500 corporations and numerous academic institutions and government agencies worldwide. The course consists of readings, class lectures, data analysis assignments, and short quizzes on data manipulations and analyses with real public health related data. The data analysis assignments will be conducted using the SAS for Windows statistical package available to students in the computer lab. The course will provide hands-on demonstrations of statistical concepts and methods on data manipulations and analyses. Students will learn how to read in data, produce descriptive statistics and graphs, and complete a host of hypothesis-testing analyses based on the needs of the study and nature of

the outcomes. Students completing this course will be prepared to serve as the data analyst, data manager, SAS programmer, or research assistant/associate at the bio-tech or health care-related industries (e.g. health insurance companies and pharmaceutical companies), academic institutions (e.g. research institutes, universities and colleges), Hospitals (e.g. Kaiser Permanente, Children's Hospital, City of Hope) and governmental and non-governmental agencies (e.g. the CDC and County Health Department, RAND Corporation, Westat) relying on SAS for analytical methods.

The specific topics that will be covered include:

- Inputting data into SAS
- Preparing and manipulating data for analysis
- Data screening to understand distributions, detect outliers, etc.
- Hypothesis testing, e.g. t-tests, nonparametric procedures, chi-square tests, etc.
- Simple and multiple linear regression
- Techniques for building and evaluating a regression model
- Analysis of variance models
- Logistic regression
- Model selection

UNIT - I **(3 Hours)**

Overview of SAS: Basic programming concepts and definitions; Program documentation; Simple examples of data input and summary

Inputting data: Understanding how the DATA step works

Creating permanent SAS datasets: Quiz - Basic programming concepts and Inputting data; Writing reports

UNIT - II **(3 Hours)**

Combining data using SET, MERGE, and UPDATE: Using FIRST. And LAST. BY variables and IN= to select records in the final dataset

The IF-THEN-DO statement: The DO loop; DO-WHILE and DO-UNTIL; Explicit and implicit arrays; Restructuring a data set using arrays

SAS functions and random number generators: Using SAS to randomly allocate treatments and simulate data; Univariate summarization of data; Computing means and frequencies; Creating tables; PROC MEANS, UNIVARIATE, CHART, PLOT, FREQ

UNIT - III **(3 Hours)**

T Tests and Non-parametric Tests: Testing hypotheses about means using t-tests and about median using non-parametric tests

Correlation and Simple Linear Regression: Correlations and simple linear regression; Assumptions of the model; Residual plots; Interpreting regression coefficients and regression fitting diagnostics

Spring Break

Cesar Chavez Day

UNIT - IV **(3 Hours)**

Multivariate Linear Regression I: More on linear regression; Transformations and coding dummy variables; Modeling interactions

Multivariate Linear Regression II: More on linear regression; Comparison of Models; Stepwise and best subsets regression

ANOVA and ANCOVA: ANOVA; Randomized blocks; Factorial designs; Split-plot design; Analysis of Covariance; ANOVA and multiple regressions

UNIT - V **(3 Hours)**

Exact Tests, Chi-square Tests and McNemar's Test: Testing hypotheses about proportions using exact tests, chi-square tests, and McNemar's test; Controlling for confounding using the Mantel-Haenzel procedure; estimating odds ratios and relative risks

Logistic Regression: Logistic regression; Interpreting regression coefficients; Assumptions of the model; Assessing model fit; Stepwise selection of variables; Conditional logistic regression for matched data

Brief introduction of SAS Macro Programming

TEXT BOOKS

1. Ronald P.Cody & Jeffrey K. Smith., "*Applied statistics and the SAS program language"* (5th ed.), Pearson Education, Inc., Upper Saddle River, NJ. ISBN 0-13-146532-5 (2006).

REFERENCES

1. Ronald P. Cody & Raymond Pass., "*SAS Programming by Example*", SAS Institute Inc., Cary, NC. ISBN-10: 1-55544-681-7 (1995).
2. Ronald P. Cody., "*SAS Statistics by Example*", SAS Institute Inc., Cary, NC. ISBN 978-1-60764-800-0 (2011).
3. Larry Hatcher., "*Step-by-Step Basic Statistics Using SAS*", Exercises. SAS Institute Inc., Cary, NC. ISBN 1-59047-149-0 (2003).

MS15A209	CERTIFICATION COURSES: INTRODUCTION TO OTHER BA TOOLS (TABLEAU, PYTHON, ETC)	L	T	P	C
		0	0	0	0

PYTHON

Beginning With Python: **The Python Interpreter and Idle, Part I - Whirlwind Introduction To Types and Functions - Integer Arithmetic -Strings, Part I - Variables and Assignment - Print Function, Part I - Strings Part II - The Idle Editor and Execution - Input and Output - Defining Functions of your Own - Dictionaries - Loops and Sequences - Decimals, Floats, and Floating Point Arithmetic**

Objects and Methods: Strings, Part III - More Classes and Methods - Mad Libs Revisited - Graphics - Files

More On Flow of Control: If Statements - Loops and Tuples - While Statements - Arbitrary Types Treated As Boolean - Further Topics to Consider

Dynamic Web Pages: Web page Basics - Composing Web Pages in Python - CGI - Dynamic Web Pages

TABLEAU

Introduction and Overview:

+ Why Tableau? Why Visualization?+ Level Setting – Terminology+ Getting Started – Creating powerful visualizations quickly+ The Tableau Product Line+ Things you should know about Tableau

Getting Started

+ Connecting to data+ Introduction to data source concepts+ Working with data files versus database servers+ Understanding the Tableau workspace+ Dimensions and measures+ Using Show Me!+ Tour of shelves (how shelves and marks work)+ Building basic views+ Help menu and samples+ Saving and sharing your work

Concepts and Options when Connecting to Data

+ Overview of other connection options+ Joining multiple tables+ Data blending+ Copy and paste+ Data extracts+ Custom SQL+ Publishing and reusing data connections+ Understand how to deal with data changes in your datasource such as field addition, deletion or name change+ Re-using and sharing data connections (meta data)+ Working with multiple connections in the same workbook

Analysis

Creating Views

+ Marks + Size and transparency+ Highlighting + Dates

Working with Dates
+ Date aggregations + Date parts+ Discrete vs. vontinuous + Dual axis+ Multiple measures + Combo charts+ Different mark types + Geographic map+ Page trails + Heat map+ Density chart + Scatter plots+ Pie charts + Bar charts+ Aggregate vs. disaggregate + Small multiples
Analyzing
+ Sorting + Grouping+ Aliases + Filtering and quick filters+ Cross-tabs (pivot tables) + Totals and subtotals+ Drilling and drill through + Aggregation disaggregation+ Percent of total + Stats and trendlines

Getting Started with Calculated Fields
+ Working with string functions+ Basic arithmetic calculations + Date math + Working with totals + Custom aggregations + Logic statements

Formatting
+ Options in formatting your visualization+ Working with labels and annotations + Effective use of titles and captions + Introduction to visual best practices

Building Interactive Dashboards
+ Combining multiple visualizations into a dashboard + Making worksheets interactive with actions and filters + Best practices in visualization introduction

Sharing Workbooks
+ Publish to Reader + Packaged Workbooks + Publish to Office + Publish to PDF + Publish to Tableau Server and sharing on the web

Putting it All Together
+ Scenario-based review exercises+ Best practices

MS15A210	INTERNSHIP: DATA ANALYTICS PROGRAM – 15 DAYS	L	T	P	C
		0	0	0	0

SEMESTER III

MS15A301	BIG DATA, TEXT ANALYTICS & WEB ANALYTICS	L	T	P	C
		2	0	2	3

COURSE RATIONALE

Majority of big data is unstructured and text oriented, thanks to the proliferation of online sources such as blogs, e-mails, and social media. While the amount of textual data are increasing rapidly, businesses' ability to summarize, understand, and make sense of such data for making better business decisions remain challenging. No marketing or customer intelligence program can be effective today without thoroughly understanding how to analyze textual data. Emphasizing practical skills as well as providing theoretical knowledge, this course takes a comprehensive look at how to organize, manage, and mine textual data for extracting insightful information from large collections of documents and using such information for improving business operations and performance.

COURSE OBJECTIVE

1. Identify the importance of data governance for managing Big Data Outline the components needed in a Big Data Platform
2. Compare and contrast the roles of: data-at-rest processing, data-in-motion processing, data-warehouse processing, and contextual search
3. To be able to create clusters from text data to understand customer segments
4. To derive topics from text data to better understand customer conversation
5. To create rules from text data to make predictions: combine text data with numeric data to build better models
6. To be able to create statistical, rule-based, and hybrid models for understanding and predicting customer sentiments
7. To be able to use various tools for Quantifying Text-Text Mining Application to Pattern Discovery-Text Mining Application to Predictive Modeling

UNIT - I **(9 Hours)**

Introduction to Big Data-Structuring of Big Data

UNIT – II **(9 Hours)**

Elements of Big Data-Business Applications of Big Data

UNIT - III **(9 Hours)**

Handling Big Data Technologies-Data Mining and Text Mining

UNIT - IV **(9 Hours)**

Working with Data Sources for Text Mining-Data Preparation for Text Analytics

UNIT - V **(9 Hours)**

Methods for Quantifying Text-Text Mining Application to Pattern Discovery-Text Mining Application to Predictive Modeling

REFERENCES

1. Michele Chambers, Michael Minelli, Ambiga Dhiraj., "*Big Data Big Analytics, Emerging Business Intelligence and Analytic Trends for Today's Businesses"* ,1st Edition, Wiley Publications
2. Gert H. N. Laursen, Jesper Thorlund, "*Business Analytics for Managers"* Taking Business Intelligence Beyond Reporting, Wiley Publications.

MS15A302	CLOUD COMPUTING + HADOOP + MAPREDUCE	L	T	P	C
		2	0	2	3

COURSE RATIONALE AND COURSE OBJECTIVE

1. To know the key security and control considerations within cloud computing environments and be able to identify various cloud services.
2. Assess cloud characteristics and service attributes, for compliance with enterprise objectives.
3. Identify / Implement the four primary cloud category "types" and evaluate various cloud delivery models.
4. Understand the application of cloud computing tools in various business environments

UNIT - I **(9 Hours)**

UNDERSTANDING THE CORE CONCEPTS OF CLOUD COMPUTING AND THE ENABLING TECHNOLOGIES Programming Models, Virtualization, Distributed File Systems and Cloud Storage, Emerging Cloud Tools

Programming Models Identify the design characteristics of the shared memory, message passing and MapReduce programming models, Describe the relationship between programming models and the architecture of the underlying system, Explain the Hadoop MapReduce program flow and how it communicates with the Hadoop distributed file system (HDFS), Identify several programming models as case studies such as Dryad, Pregel and GraphLab.

UNIT - II **(9 Hours)**

VIRTUALIZATION Discuss the types of virtualization: process versus system and software-based (or full virtualization) versus hardware-assisted (or paravirtualization) virtualizations, Discuss resource virtualization: CPU, Memory, Disk, and Network virtualizations, Describe distributed resource management,

distributed resource monitoring, and distributed scheduling in clouds, Identify Xen and VMWare as case studies.

UNIT - III **(9 Hours)**

STORAGE TECHNOLOGIES AND DISTRIBUTED FILE SYSTEMS Identify external, network-based storage suitable for clouds: SAN, NAS, and iSCSI, Discuss various DFS architectures: cluster-based versus client-server architectures, Describe various aspects of DFSs including communication, synchronization, replication, fault tolerance, and security, Identify the difference between distributed and parallel file systems, Identify GFS and HDFS, PVFS, BigTable and Hbase as case studies.

EMERGING CLOUD TOOLS Identify various Hadoop extensions which simplify large-scale data processing, such as Apache Pig and Hive, Apply the Apache Mahout Machine learning library and explore its usage in some machine learning tasks such as clustering and classification, Identify how to build general distributed applications using Hadoop's distributed coordination service, ZooKeeper.

UNIT - IV **(9 Hours)**

BUILDING CLOUD APPLICATIONS Embark upon a full-semester research project that will allow them to gradually master MapReduce and investigate its applicability to various domains, such as natural language processing, machine learning, bioinformatics and image processing, Glean insights on MapReduce performance under various domains, analyze its ensuing behaviors, and optimize performance through making changes in cluster configurations and provisioning. Apply workload characterization as a crucial component for their performance analysis.

UNIT - V **(9 Hours)**

EMERGING RESEARCH CHALLENGES Cloud security such as developing cloud security models, end-to-end methods for enforcing security policies, and programming models with privacy-aware APIs. Quality of service (QoS) and service level agreements (SLAs) (e.g., completion time, availability, response time) in clouds. Energy-efficient clouds that entail more elaborate energy consumption metrics, energy-aware cloud applications, and data centers with renewable energy sources (e.g., solar and wind powers) and low power processing units (e.g., GPUs).

REFERENCES

1. Vignesh Prajapati, *"Big Data Analytics with R and Hadoop"*,1st Edition, Shroff / Packt Publications
2. Chuck Lam, "*Hadoop in Action*", Dreamtech Press Publisher.

MS15A303	OPERATIONS RESEARCH (USING EXCEL SOLVER)	L	T	P	C
		2	0	2	3

COURSE RATIONALE

Operations Research (OR) refers to the science of decision making. This course provides an in-depth study of fundamental methods of Operations Research through the use of Excel (mathematical notation or the principals of optimization) and their application. The emphasis is on applications rather than the details of methodology. By the end of the course, students will be exposed to a wide variety of applications and problems that can be addressed using Operations Research techniques.

COURSE OBJECTIVES

This subject will provide students with the knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively. The subject imparts skills in the use of various mathematical models with Operations Research approach in solving real problems in industry and thereby facilitates the managerial decision making process.

UNIT - I **(9 Hours)**

Evolution and Scope of Operations Research - Linear Programming Problem - Formulating LPP and Graphical Solution of LP Maximization Problem - Special Cases in LPP - Linear Programming and its Modeling Applications

UNIT - II **(9 Hours)**

Simplex Method to Solve LPP - Duality in LPP - Sensitivity Analysis - Transportation and Assignment Models - Finding Initial Basic Feasible Solution (IBFS) of TP - Finding Optimal Solution of TP

UNIT - III **(9 Hours)**

Unbalanced Transportation Problems - Degeneracy in Transportation Problem - Integer Programming - Pure IPP - Binary IPP - Mixed IPP

UNIT - IV **(9 Hours)**

Goal Programming - Equally important goals - Ranking Multiple goals - Solving GPPs: Graphical Method and Modified Simplex Method - Simulation Modeling

UNIT - V **(9 Hours)**

Monte Carlo Simulation - Applications to inventory problems - Applications to queuing problems - Markov Analysis - Prediction of switching behavior - Prediction of market shares

REFERENCES

1. Sharma J.K., "*Operations Research* ", Macmillan India Ltd.
2. Fredrick S. Hillier and Mark S. Hillier., "*Introduction to Management Science"* , TMH.
3. Wagner, H.M., "*Principals of Operation Research"* - Prentice Hall.
4. Ravindran, Phillips and Solberg,Wiley., "*Operations Research - Principles and Practice*".
5. Taha, H.A., "*Operational Research - An Introduction*", - Macmillan.
6. Kanti Swarup, P.K. Gupta, Man Mohan., "*Operations Research"* - S. Chand and Company.

MS15A304	BUSINESS FORECASTING AND ECONOMETRICS (USING R)	L	T	P	C
		2	0	2	2

COURSE RATIONALE

An econometric model is one of the tools economists use to forecast future developments in the economy. In the simplest terms, econometricians measure past relationships among such variables as consumer spending, household income, tax rates, interest rate, employment, and the like, and then try to forecast how changes in some variables will affect the future course of others.

COURSE OBJECTIVE

1. The primary objective of this course is to impart to students a working knowledge of how best to analyze simple and multivariate relationships using a variety of regression models.
2. Students will learn how to test and correct for a wide variety of standard statistical problems that appear when data is analyzed.

UNIT - I **(6 Hours)**

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

UNIT - II **(6 Hours)**

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

UNIT - III **(6 Hours)**

Autocorrelation and Auto regression-Autoregressive Models - ARIMA time-series model

UNIT - IV **(6 Hours)**

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

UNIT - V **(6 Hours)**

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

REFERENCES

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

MS15A305	LAB 6: ENTERPRISE RESOURCE PLANNING (ERP)	L	T	P	C
		0	0	2	1

UNIT - I **(3 Hours)**

INTRODUCTION TO ERP: Integrated Management Information Seamless Integration – Supply Chain Management – Integrated Data Model – Benefits of ERP – Business Engineering and ERP – Definition of Business Engineering – Principle of Business Engineering – Business Engineering with Information Technology.

UNIT - II **(3 Hours)**

BUSINESS MODELLING FOR ERP - Building the Business Model – ERP Implementation – An Overview – Role of Consultant, Vendors and Users, Customization – Precautions – ERP Post Implementation Options-ERP Implementation Technology –Guidelines for ERP Implementation.

UNIT - III **(3 Hours)**

ERP AND THE COMPETITIVE ADVANTAGE ERP domain MPGPRO – IFS/Avalon – Industrial and Financial Systems – Baan IV SAP-Market Dynamics and Dynamic Strategy.

UNIT - IV **(3 Hours)**

COMMERCIAL ERP PACKAGE Description – Multi-Client Server Solution – Open Technology – User Interface- Application Integration.

UNIT - V **(3 Hours)**

ARCHITECTURE Basic Architectural Concepts – The System Control Interfaces – Services – Presentation Interface – Database Interface - Cases.

REFERENCES

1. Ray, "*Enterprise Resource Planning*",Tata McGraw Hill.
2. Alexis Leon, "*ERP Demystified*", Tata McGraw Hill.
3. Goyal , "*Enterprise Resource Planning*", A Managerial Perspective, Tata McGraw Hill.
4. Materials from times Pro.

MS15A306	LAB 7: MULTIVARIATE DATA ANALYSIS	L	T	P	C
		0	0	2	1

UNIT - I **(3 Hours)**

Introduction to Multivariate Data Analysis-Classification of Univariate and Multivariate Statistical Techniques-Meaning and Scope of Multivariate Analysis-Types of Multivariate Techniques -Guidelines for Multivariate Analysis and Interpretation

UNIT - II **(3 Hours)**

Multivariate Model Building Approach -Data Preparation for Multivariate Analysis Examining Data Graphically-Missing Data Analysis-Outliers – Detecting, Profiling and Analyzing

UNIT - III **(3 Hours)**

Testing Assumptions of Multivariate Analysis-Factor Analysis-Factor Analysis Decision Process-Multiple Discriminant Analysis-Decision Process for Multiple Discriminant Analysis
Two-Group Multiple Discriminant Analysis

UNIT - IV **(3 Hours)**

Three- Group Multiple Discriminant Analysis-Multivariate Analysis of Variance (MANOVA)-Conjoint Analysis-Managerial Uses of Conjoint Analysis-Designing a Conjoint Analysis Experiment-Canonical Correlation

UNIT - V **(3 Hours)**

Analyzing relationships with Canonical Correlations-Interpreting the Canonical Variate – Canonical Weights, Canonical Loadings, Canonical Cross-Loadings-Multidimensional Scaling-Perceptual Mapping-Correspondence Analysis

REFERENCE:

1. Materials from times Pro.

MS15A307	CERTIFICATION COURSES: 1. MACHINE LEARNING (USING R) 2. HADOOP + APACHE PIG	L	T	P	C
		0	0	0	0

MACHINE LEARNING (USING R)

Introduction: Machine Learning - Machine Learning Foundations –Overview – applications - Types of machine learning - basic concepts in machine learning Examples of Machine Learning -Applications – Linear Models for Regression - Linear Basis Function Models - The Bias-Variance Decomposition - Bayesian Linear Regression - Bayesian Model Comparison

Supervised Learning: Linear Models for Classification - Discriminant Functions - Probabilistic Generative Models - Probabilistic Discriminative Models - Bayesian Logistic Regression. Decision Trees – Classification Trees- Regression Trees - Pruning. Neural Networks -Feed-forward Network Functions - Error Back propagation - Regularization - Mixture Density and Bayesian Neural Networks - Kernel Methods - Dual Representations - Radial Basis Function Networks. Ensemble methods- Bagging- Boosting.

Unsupervised Learning: Clustering- K-means - EM - Mixtures of Gaussians - The EM Algorithm in General -Model selection for latent variable models - high-dimensional spaces -- The Curse of Dimensionality –Dimensionality Reduction - Factor analysis - Principal Component Analysis - Probabilistic PCA- Independent components analysis

Probabilistic Graphical Models: Directed Graphical Models - Bayesian Networks - Exploiting Independence Properties – From Distributions to Graphs -Examples - Markov Random Fields - Inference in Graphical Models – Learning –Naive Bayes classifiers-Markov Models – Hidden Markov Models – Inference – Learning-Generalization – Undirected graphical models- Markov random fields- Conditional independence properties - Parameterization of MRFs - Examples - Learning - Conditional random fields (CRFs) - Structural SVMs

Advanced Learning: Sampling – Basic sampling methods – Monte Carlo. Reinforcement Learning- K-Armed Bandit- Elements - Model-Based Learning-Value Iteration- Policy Iteration. Temporal Difference Learning- Exploration Strategies- Deterministic and Non-deterministic Rewards and Actions- Eligibility Traces- Generalization- Partially Observable States- The Setting- Example. Semi - Supervised Learning. Computational Learning Theory - Mistake bound analysis, sample complexity analysis, VC dimension.

HADOOP + APACHE PIG

Introduction

Hadoop Fundamentals: The Motivation for Hadoop - Hadoop Overview - Data Storage: HDFS - Distributed Data Processing: YARN, MapReduce, and Spark - Data Processing and Analysis: Pig, Hive,and Impala - Data Integration: Sqoop - Other Hadoop Data Tools - Exercise Scenarios Explanation

Introduction to Pig: What Is Pig? - Pig's Features - Pig Use Cases - Interacting with Pig

Basic Data Analysis with Pig: Pig Latin Syntax - Loading Data - Simple Data Types - Field Definitions - Data Output - Viewing the Schema - Filtering and Sorting Data - Commonly-Used Functions

Processing Complex Data with Pig: Storage Formats - Complex/Nested Data Types - G rouping - Built-In Functions for Complex Data - Iterating Grouped Data

Multi-Dataset Operations with Pig: Techniques for Combining Data Sets - Joining Data Sets in Pig - Set Operations - Splitting Data Sets

Pig Troubleshooting and Optimization: Troubleshooting Pig – Logging - Using Hadoop's Web UI - Data Sampling and Debugging - Performance Overview - Understanding the Execution Plan - Tips for Improving the Performance of Your Pig Jobs

Introduction to Hive and Impala: What Is Hive? - What Is Impala? - Schema and Data Storage - Comparing Hive to Traditional Databases - Hive Use Cases

Querying with Hive and Impala: Databases and Tables - Basic Hive and Impala Query Language Syntax - Data Types - Differences between Hive and Impala Query Syntax - Using Hue to Execute Queries - Using the Impala Shell

Data Management: Data Storage - Creating Databases and Tables - Loading Data - Altering Databases and Tables - Simplifying Queries with Views - Storing Query Results

Data Storage and Performance: Partitioning Tables - Choosing a File Format - Managing Metadata - Controlling Access to Data

Relational Data Analysis with Hive and Impala: Joining Datasets - Common Built-In Functions - Aggregation and Windowing

Working with Impala: How Impala Executes Queries - Extending Impala with User-Defined Functions - Improving Impala Performance

Analyzing Text and Complex Data with Hive: Complex Values in Hive - Using Regular Expressions in Hive - Sentiment Analysis and N-Grams - Conclusion

Hive Optimization: Understanding Query Performance - Controlling Job Execution Plan – Bucketing - Indexing Data

Extending Hive: SerDes - Data Transformation with Custom Scripts - User-Defined Functions - Parameterized Queries

Choosing the Best Tool for the Job: Comparing MapReduce, Pig, Hive, Impala, and Relational Databases - Which to Choose?

MS15A308	INTERNSHIP: INDUSTRY VERTICALS – 15 DAYS	L	T	P	C
		0	0	0	0

SEMESTER – IV

MS15C401	PROJECT WORK 5 + 2 (FOR THE PROJECTS DONE IN THE PREVIOUS SEMESTERS)	L	T	P	C
		7			

MMS- FUNCTIONAL ELECTIVE- 2015-17
Business Analytics

MS15AE01	INVESTMENT ANALYSIS AND PORTFOLIO MANAGEMENT	L	T	P	C
		2	0	2	3

COURSE RATIONALE

The objective of the course is to impart adequate knowledge to trade off risk and return for managing investment to achieve optimal return. At the end of the course students are expected to take investment decisions for optimal utilization of fund through different investment channels following modern portfolio management concept.

COURSE OBJECTIVE

1. to describe and to analyze the investment environment, different types of investment vehicles;
2. to understand and to explain the logic of investment process and the contents of its' each stage;
3. to use the quantitative methods for investment decision making – to calculate risk and expected return of various investment tools and the investment portfolio;
4. to distinguish concepts of portfolio theory and apply its' principals in the process of investment portfolio formation;
5. to analyze and to evaluate relevance of stocks, bonds, options for the investments;
6. to understand the psychological issues in investment decision making;
7. to know active and passive investment strategies and to apply them in practice

UNIT - I **(9 Hours)**

INTRODUCTION

Concept, Investment, Speculation & Gambling, Influencing Factors of Investment Decision Making, Financial Decisions vs Investment Decisions, Investors Classification, Investment Avenues - Bonds , Preference Shares , Equity Shares, Government Securities , Post Office Deposits, Real Estates, Venture Capital , Mutual Fund ,Exchange Traded Funds, Life Insurance.

UNIT - II **(9 Hours)**

SECURITIES MARKET

Financial Market- Money Market, Capital Market & Gilt Edge Security Market, Participants in Financial Market. Methods of Floating New Issues, Role of Primary Market and Secondary Market, Stock Exchanges – Functions, Over the Counter Exchange of India, National Stock Exchange of India, Trading System – Type of Orders, Settlement, Speculations.

UNIT - III **(9 Hours)**

RISK & RETURNS

Meaning & Concept, Measurements of Risk and Return - Mean, Standard Deviation & Variance, Classification of Risk, Management of Risk.

INVESTMENT ANALYSIS

Concept of Fundamental Analysis - Analysis of Country's Economic Condition, Study and Analysis of State of the Industry and the Company – Concept of Industries, Lifecycle, Characteristics, Company Analysis –Analysis of Financial Statements. Technical Analysis- Dow's Theory, Charts and Technical Indicators. Random Walk Model, Efficient Market Hypothesis (EMH).

UNIT – IV **(9 Hours)**

VALUATION OF BONDS & EQUITY

Bond Theorem, Valuation of Bond, Preference Shares, Equity Shares.

FINANCIAL DERIVATIVES

Concept, Forward Contract – Features, Advantages and Disadvantages, Future Contracts – features, Advantages and Disadvantages, Long and Short Positions, Margin System, Options – Call Options, Put Options, Uses of Options.

UNIT - V **(9 Hours)**

Portfolio Management Traditional Investment Management, Introduction to Modern Portfolio Management, Markowitz Portfolio Model, Sharpe Model, CAPM, APT Model, Portfolio Management process, Portfolio Management Strategies, Portfolio Revision & Evaluation.

REFERENCES

1. Prasanna Chandra., "*Investment & Portfolio Management*", Tata McGraw Hill.
2. Kevin S., "*Security Analysis & portfolio Management*", PHI Learning.
3. Punithavathy Pandian, "*Security Analysis and Portfolio Management*", Vikas Publishing.
4. Fischer & Jordan, "*Security Analysis and Portfolio Management*", PHI.

5. Charles P Jones, John Wiley., "*Investment Analysis and Management*".
6. Haugen Roberts., "*Modern Investment Theory*", PHI.
7. Alexander, Gordon, Jeffery, and Sharpe Williams., "*Fundamentals of Investments*".
8. Elton, Gruber, Brown and Goetzmann ., "*Modern Portfolio Theory and Investment Analysis*.

MS15AE02	SUPPLY CHAIN RISK ANALYTICS	L	T	P	C
		2	0	2	3

COURSE DESCRIPTION

Although supply chain engineering methods have advanced rapidly in sophistication over the past two decades, the application of modeling and methods to explicitly consider and manage uncertainties and risks in supply chain activities are required for firms to advance to the next level of sophistication. The ability to identify, assess, manage, mitigate and control the impact of disruptive events within the extended supply chain sits at the heart of comprehensive supply chain risk management". – From Supply Chain Risk Management – A Delicate Balancing Act, White Paper, IBM Global Services.

While risk management practices have been widely used for years in the financial sector, it is only recently that the implementation and use of risk practices have started receiving attention for the management of supply chains. Over the last decade, supply chain management has gradually evolved towards leaner processes, such as just-in-time, virtual inventory, supplier rationalization, and reductions in the number of distribution facilities, in an attempt to reduce waste within the overall chain. The lean process trend contributed to a reduction in the supply chain costs, but at the expense of arisk increase. The trade-off between supply chain risk and efficiency has sometimes led to undesirable outcomes and supply chain malfunctions caused by supply and demand disruptions. The course will cover Predictive and Prescriptive Analytic models that will enable an organization to understand their data better by helping them uncover key information, see patterns in data they could not detect before, understand their exposure to risk, predict the outcomes of business decisions with greater certainty, and act on that insight. Particular attention will be paid to quantitative risk models from the perspectives of:

- the supply chain planner who has concerns about how to assess strategic & operational risks;
- the supply chain operations director who must help the enterprise adapt to day to day uncertainties in demand and supply;

- the supply chain customers who are concerned about how to ensure day to day business continuity and also how to cope with low probability but high impact events such as a terrorist attack or earthquake.

COURSE OBJECTIVES

The primary learning objectives are:

1. To understand the effects of disruptions at various levels of the supply chain;
2. To become familiar with the various typologies for risk classification, and understand the ways in which the associated risks can be quantified/modeled.
3. To develop an understanding of the complexity of managing risk in supply chains through a discussion of several real-world cases;
4. To understand the modeling approaches typically used in SCM and learn to develop better predictive and prescriptive models.
5. To get acquainted with stochastic and robust optimization models that explicitly account for uncertainty and risk.
6. To develop modeling skills using spreadsheet-based and algebraic modeling tools that can be used to formulate and solve practical problem with a software package, such as Excel, Excel Solver add-in, OPL, Cplex, @Risk, and Expert Choice.

COURSE ORGANIZATION AND SCHEDULE

The course is organized around four main modules including each specific concepts/methods along with relevant software tools. The content of each module is described below. The course will cover a sample of these topics.

UNIT - I **(9 Hours)**

MODULE 1: INTRODUCTION TO KEY CONCEPTS IN SCM AND RISK

- Typologies of risk
- Quantifying risk
- Risk measures

UNIT - II **(9 Hours)**

- Risk models in SCM – operational risks vs. disruption risks

MODULE 2: CUSTOMER AND DEMAND SIDE ANALYTICS

- Models for demand uncertainty
- Service level policies

UNIT - III **(9 Hours)**

- Production-distribution model

- Risk mitigation strategies to manage disruptions

MODULE 3: SUPPLY SIDE ANALYTICS

- Supply chain network design

UNIT - IV **(9 Hours)**

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

UNIT - V **(9 Hours)**

MODULE 4: INTEGRATED MODELS FOR MANAGING OPERATIONAL AND DISRUPTION RISKS

- Multi-objective models with alternative performance measures
- Models for sourcing decisions
- Information management: models of information sharing

Students are expected to come to class: 1) having read and prepared to discuss the material for the current lecture; 2) having reviewed the material of the previous lectures. Extensive participation in class discussions and modeling and computational exercises is expected from all students

REFERENCES

1. Basu G., Ben-Hamida M., Butner K., Cope E., Dao H., Deleris L., Dong J., Helander M., Katircioglu K., Ray B., Torpy J., "*Supply Chain Risk Management: A Delicate Balancing Act",* White Paper, IBM Global Business Services 2008.
2. Kirkwood C.W., Slaven M.P., Maltz A., "*Improving Supply-Chain-Reconfiguration Decisions at IBM*". *Interfaces* 35, 460-473 2005.
3. Sashihara S., "*The Optimization Edge"* Reinventing Decision Making to Maximize All Your Company's Assets. McGraw-Hill 2011.
4. Sodhi M.S., Son B.-G., Tang C.S. ASP, "*The Art and Science of Practice*" What Employers Demand from Applicants for MBA-Level Supply Chain Jobs and the Coverage of Supply Chain Topics in MBA Courses. *Interfaces* 38, 469-484 2008.
5. Tang C.S., "*Perspectives in Supply Chain Risk Management," International Journal of Production Economics* 103 (2), 451-488, 2006.
6. Fisher M., Raman A., "*The New Science of Retailing: How Analytics are Transforming the Supply Chain and Improving Performance*". Harvard Business 2010.Press: http://newscienceofretailing.com/

7. Watson M., Lewis S., Caciopi P., Jayaraman J. "*Supply Chain Network Design", Applying Optimization and Analytics to the Global Supply Chain*. FT Press 2012.

MS15AE03	PRICING AND REVENUE MANAGEMENT	L	T	P	C
		2	0	2	3

COURSE RATIONALE AND OBJECTIVE

This course provides an introduction to both the theory and the practice of revenue management and pricing. Fundamentally, revenue management is an applied discipline; its value derives from the business results it achieves. At the same time, it has strong elements of an applied science and the technical elements of the subject deserve rigorous treatment. The plan of this course is to discuss both these practice and theory elements.

Building on a combination of lectures, case studies the course develops a set of methodologies that students could use to identify and develop opportunities for revenue optimization in different business contexts including the transportation and hospitality industries, retail, media and entertainment, financial services, health care and manufacturing, among others. The course places particular emphasis on discussing quantitative data-driven models and their implementations.

UNIT - I **(9 Hours)**

Introduction: Examples and simulations - The RM Process - Classification and introduction to the models, course plan

The Theories of Pricing: Brief review of microeconomic and marketing theories on consumer behavior and pricing - Product design, bundling and demand segmentation - Dynamic pricing policies

UNIT - II **(9 Hours)**

Pricing Policies in Action: Markdown policies and liquidations - Pricing with supply constraints - Customized pricing and e-commerce

An Operational Model of RM: Stochastic Inventory Management and the Newsvendor Model - Single resource Revenue Management, expected marginal value to control sales - Overbooking

UNIT - III **(9 Hours)**

Network RM: Network revenue management, control mechanisms - Linear Programming approach to Revenue Management - Applying network RM to different industries

Implementing a RM System: Solving Revenue Management Problems - Computational methods in Revenue Management - Performance Measurement

UNIT - IV **(9 Hours)**

Demand Forecasting and Data Analysis: Data, sources, systems, automation - Time-series forecasting and perfect demand segmentation models - Estimation techniques - Unconstraining for unobservable no-purchases--concept and the EM technique

Competitive Factors: Imperfect segmentation model: Discrete choice models - Customer management and strategic purchasing behavior - RM Process management (organizational issues)

UNIT - V **(9 Hours)**

Industry Applications: Various case studies related to capacity management in airlines, hotels, car rentals, cruises. Industry implementations and practices

New Directions in Revenue Management: Business Analytics - Applications in new industries: Event sales, casinos, Display advertising - Bundling and RM

TEXT BOOK

1. Robert L. Phillips., "*Pricing and Revenue Optimization",* Stanford Business Book, 2005.

REFERENCE

1. K. Talluri andG. Van Ryzin., "*The Theory and Practice of Revenue Management"* , Kluwer Academic Publishers, 2004.

MS15AE04	SOCIAL NETWORK ANALYTICS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE

This course is especially valuable to students contemplating careers in business analytics, marketing, prediction modeling, consulting and general management. Students taking this course will develop expertise in the following areas:

1. Strategic aspects of social media analytics
2. Metrics for assessing the effectiveness of social media strategies
3. Collecting, analyzing, deriving insights from, and dash boarding social media chatter practical analytical and technical skills that differentiates you in any modern enterprise
4. Practical analytical and technical skills that differentiates you in any modern enterprise
5. Techniques for sentiment analysis and text analytics
6. Real world social media applications

UNIT - I **(9 Hours)**

Introduction-The need to measure customer network value-Predictive analytics and social media-Google social media analytics

UNIT - II **(9 Hours)**

Introduction to social networks-Social network metrics-Social network analysis, homophily, and affiliation

UNIT - III **(9 Hours)**

Social influence-Analyzing Twitter and Facebook-Analyzing Email and Wikis

UNIT - IV **(9 Hours)**

Sentiment analysis-Hands on session with social media tools-Hands on session, project discussion

UNIT - V **(9 Hours)**

Text analytics-Social media ROI-Mobile social web

TEXTBOOK

1. Derek Hansen, Ben Shneiderman and Marc A. Smith, *"Analyzing Social Media Networks with NodeXL: Insights from a Connected World",* Morgan Kaufmann.

MS15AE05	BUSINESS PROCESS ANALYTICS	L	T	P	C
		2	0	2	3

COURSE RATIONALE

Processes are the core technologies of all organizations for producing and delivering products or services that satisfy customer needs. Improving overall operating efficiency and customer service effectiveness to meet customer and shareholder expectations requires continuously improving these business processes. This is especially critical for large organizations with complex service and products. Improving business processes has proved challenging especially when technology is introduced to automate processes that are designed poorly. The first rule of any technology is that automation applied to an efficient operation will magnify the efficiency; the second rule is that automation applied to an inefficient operation will magnify the inefficiency. The goal of this course is to provide students with the knowledge & skills necessary to analyze, design, and model a business process that leverages new technologies especially web service technologies to achieve desired operational efficiencies.

COURSE OBJECTIVE

1. To understand the "business process perspective of operations" and its critical importance of process management in manufacturing and service organizations in successfully executing their competitive strategies.
2. To learn to map the critical elements of business processes in manufacturing and service firms; and to model these processes (customers or entities, activities, resources, queues, storages, routings, decisions, processing logic) using a process modeling software such as Process Model™.
3. To understand the impact of resource capacities and flexibility, process efficiencies (speed and robustness and alternative process logic) on process performance metrics (flow time, throughput rate, inventory, and cost).
4. To understand the role of business process management in operations improvement strategies (TQM, BPR, Six-Sigma Campaigns, ERP); and to understand the role of organizational culture and change management during business process improvement.
5. To complete "lean-six-sigma green-belt certification" (written exam) requirements of a Fortune 500 organization.

UNIT - I **(9 Hours)**

Business Process Analysis and Improvement Methods-Key Process Performance Metric; Process Flow Times and Capacity Calculations

UNIT - II **(9 Hours)**

Six-Sigma: DMAIC - DEFINE Phase-Six-Sigma: DMAIC - MEASURE Phase

UNIT - III **(9 Hours)**

Six-Sigma: ANALYZE Phase-Six-Sigma: DMAIC – IMPROVE Phase

UNIT - IV **(9 Hours)**

Six-Sigma: DMAIC – CONTROL Phase

UNIT - V **(9 Hours)**

Six-Sigma: DFSS (Design for Six-Sigma)

TEXTBOOKS

1. James R. Evans and William M. Lindsay., "*An Introduction to Six Sigma &Process Improvement"* (Book and CD), Thomson-Southwestern, 2005. ISBN: 0-324-30075-1 (book and CD package)
2. Michael L. George, David Rowlands, Mark Price, and John Maxey., "*The LeanSix-Sigma Pocket ToolBook*", McGraw-Hill (New York). 2005. ISBN: 0-07-144119-0.
3. Goldratt, E. and Cox, J., The Goal "*A Process of Ongoing Improvement*". 3rd Revised Edition, North River Press, Inc., Croton-on-Hudson: NY 2004.

MS15AE06	SPORTS ANALYTICS	L	T	P	C
		2	0	2	3

COURSE RATIONALE AND OBJECTIVE

Sports analytics refers to the use of data and quantitative methods to measure performance and make decisions to gain advantage in the competitive sports arena. This course builds on the Business Analytics core course and is designed to help students to develop and apply analytical skills that are useful in business, using sports as the application area. These skills include critical thinking, mathematical modeling, statistical analysis, predictive analytics, game theory, optimization and simulation. These skills will be applied to sports in this course, but are equally useful in many areas of business. Typical questions addressed in sports analytics include: How much is a player on a team worth? How to rank players or teams? How to predict future performance of players or teams? How likely are extreme performances, i.e., streaks? Which decision is more likely to lead to a win (e.g., attempt a stolen base or not in baseball, punt or go for it on fourth down in football, dump and chase or not in hockey, pull the goalie or not in hockey)?

Class sessions will involve a mixture of lecture, discussion, and hands-on analysis with computers in class. Each session will typically address a question from a sport using an important analytical idea (e.g., mean reversion) together with a mathematical technique (e.g., regression). Because of the "laboratory" nature of part of the sessions, students should bring their laptops to each class.

UNIT - I **(9 Hours)**

RATING SPORTS TEAMS AND PLAYERS: Course overview - Which basketball team is the best? Which team has the best offense? - How to account for the strength of the schedule or the strength of the field? - Applications of logistic and fixed effects regression models.

UNIT - II **(9 Hours)**

BASEBALL AND FOOTBALL DECISION-MAKING: Baseball: analysis of bunting and base-stealing strategies - Football: analysis of run versus pass, punt or go-for-it - Win probability added, player value added - Applications of state space / Markov chain and game theoretic methods.

UNIT - III **(9 Hours)**

FANTASY SPORTS: Draft strategies, daily leagues, accounting for variability - Performance prediction: exponential smoothing, mean reversion - Application of integer and nonlinear optimization

UNIT - IV **(9 Hours)**

BASEBALL: An analysis using PITCHf/x data - Analysis of streaks - Applications of simulation

UNIT - V **(9 Hours)**

GOLF: Measuring golf performance: What is the key to Tiger's success? - Optimal strategies in golf: trading off risk and reward - Applications of simulation

TEXTBOOK

1. Mathletics, Wayne Winston, Princeton University Press 2009.

REFERENCES

1. Mark Broadie., "*Every Shot Counts*", Gotham Books 2014.
2. Michael Mauboussin, "*The Success Equation*", Harvard Business Review Press 2012.
3. Joe Peta ., "*Trading Bases*", Dutton 2013.
4. Moskowitz and Wertheim., "*Scorecasting*", Crown Archetype 2011.
5. "*Analyzing Baseball Data with R*", Chapman & Hall/CRC 2013.