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THIRD SEMESTER SYLLABUS

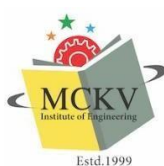| Course Name:	Project Management		
Course Code:	PGBA 301	**Category:**	Management Science and Humanities Courses
Semester:	First	**Credit:**	02
L-T-P:	2-0-0	**Pre-Requisites:**	Must have the knowledge on basic statistics and other decision-making tools.
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To understand the concepts of project planning and organization, budgeting and control, and project life cycles.
2	To learn concepts related to organizational workflow including the staffing process, project planning elements, and the project plan contents and project communications.

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	**Introduction to Project Management**: Meaning and Importance of Project, Determinants of Project Success, Project Life Cycle, Leader Vs Manager, Roles and Responsibilities of Project Manager, Traits of Effective Project Leaders, IT Project Management.	4L
2	**Project Feasibility Studies**:	5L

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	Project Identification, Market and Demand Analysis, Project Evaluation and Selection, Financial Sources, Technical Analysis, Project Cost Estimate, Project Asset- issues and problems	
3	**Investment Feasibility Test:** Estimation of Investment and ROI, Sensitivity and Breakeven Analysis, Economic Decision Trees, various types of Budget, Cost of Capital, Capital Budgeting. Project Management techniques like SDLC, Agile Scrum	10 L
4	**Issues in Project Management:** Project Audit, Project Monitoring and MIS, Real Time Planning, Intangibles,	3L
5	**Project Management:** Case Studies	2L
Total		**24L**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Make a framework for analyzing a project and apply their knowledge systematically to value a business
2	Applying the principles and practices while maintaining high standards of practice, making ethical judgments and decisions in a respectful, and sustaining professional standing through a commitment to life-long learning.
3	Implements the generally recognized framework and good practices of project management, organizational influences; operations; strategic planning; programs; project life cycles; and project management cycles

Learning Resources:	
1	*Project Management - David I Cleland - Mcgraw Hill International Edition.*
2	*Project Management – Gopalakrishnan – Mcmillan India Ltd*
3	*Project Management – K Nagarajan*
4	*Project Management- Erik Larson and Clifford Gray- SEI*
5.	*Project Management-Prasanna Chandra*

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Course Name:	Strategic Management		
Course Code:	PGBA302	Category:	Management Science and Humanities Courses
Semester:	First	Credit:	3
L-T-P:	3-0-0	Pre-Requisites:	To know the existence of management as a tool for making strategic decision
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To introduce the concepts of strategic management and understand its nature in competitive and institutional landscape
2	To understand Strategy formulation process and frameworks, tools and techniques of strategic analysis and its application.
3	To know Key business issues/challenges/problems of business in light of dynamic business environment.
4	Identification, appreciation and interpretation of the critical challenges and opportunities before an organization.

Course Contents:		
Module No.	Description of Topic	Contact Hrs.
1	Introduction to competition, Strategy & Strategist and Process of Strategy	7L
2	Market, Environment & Competitive analysis, External Analysis, Internal Analysis, Solution Analysis, Competitive Advantage Porter's Forces, BCG Matrix, GE Matrix, Ansoff Matrix,	4L

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3	Strategic Position and Dynamics: Competitive Advantage and Value Creation: Conceptual Foundations, Generic strategies, sustaining competitive advantage , business model & value chain	6L
4	Firm Boundaries/Scope of the firm (Corporate strategy), Boydian Thinking & OODA Loop, Evaluation of Strategic Alternatives, Case Study	5L
5	Industry specific strategy- Managing company & Govt. Organization, Managing Change, Risk & Uncertainty, Innovative & Disruptive Technology, Disruptive Innovation	4L
6	Strategy execution and leading change, Case Study	4L
7.	Corporate governance, Corporate Strategy & IT Analytics, New thinking in Strategic Management, Digital Strategy, Implementation	6L
Total		**36L**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Develop their capacity to think and execute strategically
2	Demonstrate capability of making their own decisions in dynamic business landscape.
3	Demonstrate effective application of concepts, tools & techniques to practical situations for diagnosing and solving organizational problems.
4	Developing and executing strategies and will appreciate its integrative and interdisciplinary nature.
5.	Demonstrate a clear understanding of the concepts, tools & techniques used, theories, background work, concept & research.

Learning Resources:	
1	Grant, M.A. (2010), Contemporary strategic analysis, John Wiley & Sons, Edition 8th (SIE)
2	Besanko, David, David Dranove, Mark Shanley and Scott Schaefer. 2009. Economics of strategy, 5th ed. John Wiley & Sons: New York.
3	Concepts in Strategic Management & Business Policy by Thomas L. Wheelen& J. David Hunger, Pearson

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4	The Strategy Process by Mint burg, Quinn, and Ghosal, Publishing House: Prentice Hall
5	Strategy and the business Landscape by Pankaj Ghemawat; Create Space Independent Publishing Platform,Pearson, Fourth Edition
6.	The Innovator's Dilemma by Clayton Christensen – Harvard Business Review Press
7.	Blue Ocean Strategy by W. Chan Kim and Renee Mauborgnee, ISBN :1625274491,Allbooksworld

Course Name:	IOT and Cloud Computing		
Course Code:	PGBA303	Category:	Management Science and Humanities
Semester:	Third	Credit:	2
L-T-P:	2-0-0	Pre-Requisites:	Basic computer knowledge
Full Marks:	100		
Examination Scheme:	70	Continuous Assessment: 25	Attendance: 5

Course Objectives:	
	This module provides an overview of the Internet of Things (IoT) and Cloud Computing concepts, infrastructures and capabilities. This will help students gain the necessary knowledge on IoT systems and use cloud services for processing and storage of the data produced by the IoT devices in different business requirements. Emphasis will be placed on the architecture and design of IoT systems,the different technologies(wireless/mobile/sensor) governing system implementation and

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the migration of the data to the Cloud for processing. This module aims to develop knowledge and critical understanding of the underlying principles of Cloud Computing and IoT systems, and the commercial and business implications of technical advances in this area. Students will gain insights of Cloud-based IoT systems and exposure to appropriate hardware and software platforms that address different business requirements.

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	**Introduction to IoT &Cloud:**Topic 1: Trends of Computing Topic 2: Introduction to IoT Topic 3: Basics of Networking and Communication Protocols	**6**
2	**Internet of Things:** Topic 1: Concept of Smart Things / Objects and IoT Architectures Topic 2: IoT Devices and Sensors Topic 3: IoT communication and protocols Topic 4: IoT and Business Process Management	**6**
3	**Cloud Computing:** Topic 1: Cloud Computing Fundamentals Topic 2: Cloud Computing Architectures Topic 3: Models of Cloud Computing ,Cloud Types and Services Topic 4: Virtualization and Resource Management	**8**
4	**Application of IoT & Cloud:** Topic 1: IoT and cloud integration Topic 2: Security and Privacy for IoT/Cloud Computing Topic 3: Application of Cloud and IoT for different business with use cases	**6**
Total		**26L**

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Course Outcomes:	
After completion of the course, students will be able to:	
1	Describe the IoT and Cloud architectures
2	Determine the right sensors and communication protocols to use in a particular IoT system.
3.	Explain Cloud Services using different cloud technologies
4.	Implement cloud computing elements such as virtual machines, web apps, mobile services, etc
5.	Define security features to protect data stored in the cloud.
6.	.Use visualization techniques to show data generated from the IoT device
7.	Identify the possibilities of implementation of IoT and Cloud in different business problems.

Learning Resources:	
1	Cloud Computing: Concepts, Technology & Architecture (The Pearson Service Technology Series from Thomas Erl) by Erl Thomas (Author), Puttini Ricardo (Author), Mahmood Zaigham (Author)
2	Cloud Computing: Focuses on the Latest Developments in Cloud Computing by Shailendra Singh, Oxford University Press
3	Cloud computing a practical approach - Anthony T.Velte ,Toby J. Velte Robert Elsenpeter,• TATA McGraw- Hill , New Delhi – 2010
4	Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate• Online - Michael Miller - Que 2008
5	"The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
6	"Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)

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7	Internet of Things –by Surya Durbha (Author), Jyoti Joglekar (Author) (Oxford University Press)
8	Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern● Halper, Wiley Publishing, Inc, 2010
9.	Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg,● Andrzej Goscinski, John Wiley & Sons, Inc. 2011

Course Name:	Artificial Intelligence and Machine Learning		
Course Code:		**Category:**	
Semester:	Third	**Credit:**	3
L-T-P:	3-0-0	**Pre-Requisites:**	
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To understand the basic concepts of AI and its use as optimization technique.
2	To understand different search strategies and Resolution in AI.
3	To understand classification and clustering methodology
4	To understand Deep Learning Paradigms.

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1.	Introduction to AI, Machine Learning, AI VS Machine learning Vs. Deep Learning	2
2.	Production Rules, State Diagram, Search Techniques BFS,DFS, DLS, Iterative Deepening etc.	3
3..	Heuristic search Strategy like Hill Climbing, Best First Search, A* search etc. Concept of fuzzy Logic.	3

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4.	Concept of Probabilistic Reasoning, Dempster Shafer theory, concept of False Positive and False Negative, Bayes Theorem , Genetic Algorithm concept as an optimization, Resolution with Proposition and Predicate Logic	5
4	Introduction to Machine Learning , Difference between Supervised and unsupervised learning, Linear regression and Logistic regression , Multivariate Logistic Regression	6
5.	Model Selection and Optimization, Decision Trees, Ensembles and Other Techniques with Case Study.	5
6.	Forecasting Techniques using Time Series, Unsupervised Learning – Clustering, Advanced Topics like SVM. And Case Study.	6
7.	Deep Learning - Neural Network Basics, Shallow Neural Network and Deep Neural Network with Case Study.	6
Total		**36**

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Course Outcomes:	
After completion of the course, students will be able to:	
1	Understand the concept of AI, Fuzzy system and Search Techniques
2	Understand and Implement supervised and Unsupervised Techniques
3	Understand the concept of Deep Learning
4	Apply different AI and ML Techniques to different Business Problems.

Learning Resources:	
1	Artificial Intelligence- Ritch & Knight TMH
2	Machine Learning – Tom Mitchell
3	Deep Learning with Python Paperback- François Chollet (Author)
4.	Pattern Recognition & Machine Learning – C.M. Bishop (Springer)

Course Name:	Data Visualization using Business Intelligence Tools		
Course Code:	PGBA 305	**Category:**	MBA
Semester:	Third	**Credit:**	2
L-T-P:	2-0-0	**Pre-Requisites:**	Basic concepts of Computer
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05
Course Objectives:			
1	To enable the students to analyze large commercial datasets using Business Intelligence/Business Analytics tools to generate insights with clear visual presentation		
2	To develop the ability to apply the knowledge of BI tools and techniques for providing solutions to an organization's real life problems.		
Course Contents:			
Module No.	Description of Topic		Contact Hrs.

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1	Concept of business value from corporate data, Nature and Value of Business Intelligence, Business Intelligence Environment, How types of data processing can add value to corporate data sources	4**L**
2	Knowledge discovery, Data warehousing,Data mining, Business analytics	4L
3	Data visualization, Visualization techniques, Dashboard, Relationship between Corporate Strategy, Business Intelligence Strategy	4L
4	BI links to Enterprise Systems, CRM (Customer Relationships Management), SCM (Supply Chain Management) Structured & Unstructured data, Content Management Systems	4L
5	Privacy, Ethical, Legal issues associated with BI Implementation,Decision Support Systems, Expert Systems and Executive Information Systems	4L
6	Selection of BI/BA tools to provide insights in decision making scenarios, Tools to refine the Data and Create, Edit, Alter, and Display their Visualizations through Excel and RStudio	4L
Total		**24L**

Course Outcomes:

After completion of the course, students will be able to:

1	Apply suitable design principles in the creation of presentations andvisualizations
2	Select appropriate data visualization techniques for given particularrequirements imposed by the data
3	Present data with visual representations for any kind of target audience, task, and data
4	Create multiple versions of digital visualizations using Excel and R.

Learning Resources:

1	Data Visualization - A Practical Introduction By Kieran Healy
2	Storytelling With Data: A Data Visualization Guide for Business Professionals By Cole Nussbaumer Knaflic
3	Big Data Visualization, By James W Miller
4	High Impact Data Visualization with Power View, Power Map, and Power BI, By Adam Aspin
5	Big Data & Hadoop, By V.K. Jain, Khanna Publishing House

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Course Name:	Probability and Stochastic Processes		
Course Code:	PGBA 306	Category:	Basic Science Courses
Semester:	First	Credit:	03
L-T-P:	3-0-0	Pre-Requisites:	High School Mathematics
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To introduce fundamental and advanced probability concepts.
2	To illustrate these probability concepts with examples from Management Sciences.
3	To Learn application in Business decision process and Management.
4	To do statistical analysis informs the judgment of the ultimate decision-maker.
5	Conceptual underpinnings of statistical analysis will be required.

Course Contents:		
Module No.	Description of Topic	Contact Hrs.
1	**Bivariate Probability Distribution:** ➤ Discrete Probability Distribution- Joint Probability Distribution, Marginal Distribution, Expectation, Covariance, Conditional Probability, Independence, Baye's Theorem. ➤ Continuous Probability Distribution- Joint Probability Distribution, Marginal Distribution, Expectation, Covariance, Conditional Probability, Independence, Baye's Theorem.	10L
2	**Convergence Theorem:** ➤ Law of large numbers (Weak and Strong) and Central Limit ➤ Theorem, Convergence of Binomial Distribution to Poisson	6L
3	**Stochastic Process and Markov Chains:** ➤ Definition and classification of general stochastic processes ➤ Markovian process; Definition and examples of Markov Chains ➤ Condition for a Stochastic process to be Markov chain ➤ Classification of states, limiting properties ➤ Transition Probability Matrix	10L
4	**Markov Chains with Discrete State Space:** ➤ Poisson process ➤ Birth and death processes	7L

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	➤ Renewal Process: renewal equation, mean renewal time, stopping time	
5	**Markov Chains with Continuous State Space:** ➤ Introduction to Brownian motion ➤ Congestion Process: Queuing Process, M/M/1 Queue	**7L**
Total		**40L**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Facilitate Objective Solutions in Business Decision Making
2	Enhance Knowledge in Probability Theory.
3	Describe Normality and its Distribution Concepts
4	Stress The Need For Stochastic Process
5	Apply Markov Chains To Control Birth and Death Rate
6	Draw Conclusions over the Brownian Motion
7	Extract the variance among the factors of study concerned

| **Learning Resources:**	
1	R.S.N. Pillai, V. Bagavathi," Statistics", S.Chand Limited, 7th Ed,2008
2	N.D. Vohra, "Business Statistics", Tata McGraw-Hill Education, 2nd Ed,2013
3	G. V. Shenoy, Uma K. Srivastava, S. C. Sharma," Business Statistics", New Age International,2nd Ed, 2005
4	Beri, "Business Statistics" Tata McGraw Hill,2nd Ed,2009
REFERENCE BOOKS:	
1.	Stochastic Processes. S.M. Ross. 2nd Edition. John Wiley & Sons 1996
2.	J. K Sharma, "Business Statistics", Pearson, 2nd Ed, 2010.
3.	Arora PN &others," Complete Statistical Methods", S. Chand, 3rd Ed, 2010

Course Name:	**Business Forecasting & Time Series Analysis**		
Course Code:	PGBA 307	**Category:**	Management Science & Humanities Courses
Semester:	3rd	**Credit:**	03
L-T-P:	3-0-0	**Pre-Requisites:**	Statistics & Quantitative Techniques
Full Marks:	100		
Examination Scheme:	Semester Examination : 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1.	Students master the framework of business forecasting
2.	Students master the use of Excel & SPSS for analyzing the data
3.	Students apply the forecasting methods to evaluate the variables of interest
4.	Students use the result to make the suggestion in the business and economic contexts

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Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	Introduction to Business Forecasting, Overview of the forecast, Review of Statistics, Linear Regression Model	**4**
2	Introduction to Forecasting with Regression Methods, RMSE and Coefficient of Determination ,Introduction to Multiple Regression , Statistical Inference in Multiple Regression	**6**
3	Comparative Analysis Using Regression ,Variable Selection in Multiple Regression, Model Selection in Regression, Checking Regression Models ,Autocorrelation in Regression	**6**
4	Introduction of Time Series : Some representative Time series, Terminology,Objective of Time Series,Approaches to Time Series,Types of Variation, Trend and Seasonal Variation	**6**
5	Time-Series Decomposition and Box-Jenkins (ARIMA)Types of Forecasting Models Concept of Auto correlation and correlogram ,Stationary process	**4**
6	Identification of ARMA models, ARIMA Models, ARIMA Models Identification, Building better models from ARIMA Concept of Unit root test and Inevertibilty.	**5**
7	Parameter Estimation and Diagnostic checking, Forecast using ARIMA models, Modeling Seasonal Data ,Intervention Analysis	**5**
Total		**36L**

Course Outcomes:	
After completion of the course, students will be able to:	
1.	Identify, collect, and organize relevant data useful for forecasting
2.	Identify the appropriate forecasting methods (regression, time series, smoothing, etc.) for any given data.
3.	Forecast using regression
4.	Interpret the results and write a basic report useful for management for decision making
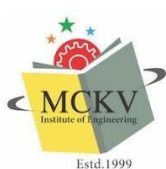
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Learning Resources:	
1	"Forecasting and Time Series", 4th Edition, by Bowerman and O'Connell, Duxbury
2	Francis X. Diebold, *Elements of Forecasting,* 4th Edition, South-western Cengage Learning, 2007
3	J. Holton Wilson and Barry Keating, *Business Forecasting with ForecastX™,* 6th Edition McGraw Irwin, John Galt Solutions, Inc.
4	Introductory Time Series PAUL S.P. Cowpertwait . Andrew V. Metcalfe Springer
5	The Analysis of Time Series An Introduction[Sixth Edition] Chris Chatfield CHAPMAN & HALL/CRC

Course Name: PGBA381: Summer Internships:6 credits

At the end of the second semester, the students will undergo Summer Training for about eight weeks duration in a Professional Organization dealing with data and Analytics. Students need to submit a detailed report related to their internships .Students also need to show a power point presentation in front of a panel comprising of 3-4 faculty members and experts. This entire evaluation would be a part of third semester comprising of 6 credit points.

Course Name:	Machine Learning & Data Visualization Lab		
Course Code:	PGBA391	Category:	Laboratory paper
Semester:	Third	Credit:	2
L-T-P:	0-0-4	Pre-Requisites:	
Full Marks:	100		
Examination Scheme:	Semester Examination: 60	Continuous Assessment: 35	Attendance: 05

Course Objectives:	
1	To understand different figure plots and its implications in problems.
2	To implement different classification and clustering Technique
3	To implement neural network models and understand deep learning methodologies.

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Module No.	Description of Topic/ Experiment	Contact Hrs.
	Course Contents:	
1.	Introduction to Matplotlib – Experiment with plotting of bar Charts, Pie Charts, plotting boxplots , multiple boxplots, triangulation, histogram	4
2.	Customization of Charts – scatter plot, use of Marker and styles, saving graphs to pdf files.	4
3.	Brief introduction to Open Source software like Jamovi®	4
4.	Annotations:- Use of grid, label ,Title etc.	4
5.	Seaborn – Use of factor plot, Figure Level functions, Color map etc.	4
6.	Implementation of Linear Regression , logistic regression, multivariate logistic regression	8
7.	Decision Tree and Ensemble Techniques	4
8.	LSTM algorithm-Time Series Analysis	4
9.	Clustering Techniques Implementation – Different Techniques, SVM implementation	4
10.	Simple neural network implementation, Deep Learning techniques – Shallow and Deep Neural network Concept of Keras , Tensor Flow should be given at the preliminary level.	8
Total		**48**

Course Outcomes:
After completion of the course, students will be able to:

1	Plot and implement graphs in different modes using matplotlib and seaborn.
2	Implement different classification and clustering algorithm
3	Understand and implement decision tree
4.	Should be able to implement Deep Learning Techniques.

Learning Resources:

1	Practical Machine Learning Released January 2016 Publisher(s): Packt Publishing ISBN: 9781784399689 – Sunita Gollapudi
2	Hands-On Machine Learning with Scikit-Learn and TensorFlow- Aureillen Garon O Reilley
3	Hands-On Deep Learning Algorithms with Python-Sudharsan Ravichandiran Packt Publishing
4	Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido Released October 2016 Publisher(s): O'Reilly Media, Inc. ISBN: 9781449369415

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Course Name:	Time Series Analysis with Excel or Other Open Source Softwares		
Course Code	PGBA 392	Category:	MBA Courses
Semester:	3rd	Credit:	1
L-T-P:	0-0-2	Pre-Requisites:	Excel
Full Marks:	100		
Examination Scheme:	60	Continuous Assessment: 35	Attendance: 5

Course Objectives:	
1.	Students to apply the forecasting methods to evaluate the variables of interest
2	Forecast using all average moving methods
3.	Using the combination of excel and the solver

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	i)Introduction to Forecasting ii)Simple Linear Regression Model	**4L**
2	i)Multiple Linear Regression Model ii)Time Series Regression experiment	**4L**
3	i)Modeling and Forecasting Trend experiment ii)Modeling and Forecasting Seasonality experiment	**4L**
4	i) Decomposition of Different Time Series Component with some example. ii) Checking the Stationary with Different methods [Dicky Fuller Test, Kwiatkowski–Phillips–Schmidt– and etc]	**4L**
5	i)Forecasting Cycles problem ii)Forecasting with Trend, Seasonality and Cycles problem	**4L**
6	Forecast using ARMA, ARIMA for time series data	**4L**
Total		**24L**

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Course Outcomes:	
After completion of the course, students will be able to:	
1.	Use the software packages for developing forecasting models
2.	Construct forecasting reports to higher level management for vital decision making process
3.	Understand how to handle the trend, seasonal and cyclical issues in forecasting analysis
4.	Understand the basics in regression analysis, time series analysis and their applications in forecasting

Learning Resources:	
1	J. Holton Wilson and Barry Keating. **Business Forecasting,** _**Sixth Edition**_ (McGraw-Hill/Irwin, 2009)
2	Steven Struhl. **Practical Text Analytics** (Kogan Page, 2015)
3	Shumway, R.H. and D.S. Stoffer, Time Series Analysis and Its Applications, SpringerVerlag, New York, 2000.
4	West, M. and J. Harrison, Baysian Forecasting and Dynamic Models, Second Edition, Springer-Verlag, New York, 1997.

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