MCKV INSTITUTE OF ENGINEERING

NAAC Accredited "A" Grade Autonomous Institute under UGC Act 1956
Approved by AICTE & affiliated to MaulanaAbulKalam Azad University of Technology, West Bengal
243 G.T. Road (N), Liluah, Howrah- 711204, West Bengal, India
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Course Name:	**Financial Analytics**		
Course Code:	PGBA 401A	**Category:**	Management Science and Humanities Courses
Semester:	Fourth	**Credit:**	03
L-T-P:	3-0-0	**Pre-Requisites:**	Basic concept of Managerial Finance
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	The objective of this course is to analyze a firm's past performance, estimating its future performance, and valuing its equity. The course integrates key concepts from accounting, finance, economics, and business strategy and applies them to financial decision-making.
2	The course focuses on how to explore the financial status of any organization.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	Introduction: Meaning-Importance of Financial Analytics; Uses-Features-Documents used in Financial Analytics: Balance Sheet, Income Statement, Cash flow statement-Elements of Financial Health: Liquidity, Leverage, Profitability.	**6**

2	Performance Measures and Holt-Winters Model; Financial Statistics: Concept and mathematical expectation - Probability - Mean; SD and Variance - Skewness and Kurtosis - Covariance and correlation -	**5**
3	Modern Portfolio Theory and Intro to Algorithmic Trading: Concept of Risk and Return; Markowitz Efficient Frontier - variance optimization - Optimal Portfolio of two risky assets - Capital Asset Pricing model, Portfolio Optimization and Trading Analytics; Best income statement Portfolio	**6**
4	Investment and Financial Securities: Bond and Stock investments - Housing and Euro crisis – Securities Market Datasets; Stimulating Trading Strategies: Foreign exchange markets - Applying Computational finance - risk Neutral Pricing and No Arbitrage	**5**
5	Introduction to Pricing and Options; Black - Scholes model and option - Implied volatility: Concept and applications - Derivation - Algorithm for - Implied volatility; Prediction using fundamentals and binomial model for options;	**6**
6	Systematic Risk and Financial Regulations; Advanced Financial Risk Analytics; Empirical characteristics of economic and financial time series;. Bootstrapping confidence intervals; Time Series and Sharpe ratio; Concept of Mobile banking and Fintech and their application in Analytics	**6**

7	Use of Python and R in Financial Analytics; Caselets	**2**
Total		**36L**

Course Outcomes:	
After completion of the course, students will be able to:	
1	To have in-depth knowledge and views regarding the company's financial data
2	Understand different metrics of measuring and managing the tangible assets of a business
3	Take smart financial decisions to increase the business revenue and minimize the waste of the business

Learning Resources:	
1	Financial Analytics with R _ Mark J. Bennets, Cambridge University
2	Paul Teetor. 2011. R Cookbook. O'Reilley: Sebastopol, CA.
3	William G. Foote. 2017. Financial Engineering Analytics: A Topical Manual Using R.
4	Richard Brealey, Stewart Myers, and Franklyn Allen, 2015. Principles of Corporate Finance, various editions, McGraw-Hill

Course Name:	Text and Web Analytics		
Course Code:	PGBA 401B	**Category:**	MSH
Semester:	Fourth	**Credit:**	3
L-T-P:	3-0-0	**Pre-Requisites:**	Basic concepts of Computer
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05
Course Objectives:			

1	To understand the text data processing &Web data
2	To describe the different metrics for text data &Web data
3	To understand the application for text analytics & Web analytics

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	**Introduction:** Understanding of Text Data Sets, Basics of Web Search Engines and Digital Advertising	4**L**
2	**Overview of Text Analytics:** Text Data Formats, Cleaning Data Sets, Duplicate Detection, Tagging Text, Indexing and Searching, Evaluating Classification and Clustering Algorithms on text data with case studies including telemetry data mining techniques.	12L
3	**Overview of Web analytics**: Web analytics 2.0 framework (clickstream, multiple outcomes analysis, experimentation and testing, voice of customer, competitive intelligence, Insights), Experimental methods in web data analytics, Air France Internet Marketing Case Study, Econometric modeling of search engine ads	12L
4	**Overview of some open source Text and Web Analytics tools:** Text Analytics tools like IBM Watson, Meaning Cloud etc. Web analytics metrics: PULSE metrics (Page views, Uptime, Latency, Seven-day active users) on business and technical issues. HEART metrics (Happiness, Engagement, Adoption, Retention, and Task success) on user behavior issues. Web Analytics Tools: Google Analytics, Woopra etc. On-site web analytics, off-site web analytics, the goal-signal-metric process	8L
Total		**36L**

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Course Outcomes:	
After completion of the course, students will be able to:	
1	Recognize the fundamental concepts of Web
2	Analyze text data obtained from different media
3	Explain the experimental methods in text and web data analytics
Learning Resources:	
1	Brian Clifton, Advanced Web Metrics with Google Analytics, John Wiley & Sons; 3rd Edition edition (30 Mar 2012)
2	Avinash Kaushik, Web Analytics: An Hour a Day, John Wiley & Sons. - 2007
3	Applied Text Analysis with Python: Enabling Language-Aware Data Products with Machine Learning by Benjamin Bengfort , Rebecca Bilbro , Tony Ojeda

Course Name:	**Healthcare Analytics**		
Course Code:	PGBA 401 C	**Category:**	Management Science and Humanities Courses
Semester:	Fourth	**Credit:**	03
L-T-P:	3-0-0	**Pre-Requisites:**	Basic understanding of data analytics and programming
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

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Course Objectives:	
	Applying analytics within the healthcare setting. This course focuses on analytical tools used to synthesize big data into meaningful management information that is used in making key business decisions that impact the delivery of healthcare services.

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	Fundamentals of Healthcare Analytics, Data Quality and Governance	6L
2	Application of Business Analytics in Healthcare, Working with Data	8L
3	Developing Effective Indicators, Basic Statistical Methods	6L
4	Big Data & Pharma, Advanced Analytics in Healthcare, Understanding EMR & Understanding compliance standard, Healthcare Domain Data	8L
5	Analyze Big Data using SAS, Ethics & Legal Issue in Health Analytics, Health Institution & Policy	8L
Total		36L

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Course Outcomes:	
After completion of the course, students will be able to:	
	After the completion of the course, students will be able to – • Students will gain knowledge and skills about healthcare analytics • Students will be able to think about new venues on their own • Students will understand the advanced analytics in healthcare • Students will understand data quality & governance

Learning Resources:	
1	*Strome, T. L. (2013). Healthcare analytics for quality and performance improvement.* ISBN: 978-1-118-51969-1
2	*Healthcare Data Analytics (Chapman & Hall/CRC Data Mining and Knowledge Discovery Series Book 36) 1st Edition, Kindle Edition*
3	*Healthcare Analytics Made Simple by Vikas Kumar July 2018 Edition Publisher(s): Packt Publishing ISBN: 9781787286702*

Course Name:	**Introduction to Natural Language Processing**		
Course Code:	PGBA 401D	**Category**:	CSE/IT/MCA
Semester:	Fourth	**Credit**:	3
L-T-P:	3-0-0	**Pre-Requisites:**	B.Tech – CSE Automata/Compiler Design –Preferred.
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

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Course Objectives:	
1	To understand the key concepts from NLP are used to describe and analyze language.
2	To understand POS tagging and context free grammar for English language.
3	To understand semantics and pragmatics of English language for processing

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1.	Introduction:-NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The problem of ambiguity. The role of machine learning. Brief history of the field.	5
2.	N-gram Language Models: - The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models.	5
3.	Part Of Speech Tagging and Sequence Labeling:- Lexical syntax. Hidden Markov Models (Forward and Viterbi algorithms and EM training)	4
4.	Basic Neural Networks:- Any basic introduction to perceptron and back propagation	4
5.	LSTM Recurrent Neural Networks:- Understanding the basic network architecture.	4
6.	Syntactic parsing: - Grammar formalisms and tree banks. Efficient parsing for context-free grammars (CFGs). Statistical parsing and probabilistic CFGs (PCFGs). Lexicalized PCFGs. Neural shift-reduce dependency parsing.	5

7.	Semantic Analysis: - Lexical semantics and word-sense disambiguation. Compositional semantics. Semantic Role Labelling and Semantic Parsing	4
8.	Information Extraction (IE):- Named entity recognition and relation extraction. IE using sequence labeling.	2
9.	Machine Translation (MT):- Basic issues in MT. Statistical translation, word alignment, phrase-based translation, and synchronous grammars.	3
Total		**36**

Learning Resources:
1. Speech and Language Processing, Jurafsky and Martin, Pearson Education
2. Foundation of Statistical Natural Language Processing, Manning and Schutze, MIT Press
3. SPEECH and LANGUAGE PROCESSING-Daniel Jurafsky and James H. Martin

Course Outcomes:	
	After completion of the course, students will be able to:
1	To explain the concept of automata, tokenization and parsing
2	To execute classification, modeling of texts both normal and stochastic form.
3	To evaluate and differentiate Parsing and Semantic analytics
4	To execute different information retrieval models and techniques.

PROFESSIONAL ELECTIVE -II

Course Name:	**Pricing Analytics for Revenue Management**		
Course Code:	PGBA 402A	**Category:**	Management Science and Humanities Courses
Semester:	Fourth	**Credit:**	03
L-T-P:	3-0-0	**Pre-Requisites:**	Knowledge of Elementary Marketing, Probability and Optimization Techniques
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To provides an introduction about both the theory and the practice of revenue management and pricing.
2	Examine the role pricing plays in RM Interpret the role of value as it pertains to buyer
3	Compare and Contrast different strategies employed in revenue management for differing economic conditions

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	Introduction: Examples and simulations - The Revenue Management 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	**8L**
2	Pricing Policies in Action: Markdown policies and liquidations - Pricing with supply constraints - Customized pricing and e-commerce An Operational Model of Revenue Management: Stochastic Inventory Management and the Newsvendor Model - Single resource Revenue Management, expected marginal value to control sales – Overbooking	**7L**
3	Network Revenue Management: Network revenue management, control mechanisms - Linear Programming approach to Revenue Management - Applying network Revenue Management to different industries. Implementing a Revenue Management System: Solving Revenue Management Problems - Computational methods in Revenue Management - Performance Measurement	**7L**
4	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); Regressional models and Application through software	**7L**
5	Industry Applications: Various case studies related to capacity management in airlines, hotels, car rentals, cruises. Industry implementations and practices New Directions in Revenue Management:	**7L**

	Business Analytics - Applications in new industries: Event sales, casinos, Display advertising - Bundling and Revenue Management	
Total		**36L**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Apply strategic and tactic roles of pricing in relevant business contexts
2	Demonstrate how to implement pricing solutions
3	Illustrate successful business requires adequate revenues.
4	Recognize the strategic impact of revenues to the business, organize resources
5	

Learning Resources:	
1	K. T. Talluri and G. J. van Ryzin (2004). The Theory and Practice of Revenue Management. Springer
2	Robert L. Phillips., "Pricing and Revenue Optimization", Publisher: Stanford University Press, 2005.
3	David Hirshleifer, Amihai Glazer Jack Hirshleifer., Price Theory and Applications: Decisions, Markets, & Information; Cambridge University Press, 7th Ed, 2016
4	K. TalluriandG. Van Ryzin., "The Theory and Practice of Revenue Management" , Kluwer Academic Publishers, 2004
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Course Name:	**Marketing Metrics for Analytics**		
Course Code:	PGBA 402B	**Category:**	Management Science and Humanities Courses
Semester:	Fourth	**Credit:**	03
L-T-P:	3-0-0	**Pre-Requisites:**	Basic understanding of data analytics and programming
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
	Applying analytics within the marketing setting. This course focuses on analytical tools used to synthesize big data into meaningful management information that is used in making key business decisions that impact the delivery of marketing services.

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	Marketing Analytics Introduction, : Marketing decisions as interventions ;What customers want?: Customer value, Conjoint Analysis	6L

2	Analytics for customer segmentation and targeting; Demand Forecasting & Pricing; Pricing; Marketing Mix Models and Advertising Models: Advertising and marketing experiments Measuring ROI of marketing campaigns, especially advertising.	8L
3	Market Segmentation & Cluster Analysis; Marketing Mix Models and Advertising Models; Recommender System ; Market Basket Analysis and RFM Analysis ; Metrics, customer lifetime value & ROI ;Customer Churn & Customer Lifetime Value ;Text Mining and Sentiment Analytics	6L
4	Text Mining and Product Innovation Management ; Social Network Analysis for Marketing; Marketplace analytics; Analytics in B2B marketing and startups-Case Studies	8L
5	Political and consulting perspectives on marketing analytics; Building analytics products and the digital marketing ecosystem	8L
Total		36L

Course Outcomes:	
After completion of the course, students will be able to:	
	After the completion of the course, students will be able to – • Students will gain knowledge and skills about marketing analytics • Students will be able to think about new venues on their own • Students will understand the importance of data mining • Students will understand various visual display including pivot tables • Role of Marketing Analytics as a decision support tool in an organization

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Learning Resources:	
1	*Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie or Die* (2016) – ISBN 978-1119145677 – Author: Eric Siegel
2	Marketing Analytics: A Practical Guide to Improving Consumer Insights Using Data Techniques ; Ed. 2 (Paperback – 2018) – Author : Mike Grigsby
3	Marketing Analytics : Strategic Models & Matrics Author : Stephen Sorger Paperback 1st edition 2013.

Course Name:	Social Media Analytics		
Course Code:	PGBA402C	**Category:**	MSH
Semester:	Fourth	**Credit:**	3
L-T-P:	3-0-0	**Pre-Requisites:**	Basic concepts of Data Analytics
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:

1	Understand the role of social media data and analytics in helping organizations achieve their goals and understand their publics;
2	Familiarize the learners with the concept of social media analytics and understand its significance as well monitor consumers and competitors and glean deeper consumer insights based on advanced social media data modeling.
3	Enable the learners to develop skills required for analyzing the effectiveness of social media for business purposes so as to

Course Contents:

Module No.	Description of Topic	Contact Hrs.

1	**Introduction to Social Media Analytics (SMA)**: Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas **Network fundamentals and models:** The social networks perspective - nodes, ties and influencers, Social network and web data and methods. Information visualization	9**L**
2	**Making connections:** Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity. **Web analytics tools:** Clickstream analysis, A/B testing, online surveys, Web crawling and Indexing. Natural Language Processing;Pic metrics; Hit Mart analysis	9L
3	**Facebook Analytics:** Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post-performance on FB. Social campaigns. Measuring and Analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis. (LinkedIn, Instagram, YouTube Twitter etc. Google analytics. Introduction.)	9L
4	Collecting, Processing and analyzing social media data and Visualizing Data, Influence Maximization, Link Prediction, Collective Classification, Applications in Advertising and Game Analytics	9L
Total		**36L**

Course Outcomes:

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

1	Explain concept of social media analytics and understand its significance.
2	Develop social media strategy and measure social media campaign effectiveness
3	Make better business decisions by leveraging social media data
4	Draw meaningful insights and provide actionable and strategic recommendations based on thorough social media data analysis.

5	Understand the tools of social media analytics and their uses
Learning Resources:	
1	Matthew Ganis, Avinash Kohirkar , Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media, Pearson, 2016
2	Jim Sterne ,Social Media Metrics: How to Measure and Optimize Your Marketing Investment , Wiley, Latest Edition
3	Oliver Blanchard ,Social Media ROI: Managing and Measuring Social Media Efforts in Your Organization (Que Biz-Tech) ,Que Publishing , Latest Edition
4	Marshall Sponder, Social Media Analytics , McGraw Hill , Latest Edition
5	Tracy L. Tuten, Michael R. Solomon , Social Media Marketing, Sage, Latest Edition.

Course Name:	HR Analytics		
Course Code:	PGBA402D	**Category:**	MSH
Semester:	Fourth	**Credit:**	3
L-T-P:	3-0-0	**Pre-Requisites:**	Basic concepts of Data Analytics
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To understand the concepts, tools and techniques of HR Analytics that could be applied as resource management evidence based
2	To understand HR reports & to understand the decisions technologies
3	Recognize the fundamental strategic priorities of the business and learn how to provide enhanced decision support leveraging analytics.

Course Contents:

Module No.	Description of Topic	Contact Hrs.

1	**Introduction to HR Analytics:** Basics of HR Analytics: Concept and Evolution of HR Analytics & data sources - HCM: 21Model, use of workforce analytics to improve decision making, Analytics and Prediction.	5**L**
2	**Introduction to HR Metrics and predictive analytics:** Importance of HR Analytics. Data Analytic techniques using software packages, Future of Human Resource Analytics.	5L
3	**Creating business understanding for HR initiatives**: Workforce segmentation and search for critical job roles; Linking HR measures to business results; Identifying and using key HR Metrics.	6L
4	**Forecasting budget numbers for HR costs:** Workforce planning including internal mobility and career pathing; training and development requirement forecasting and measuring the value and results of improvement initiatives; optimizing selection and promotion decisions	8L
5	**Predictive analytics in HR**: Employee recruitment & hiring, Employee retention and turnover	6L
6	**Predictive modeling in HR**: Workforce productivity and performance; scenario planning and employee exits	6L
Total		**36L**
Course Outcomes:		

After completion of the course, students will be able to:	
1	Analyse appropriate internal and external human resource metrics benchmarks and indicators
2	Operate relational databases and make recommendations regarding the appropriate HRIS to meet organization's human resource needs
3	Employ appropriate software to record, maintain, retrieve and analyse human resources information (e.g., staffing, skills, performance ratings and compensation information).
4	Apply quantitative and qualitative analysis to understand trends and indicators in human resource data; understand and apply various statistical analysis methods
5	Analyse the Employee work history & Multi-rater reviews
Learning Resources:	
1	Jac Fitz-Enz and John Mattox, Predictive Analytics for Human Resources, John Wiley & Sons. 2014
2	The New HR Analytics: Predicting the Economic Value of Your Companys Human Capital Investments: Hardcover – Import, 1 Jun 2010
3	Jac Fitz-Enz , The New HR Analytics: Predicting the Economic Value of YouCompany's Human Capital Investments, Amacom.2009
4	Gene Pease, Boyce Byerly and Jac Fitz-enz, Human Capital Analytics: How to Harness the Potential of Your Organization's Greatest Asset, John Wiley & Sons-2009

Course Name:	**Entrepreneurship Development**		
Course Code:	PGBA 403	**Category:**	Management Science and Humanities Courses
Semester:	Fourth	**Credit:**	02
L-T-P:	2-0-0	**Pre-Requisites:**	Basic understanding of marketing and finance

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Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
	To develop and strengthen entrepreneurial quality and motivation in students. To impart basic entrepreneurial skills and understandings to run a business efficiently and effectively

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	**ENTREPRENEURAL COMPETENCE & ENVIRONMENT** Entrepreneurship concept – Entrepreneurship as a Career – Entrepreneurial Personality - Characteristics of Successful, Entrepreneur – Knowledge and Skills of Entrepreneur Business Environment - Role of Family and Society - Entrepreneurship Development Training and Other Support Organizational Services - Central and State Government Industrial Policies and Regulations - International Business	**8L**
2	**BUSINESS PLAN PREPARATION** Sources of Product for Business - Prefeasibility Study - Criteria for Selection of Product - Ownership - Capital - Budgeting Project Profile Preparation - Matching Entrepreneur with the Project - Feasibility Report Preparation and Evaluation Criteria. Funding & Scaling Up, Ideation & Validation, Compliance & Business Plan Communication	**6L**

3	**LAUNCHING OF SMALL BUSINESS** Finance and Human Resource Mobilization Operations Planning - Market and Channel Selection -Growth Strategies - Product Launching – Incubation, Angel Investor & Venture capital, IT startups. Validation Feasibility, ESOP, Field of Analytics based start up	**6L**
4	**MANAGEMENT OF SMALL BUSINESS** Monitoring and Evaluation of Business - Preventing Sickness and Rehabilitation of Business Units- Effective Management of small Business	**4L**
Total		**24L**

Course Outcomes:	
After completion of the course, students will be able to:	
	After the completion of the course, students will be able to – • Students will gain knowledge and skills needed to run a business • Students will be able to write business plan on their own • Students will understand the central and state government policies and regulations • Students will understand venture capital, incubation and IT startups

Learning Resources:	
1	Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi, 2001
2	S.S.Khanka, Entrepreneurial Development, S.Chand and Company Limited, New Delhi,

	2001
3	Mathew Manimala, Entrepreneurship Theory at the Crossroads, Paradigms & Praxis, Biztrantra ,2nd Edition ,2005
4	Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation and Reviews, Tata McGraw-Hill, 1996.
5	P.Saravanavel, Entrepreneurial Development, Ess Pee kay Publishing House, Chennai - 1997.
6	Arya Kumar. Entrepreneurship. Pearson. 2012
7	Donald F Kuratko, T.V Rao. Entrepreneurship: A South Asian perspective. Cengage Learning. 2012

Course Name:	**Predictive and Prescriptive Analytics with Advanced Data**		
Course Code:	PGBA 404	**Category**:	CSE/IT/MCA/BS/Management
Semester:	Fourth	**Credit**:	3
L-T-P:	3-0-0	**Pre-Requisites:**	PGBA 106/PGBA206/PGBA 304
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To learn, how to develop models to predict categorical and continuous outcomes, using such techniques as neural networks, decision trees, logistic regression, support vector machines and Bayesian network models.
2	To know the use of the binary classifier and numeric predictor nodes to automate model selection.
3	To advice on when and how to use each model. Also learn how to combine two or more models to improve prediction

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1.	Introduction to Modeling and Simulation, Mathematical Modeling - Linear Programming (Sensitivity Analysis, Budget Allocation, Scheduling, DEA) - Nonlinear Programming (Pricing, Facility Location, Portfolio Selection) - Integer Programming (Logical constraints, Project Selection, Set Covering) - Network Models (Transportation, Logistic, Supply Chain, Bidding, Shortest Path), AHP in decision making.	12
2.	Review of Regression Analysis - Seasonal, Non-seasonal, Stationary, and Non-stationary Forecasting Techniques	4
3.	Simulation - Probability Distributions and Random Number Generation - Monte Carlo Methods - Statistical Analysis of Simulation Output and Decision Making	6
4.	Artificial Neural Networks - Classification (K-NN, DA) and Clustering (K-means)	4
5.	Model development & techniques Data Partitioning, Model selection, Model Development Techniques, Bayesian Networks, Cox Regression, Association rules	4
6.	Model Evaluation and Deployment Introduction, Model Validation, Rule Induction Using CHAID, Automating Models for Categorical and Continuous targets, Comparing and Combining Models, Evaluation Charts for Model Comparison, MetaLevel Modeling, Deploying Model, Assessing Model Performance, Updating a Model.	6
Total		**36**

Learning Resources:
1. Predictive & Advanced Analytics (IBM ICE Publication)

2. Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die 2nd Edition Wiley
3. Prescriptive Analytics: The Final Frontier for Evidence-Based Management and Optimal Decision-Making Paperback- Pearson

Course Outcomes:	
After completion of the course, students will be able to:	
1	Understand the process of formulating business objectives, data selection/collection, preparation and process to successfully design, build, evaluate and implement predictive models for a various business application.
2	Compare the underlying predictive modeling techniques
3	Select appropriate predictive and prescriptive modeling and identify cases.
4	Apply Predictive and Prescriptive Modeling approaches using Numerical and Software Packages.

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Course Name:	**Data Analytics with Big Data**		
Course Code:	PGBA405	**Category:**	CSE/IT/MCA
Semester:	Fourth	**Credit:**	2
L-T-P:	2-0-0	**Pre-Requisites:**	Should have knowledge of one Programming Language, Practice of SQL (queries and sub queries)
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1.	Understand about commonly used terms and techniques related to data analytics that can be used by managers to make better decisions.
2.	Understand the Big Data Platform and its Use cases
3.	Provide an overview of Apache Hadoop and HDFS
4.	Understand Map Reduce Jobs and Hadoop Eco System

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**

1	**Data Analytics:** **Data Definitions and Analysis Techniques Overview** Elements, Variables, and Data categorization, Levels of Measurement, Data management and indexing, Introduction to statistical learning. **Data Analysis Techniques** Regression analysis , Classification techniques , Clustering , Association rules analysis	6L
2	**Introduction to Big Data and Hadoop:** Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy	8L
3	**HDFS(Hadoop Distributed File System):** The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces	4L
4	**Map Reduce:** Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.	4L
5	**Hadoop Eco System:** Introduction to Pig, Hive and Hbase.	2L

Total	**24L**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Learn the importance of proper data analysis in decision making using Python.
2	Identify Big Data and its Business Implications.
3	Understand the components of Hadoop and Hadoop Eco-System
4	Develop Big Data Solutions using Hadoop Eco System

Learning Resources:	
1.	C. Bishop, Pattern Recognition and Machine Learning, Springer 2007
2.	Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
3.	Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.
4.	Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
5.	Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.

PGBA481: Capstone Project/Dissertation:5 credits

The business capstone project should focus on tapping the intellectual and critical thinking ability of the students related to a work on business analytics domain. Technically, the capstone project research projects need an idea that would be evaluated by a person or group of persons from the industry or an academician connected with industry. The research report should also consist of

capstone project statistics and a capstone project title. Since this is a capstone research project, the document is supposed to have at least four to five pages of information on what ought to be achieved. On average, the projects can last anywhere between eight to twelve weeks. The reports need to be documented and submitted for review. This project will be one of your last few steps in completing the management program. It should force the students to master their chosen area of study.

Course Name:	**Multivariate Data Analysis**		
Course Code:	PGBA 491	**Category:**	MBA Courses(CSE/IT/MCA)
Semester:	Fourth	**Credit:**	02
L-T-P:	**0-0-4**	**Pre-Requisites:**	Multivariate Data Analysis Methods, ML Algorithms based on Multivariate Data and Python Language
Full Marks:	100		
Examination Scheme:	Semester Examination: 60	Continuous Assessment: 35	Attendance: 05

Course Objectives:	
1	To understand the main features of multivariate data.
2	To understand the principles and characteristics of the multivariate data analysis techniques

3	To be able to carry out multivariate statistical techniques and methods efficiently and effectively.
4	To be able to use exploratory and confirmatory multivariate statistical methods properly.

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	• Python for Multivariate Analysis Setting up the python environment Importing the libraries • Reading Multivariate Data into Python • Plotting Multivariate Data A Matrix Scatter-plot A Scatter-plot with the Data Points Labeled by their Group A Profile Plot	**6**
2	• Calculating Summary Statistics for Multivariate Data Means and Variances Per Group Between-groups Variance and Within-groups Variance for a Variable Between-groups Covariance and Within-groups Covariance for Two Variables • Calculating Correlations for Multivariate Data • Standardizing Variable	**6**
3	• Principal Component Analysis Deciding How Many Principal Components to Retain Loadings for the Principal Components Scatter-plots of the Principal Components	**12**
4	• Linear Discriminant Analysis Loadings for the Discriminant Functions Separation Achieved by the Discriminant Functions A Stacked Histogram of the LDA Values Scatter-plots of the Discriminant Functions	**6**
5	• Cluster Analysis	**12**
6	• Regression Analysis	**6**

Total	**48P**

Course Outcomes:	
At the end of the course, the student should be able to:	
1	Explore and summarize multivariate data using graphical and numerical methods and techniques to uncover hidden information and patterns.
2	Distinguish between dependence and interdependence methods in multivariate data analysis
3	Identify the most appropriate statistical techniques for a multivariate dataset
4	Use principal component analysis effectively for data exploration and data dimension reduction.
5	Discriminate between groups and classify new observations.
6	Find groupings and associations using cluster and correspondence analysis.
7	Use factor analysis effectively for exploratory and confirmatory data analysis.
8	Use of statistical software packages effectively and efficiently for the analysis of multivariate data

Learning Resources:	
1	Afifi A., May S. and Clark V.A. (2012) Practical Multivariate Analysis, CRC Press, Taylor &Francis, Boca Raton.
2	Johnson R.A. and Wichern D.W. (2002) Applied Multivariate Statistical Analysis, Prentice Hall of India Pvt Ltd., New Delhi.
3	Brian S. Everitt and Graham Dunn, Applied Multivariate Analysis, Second edition, Arnold press, 2001
4	Manly B.F.J. (1994) Multivariate Statistical Methods–A Primer, Chapman and Hall, London.
5	Case studies from different Websites

Course Name:	**Big Data Lab (Hadoop & Map-Reduce Lab)**		
Course Code:	PGBA492	**Category:**	Professional Core
Semester:	Fourth	**Credit:**	2
L-T-P:	0-0-4	**Pre-Requisites:**	Basic knowledge of Big Data and Python

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Full Marks:	100		
Examination Scheme:	Semester Examination: 60	Continuous Assessment: 35	Attendance: 05

Course Objectives:	
5.	Optimize business decisions and create competitive advantage with Big data analytics
6.	Understand the Big Data Platform and its Use cases
7.	Impart the architectural concepts of Hadoop .
8.	Understand Map Reduce Jobs and Hadoop Eco System

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	**Setting up the platform and environment:-** **Perform setting up and Installing Hadoop in its three operating modes:** **Standalone, Pseudo distributed, Fully distributed**	4P
2	**HDFS(Hadoop Distributed File System):** **Implement the following file management tasks in Hadoop:** **Adding files and directories** **Retrieving files** **Deleting files**	8P
4	**Map Reduce:**	16P

	Word Frequency in a Book Example: hands-on: Find how often each word is used in a real book's text. **Making the Word Frequency Mapper Better with Regular Expressions:** We build on the previous example to do a better job of identifying words, using regular expressions in Python. **Map Reduce program that mines weather data.** Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.	
5	**Hadoop Eco System:** Introduction to Apache Pig, Hive. through Pig Command and Hive operations	12P
Total		**40P**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Implement the file management tasks in Hadoop.
2	Understand Map Reduce Paradigm
3	Understand the components of Hadoop and Hadoop Eco-System
4	Develop Big Data Solutions using Hadoop Eco System

Learning Resources:	
6.	Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
7.	Arshdeep Bahga , Vijay Madisetti "Big Data Analytics: A Hands-On Approach"
8.	Jisha Mariam Jose " Hadoop Practice Guide: SQOOP, PIG, HIVE, HBASE for Beginners,Notion Press
9.	Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

PGBA493: Grand Viva- 3 credits

A Comprehensive Viva-Voce would be conducted for the students to review the knowledge that they have gathered through the two- year course. A group of faculty panel members can ask random questions to the students from any part of the curriculum and they would be reviewed based on it

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