UNIVERSITY OF MADRAS

MASTER OF BUSINESS ADMINISTRATION (MBA) DEGREE PROGRAMME

SYLLABUS WITH EFFECT FROM 2023-2024

934E902: Specialization Courses in Business Analytics

Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E902A	Fundamentals of Business Analytics	Elective	3	-	-	-	3	3	25	75	100
934E902B	Data Analytics with R Programming	Elective	3	-	-	-	3	3	25	75	100
934E902C	Business Analytics Using Python	Elective	3	-	-	-	3	3	25	75	100
934E902D	Data Visualization	Elective	3	-	-	-	3	3	25	75	100
934E902E	Data Analytics in Business Functional Areas	Elective	3	-	-	-	3	3	25	75	100
934E902F	Data Science	Elective	3	-	-	-	3	3	25	75	100
934E902G	Business Intelligence, Big Data, Cloud Computing	Elective	3	-	-	-	3	3	25	75	100
934E902H	Block Chain Technology	Elective	3	-	-	-	3	3	25	75	100
934E902I	Software Project Management	Elective	3	-	-	-	3	3	25	75	100
934E902J	Design and Analysis of Algorithm	Elective	3	-	-	-	3	3	25	75	100

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E902A	**Fundamentals of Business Analytics**	Elective	3	-	-	-	3	45	25	75	100

Course Objectives	
C1	To enable the students to understand the basics of Business Analytics
C2	To create awareness and understanding on visualizing data through collecting, managing and analyzing data.
C3	To educate the students on data mining and multi-dimensional data analysis
C4	To educate the students on machine learning and AI.
C5	To elucidate the students on the analysis of various areas of business

SYLLABUS

UNIT	Details	No. of Hours	Course Objectives
I	**Introduction to Business Analytics:** Meaning - Historical overview of data analysis – Data Scientist Vs Data Engineer Vs Business Analyst – Career in Business Analytics – Introduction to data science – Applications for data science – Roles and Responsibilities of data scientists	9	C1
II	**Data Visualization:** Data Collection - Data Management - Big Data Management - Organization/sources of data - Importance of data quality - Dealing with missing or incomplete data - Data Visualization - Data Classification Data Science Project Life Cycle: Business Requirement - Data Acquisition – Data Preparation - Hypothesis and Modeling - Evaluation and Interpretation, Deployment, Operations, Optimization.	9	C2
III	**Data Mining:** Introduction to Data Mining - The origins of Data Mining - Data Mining Tasks - OLAP and Multidimensional data analysis - Basic concept of Association Analysis and Cluster Analysis.	9	C3
IV	**Machine Learning:** Introduction to Machine Learning - History and Evolution - AI Evolution - Statistics Vs Data Mining Vs, Data Analytics Vs, Data Science - Supervised Learning, Unsupervised Learning, Reinforcement Learning – Frame works for building Machine Learning Systems.	9	C4

V	**Application of Business Analysis:** Retail Analytics - Marketing Analytics -Financial Analytics - Healthcare Analytics - Supply Chain Analytics.	9	C5
	Total	**45**	

Course Outcomes		
Course Outcomes	On completion of this course, students will;	**Program Outcomes**
CO1	Define the basics of Business Analytics	PO1, PO2
CO2	Describe and visualize data through collecting, managing and analyzing data.	PO1, PO2,
CO3	Apply knowledge on data mining and multi-dimensional data analysis	PO2, P05, PO6
CO4	Survey knowledge on machine learning and AI.	PO4, PO5
CO5	Summarize knowledge on the analysis of various areas of business.	PO2, P05, PO6

Reading List	
1.	https://ptgmedia.pearsoncmg.com/images/9780133552188/samplepages/0133552187.pdf
2.	http://www.gerkoole.com/IBA/downloads/IBA_Koole_first_chapters.pdf
3.	Jeen- Su Lim, John H. Heinrichs. (2021) Developing context- relevant project experiences for marketing analytics students. Decision Sciences Journal of Innovative Education 19:2, pages 150-156.
4.	Wullianallur Raghupathi, Viju Raghupathi. (2021) Contemporary Business Analytics: An Overview. Data 6:8, pages 86.

References Books	
1.	Majid Nabavi, David L.Olson, Introduction to Business Analytics, Business Expert Press,2018
2.	Umesh R Hodeghatta and Umesha Nayak, Business Analytics Using R - A PracticalApproachApress, 2017.
3.	Jeffery D.Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, David R.Anderson, Essentials of Business Analytics, Cengage Learning, 2015
4.	Sandhya Kuruganti, Business Analytics: Applications To Consumer Marketing, McGrawHill, 2015
5.	Bernard Marr, Big Data: Using Smart Big Data, Analytics and Metrics to Make BetterDecisions and Improve Performance, Wiley, 2015

CO-PO MAPPING

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1	3	2						
CO 2	2	3						
CO 3		3			3	3		
CO 4				2	3			
CO 5		3			3	3		

3 STRONG 2 MEDIUM 1 LOW

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SYLLABUS WITH EFFECT FROM 2023-2024

Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E902B	**Data Analytics with R Programming**	Elective	3	-	-	-	3	45	25	75	100

Course Objectives	
C1	To familiarize the students about R programming
C2	To understand the R platform
C3	To learn about R tools
C4	To learn about the tools in R platform
C5	Understand the reinforcement learning

SYLLABUS

UNIT	Details	No. of Hours	Course Objectives
I	Overview of R programming - Environment setup with R Studio - SAS versus R - R, S, and S-plus - Obtaining and managing R - Objects - types ofobjects, classes, creating and accessing objects - Arithmetic and matrix operations - Introduction to functions.	9	C1
II	Working with R - Reading and writing data - R libraries - Functions and R programming – the If statement - looping: for, repeat, while - writing functions - function arguments and options – Basic R commands	9	C2
III	Reading and getting data into R (External Data): Using CSV files, XML files, Web Data, JSON files, Databases, Excel files. Working with R Charts and Graphs: Histograms, Boxplots, Bar Charts, Line Graphs, Scatterplots, Pie Charts.	9	C3
IV	Random Forest, Decision Tree, Normal and Binomial distributions, Time Series Analysis, Linear and Multiple Regression, Logistic Regression, Survival Analysis.	9	C4
V	Creating data for analytics through designed experiments, Creating data for analytics through active learning, Creating data for analytics through reinforcement learning.	9	C5
	Total	**45**	

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Course Outcomes		
Course Outcomes	On completion of this course, students will;	**Program Outcomes**
CO1	State knowledge about the R platform	PO2, PO6
CO2	Explain knowledge on R tools	PO1, PO2, PO6
CO3	Develop knowledge graphs and other statistical methods	PO5, PO6, PO7
CO4	Describe advanced statistical tools	PO4, PO7
CO5	Develop knowledge about active and reinforcement learning	PO1, PO6
Reading List		
1.	https://www.cs.upc.edu/~robert/teaching/estadistica/rprogramming.pdf	
2.	https://diytranscriptomics.com/Reading/files/The%20Art%20of%20R%20Programming.pdf	
3.	R Core Team (2016). R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.	
4.	Ritz C, Streibig JC (2005). "Bioassay Analysis using R." Journal of Statistical Software,12(5), 1–22. doi:10.18637/jss.v012.i05.	
References Books		
1.	Raghav Bali, Dipanjan Sarkar and Tushar Sharma, Learning Social Media Analytics withR, Packt Publishing Ltd, 2017.	
2.	Nina Zumel and John Mount, Practical Data Science with R, Manning PublicationsCompany, 2014.	
3.	Peter Dalgaard, Introductory Statistics with R (Paperback) 1st Edition Springer-VerlagNew York, Inc. (ISBN 0-387-95475-9) (2019)	
4.	W. N. Venables and B. D. Ripley. 2002, Modern Applied Statistics with S. 4th Edition.Springer. (ISBN 0-387-95457-0)]	
5.	Andreas Krause, Melvin Olson. 2005, The Basics of S-PLUS, 4th edition, Springer-Verlag, New York (ISBN 0-387-26109-5)	

CO- PO MAPPING

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1		3				2		
CO 2	2	3				3		
CO 3					3	2	3	
CO 4				2			3	
CO 5	3					2		

3 STRONG 2 MEDIUM 1 LOW

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SYLLABUS WITH EFFECT FROM 2023-2024

Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E902C	**Business Analytics Using Python**	Elective	3	-	-	-	3	45	25	75	100

Course Objectives	
C1	Business data analysis techniques and their theoretical foundations
C2	Visualizations using tableau
C3	To understand business models
C4	Analyse various models
C5	Applications of Marketing Analytics

SYLLABUS

UNIT	Details	No. of Hours	Course Objectives
I	**Introduction** Introduction to Business Analytics - Evolution of Business Data and Analytics timeline - Types of Analytics - Marketing Analytics Applications - Summarizing & Reporting Marketing Data using Excel	9	C1
II	**Visualizing Business Data using Tableau** - Visualizations Using Python & R - Understanding the Metrics across domains -Developing Metrics - Flowchart for Metric Creation	9	C2
III	**Business Models & Strategies** Business Models - Marketing Engineering – Segmentation Analytics – Clustering Algorithms - Positioning Analysis - Data Mining applications	9	C3
IV	**Marketing Mix Analytics**: New Product development decisions - Pricing the Product - Forecasting the Sales – Allocating the Retail space & Sales Resource – Consumer Attribution Modelling Methods	9	C4
V	**Marketing Mix Analytics Applications** Customer Churn Modelling – Purchase Behaviour Prediction Models- social media Listening and Sentimental Analysis – Market Basket Analysis – RFM Analysis – Recommender Systems development	9	C5
	Total	**45**	

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Course Outcomes		
Course Outcomes	On completion of this course, students will;	**Program Outcomes**
CO1	Understand and explain key principles, concepts and terms associated with marketing analytics including the Marketing Metrics, web analytics, big data analytics, social media analytics and analytics trends	PO1, PO6
CO2	Construct a metric identifying the areas to be measured for the individual or corporate and how it makes sense to the business managers.	PO1, PO2, PO5
CO3	Demonstrate marketing situations using appropriate instruments to formulate marketing strategies and plans, and to evaluate their impact	PO4, PO6
CO4	Compare marketing situations using appropriate instruments to formulate marketing strategies and plans, and to evaluate their impact	PO4, PO5, PO6
CO5	Prepare marketing Instruments and quantitative methods providing students with an image of the complexity and pitfalls of typical marketing situations and problems	PO2, PO6
Reading List		
1.	https://bedford-computing.co.uk/learning/wp-content/uploads/2015/10/Python-for-Data-Analysis.pdf	
2.	https://cfm.ehu.es/ricardo/docs/python/Learning_Python.pdf	
3.	Van Rossum G, others (2016). Python Programming Language. URL http://www.python.org/.	
4.	Jesus Rogel-Salazar,Data Science and Analytics with Python, 2017	
References Books		
1.	"R for Marketing Research and Analytics", Chris Chapman,Springe Publications, 1st Edition, 2015.	
2.	"Business Analytics", Dinesh Kumar U Wiley India, 1st Edition, 2017.	
3.	"Marketing Metrics: The Definitive Guide to Measuring Marketing Performance", Paul W Farris,Pearson Education, 2nd Edition, 2010.	
4.	"Business Analytics- Texts and Cases", Tanushri Banerjee & Arindham BanerjeeSage Publications, 1st Edition, 2019.	
5.	"Marketing Analytics – Data Driven Techniques with Microsoft Excel", Wayne L Winston,Wiley Publications, 1st Edition, 2015..	

CO-PO MAPPING

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1		3				2		
CO 2	3	3			2			
CO 3				2		3		
CO 4				3	2	2		
CO 5		3				3		

3 STRONG
2 MEDIUM
1 LOW

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SYLLABUS WITH EFFECT FROM 2023-2024

Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E902D	**Data Visualization**	Elective	3	-	-	-	3	45	25	75	100

Course Objectives	
C1	To understand Data visualization
C2	To understand basic visualizations using tableau with basics
C3	To understand advanced Visualizations using tableau
C4	To understand BI and power BI
C5	Visulizations through R

SYLLABUS

UNIT	Details	No. of Hours	Course Objectives
I	**Data Visualization –A primer of Business Intelligence Business** Intelligence - Data Visualization Evolution and Characteristics – Importance of Data Visualization – Data Visualization Process - Data Visualization Tools and Software - Data Visualization Techniques – Best Practices in Data Visualization	9	C1
II	**Data visualization Using Tableau – Basics** - Introduction to Tableau – Tableau interface & Architecture – Data connections & Data Sources – Preparation of Data – Exploring and analyzing data – Creating basic charts – Apply analytics to a worksheet – Creating Groups and Hierarchies - Mapping -Sharing Insights	9	C2
III	**Data visualization Using Tableau – Advanced** Advanced calculations - Parameters – Special Charts - Creation of Dashboards – Dashboard Actions -Story Boards Preparation - Sharing the work – Profile creation in Tableau Public	9	C3
IV	**Reports & Dashboards using Power BI**: Power BI introduction – Power BI Architecture & Process – Connecting Power BI with different Data Sources – Power Query for Data transformation- Data Modelling in Power BI – Reports – Visualization types in Power BI – Statics and Live Dashboards- Data Refresh & Security	9	C4
V	**Visualizing through R , Python & Qlikview** :Grammar of Graphics – GGplot and visualizations using R – Advanced visualizations using matplotlib, seaborn and pyplot – Qlikview overview	9	C5

	Total	**45**	

Course Outcomes		
Course Outcomes	On completion of this course, students will;	**Program Outcomes**
CO1	Define data visualization process and explore different types of visualization and how humans perceive information.	PO2, PO5
CO2	Discuss principles of design and color to make visualizations more engaging and effective and apply techniques from user-interface design to create an effective visualization system.	PO1, PO2
CO3	Demonstrate Data Models and use the DAX Formula language and M language to develop POWERFUL calculations	PO6, PO7
CO4	Explain visualization system for large datasets and dashboards using tableau and power BI, Python and R, interpret the visualization created from the data set	PO2, PO5
CO5	Estimate professional-quality business intelligence reports from the ground up and share for collaboration	PO2, PO4

Reading List	
1.	https://cicerocq.files.wordpress.com/2020/03/sosulski-kristen-data-visualization-made-simple_-insights-into-becoming-visual-2019-routledge.pdf
2.	https://indico.cern.ch/event/681081/contributions/2790760/attachments/1729504/2794629/Principles-of-Visualization-Course-Pt1-Full.pdf
3.	Eric Hehman, Sally Y. Xie, Doing Better Data Visualization, ,First Published October 8, 2021
4.	Wilke, C, fundamentals of data visualization : a primer on making informative and compelling figures, 2019
References Books	
1.	"Storytelling with Data: A Data Visualization Guide for Business Professionals", Cole Nussbaumer Knaflic, Amazon Asia-Pacific Holdings Private Limited, 2015.
2.	"Microsoft Power BI Complete Reference: Bring your data to life with the powerful features of Microsoft Power BI", Devin Knight, Packt Publishing, 2018.
3.	"Data Visualization and Exploration with R: A practical guide to using R, R Studio, and Tidyverse for data visualization, exploration, and data science applications", Eric Pimpler, Amazon Asia-Pacific Holdings Private Limited, 2017.
4.	"Practical Tableau", Ryan Sleeper, O'Reilly Media, 2018.
5.	"Visualization: Visual representations of data and information", The Open University, Amazon Asia-Pacific Holdings Private Limited, 2016.

CO-PO MAPPING

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1		3			2			
CO 2	2	3						
CO 3						2	3	
CO 4		2			3			
CO 5		3		2				

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E902E	**Data Analytics in Business Functional Areas**	Elective	3	-	-	-	3	45	25	75	100

Course Objectives	
C1	To have clear understanding on the concept of HR Analytics
C2	To acquire knowledge on Financial Analytics
C3	To obtain knowledge on CRM Analytics
C4	To understand the concept of Retail Analytics
C5	To acquire knowledge on SCM/Logistics Analytics

SYLLABUS

UNIT	Details	No. of Hours	Course Objectives
I	**HR Analytics:** Data requirements - identifying data needs and gathering data- HR data quality, validity and consistency - Using historical data - Data exploration - Data visualization - Association between variables – Insights from reports - Root cause analysis of HR issues - Employee retention and turnover - workforce productivity and performance - scenario planning.	9	C1
II	**Financial Analytics**: Prospective analysis – Techniques - Elements of detailed forecast – Sensitivity analysis –-Decision tress analysis of capital budgeting - Credit analysis - Mergers and acquisition – Motivations for M &A – Valuation of M & A - Valuation of equity and debt – Primary and secondary market analysis - Assessing market value of equity with book value and index.	9	C2
III	**CRM Analytics**: Customer Analytics Overview - Quantifying Customer Value - Using Stata for Basic Customer Analysis - Predicting Response with RFM Analysis - Statistics Review - Predicting Response with Logistic Regression - Predicting Response with Neural Networks - Predicting Response with Decision Trees.	9	C3
IV	**Retail Analytics:** The digital evolution of retail marketing - Digital natives - Constant connectivity	9	C4

	social interaction - Predictive modelling - Keeping track - Data availability - Efficiency optimization.		
V	**SCM/Logistics Analytics:** Warehousing Decisions, Mathematical Programming Models, P-Median Methods, Guided LP Approach, Balmer – Wolfe Method, Greedy Drop Heuristics, Dynamic Location Models, Space Determination and Layout Methods - Analytic Hierarchy Process, Data Envelopment Analysis, Risk Analysis in Supply Chain, measuring transit risks, supply risks, delivering risks.	9	C5
	Total	**45**	

Course Outcomes		
Course Outcomes	On completion of this course, students will;	**Program Outcomes**
CO1	Clear understanding on the concept of HR Analytics	PO2, PO5
CO2	Knowledge on Financial Analytics	PO1, PO7
CO3	Clarity on CRM Analytics	PO1, PO5, PO6
CO4	Awareness on the concept of Retail Analytics	PO2, PO6
CO5	Knowledge on SCM/Logistics Analytics	PO2, PO5

Reading List	
1.	https://book.akij.net/eBooks/2018/May/5aef50939a868/Data_Science_for_Bus.pdf
2.	http://dspace.vnbrims.org:13000/jspui/bitstream/123456789/4175/1/Business%20analytics%20for%20managers%20taking%20business%20intelligence%20beyond%20reporting.pdf
3.	https://www.netsuite.com/portal/resource/articles/business-strategy/business-intelligence-examples.shtml?mc24943=v2
4.	Peter C,Journal of Business Research, Volume 122, January 2021, Pages 889-901

References Books	
1.	Jac Fitz-Enz , The New HR Analytics: Predicting the Economic Value of YouCompany'sHuman Capital Investments, Amacom.2009
2.	Raghurami Reddy Etukuru, Enterprise Risk Analytics for Capital Markets: Proactive andReal-Time Risk, iUniverse, 2014
3.	Khalid Zidan,Supply Chain Management: Fundamentals, Strategy, Analytics & Planning forSupply Chain & Logistics Management, CreateSpace Independent Publishing Platform, 2016
4.	Chan, Hing Kai, Subramanian, Nachiappan, Abdulrahman and Muhammad Dan-Asabe,Supply Chain Management in the Big Data Era, IGI Global. 2016
5.	Karunakaran, K..Marketing Management. New Delhi: Himalaya Publishing House. 3rdedition, 2013
6.	Jac Fitz-Enz , The New HR Analytics: Predicting the Economic Value of YouCompany'sHuman Capital Investments, Amacom.2009

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1		3			2			
CO 2	3						2	
CO 3	2				3	3		
CO 4		3				2		
CO 5		3			2			

3 STRONG 2 MEDIUM 1 LOW

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E902F	**DATA SCIENCE**	Elective	3	-	-	-	3	45	25	75	100

Course Objectives	
C1	To familiarize the students with the basics of data mining.
C2	Understand the data warehouse
C3	To learn about Regression and correlation
C4	To learn about the tools in the R platform To learn about BI tools
C5	Understand the application in various sectors

SYLLABUS

UNIT	Details	No. of Hours	Course Objectives
I	Data mining, text mining, Web mining, Spatial mining, Process mining, BIprocess- Private and Public Intelligence, Strategic assessment of implementation.	9	C1
II	Data warehouse – characteristics and view - OLTP and OLAP - Design and development of data warehouse, Metadata models, Extract/ Transform / Load (ETL) design.	9	C2
III	Regression and correlation; Classification- Decision trees; clustering – Neural networks; Market basket analysis- Association rules-Geneticalgorithms and link analysis, Support Vector Machine, Ant Colony Optimization.	9	C3
IV	Business intelligence software, BI on web, Ethical and legal limits, Industrialespionage, modern techniques of crypto analysis, managing and organizing for an effective BI Team.	9	C4
V	Applications in various sectors – Retailing, CRM, Banking, Stock Pricing, Production, Crime, Genetics, Medical, Pharmaceutical field.	9	C5
	Total	**45**	

Course Outcomes		
Course Outcomes	On completion of this course, students will;	**Program Outcomes**
CO1	Identify knowledge about data mining	PO2, PO5
CO2	Explain knowledge about data warehouse	PO1, PO6
CO3	Compare knowledge on regression and correlations	PO1, PO5, PO7
CO4	Reframe understanding about business intelligence tools	PO5, PO6

CO5	Generalize knowledge about its applications in various sectors	PO6, PO8
Reading List		
1.	https://doc.lagout.org/Others/Data%20Mining/Data%20Mining_%20The%20Textbook%20%5BAggarwal%202015-04-14%5D.pdf	
2.	https://doc.lagout.org/Others/Data%20Mining/Business%20Intelligence%20and%20Data%20Mining%20%5BMaheshwari%202014-12-31%5D.pdf	
3.	Shu-Hsien Liao, Data mining techniques and applications, 2012	
4.	Dr. M.A. Dorgham, International Journal of Data Mining and Bioinformatics,2020	
References Books		
1.	Anil Maheshwari, Data Analytics Made Accessible, Kindle edition, 2019.	
2.	Foster Provost & Tom Fawcett, Data Science for Business: What You Need to Know Oreilly, 2013	
3.	Jiawei Han, Micheline Kamber and Jian Pei, Data Mining: Concepts and Techniques, 3 rded., Morgan Kaufmann Publishers, 2012	
4.	Ian H.Witten, Eibe Frank and Mark A.Hall, Data Mining: Practical Machine Learning Toolsand Techniques (3rd ed.). Morgan Kaufmann, 2011 (ISBN 978-0-12-374856-0)	
5.	Efraim Turban, Ramesh Sharda, Jay E. Aronson and David King, Business Intelligence,Pearson, 2008.	

CO-PO MAPPING

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1		3			2			
CO 2	3					2		
CO 3	3				2		2	
CO 4					2	3		
CO 5						3		2

3 STRONG 2 MEDIUM 1 LOW

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E902G	**Business Intelligence, Big Data, Cloud Computing**	Elective	3	-	-	-	3	45	25	75	100

Course Objectives	
C1	To familiarize the students on big data platform, applications on big data using Pig and Hive.
C2	To provide insights on data mining tools, methods and techniques.
C3	To throw light on business intelligence software and modern techniques of crypto analysis.
C4	To elucidate on cloud computing characteristics, challenges and applications.
C5	To create awareness and importance of predictive analytics and visual data analysis techniques.

SYLLABUS

UNIT	Details	No. of Hours	Course Objectives
I	**Big Data Frameworks:** Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting. Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and Zookeeper - IBM Info Sphere Big Insights and Streams.	9	C1
II	**Data Mining Tools, Methods and Techniques:** Data mining, Text mining, Web mining, Spatial mining, Process mining, BI process, Private and Public intelligence, Strategic assessment of implementing BI Data Mining Techniques: Introduction, Statistical Perspective on Data Mining, Statistics-need and algorithms, Naïve Bayes Algorithm, Chi-Square Automatic Interaction-Detectors (CHAID)-Classification and Regression Tree (CART) - Analysis of Unstructured Data.	9	C2
III	**Modern Information Technology and its Bu siness Opportunities:** Business intelligence software, BI on web, Ethical and legal limits, Industrial espionage, modern techniques of crypto analysis, managing and organizing for an effective BI Team.	9	C3
IV	**Cloud Computing Introduction and Applications:**	9	C4

	Cloud issues and challenges - Properties - Characteristics - Service models, Deployment models. Cloud resources: Network and API - Virtual and Physical computational resources - Data-storage. Virtualization concepts - Types of Virtualization- Introduction to Various Hypervisors - High Availability (HA)/Disaster Recovery (DR) using Virtualization, Moving VMs, Cloud Computing Applications**:** Overview on Amazon AWS, Microsoft Azure and Google App Engine		
V	**Visualization techniques:** Predictive Analytics- Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.	9	C5
	Total	**45**	

Course Outcomes		
Course Outcomes	On completion of this course, students will;	**Program Outcomes**
CO1	State the knowledge on big data platform, applications on big data using Pig and Hive.	PO2, PO6
CO2	Compare insights on data mining tools, methods and techniques.	PO1, PO5
CO3	Demonstrate knowledge on business intelligence software and modern techniques of crypto analysis.	PO5, PO6, PO7
CO4	Summarize cloud computing characteristics, challenges and applications.	PO2, PO6, PO7
CO5	Develop better understanding on predictive analytics and visual data analysis techniques.	PO1, PO6

Reading List	
1.	http://dhoto.lecturer.pens.ac.id/lecture_notes/internet_of_things/Big%20Data%20Principles%20and%20Paradigms.pdf
2.	https://www.fujitsu.com/rs/Images/WhiteBookofBigData.pdf
3.	Julian Ereth, H. Baars, Cloud-Based Business Intelligence and Analytics Applications - Business Value and Feasibility,2015
4.	O. Ylojoki, and J. Porras, "Perspectives to Definition of Big Data: A Mapping Study and Discussion", Journal of Innovation Management, vol. 4, no. 1, pp. 69-91, 2016. http://hdl.handle.net/10216/83250.
References Books	
1.	Jaiwei Ham and Micheline Kamber, Data Mining concepts and techniques, Kauffmann Publishers, 2006
2.	Efraim Turban, Ramesh Sharda, Jay E. Aronson and David King, Business Intelligence,Prentice Hall, 2008.
3.	Colleen Mccue, "Data Mining and Predictive Analysis: Intelligence Gathering and

	Crime Analysis", Elsevier, 2nd Edition, 2015.
4.	Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2nd Edition, 2007.
5.	Frank J Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series, 2013.

CO-PO MAPPING

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1		3				2		
CO 2	2				3			
CO 3					3	2	2	
CO 4		3				3	2	
CO 5	3					2		

3 STRONG 2 MEDIUM 1 LOW

UNIVERSITY OF MADRAS

MASTER OF BUSINESS ADMINISTRATION (MBA) DEGREE PROGRAMME

SYLLABUS WITH EFFECT FROM 2023-2024

Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E902H	**Block Chain Technology**	Elective	3	-	-	-	3	45	25	75	100

Course Objectives	
C1	To acquire knowledge of various techniques and various algorithms used in Blockchain
C2	To understand how blockchain systems work and how to securely interact with them
C3	To familiarize the functional and operational aspects of cryptocurrency
C4	To establish deep understanding of the Ethereum model and deploy smart contracts applications
C5	To understand the consensus and hyper ledger fabric in block chain technology.

SYLLABUS

UNIT	Details	No. of Hours	Course Objectives
I	Introduction: Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.	9	C1
II	Blockchain & Applications: Introduction to Block chain, Gartner's Hype Curve and Evolution of Blockchain Technology, Blockchain Need & Genesis, Key Characteristics of Blockchain, Blockchain Structure, Blockchain types and Network, Mining and Consensus, How Blockchain Works, Bitcoin Whitepaper, Understanding Bitcoin, Components of a Block, Forks: soft & hard forks, Ummer blocks, Different forks from Bitcoin, Wallets, Transactions, Public & Private keys, Blockchain Applications : Internet of Things, Medical Record Management System, Do-main Name Service and future of Blockchain.	9	C2
III	Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin. Cryptocurrency Regulation: Stakeholders, Roots of	9	C3

	Bitcoin, Legal Aspects - Cryptocurrency Exchange, Black Market and Global Economy.		
IV	Ethereu**:** Need of Ethereum, Ethereum Foundation, Ethereum Whitepaper, How Ethereum Works, Ethereum network, Ethereum Virtual Machine, Transactions and Types, Mining & Consensus, Smart Contracts.	9	C4
V	Hyperledger fabric: Hyperledger, Hyperledger Fabric, Comparison between Fabric & Other Technologies, Fabric Architecture, Components of Hyperledger Fabric, Advantages of Hyperledger Fabric Blockchain, How Hyperledger Fabric Works.	9	C5
	Total	**45**	

Course Outcomes		
Course Outcomes	On completion of this course, students will;	**Program Outcomes**
CO1	Define the importance and the foundations of Blockchain.	PO2, PO6
CO2	Associate key features, different types of platforms & languages of blockchain technology.	PO1, PO2, PO8
CO3	Solev better insights about cryptocurrency concepts.	PO1, PO6, PO7
CO4	Explain the design principles of ethereum.	PO2, PO5
CO5	Develop hyperledger fabric model and its architecture.	PO2, PO6

Reading List	
1.	http://book.itep.ru/depository/blockchain/blockchain-by-melanie-swan.pdf
2.	https://www.blockchainexpert.uk/book/blockchain-book.pdf
3.	Sanyam Jain, Journal of Emerging Technologies and Innovative Research,2017
4.	Sheikh Mohammad Idrees, Exploring the Blockchain Technology: Issues, Applications and Research Potential,2021

References Books	
1.	Imran Bashir, Mastering Blockchain, Packt Publishing, March 2017
2.	Debajani Mohanty, BlockChain: From Concept to Execution, BPB Publications, 2nd edition, 2018
3.	Artemis Caro, Blockchain: Bitcoin, Ethereum&Blockchain: The Beginners Guide to Understanding the Technology Behind Bitcoin & Cryptocurrency, 2017
4.	Andreas M. Antonopoulos, Gavin Wood, Mastering Ethereum: Building Smart Contracts and DApps, O'REILLY, 2018
5.	Nitin Gaur, Luc Desrosiers, Venkatraman Ramakrishna, Petr Novotny, Dr. Salman A. Baset and Anthony O'Dowd, Hands-on Blockchain with Hyperledger, Packt Publishing, 2018
6.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfede, "Bitcoin and Cryptocurrency Technologies", Princeton University Press, 2016.

CO-PO MAPPING

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1		3				2		
CO 2	2	3						3
CO 3	3					3	2	
CO 4		2			3			
CO 5		3				3		

3 STRONG 2 MEDIUM 1 LOW

UNIVERSITY OF MADRAS

MASTER OF BUSINESS ADMINISTRATION (MBA) DEGREE PROGRAMME

SYLLABUS WITH EFFECT FROM 2023-2024

Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E902I	**Software Project Management**	Elective	3	-	-	-	3	45	25	75	100

Course Objectives	
C1	To acquire and understand the concept of software projects and steps in software project management
C2	To enable the students to prepare business proposals for software management
C3	To familiarize the students to evaluate technical feasibility and financial viability of projects
C4	To establish deep understanding of the market acceptability and social desirability of software projects
C5	To make the students as effective project managers and as part of software project teams.

SYLLABUS

UNIT	Details	No. of Hours	Course Objectives
I	Software projects and metrics - Software Project Management – Concepts and 3 P's (People, problem and process) Metrics in the process and project domains, Software measurement – size-oriented metrics, function-oriented metrics and extended function point metrics, Integrating metrics within the software process	9	C1
II	Software project planning - Software Project planning – objectives, scoping, Resources – human resources, reusable software resources and environmental resources Software project estimation – Popular decomposition techniques – problem-based, process-based and empirical estimation (COCOMO model).	9	C2
III	Software outsourcing and project scheduling - The Make-Buy decision – creating a decision tree, Software outsourcing – issues involved Project Scheduling and tracking – relationship between people and effort – defining a task set for the software project.	9	C3
IV	Software risk management and configuration management -Risk Management – Reactive and Proactive risk strategies, Risk identification, projection, mitigation and monitoring – RMMM Plan Software configuration management – process and	9	C4

	standards		
V	Object-oriented software projects and CASE tools - Management of Object-oriented software projects – process framework, metrics, estimation and scheduling approach, Computer-aided Software Engineering (CASE) – CASE tools – their building blocks and taxonomy	9	C5
	Total	**45**	

Course Outcomes		
Course Outcomes	On completion of this course, students will;	**Program Outcomes**
CO1	Understand the steps in software project management	PO2, PO6
CO2	Discuss and prepare business proposals for software management	PO1, PO2, PO8
CO3	Discover better insights about technical feasibility and financial viability of projects	PO1, PO6, PO7
CO4	Support the market acceptability and social desirability of software projects	PO2, PO5
CO5	Develop the students as effective project managers and as a part of software project teams.	PO2, PO6

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

References Books	
1.	Robert T. Futrell, Donald F. Shafer, and Linda I. Safer, Quality Software Project Management, Pearson Education, 2002
2.	Ian Sommerville, Software Engineering, Pearson Education, 2010
3.	Bob Hughes and Mike Cotterell, Software Project Management,McGraw-Hill, 2009
4.	Roger Pressman, Software Engineering: A Practitioner's Approach, Tata McGraw-Hill, 2005

CO-PO MAPPING

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1		3				2		
CO 2	2	3						3
CO 3	3					3	2	
CO 4		2			3			
CO 5		3				3		

3 STRONG 2 MEDIUM 1 LOW

UNIVERSITY OF MADRAS

MASTER OF BUSINESS ADMINISTRATION (MBA) DEGREE PROGRAMME

SYLLABUS WITH EFFECT FROM 2023-2024

Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E902J	**Design and Analysis of Algorithms**	Elective	3	-	-	-	3	45	25	75	100

Course Objectives	
C1	To understand and apply the algorithm analysis techniques.
C2	To enable the students to critically analyse the efficiency of alternative algorithmic solutions for the same problem.
C3	To familiarize the students with the different algorithm design techniques.
C4	To establish deep understanding of the design and analysis of algorithms
C5	To make the students understand the limitations of Algorithmic power.

SYLLABUS

UNIT	Details	No. of Hours	Course Objectives
I	Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. Analysis Framework – Amortized analysis – Mathematical analysis for Recursive and Non-recursive algorithms – Types of Solution Procedure/Algorithm	9	C1
II	Introduction – Terminologies of Graph – Network – Tree. Data Structure – Stack – Queue – Linked List – Binary Tree – Balanced Tree – Matrix Algorithms – Magic Square Problem – Tower of Hanoi – String Matching – Hashing. Network Algorithms – Dijkstra's Algorithm – Floyd's Algorithm – Minimum Spanning Tree – Maximal Flow Problem	9	C2
III	Sorting Algorithms – Insertion Sort – Bubble Sort – Heap Sort – Quick Sort – Merge Sort – PARSORT – Radix Sort – Selection Sort – Topological Sort. Backtracking Algorithms – n-Queen Problem – Hamiltonian Circuit Problem – Subset Sum Problem – Graph Colouring Problem. Search Algorithms – Increment Search – Binary Search – Fibonacci Search – Brand and Bound Algorithms – Heuristics – Travelling Salesman Problem – Simple Heuristic to Minimize Total Tardiness in Single Machine Scheduling Problem – Heuristic for Total Covering Problem – Huffman Code – Transportation Problem –	9	C3

	Heuristics for Scheduling.		
IV	Dynamic Programming – Terminologies – Knapsack Problem – Shortest Path Problem – Minimizing total tardiness in a Single Machine Scheduling Problem – Reliability Problem – Travelling Salesman Problem – Chained Matrix Multiplication – Binomial Coefficients. MetaHeuristics – Simulated Annealing Algorithm – Genetic Algorithm – Tabu Search – Ant Colony Optimization Algorithm. Cryptography – Substitution Algorithms – Transposition Methods – Public-key Cryptography. Probabilistic Algorithms – Construction of Cumulative Probability Distribution – Methods of Random Number Generation – Discrete Event Simulation	9	C4
V	Benchmarking of Algorithms – Comparison of Algorithm using Optimal Solutions – Comparison of Algorithm in terms of Performance Measure of Another Algorithm – Comparison of GA-based Heuristic (GAH) with an existing Heuristic (H). Algorithms to Schedule Processor – Concept of Single Processor Scheduling – Algorithms to Schedule Jobs in Parallel Processors – Scheduling 56 of Pre-emptible Dependent Jobs on Parallel Processors to Minimize Makespan. Complexity of Algorithms – Intractability of Problem – Problems with Polynomial Time Algorithms – Exponential Time Algorithms – Problems for those neither Intractability is Proved nor Polynomial Time Algorithm Exist till now. P, NP, NP-Complete, NP-Hard and NP-Easy Problems	9	C5
	Total	**45**	

Course Outcomes		
Course Outcomes	On completion of this course, students will;	**Program Outcomes**
CO1	Understand and apply the algorithm analysis techniques	PO2, PO6
CO2	Discuss the efficiency of alternative algorithm solutions for the same problem	PO1, PO2, PO8
CO3	Sketch better insights about the different algorithm design techniques	PO1, PO6, PO7
CO4	Explain the design and analysis of algorithms	PO2, PO5
CO5	Support the students to understand the limitations of algorithmic power.	PO2, PO6

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

CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1		3				2		
CO 2	2	3						3
CO 3	3					3	2	
CO 4		2			3			
CO 5		3				3		

3 - STRONG 2 - MEDIUM 1 - LOW