Program: B Tech/ MBA Tech Artificial Intelligence, B Tech (Artificial Intelligence and Machine Learning, Artificial Intelligence and Data Science)					Semester:	III / IV	
Course: S	Course: Statistical Methods				Code: 702E	S0C027	
	Teaching S	Scheme			Evaluatio	on Scheme	
Lecture (Hours p week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)		Term End Examinations (T (Marks - 100)	
2	2	0	3	Marks So	caled to 50	Marks Sca	aled to 50
Pre-requi	site: Random Pi	cocesses and H	Estimatior	n, Applied	Vector and I	Linear Algeb	ora.
Course Objective This course aims to develop sound knowledge and skills in theoretical and application oriented statistics. It will also help students to equip with intermediate to advanced be concepts and tools in statistics that help them tackle relevant problems within engineer domain					pplication- anced level ngineering		
Course O	utcomes						
After com	pletion of the co	ourse, the stud	dent will l	be able to -			
1. Kn	ow the applicati	ons of statisti	cs and sai	mple the po	opulation us	ing various	sampling
tec.	nniques ssify tabulato a	nd roprosont	data and i	calculato th	o doscriptiv	o statistics	
3. Ext	plain the concep	ts of multivar	iate regre	ssion mode	els, principal	l component	analysis
and	l discriminant a	nalysis	0			1	5
4. An	alyze and imple	ment a simple	e and mul	ltiple linear	r regression	model	
Detailed	Syllabus						
Unit	Description						Duration
1 Introduction to Statistics 0 Definition of Statistics. Basic objectives. Applications in various branches of science with examples. Collection of Data: Internal and external data, Primary and secondary Data. Population and sample, Representative sample. 0					02		
Sample. 2 Sampling Techniques Random sampling. Sampling from finite and infinite populations. Estimates and standard error (sampling with replacement and sampling without replacement), Sampling distribution of sample mean, stratified random sampling.						03	

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3	Classification and tabulation of Data	07
	Meaning and objective of classification, Types of classification,	
	formation of discrete and continuous distribution.	
	Data Classification and Data Presentation	
	Histogram, Frequency distribution, Quantitative Data Graphs (Histograms, Frequency Polygons, Ogives, Dot Plots, Stem-and- Leaf Plots); Qualitative Data Graphs (Pie Charts, Bar Graphs, Pareto Charts); Graphical Depiction of Two-Variable Numerical Data: Scatter Plots	
	Descriptive Statistics Measures of Central Tendencies – Grouped and Ungrouped Data; Mean, Sample Mean– Weighted mean, Geometric Mean, Harmonic Mean; Median – Quartiles, Deciles and Percentiles; Mode, Box Plot; Measures of Variability– Dispersion, Range, Standard deviation, Chebyshev's theorem; Population v/s sample variance and standard deviation, Skewness; Kurtosis.	
4	Simple and Multiple Linear Regression Model Least squares and linear regression: Introduction; Notation; Ordinary least squares; Regression to the mean; Simple and Multiple Linear regression; Residuals; Regression inference	05
5	Multivariate Regression Assumptions of Multivariate Regression Models, Parameter estimation, Multivariate Analysis of variance.	05
6	Discriminant Analysis Statistical background, linear discriminant function analysis, Estimating linear discriminant functions and their properties.	04
7	Principal Component Analysis Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.	04
	Total	30
Text E	Books Richard A. Johnson, Dean W. Wichern, <i>Applied Multivariate Statistical Analysis</i> , edition, Pearson, 2008	6 th
2. (Supta, S. P., Statistical Methoas, Sultan Chand & Sons, 2012	

3. J.D. Jobson, Applied Multivariate Data Analysis, Vol I & II, Springer Publication.

Reference Books

1. Agresti, A., *An Introduction to Categorical Data Analysis*, 3rd edition, John Wiley & sons, 2012

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Signature (Head of the Department)



- 2. Hastie T., Tibshirani R., & Friedman J., *The Element of Statistical Learning, Data mining, Inference and Prediction*, 2nd edition, Springer, 2016
- 3. Hair, Black, Babin, Anderson and Tatham, *Multivariate Data Analysis*, 7th edition, Pearson, 2009

Laboratory/ Tutorial Work

8 to 10 experiments (and a practicum where applicable) based on the syllabus.

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Program: B Tech/ MBA Tech Artificial Intelligence, B Tech (AI and ML, AI and DS, CSE (DS))					Semes	ter : IV
Course: Machine Learning				Code:	702AI0C012	
Teaching Scheme				Evaluation Scheme		
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credi t	Internal Continuous Assessment (ICA) (Marks - 50)		Term End Examinations (TEE) (Marks - 100)
3	2	0	4	Scaled to 50 n	narks	Scaled to 50 marks

Pre-requisite: Computer Programming, Linear Algebra, Calculus, Probability

Course Objective

This course provides a concise introduction to the fundamental concepts in machine learning from a practical perspective. Also it covers the different learning algorithms, paradigms and frameworks used in Machine Learning.

Course Outcomes

After completion of the course, the student will be able to -

- 1. Identify machine learning techniques suitable for a given problem.
- 2. Apply regression model to solve problems in machine learning domain.
- 3. Analyze and apply classification and clustering algorithms on data

Detailed Syllabus

Unit	Description	Duration
1.	Overview of Machine Learning What is machine learning, Why Machine learning, Broad categories of machine learning algorithms- supervised and unsupervised learning. Supervised learning- classification and regression, unsupervised learning- clustering. Real world applications of supervised and unsupervised algorithms. Parametric vs. non parametric models, Curse of dimensionality, model selection, No free lunch theorem	04
2.	Data Exploration, Pre-processing and Visualization Missing Values Treatment, Handling Categorical data: Mapping ordinal features, Encoding class labels, Performing one-hot encoding on nominal features, Outlier Detection and Treatment. Feature Engineering: Variable Transformation and Variable Creation, Selecting meaningful features Library	05



	Sci-kit Learn for Pre-processing, Pandas for Exploratory Data Analysis, NumPy for Statistical Analysis, Matplotlib for Data				
	Visualization				
3.	Regression Simple Linear Regression, Ordinary Least square, Gradient descent algorithm, Bias, Variance, Bias-variance trade off, Cross validation, Regularization- Ridge and LASSO regression, Multiple Regression, polynomial Regression.	08			
4.	Classification Logistic Regression for binary classification, Gradient of logistic regression, Binary cross entropy function, performance evaluation of classification algorithms: confusion matrix, ROC, AUC, k-Nearest Neighbour Algorithm, Naïve Bayesian Classifier, Support Vector Machine, Kernels in SVM	10			
5.	Tree based algorithms Decision tree classifier, Ensemble Learning- Bagging, Boosting, Random forest, AdaBoost, XGBoost.	08			
6.	Clustering Hierarchical Methods: Agglomerate versus Divisive Hierarchical Clustering, Partitioning Methods: k-Means Clustering, Density-Based Clustering: DBSCAN. Dimensionality reduction: Principle Component Analysis.	10			
Text Bo	nks				
1. K	Cavin Murphy, <i>Machine Learning : A probabilistic perspective</i> , Illustrated erress, 2012.	dition, MIT			
2. A	Turelien Geron, Hands-on Machine Learning with Scikit Learn, Keras and Ter dition, Oreilly Publication, 2019.	isorflow, 2 nd			
Referen	ce books:				
1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, <i>The Elements of Statistical Learnin Data Mining, Inference, and Prediction</i> , 2nd Edition, Springer, 2017.					
2. Ju Jo	2. Judith Hurwitz, Daniel Kirsch, <i>Machine Learning for dummies</i> , IBM Limited Edition John Wiley & Sons, Inc., 2018.				
Laborat	ory/ Tutorial Work				
8 to 10 e	xperiments (and a practicum where applicable) based on the syllabus.				





Program: B Tech/ MBA Tech Data Science					Semester: IV		
Course: Introduction to Data, Signal and Image Analysis					Code: 702DB0C007		
Teaching Scheme Evaluation Scheme						luation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)		Term End Examinations (TEE) (Marks- 100)	
3	2	0	4	Marks Scaled to 50		Marks Scaled to 50	
Prerequisite: Nil							

Objectives

The interaction of data science and technology with the world is via signal processing: detecting, transcoding, understanding and generating time-dependent and space-dependent signals in the broadest sense. Data is rich and abundant. However, every data wrangler has come across most of the time this data, which is very noisy in nature. Processing noisy signals and filtering unwanted part from an image has been a huge concern over the last few decades. Signal and image processing techniques developed today are very robust and effective models. The objective is to port some processing techniques from the audio and signal field and use them to process data. To give basic mathematical understanding of transformation for image and signal processing and sampling To introduce elementary concepts of LTI system, convolution.

Course Outcomes

After completion of the course, the student will be able to -

- 1. Classify discrete and continuous data signals and learn the engineering mathematical aspect of it and perform operations on it
- 2. Model finite impulse and infinite impulse response filters
- 3. Simplify the concepts of Convolution and Sampling to solve and support problems
- 4. List the fundamental concepts in Image representation and state basic filtering techniques to facilitate noise removal

Detail	ed Syllabus	
Unit	Description	Duration
1	Data Communication Fundamentals, Data and signals, A simplified model	08
	of a data communication system, Defining Data and its types, Electrical	
	representation of data, its characteristics, domain and spectrum concept,	
	Distinguish between data and signal, basic parameters that are required	
	for characterizing the signal, introduction to standard cts, mathematical	
	operations on cts	

Signature (Head of the Department)



2	LTI convolution (Discrete), Convolution integral (continuous), single and	08			
	double side representation of signal, circular (periodic) convolution (for				
	discrete), Z-transform; finding z-tx. of signal, problems on ROC, using				
	ROC problem determining whether system is stable, causal or anti-causal,				
	sampling problem without proof to determine min/ideal/nyquist				
	sampling rate when an analog signal is given, finding transfer function,				
	impulse response, step response from given difference equation				
3	Fourier Series (for periodic cts); Trigonometric; exponential, Fourier	12			
	Transform of signal(non-periodic continuous); properties with proof,				
	Laplace transform; its properties, problems on region of convergence, from				
	given equation finding zero input; state and total response, problems of				
	initial and final values				
4	Digital iir filter design; impulse invariant; bilinear transformation,	08			
	Butterworth filter design, fir filter design using window function, fir vs. iir				
5	Image Representation; What is a digital image; its layout; color, resolution	04			
	and quantisation, bit plane slicing, image formats, image data types, image				
	compression, color spaces				
6	What is Pixel; Histogram equalisation and matching, why perform	05			
	enhancement; filtering for noise removal; mean; median; rank; Gaussian				
	filtering				
	Total	45			
Text Bo	ooks				
1. Nag	goor Kani, <i>Signals and Systems</i> , 20 th edition, Mc Graw Hill Education India pvt.	Ltd., 2018			
2. Anil Jain, Fundamentals of Digital Images Processing, 1st edition, Pearson, 2015					
Refere	nce Book				
1. S.S.	alivahanan , Digital Signal Processing, 4th edition, McGraw Hill, 2019				

Laboratory/ Tutorial Work

8 to 10 programming exercises (and a practicum) based on the syllabus



Program: B Tech (Artificial Intelligence, Data Science, Computer					Semes	ter : III/IV	
Engineering, Information Technology, CSE (Cyber), AI and ML,							
AI and DS, C	AI and DS, CSBS, CSE (DS), Computer Science)						
MBA Tech A	ll Programs						
Course: Database Management Systems				Code: 7	702AI0C001		
Teaching Scheme I				valuatio	on Scheme		
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA)		Term End Examinations (TEE) (Marks - 100)	
2	2	0	3	Marks Scale	1 to 50	Marks Scaled to 50	
2	2 2 0 3 Marks Scaled to 50 Marks Scaled to 50						
Pre-requisite: Nil							

Course Objective

The objective of the course is to provide a comprehensive introduction to the fundamental concepts for design and development of database systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a database management system.

Course Outcomes

After completion of the course, student will be able to -

- 1. Describe core concepts of database and model a database management system through ER modelling
- 2. Apply knowledge of relational algebra and structured query language to retrieve and manage data from relational database
- 3. Demonstrate the use of normalization for database design
- 4. Demonstrate the concept of transactions and use modern database techniques such as NoSQL

Detailed Syllabus

Unit	Description	Duration
1	Introduction Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Data Models, Database Users and Administrator	03
2	Database Design and the E-R Model Overview of the Design Process, The Entity-Relationship Model, Constraints, Entity Relationship Diagrams, Reduction to Relational Schemas, Schema Diagrams, Entity-Relationship Design Issues, Extended ER features	05
3	Introduction to the Relational Model	03



Signature (Prepared by Concerned Faculty/HOD) SVKM's NMIMS Deemed-to-be University Mukesh Patel School of Technology Management and Engineering

	Structure of Relational Databases, Database Schema, Keys, Relational Algebra, Basic operators of Relational Algebra,	
4	Structured Query Language Overview of the SQL Query Language, SQL Data Definition, SQL Constraints, Basic Structure of SQL Queries, Additional Basic Operations, DML operations, Set operations, Aggregate Functions, Nested Sub- queries, Joins, views	06
5	Relational Database Design Features of Good Relational Designs, Problems with bad design, Decomposition using concept of functional dependencies, Armstrong's axioms, Closure of functional dependency, Closure of attribute, Introduction to process of Normalization and de-normalization, Normal Forms- 1NF, 2NF, 3NF, BCNF	05
6	Transactions What is Transactions? Properties of transaction, Transaction states, Issues with concurrent executions, Schedules, Serializability- Conflict and View	04
7	Introduction to NoSQL Overview of NoSQL, characteristics of NoSQL, Storage types of NoSQL, Implementing NoSQL in MongoDB - Managing Databases and Collections from the MongoDB shell, Finding Documents in MongoDB collection from the MongoDB shell.	04
	Total	30
Text Bo	oks	
1. H	Jennery Korth and Abraham Silberschatz, Database System Concepts, 7th Edition	on, McGraw

- Hill, 2019
- 2. Gaurav Vaish, *Getting Started with NoSQL*, 1st edition, Packt Publication, March 2013
- 3. Brad Daylel, *NoSQL with MongoDB in 24 Hours*, 1st edition, Sams Teach Yourself, January 2015

Reference Books

- 1. Elmarsi and Navathe, Fundamentals of Database Design, 7th Edition, Addison Wesley, 2019
- 2. Bob Bryla, Kevin Loney *Oracle Database 12C The Complete Reference*, 1st edition, Tata McGraw Hill, 2017

Laboratory Work

8 to 10 experiments (and a practicum where applicable) based on the syllabus



Engineering, Information Technology, CSE (Cyber), AI and ML, AI and DS, CSE (DS),Computer Science) MBA Tech (Artificial Intelligence, Computer Engineering, Information Technology)	Program: B Tech (Artificial Intelligence, Computer				Semeste	er: III/IV/V	
and ML, AI and DS, CSE (DS),Computer Science) MBA Tech (Artificial Intelligence, Computer Engineering, Information Technology)	Engineerin	g, Informati	on Technolo	gy, CSE (Cy	ber), AI		
MBA Tech (Artificial Intelligence, Computer Engineering, Information Technology)	and ML, Al	I and DS, CS	SE (DS),Com	puter Scienc	ce)		
Information Technology)	MBA Tech	(Artificial Ir	telligence, O	Computer Er	ngineering,		
	Information Technology)						
Course: Web ProgrammingCode: 702AI0E005	Course: Web Programming				Code: 702AI0E005		
Teaching SchemeEvaluation Scheme	Teaching Scheme				Evaluation Scheme		
Lecture (HoursPractical (HoursTutorial (HoursInternal CreditTerm End Continuous Assessment (ICA)DerperperperCreditAssessment (ICA)	Lecture (Hours per	Practical (Hours per	Tutorial (Hours per	Credit	Internal Continuous Assessment (ICA)		Term End Examinations (TEE)
week) week) (Marks - 50) (Marks - 100)	week)	week)	week)		(Marks - 50)		(Marks - 100)
2 0 3 Marks Scaled to 50 Marks Scaled to 50	2	2	0	3	Marks Scal	ed to 50	Marks Scaled to 50

Prerequisite: Computer Programming

Course Objective

The objective of this course is to develop modern web application by leveraging latest technologies. It helps them to learn new technologies by applying foundation paradigms, building strong expertise to develop end to end application - web frontend and backend development.

Course Outcomes

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

- 1. Explain the fundamentals of web programming
- 2. Design front end of a web application
- 3. Establish database connectivity between front-end and back-end

Detailed Syllabus

Unit	Description	Duration
1.	Introduction Concept of website, its need and purpose, Types of websites: Static and dynamic website, Introduction to HTML, XML, JSON, Web Browsers, – Web Servers, Uniform Resource Locator, Tools and Web Programming Languages, HTTP, Web Standards, Tiered Architecture: Client Server Model, Three Tier Model	02
2.	Hyper Text MarkUp Language Languages used for website development, HTML5: basic tags, formatting tags, Adding images, Lists, Embedding multimedia in Web pages, Inserting tables, Internal and External Linking, Frames, Forms	05



3.	Cascading Style Sheets (CSS3)	05				
	Basics of Cascading Style sheets, Advantages of CSS, External Style					
	sheet, Internal style sheet, Inline style sheet, CSS Syntax, color,					
	background, Font, images					
4.	Java Script	04				
	Features of JavaScript, extension of JavaScript, Syntax of JavaScript:					
	data types, operators, variables, tag, Document Object Model (DOM)					
	statement: for for/in while do while break and continue. Form					
	Validation using IavaScript.					
5.	Angular IS	08				
	Introduction to Angular JS, Single Page Application, Angular	00				
	features, Expressions, Modules, Directives, Model, controllers, Data					
	bindings, Scopes, Tables, Angular JS Forms and validation, Services,					
	HTTP, Dependency Injection, Events.	1				
6.	Node JS	06				
	Introduction, Modules, HTTP module, URL module, File system,					
	MYSOL database with Node is					
	Introduction, Express.js, create database, create table, insert, update					
	select, delete, where, order by, drop table.					
	Total	30				
Text B	ooks					
1. DT	Editorial Services, HTML 5 Black Book, Dreamtech Press, 2nd Edition, 2016					
2. Ken Williamson, <i>Learning AugularJS – A Guide to AngularJS-Development</i> , Oreilly Media,						
	1 st Edition, 2015 2 Basent Ali Swed Basinnia Mada is 1st adition America 2014					
5. Dasart An Syeu, <i>beginnig noue</i> .js, 1 st edition, Apress, 2014						
Reference Books						
Publishing, 2020						
2. Achyut Godbole, <i>Web Technologies</i> , Tata McGraw-Hill, 3rd Edition, 2013.						
3. Azat Mardan, "Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB, 2 nd Edition,						
Ap	ress, 2015					
Laboratory/ Tutorial Work						
8 to 10 experiments (and a practicum where applicable) based on the syllabus						





: Data H	т 11• 1	Program: B Tech/ MBA Tech Data Science, B Tech AI and DS				Semester : IV / V		
	landling and	Course: Data Handling and Visualization				Code: 702DB0C001		
Teaching Scheme				Evaluation Scheme				
ure s per ek)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Examinations (TEE) (Marks- 100)			
	0	0	2	Scaled to 50 Marks	Scale	ed to 50 marks		
Pre-requisite: Nil								
Course Objective To learn data handling using appropriate tools. To visualize the data using BI tools by understanding various factors involved in developing the charts. To train on using various visual charts for unbiased and effective conveying of information.								
 Course Outcomes After completion of the course, the student will be able to - 1. Choose data precisely and handle it as per the requisite 2. Show the right chart for representing the data 3. Construct and prepare interactive dashboards 								
d Syllal	bus							
Descri	ption					Duration		
Introduction to Data Literacy How to read and interpret data and charts.					03			
Understanding color schemes and other rules of creating charts03				03				
 Introducing BI tools – Identify different types of source data, Identify how data fields differ by type and use, Describe the importance of knowing the granularity of data, Demonstrate an understanding of Analytical terminology, Describe key areas of the BI tool workspace, Build common views, including a bar chart and crosstab, 				04				
	ure s per k) uisite: I Objecti a data h anding or unbia Outcom mpletic ose data v the rig struct a: d Syllal Descri Introd Introd Identif Identif Identif Descri Build of Bring v	Teaching SurePractical (Hours per week)a0uisite: Nil0Objective0a data handling using anding various factor or unbiased and effecOutcomesonpletion of the course ose data precisely and v the right chart for restruct and prepare inte d SyllabusDescriptionIntroduction to Data How to read and int Understanding colorIntroducting BI tools Identify how data fie Describe the importa Describe the importa Demonstrate an und Describe key areas o Build common view Bring views together	Teaching SchemeIre s per k)Practical (Hours per week)Tutorial (Hours per week)0000uisite: Nil0Objectivea data handling using appropriate to anding various factors involved in or unbiased and effective conveyinOutcomesmpletion of the course, the student ose data precisely and handle it as a v the right chart for representing the struct and prepare interactive dash d SyllabusDescriptionIntroduction to Data Literacy How to read and interpret data ar Understanding color schemes and Introducing BI tools – Identify different types of source of Identify how data fields differ by Describe the importance of knowi Demonstrate an understanding of Describe the importance of knowi Demonstrate an understanding of Describe key areas of the BI tool w Build common views, including a Bring views together in an interact	Teaching SchemeIre is per k)Practical (Hours per week)Tutorial (Hours per week)Credit002uisite: Nil02Objective a data handling using appropriate tools. To vis anding various factors involved in developing or unbiased and effective conveying of informaOutcomesmpletion of the course, the student will be able ose data precisely and handle it as per the requ v the right chart for representing the data struct and prepare interactive dashboardsDescriptionIntroduction to Data Literacy How to read and interpret data and charts.Understanding color schemes and other rulesIntroducing BI tools – Identify different types of source data, Identify how data fields differ by type and us Describe the importance of knowing the gram Demonstrate an understanding of Analytical in Describe key areas of the BI tool workspace, Build common views, including a bar chart an Bring views together in an interactive dashbo	Teaching SchemeEvaluatioIrre (Fours per week)Practical (Hours per week)Tutorial (Hours per week)Internal Continuous Assessment (ICA) (Marks - 50)002Scaled to 50 Marksuisite: Nil02Scaled to 50 MarksObjectivea data handling using appropriate tools. To visualize the data using Bl anding various factors involved in developing the charts. To train on or unbiased and effective conveying of information.Outcomesmpletion of the course, the student will be able to - ose data precisely and handle it as per the requisite v the right chart for representing the data struct and prepare interactive dashboardsd SyllabusDescriptionIntroduction to Data Literacy How to read and interpret data and charts.Understanding color schemes and other rules of creating chartsIntroduction g BI tools - Identify different types of source data, Identify how data fields differ by type and use, Describe the importance of knowing the granularity of data, Demonstrate an understanding of Analytical terminology, Describe key areas of the BI tool workspace, Build common views, including a bar chart and crosstab, Bring views together in an interactive dashboard.	Teaching SchemeEvaluation ScheIrre (Hours per week)Tutorial (Hours per week)Internal (Continuous Assessment (ICA) (Marks - 50)Exam (M002Scaled to 50 MarksScale002Scaled to 50 MarksScaleobjectiveadata handling using appropriate tools. To visualize the data using BI tools I anding various factors involved in developing the charts. To train on using vo or unbiased and effective conveying of information.Outcomesmpletion of the course, the student will be able to - ose data precisely and handle it as per the requisite v the right chart for representing the data struct and prepare interactive dashboardsd syllabusDescriptionIntroduction to Data Literacy How to read and interpret data and charts.Understanding color schemes and other rules of creating chartsIntroducting BI tools - Identify different types of source data, Identify how data fields differ by type and use, Describe the importance of knowing the granularity of data, Demostrate an understanding of Analytical terminology, Describe key areas of the BI tool workspace, Build common views, including a bar chart and crosstab, Bring views together in an interactive dashboard.		



4	Basic Working with BI tools –			
	Joining tables and using calculations,			
	Using multiple data source,	05		
	Filtering on Data source,			
	Using sets.			
	Advanced Working with BI tools –			
	Applying context filter,			
5	Splits,	04		
	Table calculations,	04		
	Secondary table calculations,			
	Level of Details.			
	Analytical Working with BI tools –			
	Using parameters,			
6	Advanced mapping,	04		
	Time based data analysis,			
	Seasonality.			
7	Creating various maps to show information	04		
8	Merging BI tools with programming language for enhanced data	03		
	analytics			
Total	30			
Text Bo	ooks			
1. Cole	e Nussbaumer Knaflic, Storytelling with Data: A Data Visualization Guide for Bu	siness		
<i>Professionals</i> , 1 st Edition, Wiley, 2015				
2. Andy Cotgreave, Jeffrey Shaffer and Steve Wexler, <i>The Big Book of Dashboards: Visualizing Your</i>				
Data Using Real-World Business Scenarios, 2 nd Edition, Wiley, 2017				
Reference Books				
1. Stephen Few, Information Dashboard Design: Displaying Data for At-a-glance Monitoring, 2 nd				
Edition, Analytics Press, 2013				
2. Scott Berinato, Good Charts: The HBR Guide to Making Smarter, More Persuasive Data				
Visualizations, 1st edition, Harvard Business School Publishing, 2016				
Laboratory/ Tutorial Work				
8 to 10 programming exercises (and a practicum) based on the syllabus				

