



Department of Information Technology
Syllabus of B.Sc. in Information Technology (Big Data Analytics)
 (Effective from academic session 2019-20)

Semester-V

Name of the Course: B.Sc. in Information Technology (Big Data Analytics)			
Subject: Advanced Big Data Analytics & Advanced Big Data Analytics Lab			
Course Code:BITBDA501 & BITBDA591		Semester: V	
Duration: 36 Hrs.		Maximum Marks: 100+100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		End Semester Exam: 70	
Tutorial: 0		Attendance : 5	
Practical:4 hrs./week		Continuous Assessment:25	
Credit: 3+2		Practical Sessional internal continuous evaluation:40	
		Practical Sessional external examination:60	
Aim:			
Sl. No.			
1.	To gain knowledge in MapReduce, pig ,spark , SCALA and SPARK ,Hive, SQOOP, Tableau programming.		
Objective:			
Sl. No.	Understanding of the MapReduce paradigm and Hadoop ecosystem		
1.	develop data analysis skills with Hive and Pig		
2.	be able to analyze temporal, geospatial, text, and graph data with Spark		
3.	Learn how to use machine learning algorithms on large datasets and analyze outcomes with Mahout (Hadoop) and (Spark)		
Pre-Requisite:			
Sl. No.			
1.	Data Science & Analytics,		
2.	Big Data Analytics, ,		
3.	Database Management System		
4.	HDFS and MapReduce		
Contents			Hrs./week
Chapter	Name of the Topic	Hours	Marks
01	Advanced MapReduce: MapReduce Joins, Sorting, Counters in MapReduce, Real Time MapReduce	3	5
02	PIG: Introduction, Execution Modes, Pig Latin Basics, PIG Operators]joining data-sets, user defined functions	8	15
03	Hive:	3	5



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	Hive overview and concepts, Comparison with traditional Databases, HiveQL, Hive tables, Partitioning, Bucketing, Joins		
04	SQOOP: Introduction, SQOOP Connectors, Import and Export using SQOOP	4	10
05	SCALA and SPARK: SCALA: What is Scala? Basic Operations, variable types, control structure, for each loop, functions, procedures, array, higher order functions, Class in Scala, getters and setters, constructor, singletons, traits SPARK: Spark Components & its Architecture, Spark Deployment Modes, Spark RDDs, RDD operations, transformations and actions, data loading and saving, Key-Value Pair RDDs, RDD Persistence, SPARK SQL, data frames and datasets, JSON and Parquet file formats,	9	15
06	Tableau: Tableau installation, Data type, file type, tool type, show me menu, Type of data source supported by, how to connect different data source, edit metadata, filter fields, filter data source, type of charts, filter data, data joining, data blending, extract data, adding filter data, apply filter on chart and data, number functions, string functions.	6	15
07	Big Data Issues: Privacy, Visualization, Compliance and Security	3	5
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	44	100

Practical:

Skills to be developed:

Intellectual skills:

After successful completion of the course students should be able to

1. To understand several key big data technologies used for storage, analysis and manipulation of data.
2. To recognize the key concepts of Hadoop framework, MapReduce, Pig, Hive, SQOOP, Spark.



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3. Data Visualization using Tableau

List of Practical:

1. Configure HIVE with MySQL and perform queries for Create, Alter & Drop Table (for both managed and external tables)
2. Perform advanced HIVE queries (index, view, order by, group by, joins, subqueries, cluster by)
3. Configure PIG and implement various PIG commands, implement same programs using PIG script
4. Perform import and export database/tables from/to hadoop/RDBMS using Sqoop (Use various options like custom number of mappers, delimiters, change default directory, etc.)
5. Implement advanced mapreduce programs using joins, counters and sorting
6. Implement various tasks with Apache Spark (verify installation, create RDD, execute word count transformation, cache transformations and check output)
7. Perform Data Visualization using various Tableau features
8. Prepare a case study/survey presentation on Big Data security and visualization

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Michael Minelli, Michelle Chambers, and AmbigaDhiraj	Big Data, Big Analytics: Emerging		
Tom White	Hadoop: The Definitive Guide	Third Edition	O'Reilley, 2012

Reference Books:

Eben Hewitt	Cassandra: The Definitive Guide		O'Reilley, 2010
P. J. Sadalage and M. Fowler	NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence		Addison-Wesley Professional, 2012

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer
2.	Apache Hadoop 2 .x or above

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question	Total Marks	No of question	To answer	Marks per question	Total Marks

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		to be set		to be set			
A	1 to 7	10	10	5	3	5	60
B	1 to 7			5	3	5	
C	1 to 7			5	3	15	
<ul style="list-style-type: none"> • Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part. • Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							
Examination Scheme for end semester examination:							
Group	Chapter	Marks of each question	Question to be set	Question to be answered			
A	All	1	10	10			
B	All	5	5	3			
C	All	15	3	3			
Examination Scheme for Practical Sessional examination:							
Practical Internal Sessional Continuous Evaluation							
Internal Examination:							
Continuous evaluation				40			
External Examination: Examiner-							
Signed Lab Note Book			10				
On Spot Experiment			40				
Viva voce			10	60			



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Name of the Course: B.Sc. in Information Technology (Big Data Analytics)			
Subject: Artificial Intelligence & Artificial Intelligence Lab			
Course Code: BITBDA502 & BITBDA592		Semester: V	
Duration: 36 Hrs.		Maximum Marks: 100+100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		End Semester Exam: 70	
Tutorial: 0		Attendance : 5	
Practical: 4 hrs./week		Continuous Assessment:25	
Credit: 3+2		Practical Sessional internal continuous evaluation:40	
		Practical Sessional external examination:60	
Aim:			
Sl. No.			
1.	To provide basic knowledge of employing intelligent agents in solving complex problems.		
2.	Ability to apply the tools in knowledge representation and reasoning for real- world problems.		
3.	Explain the basic knowledge representation, problem solving, and learning methods of Artificial Intelligence.		
Objective:			
Sl. No.			
1.	Expose the history and foundations of artificial intelligence.		
2.	Showcase the complexity of working on real time problems underlying the need for intelligent approaches.		
3.	Illustrate how heuristic approaches provide a good solution mechanism.		
4.	Provide the mechanisms for simple knowledge representation and reasoning.		
5.	Highlight the complexity in working with uncertain knowledge.		
Pre-Requisite:			
Sl. No.			
1.	Knowledge in Programming in Python/R		
2.	Knowledge in Data structure		
Contents			Hrs./week
Chapter	Name of the Topic	Hours	Marks
01	History And Foundations History – Scope – Influence from life – Impact of computing domains - Agents in environments - Knowledge representation – Dimensions of Complexity – Sample application domains – Agent structure.	6	10
02	Search Problem solving as search – State spaces – Uninformed Search –	10	20

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	Heuristic search – Advanced search – Constraint satisfaction - Applications.		
03	Knowledge Representation And Reasoning Foundations of knowledge representation and reasoning, representing and reasoning about objects, relations, events, actions, time, and space predicate logic, situation calculus, description logics, reasoning with defaults, reasoning about knowledge, sample applications.	10	20
04	Representing And Reasoning With Uncertain Knowledge Probability, connection to logic, independence, Bayes rule, Bayesian networks, probabilistic inference, sample applications.	6	10
05	Case Study And Future Applications Design of a game / Solution for problem in student"s domain. Natural Language processing, Robotics, Vehicular automation – Scale, Complexity, Behaviour – Controversies.	4	10
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Practical:

Skills to be developed:

Intellectual skills:

1. Students who complete this course will be able to
2. Discuss the history, current applications, future challenges and the controversies in artificial intelligence.
3. Apply principle of AI in the design of an agent and model its actions.
4. Design a heuristic algorithm for search problems.
5. Analyze and represent the fact using logic for a given scenario
6. Represent uncertainty using probabilistic models
7. Develop a simple game or solution using artificial intelligence techniques.

List of Practical:

Hand on practical based on theory paper

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the
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			Publisher				
Ritch & Knight	Artificial Intelligence		TMH				
Stuart Russel Peter Norvig	Artificial Intelligence A Modern Approach		Pearson				
Reference Books:							
Patterson	Introduction to Artificial Intelligence & Expert Systems		PHI				
Saroj Kaushik	Logic & Prolog Programming		New Age International				
List of equipment/apparatus for laboratory experiments:							
Sl. No.							
1.	Computer						
2.	Python/R						
End Semester Examination Scheme.		Maximum Marks-70.		Time allotted-3hrs.			
Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 5	10	10				60
B	1 to 5			5	3	5	
C	1 to 5			5	3	15	
<ul style="list-style-type: none"> Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part. Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							
Examination Scheme for end semester examination:							
Group	Chapter	Marks of each question	Question to be set	Question to be answered			
A	All	1	10	10			
B	All	5	5	3			
C	All	15	3	3			
Examination Scheme for Practical Sessional examination:							
Practical Internal Sessional Continuous Evaluation							
Internal Examination:							
Continuous evaluation				40			
External Examination: Examiner-							
Signed Lab Note Book			10				
On Spot Experiment			40				
Viva voce			10		60		



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Name of the Course: B.Sc. in Information Technology (Big Data Analytics)			
Subject: Pattern Recognition			
Course Code:BITBDA503A		Semester: V	
Duration: 36 Hrs.		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		End Semester Exam: 70	
Tutorial: 0		Attendance : 5	
Practical: 0		Continuous Assessment:25	
Credit: 3		Practical Sessional internal continuous evaluation:NA	
		Practical Sessional external examination:NA	
Aim:			
Sl. No.			
1.	To solve practical problems in natural language processing using statistical techniques.		
2.	Handle generic issues in information retrieval and processing.		
3.	Process and categorize the information retrieved from sources.		
Objective:			
Sl. No.			
1.	To introduce the Natural Language Processing Methods.		
2.	To educate information retrieval from search engines.		
3.	To explain various statistical methods for natural language processing		
Pre-Requisite:			
Sl. No.			
1.	Programming knowledge		
2.	Mathematics		
Contents			Hrs./week
Chapter	Name of the Topic	Hours	Marks
01	Basics of pattern recognition Bayesian decision theory Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions Discrete features	6	5
02	Parameter estimation methods Maximum-Likelihood estimation, Gaussian mixture models, Expectation-maximization method Bayesian estimation	8	15
03	Hidden Markov models for sequential pattern classification Discrete hidden Markov models, Continuous density hidden Markov models	9	15
04	Dimension reduction methods Fisher discriminant analysis, Principal component analysis, Parzen-window method, K-Nearest Neighbour method, Non-parametric techniques for density estimation	6	20
05	Linear discriminant function based classifier	7	15

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	Perceptron, Support vector machines Non-metric methods for pattern classification Non-numeric data or nominal data, n Decision trees		
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
S. Theodoridis and K. Koutroumbas	Pattern Recognition	4th Ed.	Academic Press, 2009
R. O. Duda, P. E. Hart and D. G. Stork	Pattern Classification		John Wiley, 2001.

Reference Books:

C. M. Bishop	Pattern Recognition and Machine Learning		Springer, 2006
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End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 7	10	10				60
B	1 to 7			5	3	5	
C	1 to 7			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	All	1	10	10
B	All	5	5	3
C	All	15	3	3



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Name of the Course: B.Sc. in Information Technology (Big Data Analytics)			
Subject: Web Analytics			
Course Code: BITBDA503B		Semester: V	
Duration: 36 Hrs		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		End Semester Exam: 70	
Tutorial: 0		Attendance : 5	
Practical: 0		Continuous Assessment:25	
Credit: 3		Practical Sessional internal continuous evaluation:NA	
		Practical Sessional external examination:NA	
Aim:			
Sl. No.			
1.	Explore various parameters used for web analytics and their impact.		
2.	Explore the use of tools and techniques of web analytics.		
3.	Get experience on websites, web data insights and conversions		
Objective:			
Sl. No.			
1.	To know the importance of qualitative data, get insights and techniques.		
2.	To develop customer-centric approach in dealing with data		
3.	To know the principles, tools and methods of web intelligence		
4.	To apply analytics for business situations		
Pre-Requisite:			
Sl. No.			
1.	Data computational Skill		
Contents			Hrs./week
Chapter	Name of the Topic	Hours	Marks
01	Introduction To Web Analytics A Brief history of Web Analytics ,Web Analytics Terminology , Traditional Web Analytics , Web Analytics 2.0 ,Capturing Data- Tools Selection – Quality Aspects ,Implementing Best Practices.	3	5
02	Web Data Collection Web Traffic Data ,Web Transactional Data ,Web Server Data , Page Weights , Usability Studies ,User Submitted Information , Integrating Form based data ,Web Data Sources , Server Log Files , Page Tags , Click stream Data ,Outcomes Data ,Research Data ,Competitive Data.	6	15
03	Web Analytics Strategy Component of Web Analytics Strategy , Customer Centric Focus – ,Business Problem Solving Focus , Reporting vs Analysis , IT and Business Strength ,Clickstream vs Web 2.0 , Vendor Specific Options and Issues.	7	15
04	Metrics and KPIs Measuring Reach , Measuring Acquisition , Measuring Conversion ,	7	15



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	Measuring Retention , Focus on 'Critical Few', Key Performance Indicators , Case Studies.		
05	Data Analysis Customer centricity , Lab Usability Studies , Usability Alternatives , Surveys, Heuristic Evaluations , Web enabled user research options , Competitive Intelligence Analysis	8	15
06	Web Analytics Tools Content organization tool , Process measurement tools, Visitor Segmentation Tools, Campaign Analysis , Commerce Measurement Tools , Google Analytics, Piwik Web Analytics ,Yahoo Web Analytics , Emerging Analytics: Social, Video, Mobile.	5	5
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Assignments:
Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Avinash Kaushik	Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity	1st Edition,	Sybex
Michael Beasley	Practical Web Analytics for User Experience: How Analytics can help you Understand your Users	2013	Morgan Kaufmann
Hansen, Derek, Ben Sheiderman, Marc Smith	Analyzing Social Media Networks with NodeXL: Insights from a Connected World		Morgan Kaufmann, 2010

Reference Books:

Bing Liu	Web Data Mining: Exploring Hyperlinks, Content, and Usage Data	2nd Edition,	Springer
Justin Cutroni	Google Analytics	2010	O'Reilly
Eric Fettman, Shiraz Asif, Feras Alhlou	Google Analytics Breakthrough	2016	John Wiley & sons,



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End Semester Examination Scheme.		Maximum Marks-70.		Time allotted-3hrs.			
Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 6	10	10				60
B	1 to 6			5	3	5	
C	1 to 6			5	3	15	
<ul style="list-style-type: none"> • Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part. • Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							
Examination Scheme for end semester examination:							
Group	Chapter	Marks of each question	Question to be set	Question to be answered			
A	All	1	10	10			
B	All	5	5	3			
C	All	15	3	3			

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Name of the Course: B.Sc. in Information Technology (Big Data Analytics)			
Subject: Data Mining & Data Warehousing			
Course Code: BITBDA503C		Semester: V	
Duration: 36 Hrs.		Maximum Marks:100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		End Semester Exam: 70	
Tutorial: 0		Attendance : 5	
Practical:0		Continuous Assessment:25	
Credit: 3		Practical Sessional internal continuous evaluation:NA	
		Practical Sessional external examination:NA	
Aim:			
Sl. No.			
1.	Understand the functionality of the various data mining and data warehousing component		
2.	Appreciate the strengths and limitations of various data mining and data warehousing models		
Objective:			
Sl. No.			
1.	Be familiar with mathematical foundations of data mining tools..		
2.	Understand and implement classical models and algorithms in data warehouses and data mining		
3.	Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.		
4.	Master data mining techniques in various applications like social, scientific and environmental context.		
5.	Develop skill in selecting the appropriate data mining algorithm for solving practical problems.		
Pre-Requisite:			
Sl. No.			
1.	Knowledge of DBMS		
2.	Analytical Knowledge		
Contents			Hrs./week
Chapter	Name of the Topic	Hours	Marks
01	Introduction to Data Warehousing; Data Mining: Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives,scalable methods;	3	10
02	Classification and prediction; Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns,	6	10
03	Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series	6	10

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	analysis;		
04	Mining Data Streams, Methodologies for stream data processing and stream data systems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem; Graph Mining; Social Network Analysis; modulation for communication, filtering, feedback control systems.	10	20
05	Web Mining, Mining the web page layout structure, mining web link structure, mining multimedia data on the web, Automatic classification of web documents and web usage mining; Distributed Data Mining.	6	10
06	Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis.	5	10
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Practical:

Skills to be developed:

Intellectual skills:

1. Explain the analyzing techniques of various data
2. Describe different methodologies used in data mining and data ware housing
3. Compare different approaches of data ware housing and data mining with various technologies.
4. Can use a variety of techniques to extend the original idea.

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Paulraj Ponniah	Data Warehousing Fundamentals for IT Professionals		Wiley India
Alex Berson and Stephen J. Smith	Data Warehousing, Data Mining, & OLAP	Second Edition	Tata McGraw Hill Education
Reference Books:			
Ralph Kimball	Data warehouse Toolkit		Wiley India
Jiawei Han and M Kamber	Data Mining Concepts and Techniques	Second Edition	Elsevier Publication
G Dong and J Pei	Sequence Data Mining		Springer

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End Semester Examination Scheme.		Maximum Marks-70.		Time allotted-3hrs.			
Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 6	10	10				60
B	1 to 6			5	3	5	
C	1 to 6			5	3	15	
<ul style="list-style-type: none"> Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part. Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							
Examination Scheme for end semester examination:							
Group	Chapter	Marks of each question	Question to be set	Question to be answered			
A	All	1	10	10			
B	All	5	5	3			
C	All	15	3	3			



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Name of the Course: B.Sc. in Information Technology (Big Data Analytics)			
Subject: Data Visualisation			
Course Code: BITBDA503D		Semester: V	
Duration: 36 Hrs		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		End Semester Exam: 70	
Tutorial: 0		Attendance : 5	
Practical: 0		Continuous Assessment:25	
Credit: 3		Practical Sessional internal continuous evaluation:NA	
		Practical Sessional external examination:NA	
Aim:			
Sl. No.			
1.	Recognize the basics of data visualization		
2.	Analyze visualization design options and select appropriate one for implementation		
3.	Apply visualization techniques for various data analysis tasks		
4.	Develop visualization and evaluate the design solution		
5.	Apply these techniques to mine real-life situations		
6.	Describe the different visualization models		
Objective:			
Sl. No.			
1.	To provide insight about the importance of data visualization.		
2.	To expose the design options in data visualization.		
3.	To analyze the charts and plots used for suitable data type.		
4.	To construct and evaluate visualization on real time data		
5.	To provide insight about the importance of data visualization.		
6.	To showcase the applications of data visualization		
Pre-Requisite:			
Sl. No.			
1.	Basic Mathematical knowledge		
2.	Programming skill		
Contents			Hrs./week
Chapter	Name of the Topic	Hours	Marks
01	Introduction The context of data visualization-Visualization as a discovery tool-The bedrock of visualization knowledge-Defining data visualization-Visualization skills-Data Visualization methodology-Visualization design objectives-Setting the purpose and identifying the key factors-Visualization"s function-Visualization"s tone-Key factors of visualization project-Eight hats of Data visualization design.	6	10



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02	Data And Visualization Design Options Importance of editorial focus-Preparing and familiarizing the data-Refining the editorial focus-Use of visual analysis-example-conceiving and reasoning visual design options-Visualization anatomy-data representation-visualization anatomy- creating interactivity-annotation-arrangement.	6	15
03	Taxonomy Of Data Visualization Methods Data visualization methods-choosing the appropriate chart type-charts comparing categories-charts Accessing hierarchies and part-to-whole relationships-charts showing changes over time-charts for plotting connections and relationships-plots for showing Geo-Spatial data.	9	15
04	Construction And Evaluation Of Design Solution Constructing visualizations-technology-visualization software, Applications and - programs-charting-statistical and analysis tools-programming environments-tools for mapping-The construction process-approaching the finishing line-post Launch evaluation.	9	15
05	Applications Of Data Visualization Applications of visualization-visual analysis of social data: economic and social conditions of countries, qualitative comparison of schools-multi-dimensional data in Medicine and Pharmacology: Ophthalmological data analysis, Analysis of heart rate, Ophthalmological Binding Affinity-Correlation based visualization.	6	15
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
WARD, GRINSTEIN, KEIM	Interactive Data Visualization: Foundations, Techniques, and Applications		Natick : A K Peters, Ltd
E. Tufte	The Visual Display of		Graphics Press

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		Quantitative Information					
Reference Books:							
Andy Kirk		Data Visualization: A Successful Design Process	978-1-84969-346-2, 2012		Packt publishing		
Gintautas Dzemyda, Olga Kurasova, Julius Žilinskas		Multidimensional Data Visualization: Methods and Applications	9781441902351, 2013		springer		
Stephanie D. H. Evergreen		Effective Data Visualization: The Right Chart for the Right Data	978-1506303055, 2016		SAGE publications		
End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.							
Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 5	10	10				60
B	1 to 5			5	3	5	
C	1 to 5			5	3	15	
<ul style="list-style-type: none"> Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part. Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							
Examination Scheme for end semester examination:							
Group	Chapter	Marks of each question	Question to be set	Question to be answered			
A	All	1	10	10			
B	All	5	5	3			
C	All	15	3	3			



Department of Information Technology
Syllabus of B.Sc. in Information Technology (Big Data Analytics)
 (Effective from academic session 2019-20)

Name of the Course: B.Sc. in Information Technology (Big Data Analytics)			
Subject: XML and Web Services			
Course Code: BITBDA504A		Semester: V	
Duration: 36 Hrs.		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		End Semester Exam: 70	
Tutorial: 0		Attendance : 5	
Practical: 0		Continuous Assessment:25	
Credit: 3		Practical Sessional internal continuous evaluation:NA	
		Practical Sessional external examination:NA	
Aim:			
Sl. No.			
1.	Create web based application with the suitable markup languages like XML or HTML		
2.	Develop database driven web applications using various web designing tools.		
3.	Build and consume web services		
4.	Develop web service enabled applications.		
5.	Construct, deploy and call web services using the existing web technologies.		
Objective:			
Sl. No.			
1.	To edify evolution of web services and their architecture.		
2.	To describe, discover & develop web services.		
3.	To inculcate in-built programming skill needed to provide a web service.		
4.	To incorporate comprehensive introduction to the programming tools required to build and maintain websites		
5.	To facilitate how to build XML applications with DTD and style sheets.		
6.	To practice the technologies in building the web services.		
Pre-Requisite:			
Sl. No.			
1.	HTML		
2.	Java		
Contents			Hrs./week
Chapter	Name of the Topic	Hours	Marks
01	Introduction Role Of XML - XML and The Web - XML Language Basics - SOAP - Web Services - Revolutions Of XML - Service Oriented Architecture (SOA).	6	10
02	XML Technology XML Technology, XML - Name Spaces - Structuring With Schemas	9	20

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	and DTD - Presentation Techniques - Transformation - XML Infrastructure		
03	SOAP Overview Of SOAP - HTTP - XML-RPC - SOAP: Protocol - Message Structure - Intermediaries - Actors - Design Patterns And Faults - SOAP With Attachments.	9	20
04	WEB Services Overview - Architecture - Key Technologies - UDDI - WSDL - ebXML - SOAP And Web Services In E-Com - Overview Of .NET And J2EE.	9	10
05	XML Security Security Overview - Canonicalization - XML Security Framework - XML Encryption - XML Digital Signature - XKMS Structure - Guidelines For Signing XML Documents - XML In Practice.	3	10
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Frank. P. Coyle	XML, Web Services And The Data Revolution		Pearson Education, 2002.
Ramesh Nagappan , Robert Skoczylas and Rima PatelSriganesh	Developing Java Web Services		Wiley Publishing Inc., 2004

Reference Books:

Sandeep Chatterjee, James Webber	Developing EnterpriseWeb Services		Pearson Education, 2004
McGovern, et al	Java Web Services Architecture		Morgan Kaufmann Publishers,2005
Gustavo A, Fabio C, Harumi K, Vijay M.	Web Services: Concepts, Architectures and		Springer (Universities Press), 2004



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		Applications					
End Semester Examination Scheme.		Maximum Marks-70.		Time allotted-3hrs.			
Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 5	10	10				60
B	1 to 5			5	3	5	
C	1 to 5			5	3	15	
<ul style="list-style-type: none"> • Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part. • Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							
Examination Scheme for end semester examination:							
Group	Chapter	Marks of each question	Question to be set	Question to be answered			
A	All	1	10	10			
B	All	5	5	3			
C	All	15	3	3			



Department of Information Technology
Syllabus of B.Sc. in Information Technology (Big Data Analytics)
 (Effective from academic session 2019-20)

Name of the Course: B.Sc. in Information Technology (Big Data Analytics)			
Subject: Multimedia Systems			
Course Code: BITBDA504B		Semester: V	
Duration: 36 Hrs.		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		End Semester Exam: 70	
Tutorial: 0		Attendance : 5	
Practical:0		Continuous Assessment:25	
Credit: 3		Practical Sessional internal continuous evaluation:NA	
		Practical Sessional external examination:NA	
Aim:			
Sl. No.			
1.	Construct mathematical transformations for multimedia signals.		
2.	Analyse and process the multimedia signals such as images, audio, video.		
3.	Acquire the basic concepts of multimedia tools and process in design.		
4.	Illustrate design process of implementing multimedia systems.☒		
5.	Apply multimedia technology in various scenarios.		
Objective:			
Sl. No.			
1.	To provide the basics of multimedia systems and processing of multimedia signals.		
2.	To gain knowledge on multimedia tools and processes.		
3.	To design multimedia systems in systematic approach.		
4.	To produce information on user interface design.		
5.	To identify the major applications of multimedia systems.		
6.	To insight the research areas of multimedia systems.		
Pre-Requisite:			
Sl. No.			
1.	Basic Knowledge of image and Vedio		
Contents			Hrs./week
Chapter	Name of the Topic	Hours	Marks
01	Introduction Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications Text and Audio Text: Types of Text, Ways to Present Text, Aspects of Text Design,	6	10

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	Character, Character Set, Codes, Unicode, Encryption;		
02	<p>Audio:</p> <p>Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate, Sampling Size, Quantization), Audio Formats, Audio tools, MIDI</p> <p>Storage models and Access Techniques</p> <p>Magnetic media, optical media, file systems (traditional, multimedia)</p> <p>Multimedia devices – Output devices, CD-ROM, DVD, Scanner, CCD</p>	8	15
03	<p>Image and Video Database</p> <p>Image representation, segmentation, similarity based retrieval, image retrieval by color, shape and texture; indexing- k-d trees, R-trees, quad trees; Case studies- QBIC, Virage. Video Content, querying, video segmentation, indexing</p>	8	15
04	<p>Document Architecture and Content Management</p> <p>Content Design and Development, General Design Principles</p> <p>Hypertext: Concept, Open Document Architecture (ODA), Multimedia and Hypermedia Coding Expert Group (MHEG), Standard Generalized Markup Language (SGML), Document Type Definition (DTD), Hypertext Markup Language (HTML) in Web Publishing. Case study of Applications.</p>	9	20
05	<p>Multimedia Applications</p> <p>Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors.</p>	5	10
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100
<p>Assignments: Based on the curriculum as covered by subject teacher.</p> <p>List of Books Text Books:</p>			
Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Ralf Steinmetz and Klara	Multimedia:		Pearson Ed

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Nahrstedt	Computing, Communications & Applications						
Nalin K. Sharda	Multimedia Information System					PHI	
Reference Books:							
Fred Halsall	Multimedia Communications					Pearson Ed	
Koegel Buford	Multimedia Systems					Pearson Ed	
Fred Hoffstetter	Multimedia Literacy					McGraw Hill	
End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.							
Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 5	10	10				60
B	1 to 5			5	3	5	
C	1 to 5			5	3	15	
<ul style="list-style-type: none"> Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part. Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							
Examination Scheme for end semester examination:							
Group	Chapter	Marks of each question	Question to be set	Question to be answered			
A	All	1	10	10			
B	All	5	5	3			
C	All	15	3	3			



Department of Information Technology
Syllabus of B.Sc. in Information Technology (Big Data Analytics)
 (Effective from academic session 2019-20)

Name of the Course: B.Sc. in Information Technology (Big Data Analytics)			
Subject: Knowledge Discovery Techniques			
Course Code: BITBDA504C		Semester: V	
Duration: 36 Hrs.		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		End Semester Exam: 70	
Tutorial: 0		Attendance : 5	
Practical: 0		Continuous Assessment:25	
Credit: 3		Practical Sessional internal continuous evaluation:NA	
		Practical Sessional external examination:NA	
Aim:			
Sl. No.			
1.	Acquire skills for applying knowledge discovery techniques		
2.	Appraise both business and technical considerations in the context of applicable domains		
3.	Deploy integrated methodologies and models for gain insights through knowledge discovery process		
4.	Comparatively explore varied algorithms in the realm of knowledge discovery		
5.	Identify and build models/methods for analysis		
6.	Determine suitability of data models for different domain-specific analysis		
Objective:			
Sl. No.			
1.	To discuss Knowledge Discovery techniques/methods and their application.		
2.	To help the students to extract useful knowledge from large volumes of data		
3.	To expose to various issues, constraints and consideration in knowledge discovery process		
4.	To make aware of industry standard processes involved in knowledge discovery		
5.	To introduce newer paradigm like privacy preservation, real-time discovery and such others		
6.	To explore applicability varied domains like healthcare, e-commerce, security, etc.		
Pre-Requisite:			
Sl. No.			
1.	Basic knowledge on Machine Learning		
2.	Basic knowledge on Artificial Intelligence		
Contents			
		Hrs./week	
Chapter	Name of the Topic	Hours	Marks
01	Introduction KDD and Data Mining - Data Mining and Machine Learning, Machine Learning and Statistics, Generalization as Search, Data Mining and Ethics	3	5
02	Knowledge Representation - Decision Tables, Decision Trees, Classification Rules, Association Rules, Rules involving Relations,	6	10

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	Trees for Numeric Predictions, Neural Networks, Clusters.		
03	Decision Trees - Divide and Conquer, Calculating Information, Entropy, Pruning, Estimating Error Rates, The C4.5 Algorithm Evaluation of Learned Results- Training and Testing, Predicting Performance, Cross-Validation	7	15
04	Classification Rules - Inferring Rudimentary Rules, Covering Algorithms for Rule Construction, Probability Measure for Rule Evaluation, Association Rules, Item Sets, Rule Efficiency	6	10
05	Numeric Predictions - Linear Models for Classification and Numeric Predictions, Numeric Predictions with Regression Trees, Evaluating Numeric Predictions	7	15
06	Artificial Neural Networks – Perceptrons, Multilayer Networks, The Backpropagation Algorithm Clustering - Iterative Distance-based Clustering, Incremental Clustering, The EM Algorithm	7	15
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Maimon, oded	Data mining and knowledge discovery handbook		
Muhammad Usman	Improving Knowledge Discovery through the Integration of Data Mining Techniques	1st Edition ISBN:9781466685130 , 2015	IGI Global

Reference Books:

Kweku-Muata Osei-Bryson, Corlane Barclay	Knowledge Discovery Process and Methods to Enhance Organizational Performance	1st Edition ISBN: 978-1482212365, 2015	Auerbach Publications,
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End Semester Examination Scheme.		Maximum Marks-70.		Time allotted-3hrs.			
Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 6	10	10				60
B	1 to 6			5	3	5	
C	1 to 6			5	3	15	
<ul style="list-style-type: none"> • Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part. • Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							
Examination Scheme for end semester examination:							
Group	Chapter	Marks of each question	Question to be set	Question to be answered			
A	All	1	10	10			
B	All	5	5	3			
C	All	15	3	3			



Department of Information Technology
Syllabus of B.Sc. in Information Technology (Big Data Analytics)
 (Effective from academic session 2019-20)

Name of the Course: B.Sc. in Information Technology (Big Data Analytics)			
Subject: Wireless Networking			
Course Code: BITBDA504D		Semester: V	
Duration: 36 Hrs.		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		End Semester Exam: 70	
Tutorial: 0		Attendance : 5	
Practical: 0		Continuous Assessment:25	
Credit: 3		Practical Sessional internal continuous evaluation:NA	
		Practical Sessional external examination:NA	
Aim:			
Sl. No.			
2.	Acquiring capability to work with heterogeneous networks.		
3.	Apply the knowledge of various mobile operating systems like Android to develop mobile computing applications.		
4.	Developing mobile computing applications by analyzing their characteristics and requirements.		
Objective:			
Sl. No.			
1.	To discuss about advanced learning in the field of wireless communication.		
2.	To expose the students to the concepts of wireless devices and mobile computing.		
3.	To provide a knowledge about various operating systems available currently for developing mobile computing applications		
4.	To discuss various issues related to security of mobile computing environment		
Pre-Requisite:			
Sl. No.			
1.	Basic Networking Knowledge		
Contents			Hrs./week
Chapter	Name of the Topic	Hours	Marks
01	INTRODUCTION Wireless Networking Trends, Key Wireless Physical Layer Concepts, Multiple Access Technologies -CDMA, FDMA, TDMA, Spread Spectrum technologies, Frequency reuse, Radio Propagation and Modelling, Challenges in Mobile Computing: Resource poorness, Bandwidth, energy etc. WIRELESS LOCAL AREA NETWORKS:IEEE 802.11 Wireless LANs Physical & MAC layer, 802.11 MAC Modes (DCF & PCF) IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Adhoc Modes, Hidden Node & Exposed Terminal Problem, Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues	9	15



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02	WIRELESS CELLULAR NETWORKS 1G and 2G, 2.5G, 3G, and 4G, Mobile IPv4, Mobile IPv6, TCP over Wireless Networks, Cellular architecture, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Improving coverage and capacity in cellular systems, Spread spectrum Technologies.	9	15
03	WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE 802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview WIRELESS SENSOR NETWORKS Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.	9	15
04	WIRELESS PANs Bluetooth AND Zigbee, Introduction to Wireless Sensors	3	10
05	SECURITY Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, DoS in wireless communication.	3	10
06	ADVANCED TOPICS IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks.	3	5
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Schiller J.	Mobile Communications		Addison Wesley 2000
Stallings W.	Wireless Communications and Networks		Pearson Education 2005

Reference Books:

Stojmenic Ivan	Handbook of Wireless Networks and Mobile		John Wiley and Sons
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		Computing				Inc 2002	
	Yi Bing Lin and Imrich Chlamtac	Wireless and Mobile Network Architectures				John Wiley and Sons Inc 2000	
End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.							
Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 6	10	10				60
B	1 to 6			5	3	5	
C	1 to 6			5	3	15	
<ul style="list-style-type: none"> Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part. Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							
Examination Scheme for end semester examination:							
Group	Chapter	Marks of each question	Question to be set	Question to be answered			
A	All	1	10	10			
B	All	5	5	3			
C	All	15	3	3			



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Syllabus of B.Sc. in Information Technology (Big Data Analytics)
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Name of the Course: B.Sc. in Information Technology (Big Data Analytics)	
Subject: Industrial Training and Internship	
Course Code: BITBDA581	Semester: V
Duration: 36 Hrs.	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 0	End Semester Exam: 100
Tutorial: 0	Attendance: 0
Practical: 2 hrs./week	Continuous Assessment: 0
Credit: 1	Practical Sessional internal continuous evaluation: NA
	Practical Sessional external examination: NA
Contents	
Students be encouraged to go to Industrial Training/Internship for at least 2-3 months during semester break.	



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Name of the Course: B.Sc. in Information Technology (Big Data Analytics)	
Subject: Major Project -I	
Course Code: BITDS582	Semester: V
Duration: 36 Hrs.	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 0	End Semester Exam: 100
Tutorial: 0	Attendance: 0
Practical: 4 hrs./week	Continuous Assessment: 0
Credit: 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60
Contents	
Students will do projects on application areas of latest technologies and current topics of societal relevance.	