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BASANTSING INSTITUTE OF SCIENCE
&
J. T. LALVANI COLLEGE OF COMMERCE
(AUTONOMOUS)

"A" Road, Churchgate, Mumbai - 400 020, India.

Affiliated to
University of Mumbai

Program: M.Sc. Big Data Analytics

Semester I

Credit Based Semester and Grading System (CBSGS) with effect from the Academic year 2020-21

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M.Sc. Big Data Analytics Sem I Syllabus	
Objectives:	• To learn fundamental statistical concepts and some of their basic applications in real world. • To know the principle definitions, fundamental theorems, and important relationships in statistics • To communicate mathematical ideas orally and in writing, with precision, clarity and organization, using proper terminology and notation. • To understand the basic concepts and the applications of database systems. • To work through a complete data analysis for R and Python
Outcomes:	• Present results effectively by making appropriate displays, summaries, and tables of data, • Compute probabilities of transition between states and return to the initial state after long time intervals in Markov chains. • Formulate the LPP for a real life Problems and give the solution for the problem using Graphical, Simplex and Big-M method. • Understands the concept of Big Data. • Be proficient in using libraries for data analysis in R and Python.

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Program: M.Sc. Big Data Analytics

Course: Statistical Methods

Semester I

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M.Sc. Statistical Methods Syllabus
Semester I

Course Code	Course Title	Number of Lectures	No. of Credits
SBDA101	**Statistical Methods**	45	3

a) Data Collection & Visualization :
Concepts of measurement, scales of measurement, design of data collection formats with illustration, data quality and issues with date collection systems with examples from business, cleaning and treatment of missing data, principles of data visualization, and different methods of presenting data in business analytics.

b) Basic Statistics:
Frequency table, histogram, measures of location, measures of spread, skewness, curtosis, percentiles, box plot, correlation and simple linear regression, partial correlation, probability distribution as a statistics model, fitting probability distributions, empirical distributions, checking goodness of fit through plots and tests.

c) Contingency Tables:
Two way contingency tables, measures of association, testing for dependence.

References:

1. Statistics: David Freedman, Pobert Pisani & Roger Purves, WW.Norten & Co. 4th Edition 2007.
2. The visual display of Quantitative Information: Edward Tufte, Graphics Press, 2001.
3. Best Practices in Data Cleaning: Jason W. Osborne, Sage Publications 2012.

Evaluation: Theory: 70% + Practical/Lab: 30%

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Program: M.Sc. Big Data Analytics

Course: Probability &Stochastic Process

Semester I

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M.Sc. Probability &Stochastic Process Syllabus

Semester I

Course Code	Course Title	Number of Lectures	No. of Credits
SBDA102	**Probability &Stochastic Process**	**45**	**3**

a) **Basic Probability**:
Concepts of experiments, Outcomes, Sample space, Events, Combinatorial probability, Birthday paradox, Principle of inclusion & exclusion, Conditional probability, Independence, Bayes Theorem.

b) Probability Distribution:
Random Variables: discrete and continuous probability models, some probability distributions: Binomial, Poisson, Geometric, Hypergeometric, Normal, exponential, Chi-square, expectation, variance and other properties of the distribution.

c) Stochastic Process:
Markov Chains, Classification of states, Stationery distribution, limit theorems, Poisson process, illustrations and applications.

d) Introduction to Time Series:
Components of time series, Smoothing auto correlation, stationarity, concepts of AR, MA, ARMA & ARIMA models with illustrations.

References:

1. A First Course in Probability: Shelden M. Ross, 2014.
2. Introduction to Stochastic Process : Paul G. Hoel, Sydney C. Port & Charles J. Stone, Waveland Press, 1987.
3. Time Series Analysis and Its Applications: Robert H. Shumway and David S. Stoffer, Springer 2010.

Evaluation: Theory: 70% + Practical/Lab: 30%

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Program: M.Sc. Big Data Analytics

Course: Linear Algebra &Linear Programming

Semester I

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M.Sc. Linear Algebra &Linear Programming Syllabus

Semester I

Course Code	Course Title	Number of Lectures	No. of Credits
SBDA103	Linear Algebra &Linear Programming	45	3

a) **Linear Algebra:**
Linear equations and matrices, matrix operations, solving system of linear equations, Gauss-Jordan method, Concept & Computation of determinant and inverse of matrix, Eigen values and eigen vectors, Illustrations of the methods, Positive semi definite and position definite matrices, illustrations. Lab – using R programming

b) **Linear Programming:**
Definition of the problem, convex sets, corner points, feasibility, basic feasible solutions, Simplex method

References:

1. Linear Algebra and Its Application: Gilbert Strang, 4th Edition, Academic Press.
Hands-On Matrix Algebra Using R (Active and Motivated Learning with Applications), Hrishikesh D Vinod, World Scientific

2. Linear Programming: G. Hadley, Addison-Wesley.

Evaluation: Theory: 70% + Practical/Lab: 30%

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Program: M.Sc. Big Data Analytics

Course: Database Management

Semester I

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M.Sc. Database Management Syllabus

Semester I

Course Code	Course Title	Number of Lectures	No. of Credits
SBDA104	**Database Management**	**45**	**3**

a) Basic Concepts:
Different data models, ER and EER diagram, schema, table, Big Data Concepts and Hadoop Ecosystem

b) Relational and Non-Relational Databases:
Structure, various operations, normalization, SQL, No-SQL, Graph Database, Parallel and distributed data base, Map-Reduce.
Lab using SQL/Oracle/MySql for Relational databases; Hadoop(any), MangoDB, GraphDB for Big Data

c) Implementation:
ORACLE SQL/MS SQL/MySQL, Hadoop Ecosystem, Concept of database security.

References:

1. Database system concepts: Abraham Silberschartz, Henry F. Korth and S. Surarshan, McGraw Hill, 2011.
2. Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem, Douglas Eadline, Addison-Wesley, Pearson Education India; First edition (1 March 2016)
3. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services, 2015

Evaluation: Theory: 60% + Practical/Lab: 40% (Oracle SQL, MS SQL, Hadoop Ecosystem, MangoDB)

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Program: M.Sc. Big Data Analytics

Course: Computing for Data Sciences

Semester I

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M.Sc. Computing for Data Sciences Syllabus

Semester I

Course Code	Course Title	Number of Lectures	No. of Credits
SBDA105	**Computing for Data Sciences**	**45**	**3**

a) **Computer Packages– R and Python:**
Usage of R and Python – data handling, data analysis, statistical modeling with illustration in python and R.

b) **Data Structure & Concepts of Computation using Java:**
Algorithms, Convergence, Complexity with illustrations, some sorting & searching algorithms, some numerical methods e.g. Newton-Raphson, Steepest ascent using Java

c) **Computing Methodologies:** Monte-Carlo simulations of random numbers and various statistical methods, memory handling strategies for big data.

References:

1. Introduction to Data Science (Data Analysis and Prediction Algorithms with R), Rafael A. Irizarry, https://rafaLabgithub.io/dsbook/
2. Hands-On Programming with R - Write Your Own Functions and Simulations, Grolemund Garrett, O'Reilly
3. Data Structures and Algorithm using Java, 6th Ed. Michael T. Goodrich and Roberto Tamassia, John Wiley & Sons, Inc
4. Python Data Science Handbook - Essential Tools for Working with Data, Jake VanderPlas, O'Reilly
5. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, WES MCKINNEY, O'Reilly

Evaluation: Theory: 40% + Practical/Lab: 60%

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Program: M.Sc. Big Data Analytics

Course: Practical-I

Semester I

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M.Sc. Practical-I Syllabus

Semester I

Course Code	Course Title	Number of Practical Session	Credits
SBDA101PR	Practical-I based on SBDA101(StatisticalMethods), SBDA102(Probability &Stochastic Process)	**40**	**4**

1. Data Collection & Visualization
2. Basic Statistics
3. Contingency Tables
4. Basic Probability
5. Probability Distribution
6. Stochastic Process
7. Introduction to Time Series

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Program: M.Sc. Big Data Analytics

Course: Practical-II

Semester I

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M.Sc. Practical-II Syllabus

Semester I

Course Code	Course Title	Number of Practical Session	Credits
SBDA102PR	Practical-II based onSBDA103(Linear Algebra &Linear Programming), SBDA104 (Database Management)	**40**	**4**

1. Linear Algebra 2.Linear

programming

3. Relational Databases using MS SQL

4. Non relational databases

5. Implementations

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Program: M.Sc. Big Data Analytics

Course: Practical-III

Semester I

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M.Sc. Practical-III Syllabus

Semester I

Course Code	Course Title	Number of Practical Session	Credits
SBDA103PR	Practical-III based on SBDA105(Computingfor Data Sciences)	**20**	**2**

1. Computer packages :R and Python
2. Data Structure & Concepts of Computation using Java
3. Computing Methodologies

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