

As Per NEP 2020

University of Mumbai



Syllabus for Basket of OE	
Board of Studies in Information Technology	
UG First Year Programme	
Semester	III/IV/V
Title of Paper	Big Data Analytics
Credits	2
From the Academic Year	2025-26

Sr. No.	Heading	Particulars
1	Description the course:	Big Data Analytics is a rapidly evolving field driven by the exponential growth of digital information across industries. With organizations generating vast amounts of structured and unstructured data, understanding how to process, analyze, and derive meaningful insights is crucial. This course introduces fundamental concepts, techniques, and tools used in Big Data Analytics, focusing on data collection, storage, processing, and visualization. Students will explore real-world applications across various domains, including business, healthcare, social sciences, and finance. By analyzing case studies and learning about emerging trends, students will gain practical knowledge essential for leveraging data-driven decision-making. The course is designed for learners from diverse academic backgrounds, highlighting its interdisciplinary nature and relevance to multiple career paths.
2	Vertical :	Open Elective
3	Type :	Theory
4	Credit:	2 credits (1 Credit = 15 Hours for Theory or 30 Hours of Practical work in a Semester)
5	Hours Allotted :	30 Hours
6	Marks Allotted:	50 Marks
7	Course Objectives: 1. To introduce the fundamentals of Big Data Analytics, including its definition, characteristics, and significance in the digital era. 2. To explore the processes of data collection, storage, processing, and analysis using modern tools and techniques. 3. To examine the challenges associated with handling large-scale data, including data privacy, security, and ethical concerns. 4. To study various analytical methods, including statistical techniques, data visualization, and predictive modeling. 5. To analyze real-world case studies and applications of Big Data Analytics across diverse fields such as business, healthcare, finance, and social sciences.	

	6. To understand emerging trends in Big Data Analytics and explore career opportunities in data science, business intelligence, and related fields.
8	Course Outcomes: Learners will be able to: 1. Explain the fundamental concepts of Big Data Analytics, including its characteristics, importance, and real-world applications. 2. Explain various data collection, storage, and processing techniques used in Big Data Analytics. 3. Explain the challenges associated with managing large-scale data, including privacy, security, and ethical concerns. 4. Analyze different analytical methods, including data visualization, statistical techniques, and predictive modeling. 5. Analyze real-world case studies to understand the impact of Big Data Analytics in various domains such as business, healthcare, finance, and social sciences. 6. Explain emerging trends in Big Data Analytics and identify potential career opportunities in data science, business intelligence, and related fields.
	Modules:
	Module 1: Introduction to Big Data Analytics : 5 Hours Introduction to Data and its Importance. Understanding Big Data: Definition, Characteristics (Volume, Velocity, Variety, Veracity, and Value). Evolution of Data Analytics: Traditional Data Processing vs. Big Data. Need for Big Data Analytics in Various Fields (Business, Healthcare, Finance, Social Sciences, etc.). Sources of Big Data: Social Media, IoT, E-commerce, Financial Transactions, and Scientific Research Challenges in Big Data Management: Storage, Processing, Security, and Ethical Considerations. Introduction to Data Analytics Tools and Technologies (Hadoop, Spark, Python, R, SQL, etc.) Self-Learning Topic: Real-World Applications of Big Data Analytics Across Industries
	Module 2: Data Collection, Storage, and Processing in Big Data Analytics : 5 Hours Types of Data in Big Data: Structured, Semi-structured, and Unstructured Data. Data Collection Methods: Web Scraping, APIs, Sensors, Surveys, and Transactional Data. Big Data Storage Technologies: Relational vs. NoSQL Databases (HDFS, MongoDB, Cassandra). Data Processing Models: Batch Processing vs. Real-time Processing. Big Data Processing Frameworks: Introduction to Hadoop, MapReduce, Apache Spark. Data Cleaning and Preprocessing: Handling Missing Data, Data Transformation, and Data Normalization. Ethical and Privacy Concerns in Data Collection: GDPR, Data Protection Laws, and Ethical AI. Self-Learning Topic: Case Studies on Ethical and Unethical Data Collection Practices

	Module 3: Big Data Analytics Techniques and Applications : 5 Hours Introduction to Data Analytics: Descriptive, Diagnostic, Predictive, and Prescriptive Analytics. Basic Statistical Techniques for Data Analysis: Mean, Median, Mode, Variance, Standard Deviation. Data Visualization: Importance, Tools (Tableau, Power BI, Matplotlib, Seaborn). Basic Machine Learning Concepts: Supervised vs. Unsupervised Learning. Introduction to Data Mining: Clustering, Classification, and Association Rule Mining. Applications of Big Data Analytics: Business Intelligence, Marketing, Finance, Healthcare, Social Media Analysis. Big Data in Decision-Making: How Organizations Use Data for Strategic Planning. Self-Learning Topic: Impact of Big Data on E-Commerce and Digital Marketing
	Module 4: Big Data Tools, Technologies, and Challenges : 4 Hours Introduction to Big Data Technologies: Overview of Key Tools and Frameworks Hadoop Ecosystem: HDFS, MapReduce, YARN, and Hive. Introduction to Apache Spark: Features, Advantages over Hadoop, and Use Cases. NoSQL Databases: MongoDB, Cassandra, and HBase for Big Data Storage. Data Security and Privacy in Big Data: Encryption, Anonymization, and Access Control. Challenges in Big Data Analytics: Data Quality, Scalability, Ethical Issues, and Bias in AI Models. Future Trends in Big Data: Cloud Computing, Edge Analytics, AI-Driven Big Data Analysis Self-Learning Topic: Ethical Considerations in Big Data and Case Studies on Data Breaches.
	Module 5: Case Studies and Real-World Applications of Big Data Analytics : 4 Hours
	Real-Life Applications of Big Data: Case Studies from Various Domains. Business & Marketing: How Companies Use Big Data for Customer Insights and Targeted Advertising. Finance & Banking: Fraud Detection and Risk Assessment in Financial Institutions. Healthcare & Medicine: Predictive Analytics for Disease Detection and Patient Care. E-Commerce & Retail: Personalized Recommendations and Demand Forecasting. Social Media & Journalism: Sentiment Analysis and Trend Prediction Governance & Smart Cities: Traffic Management, Disaster Prediction, and Public Policy Decisions. Ethical Concerns in Big Data Usage: Bias, Privacy Violations, and Misuse of Data. Future of Big Data Analytics: Role in AI, IoT, and Emerging Technologies. Self-Learning Topic: The Role of Data Science in Fraud Detection and cybersecurity
	Module 6: Emerging Trends and Career Opportunities in Big Data Analytics : 3 Hours
	Introduction to Emerging Trends in Big Data Analytics: Role of Artificial Intelligence (AI) and Machine Learning (ML) in Big Data, Internet of Things (IoT) and Big Data Integration, Blockchain and Big Data for Secure Transactions, Cloud Computing and Edge Analytics, Ethical AI and Responsible Data Usage. Big Data Analytics Career Paths: Data Analyst, Data Scientist, Business Intelligence Analyst, Big Data Engineer, Data Consultant, etc. Self-Learning Topic: How Big Data is Transforming Decision-Making in Various Industries

10	Text Books: "Big Data: A Revolution That Will Transform How We Live, Work, and Think" – Viktor Mayer-Schönberger, Kenneth Cukier (2013) "Big Data Analytics" – Seema Acharya, Subhashini Chellappan (2016) Big Data: Principles and Best Practices of Scalable Real-time Data Systems" – Nathan Marz, James Warren	
11	Reference Books: Hadoop: The Definitive Guide – Tom White Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking Data Science for Dummies – Lillian Pierson	
12	Internal Continuous Assessment: 40%	Semester End: 60%
13	Continuous Evaluation through: IAT-1 : 15 marks IAT-2: 15 marks Average of IAT-1 & IAT-2 = 15 marks. Projects, Presentation and assignments, (5 marks)etc.	Semester End Examination (30 marks) - Duration 1 hours.
14	Format of Question Paper: End-semester examination Question Paper will comprise three questions each with 10 marks. All modules must be covered. All three questions need to be answered.	

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