#  Cover Page

# 23CD22T1 - DATA ENGINEERING

(CSE(DS))

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| Course Category: | Professional Core | Credits: | 3 |
| Course Type: | Theory | Lecture-Tutorial-Practical: | 3-0-0 |
| Prerequisite: | Knowledge of relational database management systems (RDBMS) like MySQL, PostgreSQL, or Oracle and Familiarity with NoSQL databases. | Sessional Evaluation:Univ. Exam Evaluation:Total Marks: | 3070100 |
| Objectives: | **Upon successful completion of the course, the students will be able to:** |
| * Explain basic concepts of Data Engineering
* Discuss bout Data Engineering Life Cycle
* How to design Good Data Architecture.
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| Course Outcomes | **Upon successful completion of the course, the students will be able to:** |
| CO1 | Understand the definition and evolution of data engineering and differentiate between data engineering and data science (L2 & L4) |
| CO2 | Analyze the data engineering life cycle in comparison to the data life cycle. Identify and evaluate the major undercurrents across the data engineering life cycle, such as security. (L4) |
| CO3 | Apply the principles of good data architecture, differentiate between enterprise and data architecture, and explain major architecture concepts. (L3) |
| CO4 | Differentiate between various data storage systems and abstractions, including data warehouses, data lakes, and data lake houses. (L4) |
| CO5 | Design, optimize, and process queries on both static and streaming data, develop data models, and perform data transformations. (L5) |
| Course Content | UNIT-I**Introduction to Data Engineering:** Definition, Data Engineering Life Cycle,Evolution of Data Engineer, Data Engineering Versus Data Science, Data Engineering Skills and Activities, Data Maturity, Data Maturity Model, Skills of a Data Engineer, Business Responsibilities, Technical Responsibilities, Data Engineers and Other Technical Roles.UNIT-II**Data Engineering Life Cycle:** Data Life Cycle Versus Data Engineering Life Cycle, Generation: Source System, Storage, Ingestion, Transformation, Serving Data. **Major undercurrents across the Data Engineering Life Cycle:** Security, Data Management, DataOps, Data Architecture, Orchestration, Software Engineering. UNIT-III**Designing Good Data Architecture:** Enterprise Architecture, Data Architecture**,** Principles of Good Data Architecture, Major Architecture Concepts. **Data Generation in Source Systems:** Sources of Data, Files and Unstructured Data, APIs, Application Databases (OLTP), OLAP, Change Data Capture, Logs, Database Logs, CRUD, Source System Practical Details. UNIT-IV**Storage:** Raw Ingredients of Data Storage, Data Storage Systems, Data Engineering Storage Abstractions, Data warehouse, Data Lake, Data Lakehouse. **Ingestion:** Data Ingestion, Key Engineering considerations for the Ingestion Phase, Batch Ingestion Considerations, Message and Stream Ingestion Considerations, Ways to Ingest Data UNIT-VQueries, Modeling and Transformation: Queries, Life of a Query, Query Optimizer, Queries on Streaming Data, Data Modelling, Modeling Streaming Data, Transformations, Streaming Transformations and Processing. Serving Data for Analytics, Machine Learning and Reverse ETL: General considerations for serving Data, Business Analytics, Operational Analytics, Embedded Analytics, and Ways to serve data for analytics and ML, Reverse ETL.  |
| Text Books &ReferencesBooks | **TEXTBOOKS:**1. Joe Reis, Matt Housley, Fundamentals of Data Engineering, O'Reilly Media, Inc.,June 2022,ISBN: 9781098108304

**REFERENCE BOOKS:**1. Paul Crickard , Data Engineering with Python,Packt Publishing, October 2020.
2. Ralph Kimball, Margy Ross, The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling, Wiley, 3rd Edition, 2013
3. James Densmore, Data Pipelines Pocket Reference: Moving and Processing Data for Analytics, O'Reilly Media, 1st Edition, 2021
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| E-Resources | 1. <https://nptel.ac.in/courses/>
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