

## Course Lesson Plan: Data Analytics

---

### Week 01: Data Analytics – An Overview (2.5 Hours)

- **Definition of Data Analytics** and its relevance in different industries
  - **Types of Data:** Structured vs. Unstructured, Quantitative vs. Qualitative
  - **Data Analytics Workflow:** Collection, Data Cleansing & Transformation, Data Modelling, and Data Visualization
  - **Types of Data Analytics:** Descriptive, Diagnostic, Predictive, and Prescriptive
  - **Data Security** and ethical considerations
  - **Case Studies:** Real-world applications of data analytics
- 

### Week 02: Clustering and Classification Techniques (2.5 Hours)

- **Introduction to Data Science & Methodology**
  - **Clustering Techniques:** K-means, Hierarchical, and DBSCAN
  - **Classification Methods:** Decision Trees, Naïve Bayes, Support Vector Machines (SVM)
  - **Descriptive vs. Predictive Analytics**
  - **Case Study:** Applying clustering and classification techniques to **educational data**
- 

### Week 03: Machine Learning for Data Science (2.5 Hours)

- **Introduction to Machine Learning:** Supervised, Unsupervised, and Reinforcement Learning
  - **Neural Networks and Deep Learning:** Basics of Artificial Neural Networks (ANNs)
  - **Regression Analysis:** Linear and Logistic Regression
  - **Popular Data Analytic Tools:** Python, R, Tableau, Power BI
  - **Case Study:** Machine Learning applications in **educational data analytics**
- 

### Week 04: Social Network Analysis (2.5 Hours)

- **What is Social Network Analysis (SNA)?:** Nodes, Edges, and Graphs

- **Social Network Analysis in Education:** Identifying Influencers and Learning Patterns
  - **Analyzing Twitter/Facebook Data:** Hands-on case study using **real social media data**
  - **Understanding Sentiment Analysis & Text Mining**
- 

#### **Week 05: Educational Data Analytics (2.5 Hours)**

- **Learning Associations & Pattern Recognition**
  - **Classification & Regression Techniques in Education**
  - **Role of Educational Data Analytics:** Student performance, dropout prediction, and personalized learning
  - **Behavior Detection & Data Synchronization**
  - **Feature Engineering & Feature Selection** for student behavior analysis
- 

#### **Week 06: Performance Factors Analysis (2.5 Hours)**

- **Latent Knowledge Estimation:** How students acquire knowledge over time
  - **Bayesian Knowledge Tracing:** Predicting students' future learning performance
  - **Performance Factors Analysis:** Identifying key metrics for academic success
  - **Relationship Mining & Correlation Mining**
  - **Students' Interaction Network Analysis:** Understanding learning dynamics
- 

#### **Week 07: Data Visualization (2.5 Hours)**

- **Introduction to Data Visualization:** Importance and best practices
  - **Educational Visualization & Learning Curves**
  - **Heat Maps & Parameter Space Maps**
  - **State-space Network & Structure Discovery**
  - **Hands-on visualization using Tableau/Power BI/Python (Matplotlib & Seaborn)**
- 

#### **Week 08: Learning from Multiple Representations (2.5 Hours)**

- **Applications of Clustering in Educational Data Analytics (EDA)**

- **Factor Analysis & Knowledge Inference** (Q-matrix and Learning Factor Analysis)
  - **Personalized Recommendation Systems**
  - **Topic-based Content Recommendation & Course Recommendation**
  - **Case Studies:** Data analytics applications in **Google, Amazon, Healthcare, Government**
-