**INTERMEDIATE**

**LEVEL 1**

**Application of Analytics in Business**

**Course Description**

This course focuses on the practical application of analytics techniques to solve real-world business problems. Students will learn how to identify business opportunities, collect and analyze relevant data, build analytical models, and communicate insights to drive effective decision-making. The course covers a range of analytical methods, including descriptive, predictive, and prescriptive analytics, and emphasizes hands-on experience using industry-standard tools and technologies.

**Learning Outcome**

 Upon successful completion of this course, students will be able to:

* Identify business problems that can be addressed using analytics.
* Formulate analytical questions and hypotheses.
* Collect and prepare data from various sources for analysis.
* Apply appropriate analytical techniques to analyze business data.
* Build and evaluate analytical models.
* Interpret results and draw meaningful conclusions.
* Communicate analytical insights effectively to stakeholders.
* Make data-driven recommendations to improve business performance.
* Understand the ethical considerations of using analytics in business.

**Course Content**

**Introduction to Business Analytics**

* What is business analytics?
* The role of analytics in decision-making.
* Types of analytics (descriptive, predictive, prescriptive).
* Analytics framework for business problem solving.
* Identifying business opportunities for analytics.

**Data Collection and Preparation**

* Data sources and types.
* Data collection methods (surveys, experiments, databases).
* Data cleaning and preprocessing.
* Data integration and transformation.
* Data visualization for exploration.

**Descriptive Analytics**

* Descriptive statistics (mean, median, mode, standard deviation).
* Data aggregation and summarization.
* Customer segmentation and profiling.
* Market basket analysis.
* Trend analysis.

**Predictive Analytics**

* Regression analysis (linear, multiple, logistic).
* Classification techniques (decision trees, support vector machines, Naive Bayes).
* Time series analysis and forecasting.
* Predictive modeling process.
* Model evaluation and validation.

**Prescriptive Analytics**

* Optimization techniques (linear programming, integer programming).
* Simulation modeling.
* Decision analysis.
* Recommender systems.
* Applications of prescriptive analytics in different business functions.

**Analytics for Specific Business Functions**

* Marketing analytics (customer acquisition, churn prediction, campaign optimization).
* Financial analytics (risk management, fraud detection, financial forecasting).
* Operations analytics (supply chain optimization, inventory management, production planning).
* Human resources analytics (talent acquisition, employee performance, workforce planning).

**Communicating Analytical Insights**

* Data storytelling.
* Creating effective visualizations and dashboards.
* Presenting analytical findings to stakeholders.
* Communicating technical concepts to non-technical audiences.

**Ethical Considerations in Business Analytics**

* Data privacy and security.
* Bias in algorithms and data.
* Responsible use of analytics.
* Ethical implications of data-driven decision-making.

**Suggested Readings**

**Competing on Analytics: The New Science of Winning** by Thomas H. Davenport and Jeanne G. Harris: A classic that emphasizes the strategic importance of analytics and how to build an analytics-driven organization. Less on the technical details, more on the "why" and "how" of analytics in business.

**Analytics: The Agile Way** by Souhaib Ben-Sliman, Steve Lohr, and Mark Madsen: Focuses on a practical, iterative approach to applying analytics, emphasizing agility and collaboration.

**The Analytics Revolution: How to Improve Decision Making, Personalize Experiences, and Boost Your Bottom Line Using Data** by Thomas H. Davenport: A more recent work by Davenport, exploring how analytics is transforming businesses and the skills needed to succeed in this data-driven world.

**Big Data Technologies**

**Course Description**

This course provides a comprehensive overview of Big Data technologies, concepts, and techniques. Students will explore the challenges and opportunities presented by Big Data, learn about various tools and frameworks used for storing, processing, and analyzing large datasets, and gain hands-on experience working with real-world Big Data scenarios. The course covers both theoretical foundations and practical applications, equipping students with the skills needed to effectively manage and leverage Big Data in diverse contexts.

**Learning Outcome**

Upon successful completion of this course, students will be able to:

* Understand the fundamental concepts of Big Data, including its characteristics, challenges, and applications.
* Describe the architecture and components of Big Data systems.
* Work with distributed storage frameworks like Hadoop Distributed File System (HDFS).
* Process large datasets using batch processing frameworks like MapReduce.
* Utilize real-time processing frameworks like Apache Spark and Apache Flink.
* Explore NoSQL databases and their role in Big Data management.
* Apply data mining and machine learning techniques to analyze Big Data.
* Understand the importance of data governance, security, and privacy in Big Data environments.
* Evaluate and select appropriate Big Data technologies for specific use cases.

**Course Content**

**Introduction to Big Data**

* What is Big Data? Definition, characteristics (Volume, Velocity, Variety, Veracity), and evolution.
* Challenges and opportunities of Big Data.
* Big Data use cases and applications across industries.
* Introduction to Big Data ecosystems and architectures.

**Distributed Storage with Hadoop**

* Hadoop Distributed File System (HDFS): Architecture, data storage and retrieval.
* Data replication and fault tolerance in HDFS.
* Working with HDFS commands and APIs.
* Introduction to Hadoop YARN (Yet Another Resource Negotiator).

**Batch Processing with MapReduce**

* MapReduce paradigm: Map and reduce functions.
* Data partitioning and shuffling.
* Developing MapReduce programs using Java or Python.
* Job scheduling and execution in Hadoop.

**Real-Time Data Processing**

* Introduction to stream processing concepts.
* Apache Spark: Architecture, core concepts, and data processing.
* Spark SQL for structured data processing.
* Spark Streaming for real-time data analysis.
* Apache Flink: Overview and key features.

**NoSQL Databases**

* Introduction to NoSQL databases: Types and characteristics.
* Key-value stores, document databases, column-family stores, graph databases.
* Use cases for NoSQL databases in Big Data applications.
* Examples of NoSQL databases: MongoDB, Cassandra, HBase.

**Data Mining and Machine Learning with Big Data**

* Data mining techniques for large datasets.
* Machine learning algorithms for Big Data: Classification, clustering, regression.
* Tools and platforms for machine learning on Big Data: Mahout, MLlib.

**Big Data Governance, Security, and Privacy**

* Data governance principles and best practices.
* Data security challenges and solutions in Big Data environments.
* Data privacy regulations and compliance.
* Access control and authentication mechanisms.

**Big Data Project Development and Deployment**

* Building Big Data applications: Design patterns and best practices.
* Deploying Big Data solutions on cloud platforms or on-premises clusters.
* Monitoring and managing Big Data systems.

**Suggested Reading**

**Big Data:** A Revolution That Will Transform How We Live, Work, and Think by Viktor Mayer-Schönberger and Kenneth Cukier: Provides 1 a broad overview of the Big Data phenomenon and its implications.

[**1. www.allaboutbookpublishing.com**](https://www.allaboutbookpublishing.com/1386/the-e-book-market-in-china/)

[**www.allaboutbookpublishing.com**](https://www.allaboutbookpublishing.com/1386/the-e-book-market-in-china/)

**Hadoop:** The Definitive Guide by Tom White: A comprehensive guide to Hadoop, covering HDFS, MapReduce, and YARN.

**Learning Spark:** Lightning-Fast Big Data Analysis by Holden Karau, Andy Konwinski, Patrick Wendell, and Matei Zaharia: A practical guide to using Apache Spark for data processing and analysis.

**NoSQL Distilled:** A Brief Guide to the Emerging World of Polyglot Persistence by Pramod J. Sadalage and Martin Fowler: Explores the world of NoSQL databases and their use cases.

Information has increasingly become the new lifeblood of society, its organisations

and its peoples. The dawn of the Information Society offers huge potential benefits for

us all. Our dependence on information grows daily with the advance of information

and communication technologies (ICT) and its global application. ICT now influences

the way we live, work, socialise, learn, interact, and relax. We expect the information

on which we rely to be correct. The integrity of such information relies upon the

development and operation of computer based information systems. Those who

undertake the planning, development and operation of these information systems

have obligations to assure information integrity and overall contribute to the public

good (Rogerson, 2001).

The Information Society can be a dangerous world. Indeed Johnson (1997) explains

that the potential benefit of the Information Society is being devalued by antisocial

behaviour such as unauthorised access, theft of electronic property, launching of

viruses, racism and harassment. Add to that list identity theft, spam, electronic

snooping and aggressive electronic marketing, and it is clear that this new society is

not problem-free. Such issues raise new ethical, cultural, economic and legal

questions. It is questionable whether legal or technological counter measures are and

ever will be very effective in combating the ever changing antisocial behaviour in the

Information Society. The absence of effective formal legal or technological controls

presents grave dangers for us all (Rogerson, 2004). Even when controls are

implemented ICT has moved on and facilitated new ethical issues. In the absence of

effective controls we must rely upon ethics coupled with education and awareness.

The added advantage of this approach is that it not only addresses problematic issues

within the Information Society but also promotes its positive attributes.

This chapter focuses on the ethical perspective of information and communication

technologies (ICT) which will be termed computer and information ethics from now on

in this chapter. The discussion starts with a brief look at the roots of computer and

information ethics focusing on the work of Norbert Wiener. There then follows an

overview of the many definitions of computer and information ethics where the aim is

to illustrate the breadth of this multidisciplinary field. Having laid some foundations,

the chapter turns to application. The section on practice considers two distinct issues.

The first is how to embed an ethical perspective into information systems

development and the second is to consider the nature of ICT professionalism within

the Information Society. A series of Information Society challenges are then

considered in turn. These include privacy, property, culture and crime. The final

substantive section looks at the future, paying particular attention to how ICT

continually increases choice in global interaction within a dispersed community and

between different and geographically distant communities

**Python for Business Analytics

Course Description**

 This course equips students with the essential Python programming skills and libraries needed to perform data analysis and solve business problems. Students will learn how to manipulate, clean, analyze, and visualize data using Python, enabling them to extract insights and make data-driven decisions. The course focuses on practical applications of Python in various business domains, including marketing, finance, operations, and human resources.

**Learning Outcome**

 Upon successful completion of this course, students will be able to:

* Understand the fundamentals of Python programming, including data types, control flow, functions, and object-oriented programming.
* Use core Python libraries like NumPy and Pandas for data manipulation and analysis.
* Import, clean, and transform data from various sources (CSV, Excel, databases, APIs).
* Perform descriptive statistics, data aggregation, and exploratory data analysis (EDA).
* Create informative data visualizations using libraries like Matplotlib and Seaborn.
* Apply Python to solve real-world business problems in different domains.
* Communicate data-driven insights effectively using reports and presentations.

**Course Content**

**Introduction to Python Programming**

* Setting up the Python environment (Anaconda, Jupyter Notebooks).
* Python syntax, data types (integers, floats, strings, lists, dictionaries, tuples).
* Control flow (if-else statements, loops).
* Functions and modular programming.
* Object-oriented programming (classes and objects).

**Data Manipulation with Pandas**

* Introduction to Pandas DataFrames and Series.
* Importing and exporting data (CSV, Excel, databases).
* Indexing, selecting, and filtering data.
* Data cleaning and preprocessing (handling missing values, duplicates, outliers).
* Data transformation (merging, joining, pivoting, reshaping).

**Data Analysis with Pandas and NumPy**

* Descriptive statistics (mean, median, mode, standard deviation).
* Data aggregation and grouping.
* Applying functions to data (map, apply, applymap).
* Working with dates and times.
* Introduction to NumPy arrays and operations.

**Data Visualization with Matplotlib and Seaborn**

* Introduction to data visualization principles.
* Creating various types of plots (line charts, bar charts, scatter plots, histograms, box plots).
* Customizing plots (labels, titles, legends, colors, styles).
* Using Seaborn for advanced statistical visualizations.

**Business Applications of Python**

* **Marketing Analytics:** Customer segmentation, market basket analysis, campaign performance analysis.
* **Financial Analysis:** Financial modeling, risk assessment, portfolio optimization.
* **Operations Analytics:** Supply chain optimization, inventory management, process improvement.
* **Human Resources Analytics:** Employee turnover analysis, performance evaluation, talent management.

**Working with Databases and APIs**

* Connecting to databases (SQL and NoSQL) using Python.
* Querying and retrieving data from databases.
* Working with APIs to access external data sources.
* Web scraping for data collection.

**Advanced Topics (Optional)**

* Introduction to machine learning with scikit-learn.
* Building interactive dashboards with Plotly or Dash.
* Text analysis and natural language processing (NLP) for business.

**Suggested Readings**

**Python for Data Analysis by Wes McKinney:** A comprehensive guide to using Pandas for data manipulation and analysis.

**Python Crash Course by Eric Matthes:** A beginner-friendly introduction to Python programming.

**Automate the Boring Stuff with Python by Al Sweigart:** A practical guide to automating tasks using Python.

**Data Visualization & Reporting**

**Course Description**

 This course focuses on the principles and techniques of effective data visualization and reporting. Students will learn how to transform raw data into meaningful visual representations and create compelling reports that communicate insights and drive decision-making. The course covers various chart types, data storytelling techniques, dashboard design, and best practices for creating accessible and impactful visualizations. Students will gain hands-on experience using popular data visualization tools and platforms.

**Learning Outcome**

Upon successful completion of this course, students will be able to:

* Understand the principles of effective data visualization.
* Select appropriate chart types for different data and purposes.
* Design clear and informative dashboards.
* Tell compelling stories with data.
* Use data visualization tools and platforms effectively.
* Create reports that communicate insights and drive action.
* Understand best practices for data accessibility and inclusivity.

**Course Content**

**Introduction to Data Visualization**

* The importance of data visualization.
* Principles of visual perception and cognition.
* Types of data (categorical, numerical, time series, geospatial).
* Data visualization best practices.
* Common chart types (bar charts, line charts, scatter plots, histograms, pie charts).

**Data Storytelling**

* The narrative structure of data storytelling.
* Identifying key insights and messages.
* Crafting compelling data narratives.
* Using visual elements to enhance storytelling.

**Dashboard Design**

* Principles of dashboard design.
* Information hierarchy and layout.
* Interactive dashboards.
* Key performance indicators (KPIs) and metrics.
* Dashboard design tools and platforms.

**Data Visualization Tools and Platforms**

* Introduction to data visualization tools (e.g., Tableau, Power BI, Google Data Studio).
* Connecting to data sources.
* Creating charts, dashboards, and reports.
* Interactive features and customization.

**Reporting and Communication**

* The purpose of reports.
* Report structure and format.
* Communicating data insights effectively.
* Creating presentations and visualizations for reports.

**Advanced Visualization Techniques (Optional)**

* Geographic data visualization (maps and choropleths).
* Network graphs and relationship visualizations.
* Interactive and animated visualizations.

**Data Accessibility and Inclusivity**

* Designing visualizations for accessibility.
* Colorblindness and other visual impairments.
* Inclusive design principles.
* Best practices for creating accessible reports.

**Suggested Reading**

**Storytelling with Data: A Data Visualization Guide for Business Professionals** by Cole Nussbaumer Knaflic: 1 Emphasizes the importance of effective data communication and provides practical tips for creating compelling visualizations.

[1. inside.tamuc.edu](http://inside.tamuc.edu/academics/cvSyllabi/syllabi/202210/10107.pdf)

[inside.tamuc.edu](http://inside.tamuc.edu/academics/cvSyllabi/syllabi/202210/10107.pdf)

**The Visual Display of Quantitative Information** by Edward Tufte: A classic text on data visualization principles, focusing on clarity and accuracy.

**Data Visualization: A Practical Introduction** by Kieran Healy: A comprehensive guide to data visualization techniques and tools.

**Strategic Change Management**

**Course Description**

 This course provides a comprehensive understanding of the theories, models, and practical approaches to managing strategic change within organizations. Students will explore the dynamics of change, learn how to diagnose the need for change, develop change strategies, implement change initiatives effectively, and manage resistance to change. The course emphasizes both the conceptual and practical aspects of change management, equipping students with the skills needed to lead and navigate organizational change successfully, particularly within the Nigerian business context.

**Learning Outcome**

Upon successful completion of this course, students will be able to:

* Understand the nature of strategic change and its importance in today's dynamic environment.
* Diagnose the need for change and assess organizational readiness for change.
* Develop and implement effective change management strategies.
* Lead and manage change initiatives, including communication and stakeholder engagement.
* Manage resistance to change and build support for change.
* Evaluate the effectiveness of change initiatives and make necessary adjustments.
* Apply change management principles and frameworks to real-world scenarios, particularly within the Nigerian business context.

**Course Content**

**Introduction to Strategic Change**

* Defining strategic change: Types, drivers, and characteristics.
* The importance of strategic change in a globalized and competitive environment.
* Understanding the change management process.
* Change management models and frameworks (e.g., Lewin's Change Model, Kotter's 8-Step Change Model).
* The Nigerian business environment: Context for strategic change.

**Diagnosing the Need for Change**

* Environmental analysis: PESTLE, SWOT, Porter's Five Forces.
* Internal analysis: Organizational capabilities, culture, and performance.
* Identifying triggers for change: Internal and external factors.
* Assessing organizational readiness for change: Capacity, willingness, and resources.

**Developing Change Strategies**

* Setting clear objectives and desired outcomes for change.
* Selecting appropriate change approaches: Transformational vs. incremental change.
* Developing a change management plan: Key activities, timelines, and responsibilities.
* Aligning change initiatives with organizational strategy and goals.
* Considering the Nigerian context: Cultural and socio-economic factors.

**Implementing Change Initiatives**

* Leading and managing the change process: Communication, stakeholder engagement, and empowerment.
* Building a change coalition and fostering buy-in.
* Managing resources and allocating budget for change initiatives.
* Overcoming obstacles and challenges during implementation.
* Adapting change strategies as needed based on feedback and evaluation.

**Managing Resistance to Change**

* Understanding the sources of resistance to change: Individual, group, and organizational factors.
* Strategies for managing resistance: Communication, education, participation, and negotiation.
* Building support for change and creating a culture of change readiness.
* Addressing resistance in the Nigerian context: Cultural sensitivities and communication styles.

**Evaluating and Sustaining Change**

* Measuring the effectiveness of change initiatives: Key performance indicators (KPIs) and metrics.
* Evaluating the impact of change on organizational performance and stakeholders.
* Identifying lessons learned and best practices for future change initiatives.
* Sustaining change over time: Embedding new behaviors and practices.

**Leading Change in the Nigerian Context**

* Cultural considerations in change management in Nigeria.
* Leadership styles and their impact on change implementation.
* Communication strategies for diverse stakeholders in Nigeria.
* Case studies of successful and unsuccessful change initiatives in Nigerian organizations.

**Suggested Books**

**Leading Change** by John P. Kotter: A classic text on leading organizational change.

**Managing Transitions** by William Bridges: Focuses on the human side of change and how to manage transitions effectively.

**Switch: How to Change Things When Change Is Hard** by Chip Heath and Dan Heath: Provides practical strategies for overcoming resistance to change.

**Suggested Reading**

Articles and case studies from reputable business journals (e.g., Harvard Business Review, McKinsey Quarterly).

Industry reports and publications on change management best practices.