FACULTY OF ENGINEERING & TECHNOLOGY

First Year Master of Technology

Semester III

Course Code: 102310206

Course Title: Advanced Data Science

Type of Course: Program Elective III

Course Objectives: To familiarize the scope, process and advantages of business analytics, to introduce the forecasting models and techniques used in analytics, to expose the formulation and decision strategies used in business analytics

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	30 / 15	20 / 10	70 / 35	30 / 15	150 / 75

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Introduction to Business analytics: The science of Data-Driven Decision Making, Descriptive-predictive-prescriptive analytics, Bigdata Analytics, Web Analytics, Social media Analytics. Framework for data driven-decision making, Challenges in data driven-decision making and Future, Business Analytics in Practice	Click
2	Hypothesis Testing: Introduction to Hypothesis Testing, Setting Up a Hypothesis Test, One-Tailed and Two-tailed Test, Type I Error, Type II Error, and Power of The Hypothesis Test, Hypothesis Testing for Population mean with Known Variance: Z-Test, Hypothesis Testing for Population Proportion: Z-Test for Proportion, Hypothesis Test for Population mean under Unknown Population Variance, Paired Sample t-Test, Hypothesis Test for Difference in Population Proportion under Large Samples: Two-Sample Z-Test for Proportions, Effect Size: Cohen's D, Hypothesis Test for Equality of Population Variances, Non-Parametric Tests: Chi-Square Tests	Click
3	Analysis of Variance: Introduction to Analysis of Variance (ANOVA), Multiple t-Tests for Comparing Several Means, One-way Analysis of Variance (ANOVA), Two-Way Analysis of Variance (ANOVA)	Click

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4	Multiple Linear Regression: Introduction, Ordinary Least Squares Estimation for Multiple Linear Regression, Multiple Linear Regression Model Building, Part (Semi-Partial) Correlation and Regression Model Building, Interpretation of MLR Coefficients -Partial Regression Coefficient, Standardized Regression Co-efficient, Regression Models with Qualitative Variables, Validation of Multiple Regression Model, Co-efficient of Multiple Determination (R-Square) and Adjusted R-Square, Statistical Significance of Individual Variables in MLR – t-Test, Validation of Overall Regression Model: F-Test, Validation of Portions of a MLR Model – Partial F-Test, Residual Analysis in Multiple Linear Regression, Multi-Collinearity and Variance Inflation Factor, Auto-correlation, Variable Selection in Regression Model Building, Avoiding Overfitting: Mallows's Cp	Click
5	Logistic Regression: Introduction – Classification Problems, Introduction to Binary Logistic Regression, Estimation of Parameters in Logistic Regression, Interpretation of Logistic Regression Parameters, Logistic Regression Model Diagnostics, Classification Table, Sensitivity, and Specificity, Optimal Cut-Off Probability, Variable Selection in Logistic Regression, Application of Logistic Regression in Credit Rating, Gain Chart and Lift Chart	Click
6	Forecasting Techniques: Introduction to Forecasting, Time-Series Data and Components of Time-Series Data, Forecasting Techniques and Forecasting Accuracy, Moving Average Method, Single Exponential Smoothing (ES), Double Exponential Smoothing – Holt's Method, Triple Exponential Smoothing (Holt-Winter Model), Regression Model for Forecasting, Auto-Regressive (AR),Moving Average (MA) and ARMA Models, Auto-Regressive Integrated Moving Average (ARIMA) Process, Power of Forecasting Model: Theil's Coefficient	Click
7	Clustering: Introduction to Clustering, Distance and Dissimilarity Measures used in Clustering, Quality and Optimal Number of Clusters, Clustering Algorithms, K-Means Clustering, Hierarchical Clustering	Click
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Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						**R**: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create
R	**U**	**A**	**N**	**E**	**C**	
15%	25%	20%	30%	10%	--	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1	Business analytics: The science of Data Driven Decision Making by u Dinesh Kumar, Willey
2	Essential of Business Analytics by by Jeffrey D. Camm (Author), James J. Cochran (Author), Michael J. Fry (Author), Jeffrey W. Ohlman (Author), David R. Anderson
3	Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press
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Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Define the scope, process and advantages of business analytics	**30**
CO-2	Understand and apply the Concepts of Descriptive and Predictive analytics	**40**
CO-3	Understand, analyze and apply concepts of hypothesis testing, analysis of variance and forecasting	**30**
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CO-9	Click or tap here to enter text.	Click
CO-10	Click or tap here to enter text.	Click

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List of Practicals / Tutorials:

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1	Tutorials on Hypothesis testing
2	Tutorials on Analysis of Variance
3	Study and perform Multilinear regression on given datasets
4	Perform Logistic Regression on given datasets
5	Apply Clustering techniques for datasets
6	Apply forecasting techniques for various timeseries datasets
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Supplementary learning Material:	
1	Open source Tools (R Studio, Candela, Python, Qlik, etc..)
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Curriculum Revision:	
Version:	**1**
Drafted on (Month-Year):	Apr-20
Last Reviewed on (Month-Year):	Jul-20
Next Review on (Month-Year):	Apr-22

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