Deccan Education Society's
Brihan Maharashtra College of Commerce (AUTONOMOUS)
845, Shivajinagar, Pune-411004
Post Graduate Diploma in Big Data Analytics
(Designed and Conducted by DES & BMCC)

With effect from June 2019

Code	Course		Credits
10101	Applied Statistics for Business using Excel / SPSS	_	4
10102	Operations Research (optimisation Techniques)	_	4
10103	Fundamentals program in R Programming	_	3
10104	Oracle SQL	_	4
10105	Python – Basics	_	2
10201	Business Economics		4
10202	Research Methodology		4

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Subject code- 10101   **Semester – 1**   **Credit - 4**

Subject title – Applied Statistics for Business (Pattern 2019)

Objectives:

Unit No.	Topics
1	Concept of statistics, population, sample, parameter and statistic, examples of use of statistic, data sources, representation of data, types of statistical analyses, sampling methods, types of variables, measures of central tendency, statistical estimation: point and interval, co-variance, coefficient of correlation, formulae.
2	Permutations and combinations, Probability concepts, types of probabilities, collectively exhaustive event set, joint probability, Bayes Theorem, probability distribution for a discreet random variable, probabilistic view on variance, covariance.
3	Distributions: Bernoulli's trail, binomial distribution, Poisson distribution, Hypergeometric distribution, student-t distribution, Chi-square distribution, F-distribution, Normal distribution, explanation of derivation of population parameter through samples and central limit theorem, Z score.
4	Hypothesis and testing, single parameter and two-parameter testing, single sided and two-sided testing, p-value, tests and test statistic and logic behind it, problems on hypothesis testing, diagnostic tests: goodness of fit, t-test, f-test and chi-sq test, contingency table, degree of freedom, analysis of variances.

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Subject code- **10102**   Semester – 1   Credit - 4

Subject title – **Operations Research** (Pattern **2019**)

Unit No.	Topics
1	**Mathematical Optimization for Business Problems** Mathematical Programming is a powerful technique used to model and solve optimization problems. This training provides the necessary fundamentals of mathematical programming and useful tips for good modeling practice in order to construct simple optimization models. In this training, students will explore several aspects of mathematical programing and more about constructing optimization models using IBM Decision Optimization technology, including: • Basic terminology: operations research, mathematical optimization, and mathematical programming • Basic elements of optimization models: data, decision variables, objective functions, and constraints • Different types of solution: feasible, optimal, infeasible, and unbounded • Mathematical programming techniques for optimization: Linear Programming, Integer Programming, Mixed Integer Programming, and Quadratic Programming • Algorithms used for solving continuous linear programming problems: simplex, dual simplex, and barrier • Important mathematical programming concepts: sparsity, uncertainty, periodicity, network structure, convexity, piecewise linear and nonlinear These concepts are illustrated by concrete examples, including a production problem and different network models.
2	**Mathematical Optimization for Business Problems** Mathematical Programming is a powerful technique used to model and solve optimization problems. This training provides the necessary fundamentals of mathematical programming and useful tips for good modeling practice in order to construct simple optimization models. In this training, students will explore several aspects of mathematical programing and more about constructing optimization models using IBM Decision Optimization technology, including: • Basic terminology: operations research, mathematical optimization, and mathematical programming • Basic elements of optimization models: data, decision variables, objective functions, and constraints • Different types of solution: feasible, optimal, infeasible, and unbounded • Mathematical programming techniques for optimization: Linear Programming, Integer Programming, Mixed Integer Programming, and Quadratic Programming • Algorithms used for solving continuous linear programming problems: simplex, dual simplex, and barrier • Important mathematical programming concepts: sparsity, uncertainty, periodicity, network structure, convexity, piecewise linear and nonlinear

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	These concepts are illustrated by concrete examples, including a production problem and different network models.
3	• Introduction to Linear programming • A production problem : Part 1 - Writing the model • A production problem : Part 2 - Finding a solution • A production problem : Part 3 - From feasibility to unboundedness • Algorithms for solving linear programs : Part 1 - The Simplex and Dual Simplex Algorithm Algorithms for solving linear programs : Part 2 - The Simplex and Barrier methods
4	**Linear Programming**
5	**Network Models** • Introduction to Network Models • The Transportation problem • The Transshipment problem • The Assignment problem • The shortest path problem Critical path analysis
6	**Beyond simple LP** • Nonlinearity and Convexity • Piecewise linear programming • Integer programming • The branch and bound method Quadratic Programming
7	**Modelling Practice** • Modelling the real world • The importance of Sparsity Tips for better models

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Subject code- 10103   **Semester – 1**   **Credit - 3**

Subject title – Fundamentals program in R Programming (Pattern 2019)

Objectives:

R is a powerful language for data analysis, data visualization, machine learning, and statistics. Data visualization plays an essential role in the representation of both small and large scale data. The main goal of this course is to teach students how to take data that at first glance has little meaning and present that data in a form that makes sense to people. In this course, participants will be learning about the basics of R, and will end with the confidence to start writing your own R scripts.

Unit No.	Topics
1	**Module 2.1 Module 1 - R basics** • Math, Variables, and Strings • Vectors and Factors Vector operations
2	**Module 2.2 Data structures in R** • Arrays & Matrices • Lists Dataframes
3	**Module 2.3 R programming fundamentals** • Conditions and loops • Functions in R • Objects and Classes Debugging
4	**Module 2.4 - Working with data in R** • Reading CSV and Excel Files • Reading text files Writing and saving data objects to file in R
5	**Module 2.5 - Strings and Dates in R** • String operations in R • Regular Expressions Dates in R
6	**Module 2.6 - Basic Visualization Tools** • Bar Charts • Histograms Pie Charts
7	**Module 2.7 - Basic Visualization Tools Continued** • Scatter Plots Line Plots and Regression

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8	**Module 2.8 - Specialized Visualization Tools** • Word Clouds • Radar Charts • Waffle Charts Box Plots
9	**Module 2.9 - How to create Maps** Creating Maps in R

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Subject code- 10104 **Semester – 1** **Credit - 4**

Subject title – Information Management - RDBMS concepts (Pattern 2019)

Unit No.	Topics
1	Introduction to RDBMS – Data Models – Database users – System Structure – Data base administrator – Basic concepts
2	Entity – Relationship model, Basic concepts – Mapping constraints – Keys – ER Diagram – Work Entity sets – Design of an ER Database Schema – reduction of ER Schema to tables
3	SQL - Set operations – Aggregate functions – Null values – Nested subqueries – views – Modification of databases joined Relations – DDL – other SQL features
4	Data Warehousing theory- concept of cubes and aggregation of data in characteristics, Key figures and data granularity
5	Comparison of OLTP and OLAP
6	TL- Extraction, Transformation and Loading of data from various sources to DW
7	Slicing, dicing and cross applications reporting and complex data analysis
8	Business Applications of BI- Business Intelligence
9	Data Mining Engine consisting of a set of functional modules for tasks such as characterization, association and correlation analysis, classification, prediction, cluster analysis, outlier analysis, and evolution analysis.
10	Pattern Evaluation-The search toward interesting patterns and knowledge presentation and visualization techniques for displaying recognized patterns
11	Mining Applications- Financial data, Retail Industry, Telecom Industry, Biological Data etc.

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Subject code- 10105   **Semester – 1**   **Credit - 2**

Subject title – Python - Basics (Pattern **2019**)

Unit No.	Topics
1	**Introduction to Python,** • Understanding Operators, Variables and Data Types, • Conditional Statements, • Looping Constructs, Functions, • Data Structure, Lists, Dictionaries • Understanding Standard Libraries in Python, Reading a CSV File in Python
2	**Data Frames and basic operations with Data Frames, Indexing a Data Frame** Data cleaning, • Data Transformation • Libraries in Python – • NumPy, • Pandas • Seaborn •

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Subject code- 10201 **Semester – 2** **Credit - 4**

Subject title – Business Economics

Objectives:

Unit No.	Topics
1	Introduction to Managerial-Economics: Nature and Scope; Approaches; Relevance to Social Economy: Concept of Scarcity; Concept of Division of Labor and Exchange; Factors of production, Utility, Market, Exchange; Market Mechanism
2	Market - Demand Side: Law of Demand; Exceptions, Elasticity Concepts; Downward Sloping Curve/ Shifts of Demand Curve; Notion of Competition/ Industry Demand Curve. Market - Supply Side: Law of Supply; Exceptions, Elasticity Concepts
3	Equilibrium and Pricing: Price Determination
4	Concepts of Cost; Fixed/ Variable/ Average Costs; Marginal Cost, Opportunity Costs; Social Costs
5	Production and Returns: Variable Proportions; Returns to Scale: Increasing; decreasing; constant returns, Input-Output; Value Added (Production Based Interpretation, 'Factor-payment' Interpretation; Labour and other factor payments)
6	Market Structures: Competition, Monopoly, Imperfect Competition, Monopolistic Competition, Oligopoly: Pricing decisions under different market structures

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Subject code- 10202   **Semester – 2**   **Credit - 4**

Subject title – **Research Methodology (Pattern 2019)**

Unit No.	Topics
1	Perspective and approaches to research: Quantitative, Positivist and Qualitative Etic and Emic perspectives, Phenomenology Ethnography, Grounded Theory Research in Business
2	Research Process: Overview and steps involved in research
3	Research Problem and Proposal: Selecting defining and developing the problem and formulating the hypothesis
4	Research Design and Planning: Meaning of research design, kinds of research design, experimental and non-experimental designs, operational design and planning
5	Primary Data Collection Methods: a.) Survey methods, Questionnaire design, Instruments for respondent communication, Experimentation b.)Observation methods, Participant Observation, Interviews, Behavioral event interview, long interview, Focus group discussion, Case study method Sampling: Sampling design, criteria for selecting a sample, types of sampling, sample size
6	Secondary data and literature research, problems in secondary data
7	Scaling: Importance, scaling, basic types of scales
8	Data Processing and Preliminary Analysis: Editing, tabulating, coding, classification, analysis, interpretation, statistics in research, use of computers in research
9	Sampling Distribution and Hypothesis Testing
10	Report writing and presentation

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