

**ME Computer Engineering (2013)**  
**Course Contents for Elective II (Semester II)**

**Open Elective – Business Analytics and Optimization**

**Teaching Scheme**  
Lectures: 5 Hrs/week

**Examination Scheme**  
**Theory In-semester Assessment: 50 Marks**  
**Theory End-semester Assessment: 50 Marks**  
**Total Credits : 05**

**Objectives:**

- i) The course will focus on applications and applied methods of Business analytics and optimization.
- ii) Mathematical modeling using statistics and analysis methods
- iii) Generation of software engineering documents using mathematical modeling for business analytics and optimization
- iv) Development using latest technologies.

**1. Application and case studies of statistics**

Probability Theory, Conditional Probability and Bayes' Theorem, Random Variables, Density and Distribution Function, Joint, Marginal and Conditional Distribution, Moment Generating Function, Law Of Large Numbers and Central Limit Theorem, Theory of Estimation and Statistical Inference, Point and Interval Estimation, Maximum Likelihood and Method of Moment Estimation, Hypothesis Testing, Error Types

**2. Relevance and use of Exploratory Data Analysis**

Understanding different types of data, Data Cleaning and Data Preparation for analysis, Univariate and Multivariate Data Visualization (With different Graphical Methods), Guidelines for Model Building

**3. Predictive Analytics**

**3. A. Classification**

Linear Discriminant Analysis, Logistic Regression, Decision Trees (CHAID / C-4.5 etc), Perceptron Algorithm, Back Propagation Neural Networks.

**3. B. Regression (Function Approximation)**

Multiple Linear Regression, Neural Networks

**3. C. Model selection in Classification and Regression**

How to interpret models and make business sense? Goodness of Fit Measures, Different Model Evaluation Criteria

**4. Time Series Analysis**

Introduction to Time Series Analysis, Autocorrelation and Partial Autocorrelation, Conditions for stationary and invertible process, Box-Jenkins approach, Models for Stationary Time Series, Auto Regressive Processes, Moving Average models, Exponential Smoothing, Forecasting and Applications

## **5. Segmentation Methods**

Cluster Analysis, Factor Analysis

## **6. Optimization**

Linear Programming & Applications, Transportation problems, Assignment problems, Game Theory & applications

## **References:**

1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani and Jerome Friedman, Available Online from <http://www.stanford.edu/~hastie/pub.htm>
2. Optimization Techniques, H. A. Taha
3. Pattern Classification, R. Duda, P. Hart, D. Stork
4. Linear Statistical Inference and Its Applications, C R Rao