# COURSE CONTENTS AND GUIDELINES

## FOR THE

## POST GRADUATE DIPLOMA IN

## BUSINESS ANALYTICS (PGDBA)

### OF

# RV INSTITUTE OF MANAGEMENT

**(AUTONOMOUS INSTITUTION UNDER BENGALURU CITY UNIVERSITY)**

## WEF 2023-24



## RV INSTITUTE OF MANAGEMENT

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**https://rvim.edu.in**

## REGULATIONS FOR ONE YEAR POST GRADUATE DIPLOMA IN BUSINESS ANALYTICS (PGDBA)

### 1. TITLE

These regulations shall be called "RV INSTITUTE OF MANAGEMENT Regulations for POST GRADUATE DIPLOMA IN BUSINESS ANALYTICS (PGDBA)"

### 2. EXTENT OF APPLICATION

This set of Regulations, on approval by the Governing Body, shall supersede all the corresponding earlier sets of regulations of the Post Graduate Diploma in Business Analytics along with all the amendments thereto and shall be binding on all students undergoing the Post Graduate Diploma Programme/(s) (Credit System) at RVIM, Bangalore. This set of Regulations, may evolve and get refined updated or amended or modified or changed through appropriate approvals from the Academic Council and/or Governing Body from time to time, and shall be binding on all parties concerned, including the Students, Faculty and the Staff of Departments. The decision of the Governing Body shall be final and binding.

### 3. VISION, MISSION AND QUALITY POLICY

**Vision:**

To Become World Class Management Institute of Eminence

**Mission:**

To nurture Universal Thought Leaders by offering holistic management education fostering Business Intelligence, Health Care, Innovation and Entrepreneurship for Inclusive Growth and Sustainable Development

AND

To provide value added services to Business, Government and Society through Staff Empowerment, Joint Research and Collaborative Engagement
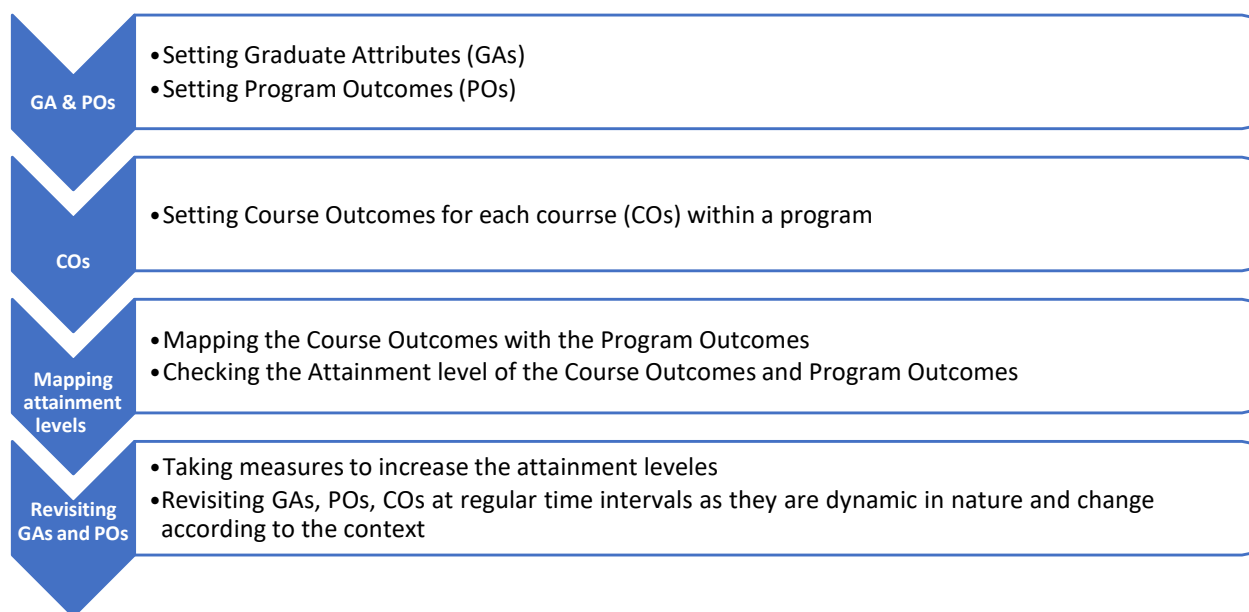
**Quality Policy:**

Constantly strive to achieve excellence across all fronts to remain an Industry relevant and socially responsible Institution by following the principle and philosophy of Outcome Based Education

**Values:**

**T**rust
**R**espect
**I**ntegrity
**P**rofessional
**H**umane

## 4. OBE PROCESS FOLLOWED AT RVIM

**GA & POs**
- Setting Graduate Attributes (GAs)
- Setting Program Outcomes (POs)

**COs**
- Setting Course Outcomes for each courrse (COs) within a program

**Mapping attainment levels**
- Mapping the Course Outcomes with the Program Outcomes
- Checking the Attainment level of the Course Outcomes and Program Outcomes

**Revisiting GAs and POs**
- Taking measures to increase the attainment levels
- Revisiting GAs, POs, COs at regular time intervals as they are dynamic in nature and change according to the context

## 4.1 ATTRIBUTES OF THE PROGRAM

| ATTRIBUTES | DESCRIPTOR |
|---|---|
| IT Skills & Business Analytics | Graduates will be able to use contemporary information, technology, tools and techniques independently to enhance productivity and strengthen decision-making skills |
| Subject Knowledge Proficiency & Application | Able to demonstrate comprehensive Knowledge in their functional domains and apply it to professional practice |
| Data Analysis, Problem Solving and Decision Making | Graduates will apply logical, critical and creative thinking to solve a range of problems for data-based decision making |
| Research Aptitude, Critical Thinking and Cognitive Flexibility | Graduates will be able to think critically with cognitive flexibility and develop an aptitude  skill towards research |
| Disciplinary Knowledge | To enhance the capability of comprehensive knowledge with a holistic approach towards recent advances in the field of business analytics & management to exhibit the skills essential for executing various business operations and resolving business problems. |
| Self-Awareness, Self-Reflection and Lifelong learning | Graduates will understand their own self and their reflections on others and engage in lifelong learning |
| Experiential Learning | Enables the students to analyze the situation from diverse perspective and to widen the horizon of their thought processes. |

**4.2 PROGRAM OUTCOMES (POs)**

| PO'S | |
|------|---|
| PO1 | Apply knowledge of management theories and Practices to solve business problems with required abilities to understand, analyse and communicate global, economic, societal, cultural, legal and ethical aspects of business |
| PO2 | Foster analytical and critical thinking abilities to draw meaningful insights for data-driven decision making |
| PO3 | Understand and use appropriate algorithms to design, develop, test and deploy the analytical models to solve business problems |
| PO4 | Deal with complex issues using multi-disciplinary approach with the help of advanced Management & IT tools and techniques |
| PO5 | Ability to apply domain specific knowledge and analytical skills to build competencies in their respective functional area |
| PO6 | Ability to develop value based leadership to lead themselves and others in the achievement of organizational goals and contributing effectively to a team environment through entrepreneurial thinking, innovation & reporting using analytics |
| PO7 | Continuously engage in research and development work using analytics with cognitive flexibility to create new knowledge and be a lifelong learner. |
| PO8 | Ability to understand social responsibility and contribute to the community for inclusive growth and sustainable development of society through ethical behaviour using power of analytics. |

## 5. MINIMUM ELIGIBILITY FOR ADMISSION AND ADMISSION PROCEDURE FOR PGDBA PROGRAM

The Graduates from any discipline from Government recognized University with minimum 50% (45 percent for SC/ST/PWD category candidates) marks in aggregate along with regular SSLC/10th + PUC/12th/3 years Diploma + Minimum 3 years Bachelors program in any discipline are eligible or an equivalent qualification recognized by the Ministry of HRD, GOI along with regular SSLC/10th + PUC/12th /3 years Diploma are eligible.

### 5.1 SELECTION PROCEDURE

Interested candidates fulfilling the eligibility norms have to login to our website https://www.rvim.edu.in & find the Admissions link on our home page.

There is a dedicated link – **Apply online** through which the candidates have to first register & then proceed as per the instructions. Candidates first have to register as a new user & use the login information to apply online in our website and submit application online. After submitting the application online, candidates should send an email to admissions.rvim@gmail.com mentioning the Name, Parents name, DOB, application number, mobile number and attach the filled application form along with the soft copy of marks cards - 10th, 12th, Degree Marks cards & one passport photograph to the mail ID: admission.rvim@gmail.com. Once we receive the application, the candidate will get email with the application fee payment information. The candidates can also pay the application fee of Rs. 500/- through demand draft in the favour of **The Director, RVIM** payable at Bengaluru or through NEFT.

## 5.2 ADMISSION PROCESS

The candidates can confirm the dates to appear for the Personal Interview to the Email ID: admission.rvim@gmail.com. The interviews are currently being conducted Online and Off-line mode. The candidate can choose the mode of interview. The interviews will be conducted on all weekdays (Monday to Friday). Documents required are 10th, 12th, Degree Marks cards & one passport photograph (Original & One set photocopy of all the documents).

After completing the application form, paying the application fee & verifying all the documents, Institution will conduct the Personal Interview. The results of the interview will be announced on the same day. The interviews are currently being conducted online and off-line. The candidates can choose the mode of interview. Students should confirm the dates at least one day in advance to the Institution. The admission team will present to the HoI, the list of selected candidates duly considering the permissible Intake along with its recommendation for each candidate and intimate the same to the candidates.

## 6. DURATION OF THE COURSE

The duration of the PGDBA program shall extend to over two semesters with real world capstone project spanning over a period of one year.

## 7. MEDIUM OF INSTRUCTION

The course being a professional course and having global connotation, the medium of instruction shall be in English medium only.

## 8. ATTENDANCE

a) Each semester is considered as a unit and the candidate has to put in a minimum attendance of 75% in each course with a provision for condonation of 10% of the attendance by the Director, RVIM for reasons such as (i) Serious medical condition or (ii) Representing the Institute / University /State /Nation in sports, cultural, technical or academic activity and any other meaningful engagements with the

Permission of the Director. Leave of absence granted by the competent Authority is must to give the attendance under special cases. The students who do not satisfy this condition will be declared as NSAR (Not Satisfied Attendance Requirement).

b) The basis for the calculation of the attendance shall be the period prescribed by the Institution through its calendar of events. For late admission, the date of admission to first semester PGDBA would be considered for the calculation of attendance (this rule does not apply to second semester).

c) The students will be informed about the attendance position periodically by the college notifying the status on the notice board before each CIA. Student declared as NSAR is not eligible to take up SEE in that particular course.

## 9. CREDIT DISTRIBUTION

| Sl.NO | TITLE | CREDITS |
|-------|-------|---------|
| 1 | Experiential Learning Courses | 14 |
| 2 | Core Courses | 13 |
| 4 | Functional Electives | 4 |
| 5 | Open Electives | 2 |
| 6 | Skill Enhancement Courses | 15 |
| 8 | Real World Capstone Project | 6 |
| | **Total Credits** | **54** |

## 10. SCHEME OF EXAMINATION

- Continuous Internal Assessment (CIA): 50 Marks
- Semester End Examination (SEE): 50 Marks
- Internal & External: 50% & 50%
- Minimum requirement to get promoted:

Students should secure minimum of 40% marks in CIA to write the semester end exam and should secure minimum of 40% in SEE to pass the subject.

### 10.1 GRADING SYSTEM

**EIGHT POINT ALPHA - SIGN GRADING SCALE under CBCS System**

| Alpha – Sign/ Letter Grade | O (Outstanding) | A+ (Excellent) | A (Very Good) | B+ (Good) | B (Above Average) | C (Average) | P (Pass) | F (Fail) | Ab (Absent) |
|---|---|---|---|---|---|---|---|---|---|
| SGPA/ CGPA | 9.00 -10.00 | 8.00-< 9.00 | 7.00 - < 8.00 | 6.00 - < 7.00 | 5.50 - <6.00 | 5.00 - < 5.50 | 4.00 - <5.00 | Below 4.00 | 00 |
| Semester /Program percentage of marks | 90.0-100 | 80.0- < 90.0 | 70.0- < 80.0 | 60.0- < 70.0 | 55.0- < 60.0 | 50.0- < 55.0 | 40.0- < 50.0 | Below 40 | Absent |
| Result/ Class description | Outstanding | First class Exemplary | First class Distinction | First class | Higher second class | Second class | Pass class | Fail/ re-appear | Absent |

### CIA:

- Attendance & Class participation- 10 Marks
- Mid – Term Test – 10 Marks
- Other Assignments & Projects - 30 Marks

**Minimum 75% attendance is required to write the Semester End Examination**

### 10.2 CLASSIFICATION OF SUCCESSFUL CANDIDATES: SEMESTER WISE

The Grade Points (GP) in a course shall be assigned based on the basis of actual marks scored in that course. They shall be generally percentages divided by 10. The Grade Point Weights (GPW) shall then be calculated as the product of the grade points earned in the course and the credits for the course. The total GPW for a semester is obtained by adding the GPW of all the courses of the semester.

### ILLUSTRATION 1 (24 CREDITS)

| PAPERS | PI | P2 | P3 | P4 | P5 | P6 | P7 | TOTAL |
|---|---|---|---|---|---|---|---|---|
| MAX. MARKS | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 700 |
| % MARKS OBTAINED | 77 | 73 | 58 | 78 | 64 | 67 | 83 | 500 |

| GRADE POINTS EARNED (G.P.) | 8.0 | 7.5 | 6.0 | 8.0 | 6.5 | 7.0 | 8.5 | - |
|---|---|---|---|---|---|---|---|---|
| CREDITS FOR THE COURSE (C) | 3 | 4 | 3 | 3 | 4 | 3 | 4 | **24** |
| TOTAL GPW = GP X C | 24 | 30 | 18 | 24 | 26 | 21 | 34 | 177 |

- **Semester Aggregate Marks: 500 / 700 = 71.43%**
- **Classification of Result: First Class Distinction.**
- **The SGPA = Total CP/Total Credits = 177/24= 7.37**
- **Semester Alpha Sign Grade: A**

## 10.3 CALCULATION OF CUMULATIVE GRADE POINT AVERAGE (CGPA)

The Cumulative Grade Point Average (CGPA) at the end of the final semester shall be calculated as the weighted average of the semester GPW. The CGPA is obtained by dividing the total of GPW of all the two semesters by the total credits for the program.

## 10.4 MINIMUM GRADE FOR A PASS

- A candidate shall be declared to have passed the PGDBA program if he/she secures at least a CGPA of 4.0 and qualify all the prescribed courses.
- The candidate who pass in all the papers in first attempt in all the two semesters is eligible for ranks provided they secure minimum CGPA of 7.0 (Alpha-Sign Grade A).
- The results of the candidates who have passed the second semester examination but not passed the lower semester examinations shall be declared as NCL (Not Completed Lower semester examinations). Such candidates shall be eligible to receive the degree only on completion of the lower semester examinations.
- A candidate who passes the semester examinations in parts is eligible for only Class / CGPA and Alpha Sign Grade but not be eligible for rank.

## 10.5 SUPPLEMENTARY EXAMINATION

Supplementary Exams are conducted every semester. Fast track Examinations are conducted yearly once.

## 11. COURSE MATRIX OF PGDBA PROGRAM

| S.NO | TITLE | I | II | Project | CREDITS | |
|------|-------|---|----|---------|---------|--|
| 1 | Experiential Learning Courses | 1+1<br>[1*3 cr + 1*4 cr] | 1+1<br>[1*3 cr + 1*4 cr] | | 14 | |
| 2 | Core Courses | 1+2<br>[1*4 cr + 2*3 cr] | 1<br>[1*3 cr] | | 13 | |
| 3 | Skill Enhancement Courses | 1+1<br>[1*3 cr + 1*4 cr] | 2<br>[2*4 cr] | | 15 | |
| 4 | Functional Electives | ------ | 1<br>[1*4 cr ] | | 4 | |
| 5 | Open Electives | ------ | 1<br>[1*2 cr ] | | 2 | |
| 6 | Real World Capstone Project (2 months) | ------ | | Internship<br>[ 6 credits ] | 6 | |
| | | | | | | |
| | TOTAL CREDITS | 24 | 24 | 6 | 54 | |
| | TOTAL TIME | 4 + 1 Month | 4+1 Month | 2 Months | 12 Months | |

## FIRST SEMESTER COURSE MATRIX

| SUBJECT CODE | NAME OF THE COURSE | CREIDTS | MAXIMUM MARKS | | TOTAL |
|--------------|--------------------|---------|------|------|-------|
| | | | CIA | SEE | |
| 23PGB111 | ADVANCED IT SKILLS | 03 | 50 | 50 | 100 |
| 23PGB112 | BUSINESS STATISTICS | 04 | 50 | 50 | 100 |
| 23PGB113 | INTRODUCTION TO BUSINESS ANALYTICS, DATA WAREHOUSING AND DATA MINING | 03 | 50 | 50 | 100 |
| 23PGB114 | DBMS & SQL | 03 | 50 | 50 | 100 |
| 23PGB115 | PREDICTIVE ANALYTICS USING R | 04 | 50 | 50 | 100 |
| 23PGB116 | EMERGING TECHNOLOGIES | 03 | 50 | 50 | 100 |
| 23PGB117 | ECONOMETRICS FOR DECISION MAKING | 04 | 50 | 50 | 100 |
| **TOTAL** | | **24** | **350** | **350** | **700** |

## SECOND SEMESTER COURSE MATRIX

| SUBJECT CODE | NAME OF THE COURSE | CREIDTS | MAXIMUM MARKS | | TOTAL |
|---|---|---|---|---|---|
| | | | CIA | SEE | |
| 23PGB121 | MACHINE LEARNING USING PYTHON | 04 | 50 | 50 | 100 |
| 23PGB122 | PRESCRIPTIVE ANALYTICS | 04 | 50 | 50 | 100 |
| 23PGB123 | WEB & SOCIAL MEDIA ANALYTICS | 03 | 50 | 50 | 100 |
| 23PGB124 | BIG DATA ANALYTICS | 03 | 50 | 50 | 100 |
| 23PGB125 | DATA VISUALIZATION & STORY TELLING USING TABLEAU | 04 | 50 | 50 | 100 |
| **FUNCTIONAL ELECTIVES**<br>**(Any One)** | | | | | |
| 23PGB221 | FINANCE & RISK ANALYTICS | | | | |
| 23PGB222 | HR ANALYTICS | | | | |
| 23PGB223 | MARKETING & RETAIL ANALYTICS | 04 | 50 | 50 | 100 |
| 23PGB224 | HEALTH CARE ANALYTICS | | | | |
| 23PGB225 | OPERATIONS & SUPPLY CHAIN ANALYTICS | | | | |
| **OPEN ELECTIVE**<br>**(Any One)** | | | | | |
| 23PGB321 | DESIGN THINKING | 02 | 50 | 50 | 100 |
| 23PGB322 | PROJECT MANAGEMENT | | | | |
| **PROJECT** | | | | | |
| 23PGB421 | REAL WORLD CAPSTONE PROJECT | 06 | 50 | 50 | 100 |
| **TOTAL** | | **24 + 6** | **350 + 50** | **350 + 50** | **700 + 100** |

# FIRST SEMESTER COURSES

| Course Title | Advanced IT Skills |
|---|---|
| Term/Semester | I |
| Course ID | 23PGB111 |
| Credits | 3 |

**INTRODUCTION:**

Technology has bought greater convenience, improved access to information, and revolutionized how we work today. Although we are familiar with technology in our daily lives but many are not skilled in to use advanced IT that is demanded by the industry today. Gaining advanced IT skills like advanced MS- Excel, Power BI, R programming and Python will make them more self-assured when applying to certain industries and facilitate better business decisions. Additionally, technical expertise makes one's multi-tasking, giving the confidence to take on increasingly challenging and complex roles for a growing career. This course is designed to improve the professional and job skills of students which will help them to get exponential growth in their careers. This course will not only help to build the future skills required to succeedin education but also those advanced IT skills that are directly relevant to industries and careers of the future.

**COURSE OUTCOMES (COS):**

After successful completion of the course students will be able to:

**CO1:** Recognize and utilize the different advanced functional tools and techniques integrated into Microsoft Excel for drawing insights

**CO2:** Understand and use the various Power BI analytical and visualization tools and approaches.

**CO3:** Identify and use R programming analytical tools and approaches

**CO4**: Comprehend various analytical and visualization tools and techniques embedded in Tableau

**CO5**: Read and write data from/to files in Python and decompose a Python program into functions

**COURSE CONTENT AND STRUCTURE:**                                    **36 Hours**

**Module 1: MS-Excel in Functional areas of Business**                  **6 Hours**

- Analyze data with Pivot tables, Grouping, Calculated Field & Item; Create and manage Scenarios and Summaries; Define and use cells names; Other What-if analysis tools
- Conditional Formatting, Match Function, Index & OFFSET Function
- SUMIFS, VLOOKUP & HLOOKUP for Slabs; Date Formulas for After Sales Service
- Understand & develop the supply chain conceptual model
- Develop a monthly bucket supply chain model in Microsoft Excel
- Applied Financial Analysis and Forecasting Financial Statements, Mathematical & Statistical Tools for Financial Analysis
- HR Dashboard & Analytics - Attendance Register using Microsoft Excel VBA, Restaurant Billing System using Microsoft Excel VBA
- Understand Inventory Coverage calculations
- Excel techniques to prepare sales reports and perform analytics

- **Advanced statistical tools:** Descriptive Statistics, Histogram, Correlation, Rank and Percentile, Regression, Moving Average & Application of Macros for Analytics

## Module 2: Data Analytics Visualization using Power BI                    6 Hours
- **Power BI Components:** Components of Power BI suite including Power BI for Desktop, Power BI mobile app, Server, Gateway
- **Business Transformation:** How Power BI will transform your data and business
- **Feature to manage & utilize data:** Power BI desktop features and managing and utilizing data with it to get Data from many sources
- **Power Query Usage:** ETL process using Power Query such as Transforming, Cleaning, Merging, Custom Visuals & Native Visuals
- **Creating Customized Data:** How to custom and create data visualizations and style reports for lucid data representation
- **Data Modeling Relationships** Data Modeling Relationship concepts like Star Schema and Snowflake Schema and Natural Query language
- Connecting data from different sources and data modeling with Power BI to enhance your business
- **Power BI functions** Dax Functions like Filter Functions, Time Intelligence Functions, Aggregate Functions, Measures etc.
- **Reports embedding with DAX:** Embedding Reports with DAX Functions and learn how to share and collaborate data using Power BI

## Module 3: Introduction to Data Analysis using R                    10 Hours
- **Introduction to R programming:** What is R; Installing R and R Studio; R Studio Overview; Working in the Console; Arithmetic Operators; Logical Operations; Using Functions; Getting Help in R and Quitting R studio
- **Installing and loading packages:** Setting up your working directory; Downloading and importing data; Working with missing data; Extracting a subset of a data frame; Writing R scripts; Adding comments and documentation; Creating reports.
- **Data structures, variables, and data types:** Creating Variables; Numeric; Character and Logical Data; Vectors; Data Frames; Factors; Sorting Numeric; Character; and Factor Vectors; Special Values
- Descriptive Statistics & Correlation

## Module 4: Introduction to Tableau                    7 Hours
- Introduction to Tableau
- Data Connection: Connecting to data; loading data
- Data Blending
- Navigating in Tableau: Menu Commands; File Menu; Data Menu; Worksheet Menu; Dashboard Menu; Story Menu; Analysis Menu; Map Menu; Format Menu
- Loading workbooks

- Dimensions and Measures
- First Visualization
- Building and Improving Visualizations

## Module 5: Introduction to Python                                  **7 Hours**
- Python Interpreter & Interactive mode
- Values and Types
- Conditionals: Boolean Values and Operators; Conditional: If, If-else, Chained Conditional, Iterations: State, While, for, Break
- Lists: List Operations, List Slices, List Methods, List Loop, List Parameters
- Tuples: Tuple Assignment, Tuple as Return Value

## Pedagogy:
- Lab based learning/teaching
- Software linked practice based teaching
- Project based learning
- Interaction with experts
- Case based teaching
- Class room discussion

## Teaching Learning Resources:
## Essential readings
1. Excel 2016 Bible", John Walkenbach
2. "Excel 2016 Power Programming with VBA", Dick Kusleika and Michael Alexander
3. "Advanced Excel Essentials", Jordan Goldmeier
4. "Mastering Microsoft Power BI: Expert techniques for effective data analytics and business intelligence, Brett Powell
5. Microsoft Power BI Quick Start Guide: Build dashboards and visualizations to make your data come to life, Devin Knight, Brian Knight, Mitchell Pearson, Manuel Quintana
6. "R Cookbook", Paul Teetor
7. "R for Data Science", Garrett Grolemund and Hadley Wickham
8. "Hands-On Programming with R", Garrett Grolemund
9. Getting Started with Tableau, By Tristan Guillevin, Packt Publishing
10. Tableau: Creating Interactive Data Visualization, By Jen Stirrup, Packt Publishing
11. Analyzing Data with Microsoft Power BI, Pivot for Excel, By Alberto Ferrari, Microsoft Press,ISBN: 978-1509302765

## References
1. Linda Foulkes- Learn Microsoft Office 2019: A comprehensive guide to getting started with Word, PowerPoint, Excel, Access, and Outlook (Packt Publishing Limited)

2. Wayne, Winston (2014). Microsoft Excel 2013: Data Analysis and Business Modelling, Micro soft Press, Washington
3. Exam Ref 70-778 Analysing and Visualizing Data by Using Microsoft Power BI 1st Edition, Daniil Maslyuk
4. The Definitive Guide to DAX: Business Intelligence for Microsoft Power BI, SQL Server Analysis Services, and Excel Second Edition (Business Skills) 2nd Edition, Marco Russo , Alberto Ferrari Data Visualization with R 100 Examples by Thomas Rahlf, Springer
5. Using R for Introductory Statistics, By John Verzani, CRC Press
6. Cotton, R. (2013). Learning R: A Step-by-Step Function Guide to Data Analysis, 1st Edition [Kindle Version]. Retrieved from http://www.amazon.in
7. Advanced Writing Skills: Success in 20 Minutes a Day, By D S Paul, Goodwill Publishing House
8. Excel 2019 All-in-One for Dummies, By Walkenbach, ISBN: 978-1119517948
9. Excel Quick Start Guide From Beginners to Expert, By William Fisher
10. Excel 2019: Pivot Table Data Crunching Best Excel Books for Pivot Table, By Bill Jelen & Michael Alexander
11. Best Excel Book for Dashboard Intermediate/Advanced Users, By Michael Alexander and John Walkenabach
12. Microsoft PowerBI Quick Start Guide, By Devin Knight, Brian Knight, Mitchell Pearson, Manuel Quintana, Packt Publishing
13. Data Visualization: Using PowerBI, Orange and Excel, By Dr. Shirshendu Roy, Notion Press

**Supplementary Resources**
1. https://docs.microsoft.com/en-us/power-bi/guided-learning/
2. https://microsoftlearning.github.io/DA-100-Analyzing-Data-with-Power-BI/
3. https://www.kaggle.com
4. https://www.github.com
5. https://www.myonlinetraininghub.com/microsoft-excel-online-training-syllabus
6. https://excelexposure.com/
7. https://corporatefinanceinstitute.com/resources/excel/study/basic-excel-formulas-beginners/
8. https://www.rstudio.com/online-learning/
9. https://hackr.io/tutorials/learn-r
10. https://www.statmethods.net/r-tutorial/index.html
11. https://www.tutorialspoint.com/r/index.htm
12. Pearson E- Books

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| **CO1** | 3 | 3 | 2 | 3 | 2 | 1 | 2 | 1 |
| **CO2** | 2 | 3 | 1 | 3 | 2 | 1 | 2 | 1 |
| **CO3** | 2 | 3 | 2 | 3 | 1 | 1 | 2 | 1 |
| **CO4** | 2 | 2 | 1 | 3 | 1 | 2 | 2 | 1 |
| **CO5** | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 1 |

*LEVEL: 3- Substantial,      2- Moderate,   1-Slight,        0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---------|-----------------|--------------------|----------------|----------|
| 1 | Semester end Lab Exam | Individual | Lab Journal          - 10<br>Execution/Presentation - 30<br>Viva Voice         -   10<br>Total             -   50 | At the end of the semester |
| 2 | Attendance and Class participation | Individual | 10 | Immediately after the Module |
| 3 | Cap-Stone project using **Advanced MS- Excel** | Each group of 3 Students (max) | 10 | |
| 4 | Cap-Stone project-2 **Power BI** | Each group of 3 Students (max) | 10 | |
| 5 | Cap-Stone project-3 **using R** | Each group of 3 Students (max) | 10 | |
| 6 | Cap-Stone project-3 **Tableau** | Each group of 3 Students (max) | 10 | |

| Course Title | Business Statistics |
|---|---|
| Term/Semester | I |
| Course ID | 23PGB112 |
| Credits | 4 |

## INTRODUCTION:

The Business Statistics course is designed to elevate students' awareness of data in everyday life and prepare them for a career in today's age of information. The course facilitates to development of statistical literacy skills in students to comprehend and practice statistical ideas to solve business problems. The course aims to promote the practice of the scientific methods amongst the students' community and the ability to identify questions, collect evidence (data), discover and apply tools to interpret the data and communicate and exchange results. Students will be able to get through the what of statistics and into the how and why of statistics by the end of this course.

## COURSE OUTCOMES (COs):

Having completed this course student will be able to:

**CO1:** Understand and apply the central tendency, Dispersion, and Skewness for data Interpretation

**CO2:** Use appropriate data collection methods, sampling techniques and develop appropriate research instruments

**CO3:** Apply correlation and regression tools for data analysis

**CO4:** Develop appropriate probability models for decision-making

**CO5:** Test the hypothesis using appropriate statistical methods and draw meaningful insights

## COURSE CONTENT AND STRUCTURE                    48 Hours

### Module 1: Measures of Central Tendency, Dispersion, Skewness, and Kurtosis  10 Hours

- Introduction to basic measures of central tendency; Missing value cases in basic measures; Problems with missing frequency; Empirical relationships between basic measures; Application of central tendency in functional areas of business
- Comparison between various measures of dispersion; Standard deviation; Coefficient of variance
- Karl Pearson coefficient of Skewness & Bowley's coefficient of Skewness
- Measures of Kurtosis

### Module 2: Sources of Data Collection & Sampling                    6 Hours
- Research - Types of Research, Research Process, Research Design
- Data Collection: Sources & Instruments for Primary and Secondary data

- Measurement & Scaling Techniques
- Sampling Techniques: Frame, Types of Sampling


**Module 3: Correlation and Regression Analysis**                    **10 Hours**

- Introduction and significance of correlation and Regression
- Methods of correlation Analysis; Scatter diagram; Karl Pearson's coefficient of Correlation for Univariate and Bi-Variate series; Spearman's Rank Correlation, Concurrent deviation method
- Simple Regression Analysis using Least Square Method
- Multiple Linear Regression


**Module 4: Probability and Theoretical Distribution**                **8 Hours**
- Concept and definition of probability and theories of probability
- Relevance of Permutations and Combinations to Probability
- Rules of Probability, Bayes' theorem & its applications
- Theoretical Probability Distributions - Binomial, Poisson, and Normal distribution

**Module 5: Testing of Hypothesis**                                   **14 Hours**
- Hypothesis Testing: Concept; Formulation of Hypotheses; Errors: Type I and II error
- Parametric tests: z-test; t-test; f-test; Chi-Square test; Analysis of Variance (ANOVA)
- Non-parametric tests - Sign test; Wilcoxon test; Mann-Whitney U test; Median test: Runtest; Kolmogorov –Smirnov one sample test.

**Pedagogy:**

- ☐ Classroom discussions
- ☐ Project-based learning
- ☐ Case-based teaching

**Teaching Learning Resources:**

**Recommended Books**

- ☐ James R. Evans, "Business Analytics – Methods, Models and Decisions", Prentice Hall T N Srivastava, Shailaja Rego, "Statistics for Management", Tata McGraw Hill
- ☐ SP Gupta, "Statistical Methods", Sultan Chand & Sons
- ☐ Glynn Davis and Branko Pecar, "Business Statistics using excel", Oxford University Press
- ☐ J K Sharma, "Fundamentals of Business Statistics", Vikas Publication

**Reference Books**

- Keller/Arora, "BSTAT: A South-Asian Perspective", Cengage Learning
- S C Gupta, "Fundamentals of Statistics", Himalaya Publications
- N D Vohra, "Business Statistics", Tata McGraw Hill
- Levin & Rubin, "Statistics for Management", Prentice-Hall
- Richard I. Levin, David S. Rubin, Masood H. Siddiqui, Sanjay Rastogi, "Statistics for Management", Pearson India

- Amir D Aczel, Jayavel Sounderpandian, Palaniswamy Saravanan, Rohit Joshi, "Complete Business Statistics", McGraw Hill Education

- Statistics for Managers Using Microsoft Excel, 9th Edition, David M. Levine, Baruch College, Zicklin School of Business, City University of New York, Pearson

**Supplementary Reading:**

https://www.coursera.org/learn/basic-statistics?specialization=social-science https://www.edx.org/learn/statistics
Pearson e-library:
https://elibrary.in.pearson.com/bookshelfDashboard EBSCO:
https://www.ebsco.com/search?search=supplychainmodel
Jgate:
https://jgateplus.com/home/resources/
www.capitaline.com
Business statistics
Business statistics by example
Course in modern business statistics
Applied business statistics
Business statistics: Concepts and application

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1   | 3   | 2   | 2   | 2   | 1   | 1   | 2   | 1   |
| CO2   | 3   | 2   | 3   | 3   | 2   | 2   | 1   | 1   |
| CO3   | 2   | 2   | 3   | 3   | 3   | 1   | 1   | 1   |
| CO4   | 2   | 3   | 3   | 3   | 3   | 2   | 2   | 1   |
| CO5   | 3   | 3   | 3   | 3   | 3   | 2   | 3   | 1   |

*LEVEL: 3- Substantial, 2- Moderate, 1-Slight, 0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---|---|---|---|---|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid - Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.) | Individual | 30 | Full Semester |

| Course Title | Introduction To Business Analytics, Data Warehousing & Data Mining |
| --- | --- |
| Term/Semester | I |
| Course ID | 23PGB113 |
| Credits | 03 |

**INTRODUCTION:**

Business Analytics usually has four pillars (namely conceptual framework, software environment, coding and interpretation of output). This course will enable learners to understand the conceptual framework and enable them to interpret the outcome. This course would ideally work as a foundation for business analytics in entirety.

Data mining is the computational process of discovering patterns from large data sets. This course discusses concepts and techniques of data warehousing and mining. Data mining is one of the most advanced tools used by IT industries. The topics covered include introduction to data warehousing, data pre-processing and foundational data mining techniques such as supervised learning including regression and classification, and unsupervised learning such as clustering and association rules. Students are introduced to design data warehouse and perform data mining tasks with neural networks, as well as exposed to open-source data mining software.

**COURSE OUTCOMES (CO):**

At the successful completion of this course, the students should be able to:

- **CO1:** Understand the application and importance of Business Analytics
- **CO2:** Design a Data warehouse system and perform business analysis with OLAP & OLTP tools
- **CO3:** Understand the Architecture of a Data Mining System.
- **CO4:** Apply frequent pattern and association rule mining techniques for data analysis
- **CO5:** Understand the application of appropriate classification and clustering techniques for data analysis

**COURSE CONTENT AND STRUCTURE:**                              **36 Hours**

 **Module 1: Introduction to Business Analytics                     8 Hours**

- Business Analytics (BA) fundamentals in an overview
- Application fields – Marketing Analytics, HR Analytics, Operation Analytics, Finance Analytics
- Descriptive Analytics: Descriptive Statistics; Box Plots; Heat Map; Correlation Matrix & Causation
- Diagnostic Analytics: Diagnostic Regression: Examining Market Demand, Consumer Behavior; Data Discovery & Drill Down.
- Predictive Analytics: Time Series; Linear and Multiple Regression.
- Prescriptive Analytics – Monte Carlo Simulation; Optimization techniques using LPP

**Module 2   Data Warehousing & Online Processing                    6 Hours**
- Data Warehousing: Concepts; Components; Schemas; Architecture.
- Online Analytical Processing (OLAP); Online Transaction Processing (OLTP);
- Types of Data Sources- structured vs. Semi Structured vs. Unstructured data, Data Warehouse vs. Databases, Relational Database vs. Non-Relational Database, RDBMS Data structures, Columnar Data structures.

**Module 3:  Introduction to Data Mining                              6 Hours**
- Introduction to Data Mining, Importance of Data Mining, Challenges in Data Mining, Data Mining functionalities
- Classification of Data mining systems, Data Mining architecture, Knowledge Discovery in Databases (KDD), CRISP- DM.
- Ethical issues in Data Mining and their Analysis; Global issues in Data Mining

**Module 4: Data Mining Techniques: Classification & Prediction        8 Hours**
- **Classification and Prediction:** Issues Regarding Classification and Prediction; Classification by Decision Tree; Associative Classification; Other Classification Methods; Prediction; Accuracy and Error Measures; Evaluating the Accuracy of a Classifier or Predictor; Model Section.

**Module 5: Data Mining Techniques: Cluster Analysis                   8 Hours**
- **Cluster Analysis: -** Types of Data in Cluster Analysis;  Categorization of Major Clustering Methods; Partitioning Methods; Hierarchical methods; Clustering High-Dimensional Data; Outlier Analysis.

**Pedagogy:**
- Classroom Discussions
- Activity Based Learning
- Practice Based Learning
- Project Based Learning
- Experiential Learning
- Software Based Learning
- Case Based Teaching

**Teaching Learning Resources:**

**Essential Readings:**

1. "Business Analytics", Global Edition, 2nd Edition, James Evans, Pearson, ISBN-13 978-1292095448

2. Albright Winston "Business Analytics, Data Analysis and Decision Making" 5th edition, Cengage Publication
3. U Dinesh Kumar "Business Analytics: The Science of Data - Driven Decision Making" by Wiley Publications
4. M.H. Dunham, "Data Mining Introductory and Advanced Topics", Pearson Education, ISBN : 978-8177587852
5. Ralph Kimball and Margy Ross, "The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling", (Third Edition). John Wiley and Sons, ISBN : 978-1118530801
6. J. Han and M. Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufman, 3/E, 2011, ISBN: 978-0-12-381479-1.
7. Vaisman, Alejandro; Zimanyi, Esteban, "Data Warehouse Systems", Springer, 2014, ISBN : 978-3-642-54655-6
8. Paulraj Ponniah, "Data Warehousing: Fundamentals for IT Professionals", Wiley India, ISBN : 0-471-41254-6
9. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 3$^{rd}$ edition, ISBN : 978-0-12-381479-1
10. Reema Theraja, "Data warehousing", Oxford University Press, ISBN : 978-0195699616
11. Tan, Steinbach & Kumar, "Introduction to Data Mining", ISBN : 978-0133128901
12. Varsha Bosale and Deepali Vora, "Data Warehousing and Data Mining", Technical Public
13. Singh Later, "Business Intelligence and Data Warehousing", Narosa, ISBN: 978-8184872125

**Reference Books:**

1. Jeffrey D Camm "Essentials of Business" by South Western Publishing.ISBN-13-978-8131527658 by R N Prasad, Seema Acharya, Fundamentals of Business Analytics, 2 Edition, Wiley publishing
2. "Prescriptive Analytics: The Final Frontier for Evidence-Based Management and Optimal Decision Making" by Dursun Delen , Pearson FT Press publishing
3. "Prescriptive Analytics", by Gerard Blokdyk, Second Edition, ISBN-13: 978-1978232211
4. Jeffrey S. Strickland, Simulation Educators (2014), "Predictive Analytics using R"
5. Vaisman, Alejandro; Zimanyi, Esteban, "Data Warehouse Systems", Springer, 2014, ISBN : 978-3-642-54655-6
6. Golfarelli, Matteo; Rizzi, Stefano, "Data Warehouse Design: Modern principles and methodologies", McGraw Hill, 2009, ISBN : 978-0071610391
7. Jensen, Christian S; Pedersen, Torben Bach; Thomsen, Christian W, Morgan & Claypool, "Multidimensional Databases and Data warehousing", cop. 2010, ISBN: 9781608456017
8. Kimball, Ralph, "The Data warehouse lifecycle toolkit: expert methods for designing, developing, and deploying data warehouses", John Wiley & Sons, 1998, ISBN: 0471255475
9. Alex Berson, StephenJ. Smith, "Data Warehousing, Data Mining, and OLAP", MGH, 1998. ISBN : 0-201-177-676

10. "Learn By Examples – A Quick Guide to Data Mining with RapidmIner and Weka", Eric Goh, SV Book Pte. Ltd.

11. Hongbo Du, "Data Mining Techniques and Applications: An Introduction", Cengage India Private Limited

12. Prateek Bhatia, "Data Mining and Data Warehousing: Principles and Practical Techniques", Cambridge University Press, 978-1108727747

**Supplementary Resources:**

NPTEL Course:          https://onlinecourses.nptel.ac.in/noc21_cs70/preview
Coursera Course:          https://www.coursera.org/specializations/business-statistics-analysis
https://www.coursera.org/specializations/business-analytics
Data Sources: Kaggle: https://www.kaggle.com/
Data world: https://data.world/,
                              Data.gov.in: https://data.gov.in/
Databases:              EBSCO: https://www.ebsco.com/academic-libraries,
                              JGATE: https://jgateplus.com
Pearson E library:          https://elibrary.in.pearson.com
https://nptel.ac.in/courses/106/105/106105174/
Andrew Moore's Data Mining Tutorials (See tutorials on Decision Trees and Cross Validation
Decision Trees (Source: Tan, MSU) Tom Mitchell's book slides (See slides on Concept Learning and
Decision Trees)
https://www.cs.waikato.ac.nz
https://jgateplus.com
https://search.ebscohost.com
https://www.guru99.com
https://www.javapoint.com
https://www.kaggle.com
https://www.github.com
Coursera course on "Data Warehousing for Business Intelligence Specialization" by Michael Mannino
and Jahangir Karimi offered by the University of Colorado System
Coursera course on "Data Mining" by John C. Hart offered by the University of Illinois at Urbana-
Champaign
https://elibrary.in.pearson.com

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| **CO1** | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| **CO2** | 2 | 2 | 2 | 3 | 2 | 1 | 2 | 1 |
| **CO3** | 1 | 2 | 1 | 2 | 2 | 1 | 1 | 1 |
| **CO4** | 2 | 2 | 3 | 2 | 1 | 2 | 2 | 1 |
| **CO5** | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 1 |

*LEVEL: 3- Substantial,      2- Moderate,   1-Slight,        0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---------|-----------------|--------------------|----------------|----------|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid – Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.) | Individual | 30 | Full Semester |

| Course Title | DBMS & SQL |
|---|---|
| Term/Semester | I |
| Course ID | 23PGB114 |
| Credits | 3 |

## INTRODUCTION:

Students who take this course will learn how to build databases for commercial enterprises. Students can build real-time databases in organizations using DBMS and SQL. Students may harness data and use it to find new opportunities with the aid of big data analytics. The introduction of SQL and RDBMS to the class will aid in the creation and extraction of data from databases. Students who complete this course will have a better understanding of how to store and operate databases using SQL. Throughout the course, students will also gain practical SQL experience, which will improve their professional prospects.

## COURSE OUTCOMES (COs):

Post Completion of this course students should be able to:

**CO1:** Apply knowledge of database for real life applications

**CO2:** Understand and apply entity relationship modelling

**CO3:** Explain the concept of relational model, relational database design and SQL

**CO4:** Identify and solve the redundancy problem in database tables using normalization

**CO5:** Understand the concepts of transactions and their processing.

## COURSE CONTENT AND STRUCTURE:                                    36 Hours

**Module 1: Introduction to DBMS (Theory & Lab)                      8 Hours**

**Introduction: Overview, Database System vs File System, Database System**

Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure.

**Module 2: Entity Relationship Modeling (Theory & Lab)             8 Hours**

Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization,

Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree**.

**Module 3: Relational Data Model (Theory & Lab)**                         **9 Hours**

Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQL Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus.

**Module 4: Data Base Design & Normalization (Theory & Lab)**           **4   Hours**

Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

**Module 5: Transaction Processing & Concurrency Control Techniques (Theory)   7 Hours**

Transaction System, Serializability, Recoverability, Recovery from Transaction Failures, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control Case Study of Oracle.

**Pedagogy:**
- Classroom Discussions
- Activity Based Learning
- Practice Based Learning
- Project Based Learning
- Experiential Learning
- Software Based Learning
- Case Based Learning

**Teaching Learning Resources:**

**Essential Readings**

1. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill
2. SQL, PL/SQL: The Programming Language of Oracle By Ivan Bayross, BPB Publications
3. Date C J, "An Introduction to Database Systems", Addision Wesley
4. Elmasri, Navathe, " Fundamentals of Database Systems", Addision Wesley
5. O'Neil, "Databases", Elsevier Publications
6. Ramakrishnan, "Database Management Systems", McGraw Hill
7. Leon & Leon, "Database Management Systems", Vikas Publishing House
8. Bipin C. Desai, "An Introduction to Database Systems", Gagotia Publications
9. Ben Forta, "SQL in 10 minutes Sams Teach Yourself", Sams Publishing
10. Sylvia Moestl Vasilik, "SQL Practice Problems", Independently Published
11. John Viescas, "SQL Queries for Mere Mortals", Addison Wesley

**References**

1. "Database Management Systems" by Rama Krishna & Gehrke, 3rd Edition, 2018, McGraw-Hill Education
2. "Database System Concepts" by Rob & Coronel, Indian Edition, 2011, Cengage Learning
3. "Fundamentals of Relational Database Management Systems" by Sumathi & Esakkirajan, 2007, Springer
4. Majumdar & Bhattacharya, "Database Management System", TMH
5. Rajiv Chopra, " Database Management Systems", S Chand
6. Avi Silberschatz, Henry F Korth, "Database System Concepts", McGraw-Hill, ISBN: 9780078022159

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1   | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 1   |
| CO2   | 1   | 2   | -   | 2   | 1   | 1   | -   | -   |
| CO3   | 1   | 1   | 1   | 1   | 1   | -   | 1   | 1   |
| CO4   | 2   | 1   | 1   | 1   | 1   | 1   | 2   | 1   |
| CO5   | 3   | 2   | 3   | 2   | 2   | 1   | 2   | 1   |

*LEVEL: 3- Substantial,     2- Moderate,   1-Slight,         0-No Co-relation*


**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---------|-----------------|--------------------|----------------|----------|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid – Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Mini/Major Project – SQL | Group | 20 | At the end of the First module |
| 5 | Remaining assignments (Quiz, Individual Assignment / Group assignments etc.) | Individual | 10 | Full Semester |

| Course Title | Predictive Analytics Using R |
| --- | --- |
| Term/Semester | I |
| Course ID | 23PGB115 |
| Credits | 4 |

## INTRODUCTION:

The amount of data in the world is increasing exponentially as time passes. It is estimated that the total amount of data produced in 2020 will be 20 zettabytes (Kotov, 2014), that is, 20 billion terabytes. Many businesses invest lots of money and effort in collecting the data and most of it is not analyzed fully and/or not analyzed appropriately. The main reason to analyze the data is to predict the future i.e. to construct actionable knowledge. This course will help and allows the students to do data analysis and build models while learning various tools & techniques. The prerequisite of the course is students must have undergone basic courses on Statistical modeling.

## COURSE OUTCOMES (CO)

At the successful completion of this course the students should be able to:

**CO1:** Understand the predictive analytics in present scenario and R Software

**CO2:** Examine the data for model fitness, ETL and discover the data visualization, evaluate the prediction by using time series analysis

**CO3:** Test the hypothesis using appropriate statistical methods & learn how to apply regression models in practice

**CO4:** Apply predictive analytics techniques in decision making process

**CO5:** Understand the concept of neural network using R programming

## COURSE CONTENT AND STRUCTURE                          48 Hours

## MODULE 1:
## INTRODUCTION TO PREDICTIVE ANALYTICS                 5 Hours

Introduction to Predictive analytics, Applications of predictive analytics; Predictive models: Propensity model, Clustering Model & Collaborative filtering; used cases on predictive analytics.

## MODULE 2: DATA VISUALIZATION & EXPLORATORY DATA ANALYSIS
                                                                  10Hours

## DATA VISUALIZATION:

Introduction to Data Visualization, Construction of Bar plots, Pie chart, Scatter plots, Box plots, Histograms & ggplots

## DATA PROCESSING & TIME SERIES ANALYSIS:

Organizing and processing of data with R, Data Cleaning – Missing values, Outlier treatment, Preprocessing and Cleaning, Time Series Analysis.

**MODULE 3:**
**STATISTICS FOR DATA SCIENCE & HYPOTHESIS TESTING     13 Hours**
**HYPOTHESIS TESTING:**
Descriptive Statistics, Hypothesis testing, Parametric & Non-Parametric test, Hypothesis test about Population – Means & Variance
Exploratory Data Analysis – Univariate and Multivariate Analysis
**PREDICTION- Regression Analysis**
Difference between Correlation & Causation, Heatmap
Simple Linear Regression: coefficient of determination, significance tests, residual analysis
Multiple Linear Regression: coefficient of determination, interpretation of regression coefficients, categorical variables, assumptions of regression analysis;  Principal Component Analysis, and Factor Analysis

**MODULE 4: CLASSIFICATION ANALYSIS                          10 Hours**
**DECISION TREES**
Introduction to Decision trees, Data pre-processing, Model building in R, Model comparison, Gini Impurity or Entropy?
**CLASSIFICATION & CLUSTERING TECHNIQUES**
Introduction to Logistic Regression: Interpreting the model parameters and assessing the impact of predictors on the probability of an outcome.
K Nearest Neighbors, K fold Cross Validation, K Means Clustering, Naïve Bayes Classifier, Random Forest Algorithm – Model Construction, Evaluate and interpret the parameters

**MODULE 5:                                                    10 Hours**
**NEURAL NETWORKS**
Introduction, Structure of neural networks, Information flow, Types of layers, Training a neural network, Back Propagation, Neural Networks in R
Deep Learning Networks – LSTMS, CNNS, GRU (Theory)

**Pedagogy:**
- Classroom Discussions
- Activity Based Learning
- Practice Based Learning
- Project Based Learning
- Experiential Learning
- Software Based Learning
- Hackathons

**Teaching Learning Resources:**
**Essential readings-**
1. Jeffrey S. Strickland, Simulation Educators (2014), "Predictive Analytics using R"
2. Evans, J. R. (2013), "Business Analytics: Methods, Models, and Decisions"
3. Robert Stine, Dean Foster, "Statistics for Business: Decision Making and Analysis", Pearson Education, 2nd edition, 2013.
4. Robert Kabacoff, "R in Action Data analysis and graphics with R", Second Edition (2015), Manning publications
5. Dr. Umesh R. Hodeghatta and Umesha Nayak, "Business Analytics Using R - A Practical Approach", A press publication
6. Subhashini Sharma Tripathi, "Learn Business Analytics in Six Steps Using SAS and R", Apress publication
7. Wickham H., Grolemund G. (2016). "R for Data Science: Import, Tidy, Transform, Visualize, and Model Data".
8. Cotton, R. (2013), "Learning R: A Step-by-Step Function Guide to Data Analysis", 1st Edition [Kindle Version]. Retrieved from http://www.amazon.in.
9. Knell, R. (2013), "Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R". [Kindle Version]. Retrieved from http://www.amazon.in.
10. Murray, S. (2013) "Learn R in a Day". [Kindle Version]. Retrieved from http://www.amazon.in.
11. Jeffrey Strickland. "Predictive Analytics Using R". Lulu.com, ISBN: 9781312841017
12. Tony Fischetti Eric Mayor. "R: Predictive Analytics". Packpt Publishing
13. James D Miller. "Mastering Predictive Analytics Using R". Packpt Publishing

**Supplementary Readings:**
1. NPTEL Course: https://onlinecourses.swayam2.ac.in/aic20_sp35
2. Coursera Course: https://www.coursera.org/learn/jhu-getting-started-data-viz-r
   https://www.coursera.org/specializations/data-science-foundations-r
3. Data Sources:
   Kaggle:https://www.kaggle.com/Data
   world: https://data.world/,
4. Data.gov.in: https://data.gov.in/
5. Databases: EBSCO: https://www.ebsco.com/academic-libraries,
6. JGATE: https://jgateplus.com
7. Pearson E library: https://elibrary.in.pearson.com

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| **CO1** | 2 | 1 | 2 | 2 | 1 | - | 1 | - |
| **CO2** | 1 | 2 | 2 | 2 | 1 | - | 2 | 1 |
| **CO3** | 2 | 2 | 3 | 2 | 2 | 1 | 2 | - |
| **CO4** | 2 | 3 | 3 | 3 | 2 | 1 | 3 | 1 |
| **CO5** | 1 | 2 | 3 | 2 | 2 | 1 | 2 | 1 |

*LEVEL: 3- Substantial,      2- Moderate,   1-Slight,        0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted |
|---------|-----------------|--------------------|----------------|
| 1 | Semester end Lab Exam | Individual | Execution/ Presentation 30<br>Viva-Voce   10<br>Lab Journal  10<br>Total - 50 |
| 2 | Attendance and Class participation | Individual | 10 |
| 3 | Capstone project | Individual/Group | 25 |
| 4 | Mini Project | Individual | 15 |

| Course Title | Emerging Technologies |
|---|---|
| Term/Semester | I |
| Course ID | 23PGB116 |
| Credits | 3 |

## INTRODUCTION:

Bill Gates said, "we're only beginning to realize computing's potential" and that "we're entering an era when the software will fundamentally transform almost everything we do," ranging from the evolutionary to the revolutionary transformations disrupting previously adopted technologies and business models. These transformations should create intelligent real-time enterprises that would conduct business in a significantly more effective, efficient, and agile manner, and that could adapt to the changing business conditions and grow "smarter" over time by leveraging the future generations of Information Technologies. These technologies can be the greatest friends or the worst foes in building such "smart businesses," depending on how well they are adopted and deployed in the enterprises.

In this course, the students will study various principles of technological innovation driving major business transformations and leading to the creation of more intelligent and agile enterprises. Some of these principles include evolution and generations of emerging technologies, different types of technological trajectories, cycles and path dependencies of these technologies, business pull, and technology push. This course will use case studies to explore frameworks, tools, and strategies that are already proven in the real world and prepare ourselves and our organizations to have the tools needed to succeed in a fast and changing world.

## COURSE OUTCOMES (COs):

After successful completion of the course, the students will be able to:

**CO1**: Remember and understand various emerging technologies.

**CO2**: Comprehend various technologies in communication and virtual reality.

**CO3:** Recognize the impact of emerging technologies in a global context.

**CO4**: Realize the impact of emerging technologies on society as a whole.

**CO5**: Understand and appreciate disruptive edge technologies

## COURSE CONTENT AND STRUCTURE:                                 36 Hours

### Module 1: Overview of Basic Principles of Emerging Technologies          4 Hours

- How innovative technologies emerge, evolve, and are adapted by businesses.
- How technical and business issues are intertwined in making certain business decisions
- Types of technological innovation and the value of emerging technologies.
- Digital Transformation: The Revolution, Hype and adoption
- Embrace the present and build the future
- How to get business and IT right?

**Module 2: Virtual, Mixed and Augmented Reality                                8 Hours**

- **Virtual, Mixed and Augmented Reality**: Overview of virtual, mixed and augmented reality, Application of AR, VR and XR (extended reality) in business.
- **Communication Technologies**: Foundations of wireless technologies, different generations of wireless technologies (2G through 5G), and the corresponding standards (e.g., GSM, CDMA, TDMA, FDMA and OFDM)

**Module 3: Cloud Computing and Internet of Things                          8 Hours**

- **Cloud Computing**: Overview; Architectures of the cloud computing systems; Performance, security, reliability and economic viability issues, as pertaining to the cloud computing systems, How Cloud Computing is being used and its applications, Types of Clouds and Technical Considerations; Cloud Services – BPaaS(Business Process as a Service)
- **Internet of things:** What is Internet of Things?; Market trends and key companies and technologies; How real companies embrace IoT; How The Internet of Things Will Impact Customer Service; How The Internet Of Things Is Changing Online Marketing; The Value of the Industrial Internet of Things (IIoT) and Big Data in Manufacturing; Applications and importance of IoT and Software Analysis and Tooling, Network, Linking & Loading.

**Module 4: Artificial Intelligence                                               6 Hours**

- Concept of Data Science, AI, and ML
- Problem Spaces and Search Knowledge and Rationality
- AI vs. Machine Learning
- Machine Learning  & Deep Learning - Types, Process, and Applications
- Natural Language Processing (NLP) & its Applications
- AI Agent in Location Analytics, in search & retrieval, Personalization and Comparison), Social Networking Analysis, Big Data Tools & Techniques, Content Analytics (Sentimental Analysis & Opinion Analysis).

**Module 5: Emerging Technologies and Issues                                10 Hours**

- **Block chain:** Building the foundations; the key concepts of Block chain technology, Block chain and black markets, applications, and Block chain towards a Decentralized Society.
- **Crypto currency:** Introduction to Crypto currencies, Legal Aspects of Virtual Currency, Applications of Crypto currencies and Block chains in Traditional Finance, Applications
- **Robotics:** Types and Components of a Robot, Classification of Robots, Industrial Robot Applications, Robot Accuracy, and Repeatability.
- Introduction to Quantum Computing
- **Cyber Security and Data Privacy:** Breaches, Penetrations, Methodologies, Frameworks, Privacy meets and Security Claims; Cyber Security – Critical Infrastructure Security, Application Security, Network Security, Cloud Security, IoT Security.
- **Application of Cyber security** – Malware Attack Detection, Threat Detection

**Pedagogy:**
- Case-based teaching
- Classroom discussion
- Activity-based teaching
- Talk by the industry experts

**Teaching Learning Resources:**
**Essential Readings**

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice-Hall. ISBN: 9781537600314
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill. ISBN:9780070087705
3. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-on Approach", University Press. ISBN:9780996025515
4. Jai Singh Arun, Jerry Cuomo, Nitin Gaur, "Blockchain for Business", Pearson publications, ISBN: 9789389588880
5. Thomas Erl, Zaigham Mahood, Ricardo Puttini, "Cloud Computing, Concept, Technology & Architecture", Prentice-Hall, 2013. ISBN: 9789332535923
6. Sinan Kufelglu, " Emerging Technologies Value Creation for Sustainable Development", Springer

**References**

1. Trivedi, M.C., "A Classical Approach to Artificial Intelligence", Khanna Publishing House, Delhi. ISBN: 9788190698894
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press. ISBN: 9781351981927
3. Barrie Sosinsky, "Cloud Computing Bible", Wiley India, 2011. ISBN: 9780470903568
4. Journal of Business Analytics – Taylor & Francis Online Journal ISSN : 2573-2358
5. Sucet Jimena Martinez Vergara, "Business Strategies and Disruptive Technologies: An Overview within Disruptive Innovation Theory"
6. http://nifm.ac.in/business-analytics-and-statistics
7. https://cloud.gov.in/services_da.php
8. https://dst.gov.in/data-science-research-initiative

**Supplementary resources-**

1. https://jgateplus.com/home/
2. https://search.ebscohost.com/
3. https://www.coursera.org/specializations/emerging-technologies
4. https://elibrary.in.pearson.com

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 1 | - | 3 | 2 | 1 | 1 | 1 |
| **CO2** | 3 | 2 | 1 | 2 | 1 | 2 | 1 | 1 |
| **CO3** | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| **CO4** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 |
| **CO5** | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 1 |

*LEVEL:  3- Substantial,       2- Moderate,   1-Slight,          0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---|---|---|---|---|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid – Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.) | Individual | 30 | Full Semester |

| Course Title | Econometrics For Decision Making |
|---|---|
| Term/Semester | I |
| Course ID | 23PGB117 |
| Credits | 4 |

### INTRODUCTION:

This course teaches time series and panel data econometrics with a focus on applications in macroeconomics and finance. This course will cover Univariate and multivariate time series models, both stationary and non-stationary. The course's goals are to develop a comprehensive set of tools and techniques for analyzing various forms of Univariate and multivariate time series; to assist students in becoming comfortable with applied time series models and panel data models through EVIEWS and R-programming packages for data management and analysis.

### COURSE OUTCOME:

After successfully completing the course the students will be able to;

**CO1:** Understand the time series analysis in the area of macroeconomics and finance

**CO2:** Investigate the data and its properties, as well as the underlying assumptions of stochastic process and time series models.

**CO3:** Applying the different Simultaneous Equation Models

**CO4:** Apply and evaluate Conditional Variance Models and gain forecasting knowledge.

**CO5:** Recognize and appreciate panel data in time series data.

### COURSE CONTENT AND STRUCTURE:               48 Hours

### MODULE 1: Introduction to Time Series Analysis       6 Hours

Introduction to Time Series Analysis, Need and uses of forecasting, classification and characteristics of forecasts, forecasting based on regression techniques: simple and multiple linear regression and nonlinear regression techniques, moving averages smoothing methods: simple and double, multi average methods; explanatory version time series forecasting, test for trend seasonality.

### MODULE 2 Stationarity Univariate       8 Hours

Stochastic processes - Properties of stochastic process. Time series as a discrete stochastic process– Stationarity- Characteristics of stochastic component of time series (mean, auto-covariation and autocorrelation functions). Lag operator- Unit root tests - Deterministic and stochastic trend models Augmented Dickey Fuller test – Phillips-Perron Test-Estimation and testing.

### MODULE 3: Simultaneous Equation Models       12 Hours

Dynamic simultaneous equations models- Granger representation theorem -Granger causality test - Vector Auto Regressive (VAR) Models-Impulse Response Function (IRF)-Variance Decomposition Analysis - Structural Vector Auto Regressive (SVAR) models– Testing for Cointegration – Engle and Granger (1987) and Johansen and Juselius (1990)-Vector error correction models (VECMs)-Estimation and Diagnostic Checking.

**MODULE 4: Conditional Variance Models**                                      **12 Hours**

Volatility Clustering- Leverage Effects- Modeling Volatility- AutoRegressive Conditional Heteroscedasticity (ARCH) Model- Generalised AutoRegressive Conditional Heteroscedasticity (GARCH) Model - Extensions to GARCH-Exponential GARCH and Threshold GARCH models.

**MODULE 5: Panel Data Models**                                                **10 Hours**

Introduction to Panel Data - Types of panels- Balanced and Unbalanced Panel Data-Benefits and drawbacks of longitudinal data. Basic models-Pooled OLS-Fixed effects-Random effects Model Estimation and testing- Fixed vs Random Effects Model -Hausman specification test.

**Pedagogy:**
- Case-based teaching
- Classroom discussion
- Practice based teaching
- Talk by the experts
- Lab-based teaching

**REFERENCES**
1. Thomopouls, N.T (1980): Applied Forecasting Methods. Engle Wood Cliffs, N.J, Prentice Hall.
2. Wheel Wishart, S.C; and S. Makridaks (1980): Forecasting Methods for Management III edition, NewYork. John Wiley.
3. Sullivan, William G. and Wayne Claycambe. W (1977): Fundamentals of Forecasting. Prentice Hall.Virginia.
4. Gupta. S.C and V.K. Kapoor (1995): Fundamentals of Applied Statistics, Sulthan & Chand Sons. NewDelhi.
5. Bovas, Abraham and Johannes Ledolter (1983): Statistical Methods for Forecasting, John Wiley &Sons. New York.
6. Box, G.E.P and Jenkkins, G.M (1976): Time Series Analysis Forecasting and Control, Holden Day,San Francisco.
7. Anderson, T.W (1971): The Statistical Analysis of Time Series, John Wiley, New York.
8. Markidakis, S Steven C. Wheel Wright and Victor E. Mcgee (1983): Forecasting: Methods andApplications, 2nd Edition, New York, John Wiley & Sons.
9. Damodar Gujarati, Basic Econometrics, Newyork, McGraw Hill
10. Jan Tinbergen: Econometrics, London: Routledge
11. Henri Theil: Introduction to Econometrics, Prentice Hall, New Delhi
12. Marno Verbeek: Guide to Modern Econometrics, John Wiley, London
13. P G Apte: Texbook of Econometrics, Tata McGraw Hill, New Delhi
14. Hashem M Mesaran, Peter Schmidit: Handbook of Applied Econometrics - Micro Economics, Volume13, Massachusetts
15. Ragnar Frisch: Econometrics in the World of Today, OSLO: Institute of Economics
16. Dennis J Aigner: Basics of Econometrics, Prentice Hall, New Jersey

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1  | 2   | 2   | 1   | 1   | 2   | 1   | 1   | 1   |
| CO2  | 2   | 3   | 3   | 3   | 2   | -   | 2   | -   |
| CO3  | 3   | 3   | 3   | 3   | 3   | -   | 2   | -   |
| CO4  | 2   | 3   | 3   | 3   | 3   | 1   | 3   | -   |
| CO5  | 2   | 3   | 3   | 3   | 3   | 1   | 3   | -   |

*LEVEL: 3- Substantial,      2- Moderate,   1-Slight,        0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---------|-----------------|--------------------|----------------|----------|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid – Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Capstone Project – Time Series Analysis | Individual | 15 | Full Semester |
| 5 | Capstone Project – On E-Views | Individual | 15 | Full Semester |

# SECOND SEMESTER COURSES

| Course Title | Machine Learning Using Python |
|---|---|
| Term/Semester | II |
| Course ID | 23PGB121 |
| Credits | 4 |

## INTRODUCTION:

This course provides a concise introduction to the fundamental concepts in machine learning and popular machine learning algorithms. Students will learn the standard and most popular supervised learning algorithms including linear regression, logistic regression, decision trees, k-nearest neighbor, an introduction to Bayesian learning and the naïve Bayes algorithm, support vector machines and kernels and neural networks with an introduction to Deep Learning. Students will cover the basic clustering and association algorithms. This course will make students industry ready and capable of analytical problem solving.

## COURSE OUTCOMES (COs):

Post Completion of this course students should be able to:

**CO1**: Understand and illustrate machine learning theories

**CO2:** Design and implement supervised learning algorithms

**CO3**: Understand and usage of unsupervised learning algorithms

**CO4**: Design and implement deep learning algorithms

**CO5**: Understand the contemporary developments in the field of machine learning.

## COURSE CONTENT AND STRUCTURE:                                    48 Hours

### Module 1: Introduction Machine Learning and Python          8 Hours

- Machine Learning: Introduction; Applications
- Environment Setup: Installing Python, First Python Program, Identifiers, Reserved Words, Line and Indentation, Multi-Line Statements, Quotation, Comments, Data Types, Variables, Operators and Operator Precedence, Decision Making, Loop Control Statements**.**
- Data and Data Preprocessing
- Data Structures: Series, List, Tuple, Dictionary, String & Data frames
- Introduction to Numpy, Matplotlib, Pandas
- Data Visualization using Seaborn
- Exploratory Data Analysis – Data Cleaning, Univariate, Bivariate and Multivariate Analysis, Hypothesis Testing

### Module 2: Supervised Learning Algorithms                    12 Hours

- Regression & Classification – Linear; Multiple; Logistic Regression; Support Vector Regression; Decision Tree; Random Forest; Gradient Descent; K Nearest Neighbors
- Gaussian Naive Bayes

- Regression & Classification Models Performance

**Module 3: Unsupervised Learning Algorithms**          **12 Hours**
- Clustering – K-Means Clustering; Hierarchical Clustering
- Dimensionality Reduction – Principal Component Analysis; Linear Discriminant Analysis; Kernel PCA

**Module 4: Deep Learning**          **12 Hours**
- Neural Networks – Multi Layered, Artificial, Backward Propagation, Concurrent & Recurrent Neural Networks, Conventional Neural Networks
- Neural Network as a Management Technique
- Illustrative example of Google ML platform and Tensor flow
- GPU in Deep Learning (**H20 & Orange**)

**Module 5: Contemporary Development (Theory-Application Oriented)**     **4 Hours**
- Reinforcement Learning
- Real time decision making - Traffic Pattern Analysis; Assistance in Ships Direction
- Temporal Difference (TD)
- Q-Learning
- Data Exploration
- Spam Filtering
- Tensor flow-Torch-Caffe: GAN Cost Function, GAN Network, Models Deployment in Production
- NLP (Natural Language Processing) – Only Introduction

**Pedagogy:**
- Classroom Discussions
- Activity Based Learning
- Practice Based Learning
- Project Based Learning
- Experiential Learning
- Software Based Learning - Python
- Hackathons

**Teaching Learning Resources:**
**Essential Readings**
1. Manaranjan Pradhan and U Dinesh Kumar "Machine Learning Using Python", Wiley Publication, ISBN-108126579900
2. Max Kuhn and Kjell Johnson "Applied Predictive Modeling" Springer; 1st ed. 2013, Corr. 2nd printing

2018 edition (27 April 2018) ISBN-10: 1461468485, ISBN-13: 978-1461468486

3.  Saikat Dutt ,Subramanian Chandramouli , Amit Kumar Das, "machine learning" - Pearson; First edition (1 October 2018) ISBN-10 :  9353066697, ISBN-13 :  978-9353066697

**Reference Books:**

1. Andrew NG, "Machine Learning Yearning" ISBN-10: 199957950X, ISBN-13: 978-1999579500
2. Andriy Burkov, "The Hundred-Page Machine Learning Book", ISBN-10 : 1999579542, ISBN-13 : 978-1999579548
3. Andre Milchman, " Prescriptive Analytics: A Short Introduction to Counterintuitive Intelligence", Amazon Kindle Edition

**Supplementary Resources**

MOOC on Machine Learning By NPTEL

1. https://nptel.ac.in/courses/106/105/106105152/
2. https://nptel.ac.in/courses/106/106/106106202/
3. https://nptel.ac.in/courses/106/106/106106213/
   MOOC on Machine Learning By Coursera
4. https://www.coursera.org/learn/machine-learning
5. https://www.coursera.org/learn/uol-machine-learning-for-all
6. Kaggle: https://www.kaggle.com/
7. Data world: https://data.world/,
8. Data.gov.in: https://data.gov.in/
9. EBSCO: https://www.ebsco.com/academic-libraries,
10. JGATE : https://jgateplus.com/
11.  https://elibrary.in.pearson.com

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1  | 3   | 2   | 1   | 2   | 2   | 2   | 1   | 1   |
| CO2  | 2   | 2   | 3   | 2   | 1   | -   | 1   | -   |
| CO3  | 2   | 2   | 3   | 2   | 1   | -   | 1   | -   |
| CO4  | 2   | 2   | 3   | 2   | 1   | -   | 1   | -   |
| CO5  | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 2   |

*LEVEL:  3- Substantial,      2- Moderate,   1-Slight,        0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted |
|---------|-----------------|--------------------|----------------|
| 1 | Semester end Lab Exam | Individual | Execution/ Presentation 30<br>Viva-Voce   10<br>Lab Journal  10<br>Total - 50 |
| 2 | Attendance and Class participation | Individual | 10 |
| 3 | Capstone project | Individual / Group | 25 |
| 4 | Mini Project | Individual | 15 |

| Course Title | Prescriptive Analytics |
| --- | --- |
| Term/Semester | II |
| Course ID | 23PGB122 |
| Credits | 4 |

## INTRODUCTION:

Prescriptive analytics are widely used to decide the best course of action. This kind of analysis results in suggestions for the following stages by taking in account all pertinent aspects. It is a useful tool for data driven decision making. It employs machine learning algorithms to process enormous amounts of data more quickly-and frequently more effectively-than people. Algorithms search through data and offer suggestions depending on a particular set of requirements. Predictive models assist firms in luring, in keeping and expanding their most lucrative clients by enhancing performance. Now a days, companies are widely using this to forecast inventory and manage resources.

## COURSE OUTCOMES (COs):

At the end of the course, students will be able to

**CO1:** Create a prescriptive analytics system, and use situational models to map real-world issues.

**CO2:** Create alternatives to make potential outcomes into choices for a decision.

**CO3**: To convert alternatives into solutions, and create decision sets utilizing evolutionary algorithms.

**CO4**: Utilize simulation to carry out judgments that have a real-world influence on the company difficulties.

**CO5**: Apply various application tools and algorithms in Multi Criteria Decision Making

## COURSE CONTENT AND STRUCTURE:                                   48 Hours

**Module 1:**                                                            13 Hours
**Prescriptive Analytics & Optimization**
**Introduction:** Prescriptive Analytics; Difference between Predictive and Prescriptive Analytics.
**Introduction to Mathematical/Optimization Models for Decision Making:** Linear Programming – Marketing Mix, Capital Budgeting, Duality & Sensitivity Analysis, Budget Allocation, Scheduling, DEA (Formulate and Solve LP problems with Excel Solver in different business applications, DEA using DEAP); Non-Linear Programming – Pricing, Facility Location, Portfolio Selection; Integer & Mixed Integer Programming – Logical Constraints, Project Selection, Set Coverage(Solve all the three types of Integer Programming and Non-Linear Programming Problems Using Tora/Excel), Difference between LP and IP.

**Module 2: Extension of LPP**                                          10 Hours
Transportation Problems – Formulation; Initial & Optimal Basic Feasible Solution – NWC, LCM, VAM, MODI. Assignment Problems – Hungarian Approximation Method; Travelling Salesman Problem;

**Module 3:**                                                           9 Hours
**Network Analysis:** Models – Shortest Path Problem, Techniques – CPM, PERT; Strategic Route Consolidation; Heuristic Optimization: Genetic Algorithms – Terminologies, Working Procedure

**Module 4:**                                                           8 Hours
**Simulation Modelling** – Types; Application; Simulation Development Process – Conceptual Design, Input

Analysis, Model Development Verification and Validation, Output Analysis & Experimentation for Decision Making; Probability Distribution and Random Number Generation; Procedure of Monte Carlo Simulation; Other types of Simulation – Discrete Event Simulation, Look ahead Simulation, Visual Interactive Simulation, Agent-Based Simulation.

**Module 5:**                                                                                    **8 Hours**
**Multi-Criteria Decision Making:** Type of Decisions – Choice Problem, Sorting Problem, Ranking Problem, Description Problem; Decision Analysis – Artificial Intelligence & Expert System for Decision Making; Decision Tree.

**Pedagogy:**
- Practice based teaching using Tora and Excel Solver
- Classroom discussion
- Case based teaching
- Project based teaching.
- Interaction with Industry experts

**Teaching Learning Resources:**
**Essential readings-**
1. Prescriptive Analytics for Business Leaders. Peter Bull, Carlos Centurion, Shannon Kearns, Eric Kelso, Nari Viswanathan. RiverLogic Publications
2. How to Win With Prescriptive Analytics. James Sanders. ZDNet, TechRepublic.
3. Prescriptive Analytics, The Final Frontier for Evidence Based Management and Optimal Decision Making. Dursun Delen. Pearson Eduction ISBN:978013439004
4. Prescriptive Analytics: A Short Introduction to Counterintuitive Intelligence
5. https://www.kobo.com/in/en/ebook/prescriptive-analytics
6. https://learning.oreilly.com/scenarios/hands-on-prescriptive-analytics/9781098126438/
7. https://www.techrepublic.com/resource-library/whitepapers/prescriptive-analytics-an-insider-s-guide-free-pdf/post

**References**
- Simulating Business Process for Descriptive, Predictive and Prescriptive Analytics. Andrew Greasley. De Gruyter Publications ISBN: 9781547400690, 2019
- Inventory Analytics: Prescriptive Analytics in Supply Chains, Third Edition. Dr. Horst Tempelmeier, University of Cologne, Germany. Books on Demand GmbH ISBN: 978-3-7519-3071-0.

**Supplementary resources-**
1. https://jgateplus.com/home/
2. https://search.ebscohost.com/
3. https://www.coursera.org/professional-certificates/
4. https://elibrary.in.pearson.com

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 2 | 2 | - | 2 | 2 |
| CO2 | 3 | 2 | 1 | 1 | 1 | 2 | 3 | 2 |
| CO3 | 2 | 2 | 3 | 1 | 2 | 1 | 1 | 3 |
| CO4 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 1 |
| CO5 | 1 | 3 | 3 | 3 | 1 | 2 | 1 | 1 |

*LEVEL:  3- Substantial,      2- Moderate,   1-Slight,        0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---------|-----------------|--------------------|----------------|----------|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid – Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Capstone Project – Using TORA | Individual / Group | 10 | At the end of the First module |
| 5 | Capstone Project – Using Excel Solver | Individual / Group | 10 | At the end of the fourth module |
| 6 | Remaining assignments (Quiz, Individual Assignment / Group assignments etc.) | Individual | 10 | Full Semester |

| Course Title | Web and Social Media Analytics |
|---|---|
| Term/Semester | II |
| Course ID | 23PGB123 |
| Credits | 3 |

**INTRODUCTION:**

E-commerce analytics is a system or tool that allows to understand user's behaviour. Although most e-commerce analytics tools focus on onsite behaviour, e-commerce analytics goes beyond that. In current scenario, many businesses are trying random tactics to succeed until something works. Real success happens when there are processes, trends, and concrete numbers that act as compass. And that's where e-commerce analytics and the data supplied by it is powerful.

Good data helps us to understand the world around us, it provides guidance and helps us make sound decisions, and this includes e-commerce data as well.

E-commerce analytics tells where users came from, how much time they spent looking at a particular product, where they spend most of their time, and much more.

The course would provide detailed knowledge about Google analytics and how informed decisions can be made with the data from websites. Students will also learn how to analyze market and social medial data which would help in evolving the process of retailing and help in making better decisions. Students will learn to create advanced reports on social media and google analytics platform on shopping behaviour and buying patterns to increase business sales.

**COURSE OUTCOMES (COs):**

At the end of the course, students will be able to

**CO1:** Understand the basics of E-Commerce & Google analytics

**CO2:** Apply different techniques in Google analytics.

**CO3**: Analyze E-Commerce Reports in Google Analytics.

**CO4**: Understand and apply analytical tools in social media analytics

**CO5**: Apply various application tools and algorithms in social media analytics.

**COURSE CONTENT AND STRUCTURE:**                                    **36 Hours**

**Module 1: E/M-Commerce Analytics Basics & Settings in Google Analytics      10 Hours**

- What is E/M-Commerce Analytics
- Introduction to Google analytics.
- The Basics: How to set up Google Analytics
- Google Analytics views; e-commerce tracking
- Google Analytics settings :latest code; Ad Words  time zone; View Settings; Ad Words Linking; Importing other paid traffic sources; Integrating Search Console; Demographics and interests reporting; Create custom alerts
- What is UTM (Urchin Tracking Module) tagging for e-commerce and it's important
- Methods to track competitors' prices and stock availability

**Module 2: Customer Experience and Analytics**                    **6 Hours**
  – Buyer personas
  – Audience Reports in Google Analytics
  – GDPR laws; structuring and ad targeting; Limitations
  – Role of geographic and demographic data in optimizing campaigns
  – Usage of Facebook data Insights for better targeting; segmentation; retention; customer satisfaction
  – Analytics through Ads: Google Ads Analytics; Facebook Ads Analytics; Display Ads Analytics

**Module 3: Text Mining, Cleaning and Pre-Processing**                    **6 Hours**
  - Various Tokenizers, Tokenization, Frequency Distribution, Stemming, POS Tagging, Lemmatization, Bigrams, Trigrams & n-grams, Lemmatization, Entity Recognition, Word Term Frequency, Text Conversion, Text classification & analytics

**Module 4: Web & Social Media Analytics**                    **6 Hours**
  - Web Analytics: Metrics Used in Web Analysis – PULSE, HEART, On & OFF Site, Goal-Signal; Fundamentals of Social Networks; KPI's in Web Analytics; Website Goals; Website Optimization; Analytics – Email, Facebook, Social Media using Sentimental Analysis;
  - Application of Social Media Analytics in various Marketing functions and activities like Segmentation; Pricing; Consumer behavior; Sales Force Management; New Product Development; Promotions.

**Module 5: Creating and Developing Social Media Identity**                    **8 Hours**
  - Using Facebook for running an advertising campaign: creating page, boosting campaign, tracking and monitoring
  - LinkedIn Marketing: Using LinkedIn for professional networking; Creating professional LinkedIn profile; Identifying job or part-time opportunities
  - Instagram Marketing- How to become an influencer; Post and hashtag strategy; Using Instagram for business opportunities
  - Twitter Marketing: Overview of Twitter; Composing a Tweet; Using Hashtag; Pinning & sharing tweet; Creating followers
  - YouTube: Creating a channel on YouTube; Increasing impression & reach; strategies to enhance followers

**Sentence Structure, Sequence Tagging, Sequence Tasks, and Language Modeling**
  - Language Modeling, Sequence Tagging, Sequence Tasks, Predicting Sequence of Tags, Syntax Trees, Context-Free Grammars, Chunking/Chinking, Automatic Paraphrasing of Texts.

**AI Chatbots and Recommendations Engine**
  - Using the NLP concepts, build a recommendation engine and an AI chatbot assistant using AI.

**Pedagogy:**

- Practice based teaching using Google Analytics
- Classroom discussion
- Case based teaching
- Project based teaching.
- Interaction with Industry experts

**Teaching Learning Resources:**

**Essential readings-**

1. Retail Analytics – The Secret Weapon, Emmett Cox. Wiley publications, ISBN-13: 9781118148327
2. The Ridiculously Simple Guide to Google Analytics, Scott La Counte. Diana La Counte Publications ISBN-13 : 978-1629178042
3. Introduction to Google Analytics, Todd Kelsey. Apress publications ISBN-13 : 978-1484228289
4. Consumer Behavior, Leon G. Schiffman, Joe Wisenblit, S. Ramesh Kumar, Pearson Education India. ISBN: 9789353943806
5. The Power of Social Media: Improve Your Knowledge On Social Media, Jim Stephens
6. Social Media Analytics Effective Tools for Building, Interpreting and Using, Marshall Ponder, McGrawhill Education
7. https://www.conversific.com/blog/ecommerce-analytics/

**References**

1. Google Analytics Breakthrough, Feras Alhlou. Wiley publications, ISBN-13:  9781119231691
2. Advanced Web Metrics with Google Analytics, Brian Clifton, Third edition. Wiley publications, ISBN-13:  9781118168448
3. Web Analytics 2.0, Avinash Kaushik, Wiley publications, ISBN-13:  9780470596449
4. B.king, A. (2008). Website Optimization. O'Reilly publication. ISBN-13:9780596515089
5. Sachs, A-L. (2014) Retail Analytics: Integrated Forecasting and Inventory Management for Perishable Products in Retailing, Springer. ISBN: ISBN 978-3-319-13305-8
6. Effective Tools for Building, Interpreting and Using Metrics, Alex Goncalves, Apress
7. Social Media Analytics, Kohirkar Ganis, Pearson Education

**Supplementary resources-**

1. https://jgateplus.com/home/
2. https://search.ebscohost.com/
3. https://www.coursera.org/professional-certificates/google-data-analytics
4. https://elibrary.in.pearson.com

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|
| **CO1** | 1 | 1 | 1 | 1 | 3 | 1 | 2 | 1 |
| **CO2** | 2 | 1 | 2 | 3 | 2 | 1 | 2 | 1 |
| **CO3** | 3 | 2 | 2 | 3 | 1 | 1 | 2 | - |
| **CO4** | 1 | 2 | 2 | 2 | 3 | 1 | 1 | - |
| **CO5** | 1 | 2 | 3 | 2 | 2 | 1 | 1 | - |

*LEVEL: 3- Substantial,      2- Moderate,   1-Slight,        0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---------|-----------------|--------------------|----------------|----------|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid – Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.) | Individual | 30 | Full Semester |

| Course Title | Big Data Analytics |
|---|---|
| Term/Semester | II |
| Course ID | 23PGB124 |
| Credits | 3 |

**INTRODUCTION:**
This course will help students to make a data driven decision which is more effective and efficient than human generated decisions. Big data analytics allows students to detect trends and spot patterns that can be used for future benefit. Big data analytics helps students to harness data and use it to identify new opportunities. Students will gain exposure to SQL and RDBMS which will help in creating and extracting data from databases. This course will help students to learn the usage of Hadoop to store and process big data in a more effective manner. Students will also get a practical exposure to Pig and Hive during the course which will help in their future career prospects.

**COURSE OUTCOMES (COs):**
Post Completion of this course, students should be able to:
CO1: Analyze and interpret the Big Data Platform
CO2: Illustrate and apply the architectural concepts of Hadoop and HDFS
CO3: Understand and analyze Hadoop Ecosystem and Map reduce
CO4: Understand and apply concepts of PIG & Hive
CO5: Understand the contemporary developments in the field of Big Data Analytics

**COURSE CONTENT AND STRUCTURE:**                    **36 Hours**

**Module 1: Introduction to Big Data**                    **4 Hours**
- Introduction to Big Data: Types of Digital Data; 5Vs; Characteristics of Data
- Challenges with Big Data
- Business Intelligence vs. Big Data-Structured and Unstructured Data
- Applications of Big Data Analytics in: Marketing and Sales, Finance Analytics, HumanResource, Healthcare
- Product Design & Service Design
- Customer Service and Support
- SCM
- Government operations

**Module 2: Hadoop and HDFS**                    **6 Hours**
- Hadoop: History of Hadoop; the Hadoop Distributed File System
- Components of Hadoop Analysing the Data with Hadoop
- HDFS: Design of HDFS
- The Design of HDFS; HDFS Concepts; Command Line Interface
- Hadoop file system interfaces
- Java interfaces to HDFS
- Analytics using Hadoop
- Application of Hadoop as a Management Technique.

**Module 3: Hadoop Ecosystem and Map Reduce (Theory)**          **12 Hours**
- Map Reduce: Anatomy of a Map Reduce Job Run; Failures
- Job Scheduling

- Shuffle and Sort
- Task Execution
- Map Reduce Types and Formats
- Map Reduce Features

## Module 4: PIG & HIVE                                    10 Hours

- Pig: Introduction to PIG
- Execution Modes of Pig
- Comparison of Pig with Databases; Grunt; Pig Latin
- User Defined Functions
- Data Processing operators
- Hive: Hive Shell; Hive Services; Hive Metastore
- Comparison with Traditional Databases
- Hive QL; Tables
- Querying Data and User Defined Functions
- Big Data Analytics using Hadoop

## Module 5: Contemporary Development                      4 Hours
- Pyspark and Rspark: Illustrative code notebooks
- Spark Basics
- Architecture RDDs
- Building blocks of Spark
- Spark Terminologies Pyspark
- Kafka: Zookeeper; API; Clusters; Brokers
- Analytics for the Future of Management.

## Pedagogy:
1) Classroom Discussions
2) Activity Based Learning
3) Practice Based Learning
4) Project Based Learning
5) Experiential Learning
6) Software Based Learning - MySQL Workbench and Cloudera/Horton works/Hue
7) Case Based Learning

## Teaching Learning Resources:

### Essential Readings
1. Big Data Simplified ,First Edition , Pearson 18 July 2019
2. Ralph Kimball and Margy Ross- "The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling"- (Third Edition). John Wiley and Sons.ISBN-10 : 1118530802,ISBN-13 : 978-1118530801
3. **J.** Han and M. Kamber- "Data Mining: Concepts and Techniques"- Morgan Kaufman- 3/E-2011.ISBN-10 : 9780123814791,ISBN-13 : 978-9380931913
4. Vaisman- Alejandro; Zimanyi- Esteban- "Data Warehouse Systems"- Springer- 2014. ISBN-10 :3642546544 ,ISBN-13 : 978-3642546549

5. Sourabh Mukherjee (Author), Amit Kumar Das (Author), Sayan Goswami (Author) ISBN-10 :9386263610,ISBN-13 : 978-9353435110
6. Viktor Mayer Schonberger, "Big Analytics: A Revolution That Will Transform How We Live, Work and Think", Harper Business
7. Foster Provost, " Data Science for Business: What You Need to Know about Data Mining and Data Analytic Thinking, O'Reily Media

**Reference**
1. Kimball- Ralph- "The Data warehouse lifecycle toolkit: expert methods for designing-developing- and deploying data warehouses"- John Wiley & Sons- 1998.ISBN-10 : 0471255475, ISBN-13 : 978-0471255475
2. Alex Berson- Stephen J. Smith- "Data Warehousing- Data Mining- and OLAP"- MGH-1998 ISBN- 10 : 0070062722,ISBN-13 : 978-0070062726
3. Davenport, "Big Data Work: Dispelling the Myths Uncovering", Harvard Business

**Supplementary Readings:**

NPTEL Course : https://nptel.ac.in/courses/106/104/106104189/
Coursera:      https://www.coursera.org/learn/hadoop  https://www.coursera.org/learn/big-data- analysis
Data Sources : Kaggle: https://www.kaggle.com/ Data world: https://data.world/ Data.gov.in: https://data.gov.in/
Databases: EBSCO: https://www.ebsco.com/academic- libraries,JGATE: https://jgateplus.com
Pearson E library: https://elibrary.in.pearson.com

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| **CO1** | 2 | 2 | 3 | 2 | 2 | 1 | 2 | 1 |
| **CO2** | 1 | 1 | 2 | 2 | 1 | 1 | 1 | - |
| **CO3** | 1 | 1 | 2 | 1 | 1 | 2 | 1 | - |
| **CO4** | 1 | 1 | 2 | 1 | 1 | - | 1 | 1 |
| **CO5** | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 1 |

*LEVEL:  3- Substantial,      2- Moderate,  1-Slight,        0-No Co-relation*

**Course Evaluation Plan**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---------|-----------------|--------------------|----------------|----------|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid – Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.) | Individual | 30 | Full Semester |

| Course Title | Data Visualization and Story Telling Using Tableau |
|---|---|
| Term/Semester | II |
| Course ID | 23PGB125 |
| Credits | 4 |

## INTRODUCTION:

Tableau is a powerful and fast-growing data visualization tool. While Tableau is designed to be used by a range of business users and non-technical audiences, it also provides access to a deep computational ability for advanced data analytics. Tableau is flexible because it can deal with a lot of different data sources. Tableau is great because it's a single tool for problem framing, importing and cleaning data, analyzing and visualizing data; taking business decisions; and presenting insights. Organizations across the world and in various industries are using visualization and reporting through Tableau. Tableau alone has a market share of about 14.2% in the Business Intelligence category, making it the most popular BI tool among the others.

## COURSE OUTCOMES (COs):

Post Completion of this course students should be able to:

**CO1**: Understand the fundamental concepts and features of tableau.

**CO2**: Create data visualizations using tableau.

**CO3:** Analyse various features of modeling using tableau.

**CO4**: Create dashboards in tableau.

**CO5:** Construct stories in tableau.

## COURSE CONTENT AND STRUCTURE:                                     48 Hours

### Module 1:  Getting Started with Tableau                            6 Hours
– Introduction to tableau
– Data Connection: connecting to data; loading data
– Navigating in tableau: Menu Commands; File Menu; Data Menu; Worksheet Menu; Dashboard Menu; Story Menu; Analysis Menu; Map Menu; Format Menu
– Loading workbooks
– Dimensions and measures
– First visualization
– Building and improving visualizations

### Module 2: Building and Customizing Visualizations               12 Hours
– Creating Basic Visualizations: Bar chart ; Line chart; pie chart; crosstab; scatter plot; bubble chart; histogram ; waterfall charts
– Filtering: basic filters; quick filters; context filters; condition filters; Hierarchical filters; Collaborative filters; top filters
– Sorting; through selection; excluding multiple fields

- Filtering for null values
- Top filters on tableau
- Aggregation
- Calculated fields: introduction; creating calculated fields

**Module 3: Analysis through tableau**                              **10 Hours**
- Mapping your data
- Creating a symbol map
- Working with dates
- Visualizing dates in data: Drill down and roll up; date formatting options; date filters
- reference lines; Spread analysis using reference lines
- Trend lines
- Forecasting

**Module 4: Presenting Your Data**                                 **8 Hours**
- Best practices for formatting your visualization
- Using color purposefully and readable fonts
- Use tooltips and adjust access as necessary
- Creating dashboards
- Customizing dashboards: Add a tiled textbox; add floating images and buttons
- Creating stories
- Customizing stories: Tailor your caption; Adjust layout

**Module 5: Creating Stories in Tableau**                          **12 Hours**
- Concept: Introduction to Tableau Stories
- CXO level data story Vs Operational data story
- Demo: Creating a Data Story
- Demo: Formatting a Story
- Activity: What's the Story?

**Pedagogy:**
- Software based teaching
- Practice based learning
- Activity based learning
- Classroom discussions
- Project based learning

**Teaching Learning Resources:**

**Essential Readings**
1. Daniel G. Murray, Tableau Your Data: Fast and Easy Visual Analysis with Tableau Software 2nd Edition, WILEY publication. ISBN: 978-1-119-00119-5
2. Ryan Lindy, Visual Data Storytelling with Tableau, Pearson Publication. ISBN:10-9353063590
3. Lindy Ryan, Visual Data Storytelling with Tableau, Pearson Education

**Reference**
1. Ryan Sleeper, Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master 1st Edition, O'REILLY publication. ISBN-13 978-1491977316
2. Joshua N. Milligan, Learning Tableau: Tools for Business Intelligence, Data Prep, and Visual Analytics, 3rd Edition, Packt publication. ISBN-13 : 978-1784391164
3. Jane A Crofts, Tableau Desktop: A Practical Guide for Business Users. ISBN-13 : 978-1518675157
4. Alexander Loth, Visual Analytics with Tableau 1st Edition, WILEY publication ISBN:9781119560203
5. Learning Tableau by Joshua Milligan. Packt Publication. ISBN-13 : 978-1800200364
6. Communicating Data with Tableau by Ben Jones. OREILLY publication ISBN-13 : 978-1449372026
7. Alex Campbell, Data Visualization Guide: Clear Introduction to Data Mining, Analysis and Visualization.

**Supplementary resources-**
1. https://jgateplus.com/home/
2. https://search.ebscohost.com/
3. https://elearning.tableau.com/tableau-fundamentals
4. https://www.coursera.org/specializations/data-visualization
5. https://elibrary.in.pearson.com

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 2 | 2 | 2 | - | 1 | - |
| **CO2** | 3 | 2 | 2 | 2 | 2 | - | 1 | - |
| **CO3** | 1 | 3 | 3 | 2 | 2 | - | 1 | - |
| **CO4** | 2 | 3 | 3 | 2 | 2 | 1 | 1 | - |
| **CO5** | 2 | 3 | 3 | 2 | 2 | 2 | 1 | 1 |

*LEVEL:  3- Substantial,      2- Moderate,   1-Slight,        0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted |
|:---:|:---:|:---:|:---:|
| 1 | Semester end Lab Exam | Individual | Execution/ Presentation 30<br>Viva-Voce   10<br>Lab Journal  10<br>Total - 50 |
| 2 | Attendance and Class participation | Individual | 10 |
| 3 | Capstone project | Individual / Group | 25 |
| 4 | Mini Project | Individual | 15 |

| Course Title | Finance & Risk Analytics |
|---|---|
| Term/Semester | II |
| Course ID | 23PGB221 |
| Credits | 4 |

## INTRODUCTION:

Huge amount of financial transactions data is getting generated every moment which is getting captured using technology. In- depth analysis of this huge amount of data can help gain insight into the process and extract value for decisions in different financial area covering credit risk, fraud analysis and retail banking.

This course equips the students with the understanding of the process and the techniques of data analysis and data mining tools for fact based decision making using Excel, R and Python for descriptive and predictive modeling in finance domain.

## COURSE OUTCOMES (CO):

On successful completion of this course, the students should be able to:

**CO1:** Understand and appreciate applied analytics for problems in domain finance

**CO2**: Differentiate between models with robustness criteria in domain finance

**CO3**: Determine the tool to be chosen for a practical business problem in domain finance

**CO4**: Interpret the outcome and develop the ability to do shareholder value analysis and recommend investment decisions

**CO5**: Develop the ability to do financial analysis using Time series and other statistical techniques

## COURSE CONTENT & STRUCTURE: 48 Hours

### Module 1: Fundamentals of Financial Analytics (FA) 10 Hours

- Analytics for a New Decade: Post Crisis Analytics; The Imperatives; Productizing Analytic;
- Innovation: The Quest for Quality, Standardization and Technology Governance.
- Structure & Unstructured data
- The Convergence of Structured and Unstructured Analytic

### Module 2: Predictive Analytics in Finance 12 Hours

- Forecasts with Credit Risk Analysis
- Unstructured Data Analytics
- Fraud Analytics
- Insurance Analytics
- Value at Risk (VaR) applications in estimating Risk
- Retail Banking: Credit Score Modelling
- Retail and Finance AI based Credit Risk Modelling & Stress testing
- Unstructured Data Analytics – Text Analysis on Compliances & Customer Feedback

**Module 3: Application of Analytics in Finance (Used cases):**     **8 Hours**
- Targeting potential customer
- Customer spend analysis
- Extension of benefit and scheme to credit cardholders

**Module 4: Application of AI and ML in Finance**     **8 Hours**
- Analytics in cross-selling
- Unlocking the True Value of a Transaction
- Real-time fraud analytics

**Module 5: Emerging Trends in Financial Analytics**     **10 Hours**
- Block chain
- Crypto currency
- FINTECH
- Algorithm trading

**Pedagogy and Teaching Aid**

1. **Class discussions with aided YouTube videos**
   1.1. Concepts will be discussed and debated post and during the video
2. **Software linked hands-on working**
   2.1. MS-Excel will be used live by both instructor and the students during the session
   2.2. R & Python will be used live by both instructor and the students during the session

**Teaching Learning Resources:**
**Essential Readings**
1. Python for Finance: Mastering Data-Driven Finance, 2nd Edition, Kindle Edition, by Yves Hilpisch, O'Reilly Media, ISBN- 978-1492024330
2. Financial Analytics with R: Building a Laptop Laboratory for Data Science 1st Edition, Kindle Edition, by Mark J. Bennett & Dirk. L. Hugen, Cambridge University Press, ISBN- 978-1107150751
3. Financial Risk Analytics: A Term Structure Model Approach for Banking, Insurance and Investment, Donald R Van Deventer, Irwin Publishing

**Supplementary Resources**
1. https://jgateplus.com/home/
2. https://capitaline.com/

3. http://web.b.ebscohost.com/ehost/search/basic?vid=1&sid=c8b5124d-307d-4f0a-843e-3b13e9156a4a%40pdc-v-sessmgr06
4. https://elibrary.in.pearson.com/login
https://www.youtube.com/watch?v=7zoTm84Hmhg&list=PLJzvu5X33puw_XkZiegE7sUpaP6YIKEW_&index=1
5. https://www.youtube.com/watch?v=SzE8s_pnaMc&list=PLJzvu5X33puw_XkZiegE7sUpaP6YIKEW_&index=2
6. https://www.youtube.com/watch?v=p4D1g_h6q5Q&list=PLJzvu5X33puw_XkZiegE7sUpaP6YIKEW_&index=3
7. https://www.youtube.com/watch?v=mAwSlgNkjb8&list=PLJzvu5X33puw_XkZiegE7sUpaP6YIKEW_&index=7
8. https://www.youtube.com/watch?v=4ghXXQAHgkI&list=PLJzvu5X33puw_XkZiegE7sUpaP6YIKEW_&index=8
9. https://www.researchgate.net/publication/347840605_Employing_Deep_Learning_In_Intraday_Stock_Trading
10. https://www.researchgate.net/publication/331225184_Bankruptcy_Modelling_of_Indian_Public_Sector_Banks_Evidence_from_Neural_Trace
11. https://www.researchgate.net/publication/318701819_FRA-CDS-VDAX_based_credit_crash_model_A_German_conundrum
12. https://www.researchgate.net/publication/322163251_Analysing_Indian_G-Secs_with_a_Predictive_Approach
13. https://www.researchgate.net/publication/303775904_PSU_Bank_Modeling-
14. A_comparative_modeling_approach_involving_Artificial_Neural_Network_and_Panel_Data_Re gression

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3   | 3   | 2   | 1   | 3   | 1   | -   | -   |
| CO2 | 2   | 2   | 3   | 2   | 3   | 2   | 1   | -   |
| CO3 | 2   | 1   | 3   | 2   | 3   | 1   | 2   | -   |
| CO4 | 2   | 2   | 1   | 1   | 3   | 1   | 1   | -   |
| CO5 | 2   | 1   | 2   | 1   | 3   | 2   | -   | 1   |

*LEVEL: 3- Substantial,     2- Moderate,   1-Slight,       0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---|---|---|---|---|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid – Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.) | Individual | 30 | Full Semester |

| Course Title | HR Analytics |
|---|---|
| Term/Semester | II |
| Course ID | 23PGB222 |
| Credits | 4 |

**INTRODUCTION:**

This course intends to increase the student's awareness about the importance of data analytics in HR, HRIS and equip them with the skills to use them at workplace. The complexities in today's world with diverse workforce, investment challenges, new and disruptive technologies, economic volatility, poses immense challenges for HRM team in terms of acquisition and retention of right resources on right time at right place. Collection of data from different sources, internal and external to the organization and in depth analysis of the same suing various statistical and data mining tools can provide the organization with valuable information regarding the workforce management and hence gain competitive advantage.

**COURSE OUTCOMES (COs):**

After completion of this course, students will be able to:

**CO1:** Understand and appreciate the concepts of analytics in human resource management and its alignment with business strategy

**CO2:** Apply quantitative and qualitative analysis to understand trends and indicators in human resource data

**CO3:** Understand and develop the forecasting and predictability of performance of an employee and other HR parameters

**CO4:** Apply the different HR metrics to conduct research and statistical analyses related to Human Resource Management

**CO5:** Understand the latest developments in the field of HR analytics

**COURSE CONTENT AND STRUCTURE:**                                    **48 Hours**

**Module 1: Overview of HR Analytics**                              **12 Hours**

- Role of Analytics: Defining HR Analytics; Basics of HR Analytics; Analytic value chain; Analytical Model; Typical application of HRanalytics; HRIS/HRMS.
- HR Analytics: The Third Wave for HR value creation; HR Measurement journey in tune with HR maturity journey; Understanding the organizational system (Lean); Locating the HR challenge in the system; Valuing HR Analytics in the organizational system; Strategic Workforce Planning; Succession and Scenario Planning; ROI of HR Policies and Activities

**Module 2: HRA Frameworks**                            **10 Hours**

- HRA Framework: Current approaches to measuring HR and reporting value from HR contributions; Strategic HR Metrics versus Benchmarking; HR Scorecards & Workforce Scorecards and how they are different from HR Analytics;
- HR Maturity Framework: From level 1 to level 5; HR Analytics Frameworks (a) LAMP framework; (b) HCM: 21 Framework and (c) Talent ship Framework; 5 predominant components of an effective Analytics framework. Class Discussion on horizon of prediction, HR intervention strategies using analytics. (Focus to be given on Benchmarking; HR Scorecards)
- HR Models and Competency Mapping

**Module 3: Predictive Analytics**                          **8 Hours**

- Analytics - Attrition; Employee Net Promoter Score; Compensation & Benefit Analysis; Employee Satisfaction; Offer Renege Analysis; POFU Analysis

**Module 4: Insight into Data Driven HRA:**                    **10 Hours**

- Data Driven HRA: Typical data sources; Typical questions faced (survey); Typical data issues; Connecting HR Analytics to business benefit (case studies); Techniques for establishing questions; Building support and interest; Obtaining data, Cleaning data (exercise); Supplementing data. Introduction to the concept of "bias" concept w.r.t surveys.

**Module 5: Emerging Trends in HR Analytics**                  **8 Hours**

- Diversity Analytics
- Recruitment & Selection Analytics
- Training Analytics
- Compensation Analytics
- Performance Management Analytics
- HR Metrics
- HR Dashboards
- People Analytics Factsheet

**Pedagogy:**
- Classroom Discussion
- Lab Driven course by using R Programme and Tableau
- Project based teaching
- Case study based teaching
- Interaction with the Practitioner

**Teaching Learning Resources:**
**Essential readings-**
1. Edwards, M. R., & Edwards, K. (2019). *Predictive HR analytics: Mastering the HR metric*. Kogan Page Publishers: London.
2. Soundararajan, R., & Singh, K. (2016). *Winning on HR Analytics: Leveraging Data for Competitive Advantage*. SAGE Publications: India.
3. Bhattacharyya, D. K. (2017). *HR Analytics: Understanding Theories and Applications*. SAGE Publications India Pvt Limited.
4. Moore, McCabe, Duckworth, and Alwan. *The Practice of Business Statistics: Using Data for Decisions*, Second Edition, New York: W.H.Freeman, 2008.
5. Jac Fitz- enz, John R. Mattox, *Predictive analytics for Human Resources*, II, Wiley, 2014.
6. Gene Pease Boyce Byerly, Jac Fitz-enz. Human Capital Analytics, Wiley, 2013.

**References**:
1. The HR Scorecard: Linking People, Strategy, and Performance, by Brian E. Becker, Mark A. Huselid, Mark A Huselid, David Ulrich, 2001.
2. HR Analytics: The What, Why and How, by Tracey Smith
3. The New HR Analytics: Predicting the Economic Value of Your Company's Human by Jac FITZ-ENZ, 2010.
4. Deloitte. (2016) *Enabling business results with HR "Measures that matter"[PDF File]*Retrievedfrom https://www2.deloitte.com/content/dam/Deloitte/us/Documents/human-capital/us-hc-enabling-business-results-with-hr-measures-that-matter.pdf on May 14, 2019.
5. Bassi, L. (2011). Raging debates in HR analytics. *People and Strategy*, *34*(2), 14.

**Supplementary reading:**
1. https://jgateplus.com/home/
2. https://capitaline.com/
3. http://web.b.ebscohost.com/ehost/search/basic?vid=1&sid=c8b5124d-307d-4f0a-843e-3b13e9156a4a%40pdc-v-sessmgr06
4. https://elibrary.in.pearson.com/login

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1  | 3   | 1   | 1   | 1   | 2   | 3   | 2   | 2   |
| CO2  | 1   | 3   | 3   | 2   | 1   | 2   | 2   | 1   |
| CO3  | 2   | 2   | 1   | 2   | 2   | 2   | 2   | 1   |
| CO4  | 1   | 2   | 1   | 2   | 2   | 2   | 2   | 1   |
| CO5  | 2   | 1   | -   | 3   | 3   | 2   | 1   | 2   |

*LEVEL: 3- Substantial, 2- Moderate, 1-Slight, 0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---|---|---|---|---|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid – Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.) | Individual | 30 | Full Semester |

| Course Title | Marketing & Retail Analytics |
|---|---|
| Term/Semester | II |
| Course ID | 23PGB223 |
| Credits | 4 |

## INTRODUCTION:

Data is critical for any organization and it also plays a vital role in helping managers take the right decision. Organizations have access to a variety of data related to their customers, channel partners, vendors, and others. After gathering and collecting data, converting the same into meaningful information and then deriving the correct interpretation is critical for organizations to grow and sustain in the present competitive environment. Organizations today use analytics to generate actionable insights which are required for effective and impactful decision making. This course will help to understand the essentials of marketing analytics and learn the techniques to address fundamental marketing challenges.

## COURSE OUTCOMES (COs):

After completion of this course, students will be able to:

**CO1:** Understand and appreciate the concepts and application of Business analytics in managing Marketing functions

**CO2:** Apply quantitative and qualitative analysis to understand trends and indicators in marketing data and demonstrate the same with the help of dashboards

**CO3:** Understand and appreciate Applications of Big Data Analytics in Marketing

**CO4:** Apply web based analytical tools to various Marketing functions

**CO5:** Understand the alignment of marketing activities and the overall business strategy of the organization

## COURSE CONTENT AND STRUCTURE:                         48 Hours

### Module 1:  Overview of   Marketing Analytics                         8 Hours
- Importance of Marketing analytics
- Application of analytics in Sales Forecasting – qualitative and quantitative methods
- Application of analytics in Market Share Analysis- Tools and techniques
- Application of analytics in measuring Market Performance Indicators; Penetration; Usage; Brand Performance and Satisfaction

### Module 2: Marketing Analytics with Specific Functions in Marketing          16 Hours
- Marketing analytics in Segmentation, Targeting and Positioning (STP)
- Marketing analytics in Product Portfolio Analysis
- Marketing analytics in Sales and Distribution

- Marketing analytics in Advertisement and Promotion
- Marketing analytics in New Product Development
- Marketing analytics in Pricing
- Marketing analytics in Product Analytics
- Place Analytics
- Promotional Analytics
- Digital Analytics

(Note: Use the cases/practical execution to discuss Marketing analytics in above functions using R)

**Module 3: Application of Data Analytics in Marketing: Part I          10 Hours**
- Application of Big Data Analytics in Marketing: Using unstructured & structured data
- Application of Big Data Analytics in various Marketing functions; Consumer Perception Mapping; Measuring Consumer Reponses w.r.t Satisfaction, Loyalty and Trust; Customer Choice Analysis; Customer Profitability Analysis; Customer Lifetime Value (CLV); Business Life Time Value; Survival Analysis; Choice Modeling; Acquisition and Retention Costs and Rates; Sentimental analysis; Churn analysis; Market Basket Analysis(MBA); Cannibalization Analysis, Text Mining & Used cases

**Module 4: Application of Data Analytics in Marketing: Part II          6 Hours**
- Brand Funnel
- Net Promoter Score (NPS)
- Cross Selling & Upselling
- Affinity Analysis
- Recommendation Engine – IBCF, UBCF
- RFM Analysis
- 7 P's Marketing Mix

**Module 5: Emerging Trends in Marketing Analytics          8 Hours**
- Retailers Dashboard to Analyze and report on Marketing KPIs;
- Augmented Analytics; Automated Alerts and Reporting.
- Mobile & Web Analytics in Marketing
- Application of Block chain and AI in Marketing
- Future of Marketing Analytics

**Pedagogy:**
- Class room discussions
- Software linked practice based teaching
- Project based learning
- Interaction with Practitioners
- Case based teaching
- Practice based teaching using R and Tableau

- Research based teaching

**Teaching Learning Resources:**
**Recommended Books**
1. Marketing Analytics: A Practical Guide to Improving Consumer Insights Using Data Techniques Mike Grigsby, 2<sup>nd</sup> Edition, Pearson
2. Principles of Marketing Engineering, 2nd Edition, by Gary Lilien, Arvind Rangaswamy and Arnaud De Bruyn (Decision Pro, Inc. 2012), ISBN: 978-0985764807
3. Database Marketing: Analyzing and Managing Customers, by Robert C. Blattberg, Byung -Do Kim, and Scott A. Neslin (Springer, 2009), ISBN: 978-1441903327
4. Marketing Analytics, by Moutusy Maity & Pavan Kumar G, Oxford University Press
5. Marketing Analytics, by Seema Gupta, Wiley

**Reference Books**
1. Marketing Analytics: Strategic Models and Metrics, Stephan Sorger, Amazon Digital Services; 1st edition, ISBN-10: 1481900307
2. Marketing Metrics, Paul W. Farris, Phillip E. Pfeifer et al, Pearson Education India; Third edition

**Supplementary Resources**
1. https://elibrary.in.pearson.com/bookshelfDashboard
2. https://www.ebsco.com/search?search=supplychainmodel
3. https://jgateplus.com/home/resources/
4. https://www.edx.org/course/marketing-analytics
5. https://www.coursera.org/learn/uva-darden-market-analytics
6. https://capitaline.com/
7. http://web.b.ebscohost.com/ehost/search/basic?vid=1&sid=c8b5124d-307d-4f0a-843e-3b13e9156a4a%40pdc-v-sessmgr06

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1   | 2   | 1   | 1   | 2   | 3   | 1   | 2   | 1   |
| CO2   | 2   | 2   | 3   | 2   | 2   | 2   | 2   | -   |
| CO3   | 3   | 2   | 2   | 2   | 1   | -   | 2   | 1   |
| CO4   | 2   | 2   | 2   | 1   | 1   | 2   | 1   | -   |
| CO5   | 1   | 3   | 2   | 1   | 1   | -   | 1   | 1   |

*LEVEL:  3- Substantial,      2- Moderate,  1-Slight,       0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---------|-----------------|--------------------|----------------|----------|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid – Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.) | Individual | 30 | Full Semester |

| Course Title | Health Care Analytics |
|---|---|
| Term/Semester | II |
| Course ID | 23PGB224 |
| Credits | 4 |

**INTRODUCTION:**
Healthcare analytics analyzes current and historical industry data to predict trends, improve outreach, and even better manage the spread of diseases. The field covers a broad range of businesses and offers insights on both the macro and micro levels. It can reveal paths to improvement in patient care quality, clinical data, diagnosis, and business management.

When combined with business intelligence suites and data visualization tools, healthcare analytics help managers operate better by providing real-time information that can support decisions and deliver actionable insights.

**COURSE OUTCOMES (COs):**
After successful completion of the course, students will be able to:
**CO1:** Analyze the healthcare organization's budgets and expenses to remain sustainable and achieve organization's business objectives
**CO2:** Understand the process of strategic outreach, building marketing strategies and communications designed to attract healthcare consumers
**CO3:** Understand how to oversee the day-to-day practices of a healthcare facility that impact the client experience and organizational goals
**CO4:** Apply the tools and techniques used for data analytics in health care organizations and prescribe the optimized solutions
**C05**: Identify techniques to communicate insights gained from health care data analysis

**COURSE CONTENT AND STRUCTURE:**                           **48 Hours**

**Module 1: Introduction to Health Care Analytics**          **8 Hours**
-   Discuss the drivers for health care transformation
-   Identify quality initiatives that have shaped the national health care landscape
-   Hospital Management: Drivers & KPI of healthcare management
-   Discuss the quality improvement frameworks for healthcare organization
-   Importance of Data Analytics in Healthcare organization

**Module 2: Health Care Organizations & Management**          **10 Hours**
-   Communication & Human Resource Management in Health Care
-   Entrepreneurship and Marketing in Healthcare
-   Ethical and Legal issues in healthcare
-   Process Improvement and lean Management in Healthcare
-   Capacity constraint and sustainability in healthcare industry

**Module 3: Working with Data**                              **10 Hours**
-   Information value chain
-   Importance of data context and its relevance to business processes

- Common data types
- Basic statistical terms
- Recognize common patterns or distributions in statistics
- Distributions using numerical measures such as mean, median and standard deviation
- Graphical representations of data including histograms, bar charts and Scatterplots

**Module 4: Healthcare Analytics Concepts, Tools and Techniques          14 Hours**
- Identify tools and techniques used to analyze and interpret healthcare data effectively
- Describe the various types of databases and how they are structured
- Describe enterprise data architecture as seen in health care organizations
- Data collection and data visualization of healthcare data
- Descriptive analytics and exploratory data analysis
- Predictive and prescriptive analytics – data modelling with Excel and R
- Process Optimization using LPP
- Risk and Simulation techniques

**Module 5: Data Analysis in Health Care                                6 Hours**
**a: Using Data to Solve Problems**
- Problem Formulation & Solution: Describe how health care organizations use the IHI Triple Aim to prioritize performance goals
- Use Six Sigma DMAIC methodology for Process Improvement
- Apply DMAIC methodology to health care

**b: Using the Data to Tell the Story**
- Data Analysis and Dashboard preparation using Power BI / Tableau

**Pedagogy:**
- Lab based learning/teaching
- Software linked Practice based Teaching
- Project based learning
- Interaction with experts
- Case based teaching
- Class room discussion

**Teaching Learning Resources:**
**References**
1. Trevor L. Strome (2013). Healthcare Analytics for Quality and Performance Improvement. John Wiley & Sons, Inc
2. Prasanth Kumar Pattnaik, Aslesha Vaidya, Suneeta Mohanty, Satarupa Mohanty, Ana Hol Editors. Smart Healthcare Analytics: State of the Art.Springer. Volume 213.
3. Chandan K Reddy & Charu C Aggarwal. Healthcare Data Analytics – Data Mining and Knowledge Discovery Series. CRC Press,ISBN: 978-1-4822-3212-7.
4. Vikas Kumar. Healtth Care Analytics Made Simple: Techniques in Healthcare Computing Using Machine Learning and Python. Packpt,Birmingham-Mumbai. ISBN: 978-1-78728-670-2.
5. Anand J Kulkarni, Patric Siarry, Pramod Kumar Singh, Ajith Abraham, Mengjie Zhang, Albert Zomaya, Fazle Baki. Big Data Analytics in Healthcare. Springer. ISBN: 978-3-030-31672-3

6. Trevor L Strome. Health Care Analytics for Quality and Performance Improvement. Wiley. ISBN: 978-1-118-51969
7. Ruth Etzioni, Micha Mandel, Roman Gulati. Statistics for Health Data Science: An Organic Approach. Springer. ISBN: 978-3-030-59888-4
8. Hui Yang Eva K Lee. Health Care Analytics: From Data to Knowledge to Healthcare Improvement. Wiley Publishers. ISBN: 9781118919408
9. Tinglong Dai, Sridhar Tayur. Handbook of Healthcare Analytics: Theoretical Minimum for Conducting 21$^{st}$ Century Research on Health Care Operations. Wiley

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| **CO1** | 2 | 3 | 3 | - | 1 | - | 2 | 1 |
| **CO2** | 1 | 2 | 2 | 3 | 2 | - | 1 | - |
| **CO3** | 1 | 1 | 2 | 3 | 3 | 2 | 1 | 1 |
| **CO4** | 1 | 1 | 1 | - | 3 | 1 | 3 | - |
| **CO5** | 1 | 2 | 1 | 2 | - | 2 | 3 | 1 |

*LEVEL: 3- Substantial, 2- Moderate, 1-Slight, 0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---------|-----------------|--------------------|----------------|----------|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid – Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.) | Individual | 30 | Full Semester |

| Course Title | Operations & Supply Chain Analytics |
|---|---|
| Term/Semester | II |
| Course ID | 23PGB225 |
| Credits | 4 |

## INTRODUCTION:

Data driven decision making is of at most importance for seamless operations of supply chain. The concept covers the working of the supply chain starting from sourcing of raw material to production and delivery to the doorstep of the end users. The entire process associated with procurement, processing and distribution of goods generates huge amounts of data. The course covers in-depth analysis of data to gain insight into the process and extract value from the analysis for quicker, smarter and more efficient operations of the supply chain.

## COURSE OUTCOMES (COs):

After successful completion of the course students will be able to:

**CO1:** Link supply chain management with the enterprise strategy

**CO2:** Develop supply chain strategies to enhance value

**CO3:** Design and optimize supply chain network

**CO4:** Demonstrate analytical tools and techniques (using software) related to supply chain and performance optimization

**C05** : Understand the latest advancements in supply chain management

## COURSE CONTENT AND STRUCTURE:                          48 Hours

## Module 1: Introduction to Operations and Supply Chain Management Analytics   9 Hours
- Understanding and defining the Supply Chain Analytics (SCA)
- Basics concepts of Supply Chain Management
- Overview of Logistics Management
- Importance of Data Analytics in Operations and Supply Chain Management
- Relating Operations Management (Inventory Management, Facility Location) with Supply Chain concepts

## Module 2: Supply Chain Analytics                                        9 Hours
- Key issues to Supply Chain Management
- Supply Chain Performance, Drivers and Metrics
- Concept of Descriptive Analytics in Supply Chain
- Supply Chain Analytics applications
- Decision Domains in supply chain analytics

## Module 3: Application of Analytics in SCM                              12 Hours
- Introduction to Modeling, Approaches for Optimization and Simulation, Modeling software, Supply Chain (SC) Decisions that require mathematical or interpretative modelling
- Problem formulation using LPP – Transportation and Transhipment problems
- Duality, Scenario Manager and Sensitivity Analysis

- Managerial implication of results of analytics

**Module 4 : Used Case Studies - Supply Chain Analytics          12 Hours**
- Network Planning  and Design of Supply Chain
- Importance of Network Planning
- Design of Logistics Network using Heuristics/optimization
- Concept of 3PL/4PL in a Supply Chain
- Case Study: Amazon/Walmart – Cross docking optimization with predictive analytics (Amazon); Inventory optimization with accurate forecasting & impact of weather (Walmart); Last Mile delivery challenges & AI solutions with E-stores (Big Basket); SCM resource optimization with real time data analytics (Asian Paints / HUL)

**Module 5 : Modeling Coordination Decisions in Supply Chain Management**

**6 Hours**
- Role of ICT and IT enablement in Supply Chain
- Latest trends in Supply Chain Management – Digital Twins and Block chain technology

**Pedagogy:**
- Lab based learning/teaching
- Software linked Practice based Teaching
- Project based learning
- Interaction with experts
- Case based teaching
- Class room discussion

**Teaching Learning Resources:**
**References**
1. Supply chain management by Sunil Chopra, and Peter Meindl, Pearson
2. Jeremy F. Shapiro. Modeling the Supply Chain. Duxbury Thomson Learning
3. D. Simchi-Levi, P. Kaminsky, E. Simchi-Levi, and Ravi Shankar, Designing and Managing the Supply Chain concepts, Strategies and Case studies, Third Edition, Tata McGraw Hill, New Delhi, 2008.
4. Rahul Saxena • Anand Srinivasan, Business Analytics
5. Kurt Y Liu, Supply Chain Analytics: Concepts Techniques and Applications, 1st Edition 2022
6. Dr. Nicoleta Tipi, Supply Chain Analytics and Modelling: Quantitative Tools and Applications, Kogan Page

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1  | 3   | 2   | -   | 1   | 3   | 1   | 1   | 1   |
| CO2  | 2   | 1   | 3   | 1   | 1   | 2   | 3   | 1   |
| CO3  | 1   | 3   | -   | -   | -   | 1   | -   | -   |
| CO4  | -   | 2   | 2   | 3   | 2   | -   | 1   | 1   |
| CO5  | 1   | 1   | 2   | 2   | 2   | 2   | -   | -   |

*LEVEL:  3- Substantial,       2- Moderate,   1-Slight,       0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---|---|---|---|---|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid – Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.) | Individual | 30 | Full Semester |

| Course Title | Design Thinking and Creativity for Business |
|---|---|
| Term/Semester | II |
| Course ID | 23PGB321 |
| Credits | 2 |

## INTRODUCTION:

Design thinking is a critical problem-solving approach for building creative and innovative solutions. Design thinking is a process that relies on understanding users' needs and experiences as they continue to evolve. It is a solution-focused mindset that is critical to developing new ideas that can uncover potential opportunities, challenge assumptions and lead to product and service innovations. Through analysis and imagination, design thinking empowers organizations to identify and implement human-centered and action-oriented solutions to complex business problems.

Gaining deeper insight into the target users' needs and expectations in turn leads to more value creation. This is the core of design thinking, and it leads to improved products, services and internal processes. This course will develop a user-centric designs for all issues and evolve a solution that will address a customers' pain points and meet their business goals.

## COURSE OUTCOMES (CO):

On completion of the course students will be able to:

  **CO1**  Understand and appreciate the design thinking frame work and develop an empathy map
  **CO2**  Understand and appreciate the importance of problem defining – in the design thinking frame work.
  **CO3**  Demonstrate ability to identify an idea based on design thinking process.
  **CO4**  Demonstrate the ability to develop prototype which offers real world solutions
  **CO5**  Apply strategies to create innovative solutions

## COURSE CONTENT AND STRUCTURE                                    24 Hours

## MODULE 1:  INTRODUCTION TO DESIGN THINKING & EMPATHY MAPPING
                                                                    **04 Hours**

— Introduction to design thinking approach
— Identify the customer journey
— Map the customer journey to understand customers' experiences with product/service
— Develop persona(s) of your target customers (CPM)
— Design Thinking Practices: Visualization Techniques and Diagrams; Use of Diagrams and Maps in Design Thinking; Story Telling Techniques throughout the Design Thinking Process; Improvisation; Scenarios; K Scripts

**MODULE 2: PROBLEM MAPPING**                                    **07 Hours**

- — Problem statement or underlying issue and possible solution options
- — Define customer profile and needs by using ethnographic research methods (interviews and observations)
- — Pinpoint target users and design interview questionnaires to understand customer pain points

**MODULE 3: IDEATE AND SYNTHESISE SOLUTION**                     **05 Hours**

- — Brainstorm ideas to explore solutions that will help customers meet their needs
- — Identify desirable features of solutions and cluster ideas, select high-quality solution ideas that can be prototyped
- — Discussion of Indian companies using design thinking.

**MODULE 4: PROTOTYPE AND EXPERIMENT**                           **04 Hours**

- — Design a prototype for the selected idea to enable a conversation with the stakeholders
- — Derive insights from user-prototype interactions with all stakeholder feedback. Rectify flaws, address constraints and enhance strengths.
- — Discuss the importance of accepting of failing quickly and cheaply. Improvise and restart.

**MODULE 5: VALIDATE AND REFINE**                                **04 Hours**

- — Refine prototype and solutions based on feedback from target users to better fit with user needs
- — Test and refine Point of View (POV)
- — Describe the applications of complementary tools of innovation: Value Proposition Designer, Business Model Canvas

**PEDAGOGY**

- Workshop by Experts
- Experiential Learning
- Expert Video Lecture
- Use of Templates to learn Concepts and Models
- Case Studies/Simulations

**RECOMMENDED BOOKS**

1) Design: Creation of Artifacts in Society by Prof. Karl Ulrich, U. Penn Change by Design by Tim Brown.
2) The Design of Everyday Things: Revised and Expanded, Norman, Don. Edition. United States, Basic Books, 2013.
3) Design Thinking: Understanding How Designers Think and Work, 1st edition, Pearson

4) Handbook on Design Thinking –Eli Woolery, Free book.
5) Design Thinking for Startups, Jimmy Jain, Notion Press, 2018.
6) Design Thinking for Small Business Putting the Power of Design to Work., Beverly Rudkin Ingle,Apress, Oct-2013.
7) Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem Solving – Pavan Soni, Penguim Random Ho
8) Design Thinking for Beginners: Innovation as a Factor for Entrepreneurial Success – Kilian Langenfeld, Personal Growth Hacker

## REFERENCE BOOKS:
1. Elements of User Experience: User-Centered Design for the Web and Beyond, Second Edition Jesse James Garrett
2. 8 Steps to Innovation –T. Krishnan Rishikesha, Harper Collins Publishers India.
3. Design thinking in Class room, David Lee, Ulysses Press, 2018.

## SUPPLEMENTARY RESOURCE:
1. https://www.ibedo.org/
2. https://blog.hypeinnovation.com/
3. Coursera: Design Thinking for Innovation by University of Virginia. By Jeanne M Liedtka
4. Coursera: Design Thinking for the Greater Good: Innovation in the Social Sector (by Jeanne M Liedtka ).
5. Swayam: Design thinking -A Primer. By IIT-Madras. (4 weeks).
6. https://elibrary.in.pearson.com/login
7. https://jgateplus.com/home/
8. https://capitaline.com/
9. http://web.b.ebscohost.com/ehost/search/basic?vid=1&sid=c8b5124d-307d-4f0a-843e-3b13e9156a4a%40pdc-v-sessmgr06.

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 3   | 1   | 2   | -   | 1   | 2   |
| CO2 | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 2   |
| CO3 | 2   | 1   | -   | 1   | 1   | 2   | 2   | 1   |
| CO4 | 2   | 2   | 2   | 2   | 2   | -   | 2   | 1   |
| CO5 | 2   | 1   | 1   | 2   | 1   | 1   | 3   | -   |

*LEVEL:  3- Substantial,      2- Moderate,  1-Slight,        0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---|---|---|---|---|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid – Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.) | Individual | 30 | Full Semester |

| Course Title | Project Management |
|---|---|
| Term/Semester | II |
| Course ID | 23PGB322 |
| Credits | 2 |

**INTRODUCTION:**
Project management involves the planning and organization of a company's resources to move a specific task, event, or duty towards completion. It can involve a one-time project or an ongoing activity, and resources managed include personnel, finances, technology, and intellectual property.

Project management is often associated with fields in engineering and construction and, more lately, healthcare and information technology (IT), which typically have a complex set of components that have to be completed and assembled in a set fashion to create a functioning product. The goal of the subject is to give you the tools to initiate a project plan, manage both stakeholders and relationships, organize their team, develop a project charter, and build a business case for a project.

**COURSE OUTCOMES (COs):**
After successful completion of the course students will be able to:
**CO1:** Understand the fundamentals of project management
**CO2:** Appreciate the agile roles and its methods
**CO3:** Explain the intricacies and scope of scheduling
**CO4:** Manage cost using tools such as earned value management
**C05:** Evaluate the effectiveness of the project

**COURSE CONTENT AND STRUCTURE:**                            **24 Hours**

**Module 1: Project Management: Foundational Elements          6 Hours**
- PM terms & definitions
- Importance of PM
- Role of Project Manager
- Relationship of Project, Program, Portfolio and Operations management
- Overview of different life cycles
- Architecture: Plan-drive, Agile & Hybrid approaches
- Enterprise Environmental Factor

**Project Integration Management**
- Project charter
- Project management plan
- Direct and manage project work
- Monitor and control project work
- Perform integrated change control
- Close project or phase

**Module 2: Agile Management                                  3 Hours**
- VUCA World
- Agility
- Agile Transformation (Change)

- Agile Roles
- Agile Methods

**Module 3: Project Scope & Schedule Management**            **5 Hours**
- Project score management
- Key terms in project scope management
- Product scope vs. project scope
- Project scope management processes
- Plan scope management
- Collect requirements
- Create WBS
- Scope: define, validate and control

**Project Schedule Management**
- Project time management
- Project schedule
- Project time management: key terms & processes
- Schedule management: plan, develop, control and schedule network analysis techniques
- Activities: define, sequence and estimate the resources

**Module 4: Project Cost Management**            **4 Hours**
- Difference between cost estimating and cost budgeting
- Control accounts
- Project cost management process
- Cost: Plan, estimate, and determine a budget
- Control costs
- Earned value management

**Module 5: Project Quality & Risk Management**            **6 Hours**
- Quality
- Quality management
- Cost of quality
- Project quality management processes
- Plan quality management
- Perform quality assurance
- Control quality
- Basic tools of quality
- Introduction to six sigma

**Project Risk Management**
- Identification
- Analysis
- Monitoring of threats and opportunities
- Initiation of preventive and corrective measures

**Pedagogy:**
- Lab based learning/teaching
- Software linked Practice based Teaching
- Project based learning
- Interaction with experts
- Case based teaching
- Class room discussion

**Teaching Learning Resources:**
**References**
1. Clements/Gido, Effective Project Management, Thomson.
2. Clifford F. Gray and Erik W. Larson, Project Management, Tata McGraw Hill.
3. Dennis Lock, Project Management, Ninth Edition, Gower.
4. K. Nagarajan, Project Management, Third Edition, New Age International.
5. P.C.K. Rao, Project Management and Control, Sultan Chand & Sons.
6. Prasanna Chandra, Projects-Planning, Selection, Financing, Implementation, andReview, Sixth Edition, Tata McGraw Hill.
7. Vasant Desai, Project Management, Second Revised Edition, Himalaya PublishingHouse
8. Gido I Clements, Project Management, Cengage Learning
9. S Choudhury, Project Management, Tata Mcgrawhill
10. Larry Richman, Project Management, Phi India
11. A Guide to the Project Management Body of Knowledge, PMBOK Guide, 6th Edition, PMI Global Standard

**CO-PO Mapping:**

**Mapping of Course Outcomes to Program Outcomes:**

|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 1 | 1 | 1 | 1 | 2 | 2 | - |
| **CO2** | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 1 |
| **CO3** | 1 | 2 | 1 | 2 | 2 | 2 | 1 | 1 |
| **CO4** | 2 | 2 | - | 2 | 2 | 1 | 1 | - |
| **CO5** | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 1 |

*LEVEL: 3- Substantial,     2- Moderate,   1-Slight,        0-No Co-relation*

**Course Evaluation Plan:**

| Sl. No. | Evaluation Item | Unit of Evaluation | Marks Allotted | Timeline |
|---|---|---|---|---|
| 1 | End Term Exam | Individual | 50 | At the end of the semester |
| 2 | Mid – Term Test | Individual | 10 | After completion of 2-3 modules |
| 3 | Attendance and Class participation | Individual | 10 | At the end of the semester |
| 4 | Remaining assignments (Quiz, Individual assignment, Cap-Stone project, Major or minor project, Group assignments etc.) | Individual | 30 | Full Semester |

# Real World Capstone Project Guidelines
## Subject Code: 23PGB421

**INTRODUCTION**

Each student should undertake the project in the area of his/her specialization during the II semester and submit a hard-bound copy of the report before the commencement of the second semester-end examination. The time duration for the project is six weeks. Students should work and complete the report under the guidance of the internal faculty of the institution and the external guide of the company. The study has to be on studying a live business/management problem/issue concerning the organization. The student can also undertake a freelancing study based on their interest in the area of Management and Business Analytics according to their specialization. The main objective of this project is to help the students to develop research ability to apply multi-disciplinary concepts, tools and techniques to solve organizational problems. The report duly signed by the guide and certified by the Director is to be submitted in a bound copy and a soft copy to the institution at the end of the second semester before the commencement of the second-semester end examination. The students have to work for not less than 2 months on a full-time basis for the internship. There will be no classes during this period.

1. The objective of the Real World Project is to help the student develop a variety of skills – analytical ability, problem solving, critical thinking, managerial ability to apply multi-disciplinary concepts, tools and techniques learnt during the course to solve the organizational problems and to draw meaningful insights for better data driven decisions.

2. Under this programme, every student is required to undertake project for a period of Eight weeks during their 2nd semester under the guidance of a recognized Faculty Guide.

3. An executive in the host organization could guide as co- Guide/external guide. It must be individual based but not as group project.

4. The Internship project carries six credits and is attributed in second semester.

5. The detailed guidelines and project layout will be issued by the Project Committee during the course.

**Specific guidelines for the same are given below:**

1. The student will be required to maintain a record of periodic progress of the internship in a dairy and be in constant touch with his/her respective guide

2. Candidates who fail to defend their project report satisfactorily shall have to repeat the project in the following year.

3. Each student shall submit two hard bound copies of the project report

4. Size of the report: 80 - 100 pages (Indicative)

5. All projects must be typed on A-4 Sheets, font size 12 (Times New Roman ONLY)

6. 1.5 spacing on all executive bond papers.

7. The following margins must be kept:  Left 2, Right 1. 5, top & bottom 1.

8. NO borders. NO Headers NO Footers.

9. No clip arts. Only essential pictures allowed

10. Graphs, charts and tables are allowed.

11. Additional copies can be made for the company, if necessary

12. One brief summary of the project (of 5 to 10 pages) must be submitted along with the hard-bound project.