**BITS PILANI, DUBAI CAMPUS**

**ACADEMIC - UNDERGRADUATE STUDIES DIVISION**

**SECOND SEMESTER 2023‑ 24**

**Course Handout (Part II)**

**Date:** 05.04.2024

In addition to part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

**Course No*.* :** MATH F432 (303)

**Course Title :** Applied Statistical Methods

**Instructor-in-charge :** Dr. Maneesha

**Instructor(s) :** Dr.Maneesha

**Scope and objective of the Course**:

This Course helps the student in two phases firstly, it helps in understanding the methods, theory and its applications in real time, precisely course gives exposure to different multivariate techniques, Secondly, it improves the methodological maturity.

**Course Pre/Co-Requisite & Catalogue/Bulletin Description:** *Given in the Bulletin 2023–24*

**Text Book(TB):**

**TB1**: David R Anderson, Dennis J Sweeney, Thomas A Williams, Jeffrey D. Camm and James J. Cochran, Statistics for Business and Economics,13th Edition, Cengage Learning,2014

**Reference Books (RB):**

**RB1**: Deepak Chawla and Neena Sondhi, Research Methodology, Vikas,2012

**RB2**: Applied Multivariate Statistical Analysis by Richard Johnson and Dean W Wichern,

Pearson,2007

**RB3**: Douglas C. Montgomery, “Statistical Quality Control”, Wiley Student Education.

**RB4**: Applied Multivariate Techniques by Subhash Sharma, John Wiley & Sons, Inc

**RB5**: Multivariate Statistical Methods by Donald F. Morrison ,4th Edition, TMH, 2005.

**Course Plan / Schedule:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl#** | **Learning Objectives** | **Topics to be covered** | **References@ (Chapters)** | **No. of Lectures** |
| 1 | It enhances the understanding the different sampling procedures, sampling distribution and Inferential procedures. | Introduction, Review of Sampling, Selecting a Sample, Sampling from a finite and infinite population, Point Estimation, Sampling distribution of sample mean and Properties of Point Estimators, Other sampling methods | 7,7.2,7.3,7.4,7.5,7.7,7.8(T1) | 1-2 |
| 2 | It helps in understanding the concepts of hypotheses, and its errors followed by decision scenarios. | Interval Estimation, Population Mean when σ is known, Population Mean σ is unknown, Determining the Sample size,  Introduction to Hypothesis testing, Types Errors, Inferences about single population mean. | 8,8.1,8.2,8.3(T1)  9,9.1,9.2,9.3(T1) | 3-4 |
| 3 | To gain knowledge on importance of variance, chi-square distributions and its types. | Inferences about Difference of means, Paired, Inferences about Population Variances, Interval estimation. | 10,10.1,10.2,10.3,11,11.1.11.2(T1) | 5-6 |
| 4 | It helps us to gain knowledge to obtain accurate and replicable findings at reasonable allocations of resources. We review some general principles of designs and its types. | Testing the equality of population proportions, Test of Independence, Goodness of fit test,  An introduction to Experimental Design and Analysis of Variance (Completely randomized design, Multiple comparison Procedures ,Randomized Block Design) | 12,12.1,12.2,12.3(T1)  13,13.1,13.2,13.3,13.4(T1) | 7-9 |
| 5 | To gain knowledge on basic regression model. | Simple Linear Regression Model, Least Squares Method, Coefficient of Determination, Model Assumptions, Test for significance, Using the estimated regression equation for estimation and prediction, Residual analysis: Validating model assumptions, outliers and influential observations. | 14,14.1,14.2,14.3,14.4,14.5,14.6,14.8.14.9(T1) | 10-12 |
| 6 | It helps in understanding more than two variables in regression analysis and also gives insight on the concept of multicollinearity. | Multiple Regression Model, Least Squares Method, Multiple coefficient of determination, Model Assumptions, Testing for significance, Multicollinearity. Regression equation for estimation and prediction, residual Analysis, Discuss Case Studies. | 15,15.1,15.2,15.3,15.4,15.5,15.6,15.8(T1) | 13-15 |
| 7 | It gives exposure to distinguish between Categorial Independent and Categorical Dependent Regression Analysis. | Categorical Independent Variable, Logistic Regression. | 15.7,15.9(T1) | 16-18 |
| 8 | It helps in assessing the classification accuracy of model. | Hoteling T2 and Mahalanobis D2 Discriminant Analysis, Objectives and its Uses, Illustration of Discriminant Analysis, Assessing Classification Accuracy. | 5.3(R2)  3.2.1,3.2.2(R4)  17(R1) | 19-21 |
| 9 | It helps in understanding hierarchical, non-hierarchical cluster analysis. | Cluster Analysis-A classification technique, Statistics associated with Cluster Analysis, An illustration of the technique, Key Concepts in Cluster Analysis, Process of Clustering, Establishing Cluster Algorithms, Discuss case studies | 18(R1) | 22-25 |
| 10 | In helps in understanding distribution free methods in parallel to parametric procedures. | Kruskal walls test, Mann Whitney Wilcoxon Test.,KS two sample test | Class notes | 26-30 |
| 11 | It gives basic idea on forecasting methods. | Forecasting, Components of a Time series, Smoothing Methods, Trend Projections, Trend and Seasonal Components, Regression Analysis, qualitative approaches. | 6,6.1,6.2,6.3,6.4,6.5,6.6(R5) | 33-39 |
| 12 | Statistical Quality Control | Introduction, Control Charts for variables, Control Charts attributes, Modified Control Charts. | 6,6.2,6.3,6.4,6.5 (R3)  7,7.1,7.2,7.3,7.4(R3)  10.2(R3) | 40-42 |
| Total number of Lectures planned | | | | 42 |

\* The lectures may be slightly diverge from aforesaid plan based on students ‘background & interest in the topic, which may perhaps include special lectures and discussions that would be planned and schedule notified accordingly.

**Course Learning Outcomes (CLOs)**

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

* **CLO1** Understand and apply the concepts of hypothesis testing
* **CLO2** Understand and apply the design of experiments.
* **CLO3** Apply the concepts of simple, multiple and logistic regression in engineering and management framework.
* **CLO4** Apply the discriminant and multivariate analysis in engineering and management scenarios.
* **CLO5** Apply non-parametric tests, forecast and quality control techniques in real world scenario..

**Evaluation scheme:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **EC N0** | **Evaluation Components** | **Nature of Component** | **Duration** | **Weightage** | **Date, Day & Time** | **Venue** |
| 1 | Mid-semester Test | Closed Book | 90 minutes | 35 % | 02.04.24-AN | **To be announced later** |
| 2 | Assignment I | Open book |  | 10 % | TBA |
| 3 | Assignment II | Open book |  | 15 % | TBA |
| 4 | Compre Exam | Closed Book | 3 hours. | 40 % | 06.06.24-FN |

**Mapping of CLOs, PLOs, and CECs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CLOs** | **PLOs** | **Evaluation Components (ECs)** | | | |
| **EC1** | **EC2** | **EC3** | **EC4** |
| CLO1 | 1,2,3 | **✓** | **✓** | **✓** | **✓** |
| CLO2 | 1,2,3 | **✓** | **✓** | **✓** | **✓** |
| CLO3 | 1,2,3,5 |  | **✓** | **✓** | **✓** |
| CLO4 | 1,2,3,4,5,8 |  | **✓** | **✓** | **✓** |
| CLO5 | 1,2,3,4,8 |  |  | **✓** | **✓** |

**Mid-sem Grading**:

Mid-sem grading will be displayed on 25 April, 2024.

**Note:** **A student will be likely to get “NC”, if he / she**

Doesn’t appear / appears for the sake of appearing for the evaluation components / scoring zero in

pre-compre total.

**Makeup and Attendance policies**:

**Make-ups** are not given as a routine. It is solely dependent upon the genuineness of the circumstances under which a student fails to appear in a scheduled evaluation component. In such circumstances, prior permission should be obtained from the Instructor-in-Charge (I/C). The decision of the I/C in the above matter will be final. **No makeup for quizzes**.

**Attendance:** Every student is expected to be responsible for regularity of his/her attendance in class rooms, to appear in scheduled tests and examinations and fulfill all other tasks assigned to him/her in every course. **A student should have a minimum of** **60% of attendance** in this course to be eligible to appear for the Comprehensive Examination in this course. For the students under the purview of Academic Counseling Board (ACB), the Board shall prescribe the minimum attendance requirement on a case-to-case basis. Attendance in the course will be a deciding factor in judging the seriousness of a student which may be directly / indirectly related to grading.

**General timings for consultation**

Chamber Consultation Hour: *Wednesday 4th hour*

**General instructions**:

Students should come prepared for classes and carry the text book(s) or material(s) as prescribed by the Course Faculty to the class.

**Notices:**

 All notices will be displayed on the ***General Sciences*** Notice Board.

Dr.Maneesha

**Instructor-in-Charge**

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