General Information on the Course MA 324
Semester: January–May, 2022

1 Welcome Note

Welcome to the course titled "Statistical Inference and Multivariate Analysis (MA 324)". As you know that all BTech courses in the current semester (January–May, 2022) will be taught in online mode, this course will be handled mainly using Microsoft Office 365.

2 Lectures and Study Materials

I have created a group named `Grp_MA324_2022` on Microsoft Teams to conduct various activities of the course. Please join the group. To join the group please follow the following steps.

1. Login to Microsoft Teams.
2. Click on `Join or create team`.
3. Choose the option `Join a team with a code`.
4. Use the code `14q4l29`.

The class will be online (no pre-recorded video will be provided) as per the following schedule:

- Monday 15:00 – 15:55 IST
- Thursday 14:00 – 14:55 IST
- Friday 14:00 – 14:55 IST

I have already scheduled the classes on `Grp_MA324_2022` as recurrent meeting. Class notes, problem sets and other necessary materials will be uploaded on `Grp_MA324_2022` at Microsoft Teams. You are supposed to solve the problem sets by yourself. In case of difficulty, we will discuss it during the classes (preferably on Monday's class).

3 Examinations and Grading Policy

There will be two quizzes, mid-semester and end-semester examinations throughout the semester. All the examinations will be conducted using the Microsoft Teams through assignments. The weightages and tentative dates of several examination are given in the following table. Finally, the letter grades will be awarded based on total marks obtained after the end-semester examination following a relative grading policy.

Item	Weight	Date	Time (IST)
Quiz I	15%	February 11, 2022	14:00 – 15:00
Mid-sem	30%	March 01, 2022	14:00 – 16:00
Quiz II	15%	April 08, 2022	14:00 – 15:00
End-sem	40%	May 05, 2022	14:00 – 16:00

4 Syllabus

Review of different transformation techniques, modes of convergence, law of large numbers, and central limit theorem; Sampling distributions based on normal distributions, multivariate normal distribution.

Point estimation: sufficiency, Neymann-Fisher factorization theorem, unbiased estimation, method of moments, maximum likelihood estimation, consistency and asymptotic normality of maximum likelihood estimator.

Interval estimation: confidence coefficient and confident level, pivotal method, asymptotic confidence interval, Bootstrap confidence interval.

Hypothesis testing: type-I and type-II errors, power function, size and level, test function and randomized test, most powerful test and Neyman-Pearson lemma, likelihood ratio test, p-value.

Multiple linear regression: least squares estimation, estimation of variance, tests of significance, interval estimation, multicollinearity, residual analysis, PRESS statistic, detection and treatment of outliers, lack of fit.

Multivariate analysis: principle component analysis, factor analysis, canonical correlations, cluster analysis.

5 Books

- Text Books

1. R. V. Hogg, J. W. McKean and A. T. Craig, Introduction to Mathematical Statistics, 7th Ed., *Pearson*, 2013.
2. D. C. Montgomery, E. A. Peck and G. G. Vining, Introduction to Linear Regression Analysis, 5th Ed., *Wiley*, 2012.
3. R. A. Johnson and D. W. Wichern, Applied Multivariate Statistical Analysis, 6th Ed., *Prentice Hall of India*, 2012.

- Reference Books

1. V. K. Rohatgi and A. K. Saleh, An Introduction to Probability and Statistics, 3rd Ed., *Wiley*, 2015.
2. G. Casella and R. L. Berger, Statistical Inference, 2nd Ed., *Cengage Learning*, 2006.
3. N. R. Draper and H. Smith, Applied Regression Analysis, 3rd Ed., *Wiley*, 2000.
4. S. Weisberg, Applied Linear Regression, 1st Ed., *Wiley*, 2005.
5. T. W. Anderson, An Introduction to Multivariate Statistical Analysis, 3rd Ed., *Wiley*, 2012.
6. W. K. Hardle and L. Simar, Applied Multivariate Statistical Analysis, 3rd Ed., *Springer*, 2012.

6 Resource Persons

Instructor: Ayon Ganguly (Email: aganguly@iitg.ac.in, Phone: 0361-258-2639)

7 Remark

The above policy and/or schedule may change due to unforeseen issues and/or difficulties.