General Information on the Course MA 324
Semester: January–May, 2021

1 Welcome Note

Welcome to the course Statistical Inference and Multivariate Analysis (MA 324). As you know that all the courses in the current semester (January–May, 2021) will be taught online, this course will be handled mainly using Microsoft Office 365.

2 Lectures and Study Materials

I have created a group named `Grp_MA324_2021` 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 `cjb786k`.

Video lectures of duration of 130 minutes (approximately) will be released on each Thursday (tentatively) for the next week. The first set of videos will be uploaded on January 07, 2021. You are expected to listen those videos and try to understand the concepts. The videos will be uploaded on Microsoft Streams and Dropbox. To get the videos, please click here for Microsoft Streams Channel and click here for Dropbox link. Note that if you do not join the group on Microsoft teams, you may face issues realted to authorization to visit the video lectures on Microsoft Streams. Class notes, problem sets and other necessary materials will be uploaded on `Grp_MA324_2021` at Microsoft teams.

3 Doubt Clearing Session

The doubt clearing session will be conducted on each Wednesday starting from 14:00 hours IST through `Grp_MA324_2021` on Microsoft Teams. The first doubt clearing session will be conducted on January 13, 2021. You are also expected to solve the problem sets and discuss the doubts, if any, during the doubt clearing session.

4 Examinations and Grading Policy

There will be two quizzes and two vivas throughout the semester. The quizzes will be handled on the Microsoft Teams through assignments. The schedules and syllabus of different examinations will be informed at least one week prior to the examination. The weightage of each quiz is 15%. I shall use the following linear mapping to convert the obtained marks into marks that will be added out of 15:

$$y = \frac{15x}{z},$$

where z, x, and y are maximum marks of the quiz, marks obtained out of z, and marks obtained out of 15, respectively. The weighatage of each viva is 35%. Finally, the letter grades will be awarded based on total marks obtained after the end semester examination. A relative grading policy will be followed.

5 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.

6 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.

7 Resource Persons

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

8 Final Remark

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