MA341: Matrix Analysis and Positivity
(*2025 Autumn Semester*)

Place & Time: Lecture Hall LH-3, Maths Dept.,   Tue Thu 11:30 AM–1 PM   (Credits 3:0)

Instructor: Apoorva Khare   **Office:** Mathematics, X26
Email: khare@iisc.ac.in   **Office Hours:** Wednesday 1:15–3:15 PM
Phone: +91-80-2293-3214   **Microsoft Team:** MA341 - Matrix Positivity - Fall 2025

Course website: http://www.math.iisc.ac.in/∼khare/teaching.html#2023-341

About the course: This course explores matrix positivity and operations that preserve it. These involve fundamental questions that have been extensively studied in the mathematics literature over the past century, and are still being studied owing to modern applications to high-dimensional covariance estimation. The course will bring together techniques from different areas: analysis, linear algebra, combinatorics, and symmetric functions.

Pre-requisites: A course in linear algebra, and a course in calculus/real analysis.

List of topics: Depending on constraints of time and preferences, we will cover topics from the ones listed at http://www.math.iisc.ac.in/all-courses/ma341.html.

Suggested books and references:

(1) A. Khare, *Matrix Analysis and Entrywise Positivity Preservers*, Cambridge / TRIM, 2022. (Or see the online lecture notes, which contain most of the book, at https://math.iisc.ac.in/ khare/teaching/Math341-notes.pdf.)

(2) See http://www.math.iisc.ac.in/all-courses/ma341.html. for additional references.

Grading & Exam Schedule   (Credits 3:0)

Homework	25%	due on/at the announced date/time in each HW
Mid-sem	25%	Sunday, September 21, 11am-12:30pm (in class)
Final project	50%	TBA

Homework:
   Homework will be assigned periodically – posted on the course webpage. Each student should hand in their **independently written** solutions, written in their own words.

Miscellaneous

(1) **Exams:** There will be no backup exam, so please be available for the mid-sem.

(2) **Emails:** Please write MA341 in the subject heading of all email correspondence with the instructor/TAs. This is in general effective in filtering / weeding out spam email.

(3) **Office Hours:** Please note that it is difficult to discuss mathematics questions by email due to the lack of an appropriate interface. You are encouraged to ask your technical questions during office hours. As the instructor / TAs have responsibilities other than this course, please go to them only during office hours (unless prior arrangements have been made).

(4) **Ethics:** Read the information on the IISc student ethics page.