MA219: Linear Algebra
(*2020 Autumn Semester*)

Place & Time: Microsoft Teams,   Tue Thu 10–11:30 am   (Credits 3:1)

Instructor: Apoorva Khare   **Office:** Mathematics, X26
Email: `khare@iisc.ac.in`   **Office Hours:** *Thursday 10–11:30 AM, online on*
Phone: +91-80-2293-2514   *MS Teams*

Teaching Assistants, rooms, office hours

Gouranga Mallik	`gourangam@iisc.ac.in`	online	Monday	3:30–5 PM
Prateek Kumar Vishwakarma	`prateekv@iisc.ac.in`	online	Tuesday	10–11:30 AM

Course website: `http://www.math.iisc.ac.in/∼khare/teaching.html#2020-219`

Pre-requisites for Undergraduates: UM102

Syllabus:

- Vector spaces: definition, basis and dimension, direct sums.
- Linear transformations: definition, rank-nullity theorem, algebra of linear transformations, dual spaces, matrices.
- Systems of linear equations: elementary theory of determinants, Cramer's rule.
- Eigenvalues and eigenvectors, the characteristic polynomial, the Cayley–Hamilton theorem, the minimal polynomial, algebraic and geometric multiplicities, diagonalization, Jordan canonical form.
- Symmetry: group of motions of the plane, discrete groups of motion, finite groups of $SO(3)$.
- Bilinear forms: Symmetric, skew symmetric and Hermitian forms, Sylvester's law of inertia, Spectral theorem for the Hermitian and normal operators on finite-dimensional vector spaces.

Suggested books and references:

(1) Hoffman, K. and Kunze, R. *Linear Algebra*, Prentice-Hall India, 1992.
(2) Artin, M. *Algebra*, Prentice-Hall India, 1994.
(3) Halmos, P., *Finite dimensional vector spaces*, Springer, 1987.

Grading & Exam Schedule   (Credits 3:0)

Homework+Quizzes	50%	due by Wednesday 11:59 pm, on Microsoft Teams
Mid-sem	20%	November 26, Thursday, 10:30 am – 12 pm, on Microsoft Teams
Final	30%	**January 29, 2021 (Friday), TBA**

Homework:

Homework will be assigned weekly – posted on the course webpage – and is due by Wednesday noon, in the following week, on Microsoft Teams. Each student should hand in their **independently written** solutions, written in their own words.

Miscellaneous

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

(2) **Emails:** Please write MA219 in the subject heading of all email correspondence with the instructor/TAs. This is in general effective in filtering / weeding out spam email.

(3) **Homework:** The TAs are responsible for the homework component of the class. We are unable to accept late homework. Homework extensions only delay the grading of solutions. Please submit HW on time, in Teams.

(4) **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 TAs have responsibilities other than this course, please go to them only during office hours (unless prior arrangements have been made).

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