Linear Algebra and Matrix Computation (LAMC)

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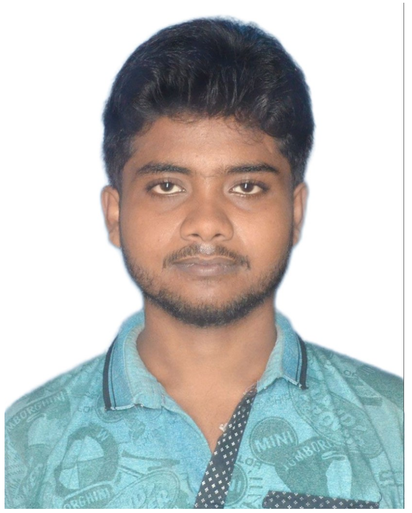
LAMC Class schedule

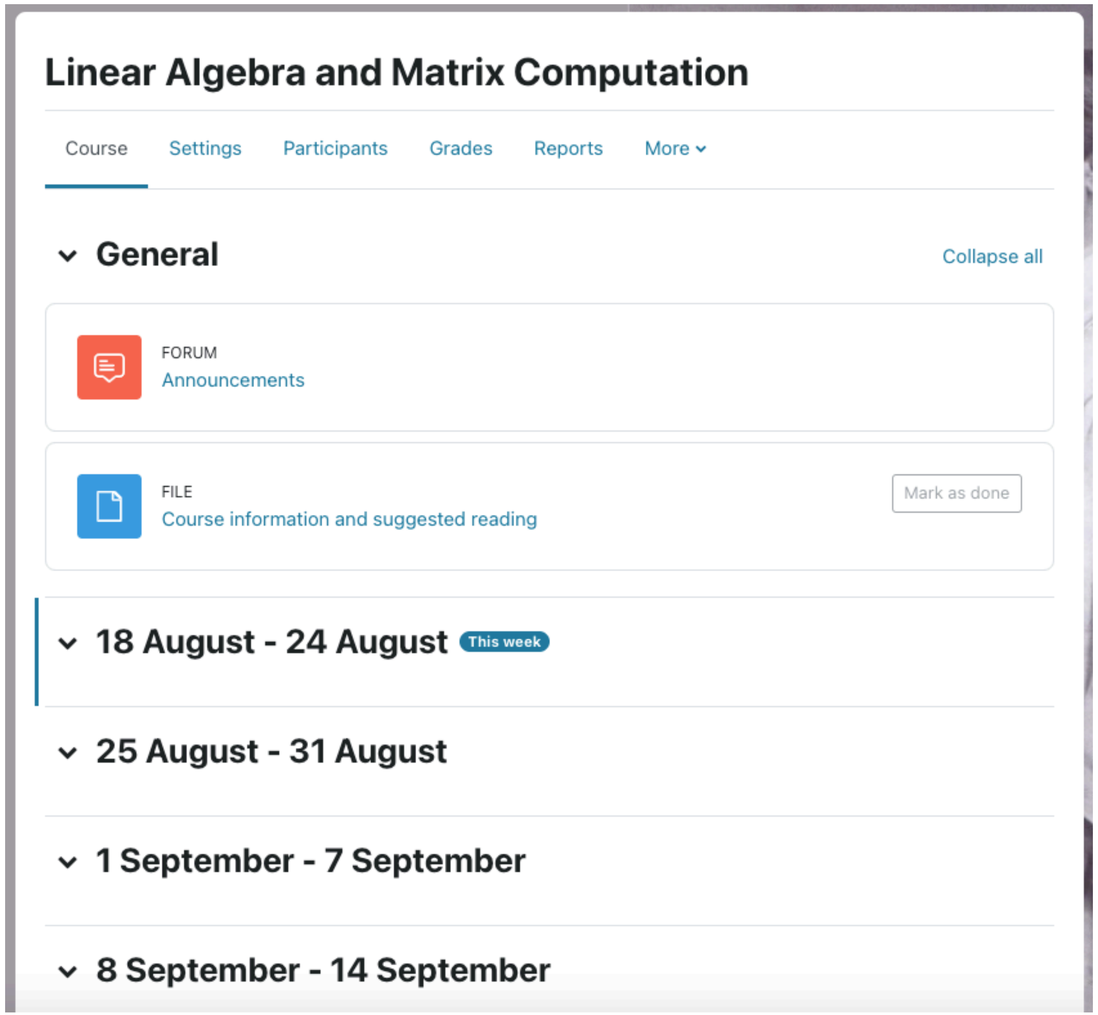
- Tuesday - 3:00-5:00 PM (MB207)
- Thursday - 3:00-5:00 PM (MB207)
- TA - Rajdeep Mondal (2nd yr. PhD student)
  - Room no.- PB412 or MB214



Prerequisites

- Mathematics
  - Basic concept on algebra, vectors and coordinate geometry
- Computer programming: Any one from C/C++/Python (recommended for the class assignments)/MATLAB/Octave

Course logistics



https://xlms.rkmvu.ac.in/course/view.php?id=19

Tentative syllabus

- Vector space
  - Vector space, Subspace, Basis and dimension, Change of basis
- Linear transformations:
  - Rank-Nullity theorem, Matrix of a linear transformation, Linear operators and isomorphism, Linear functionals
- Matrix algebra:
  - Matrix addition and multiplication, transpose, inversion Special matrices, Row rank and column rank of a matrix, Determinant of a matrix and its geometric interpretation, Cramer's rule to solve system of linear equations, Various matrix decompositions
- Eigenvalues and Eigenvectors:
  - Introduction to eigenvalues and eigenvectors of matrices, Characteristic polynomial, Cayley-Hamilton theorem, Algebraic and geometric multiplicities of eigenvalues , Matrix diagonalization, Positive (semi-) definite matrices, Solving linear recurrences

Tentative syllabus (cont.)

- Normed linear spaces:
  - Normed spaces, Cauchy-Schwarz inequality and triangle inequality, Projection, Gram-Schmidt orthogonalization, Hermitian operators, The Spectral theorem
- Matrix Computations:
  - Floating point numbers and operations, Error Analysis
  - Solving system of linear equations:
    - Direct methods: Gaussian elimination, LU factorization
    - Iterative methods: Jacobi method, Gauss-Seidel method
  - Solving least square problems: QR decomposition, Gram-Schmidt orthogonalisation, Singular value-decomposition (SVD)
  - Solving Eigenvalue problems:Tridiagonal QR iteration, Jacobi method

Books

[1] Sheldon Axler. Linear Algebra Done Right. Springer, 3rd edition, 2015. [sample chapter online]

[2] Kenneth Hoffman and Ray Kunze. Linear Algebra. Prentice Hall of India, 2nd edition, 1971. [library] or [online]

[3] Gilbert Strang. Introduction to linear algebra. Cambridge Press, 5th edition, 2016. [sample chapter online] and [online]

[4] Gene H. Golub and Charles F. Van Loan. Matrix Computations. Hindustan Book Agency, 4th edition, 2015. [library] and [online (3rd ed.)]

[5] Holger Wendland Numerical linear algebra : an introduction. Cambridge University Press, Cambridge texts in applied mathematics, 2018. [library]

Evaluation

- Mid-term: 20%
- End-term: 50%
- Assignments/Class test: 20%
- Attendance: 10%
  - to qualify >=85% ?

Assignments

- Both theoretical and programming assignment
  - Python (preferable)/C/C++/MATLAB/Octave
- Submission deadline is strict and weightage reduce to 10%/day after the deadline
  - We will consider 11.59PM as our day end

Academic ethics

- Your grade should reflect your own work
- Copying or paraphrasing someone's work (code included), or permitting your own work to be copied or paraphrased, even if only in part, is strictly forbidden, and will result in an automatic grade of zero for the entire assignment or exam in which the copying or paraphrasing was done.
- So, ask yourself before copying from others
- If you are going to have trouble completing an assignment, talk to the instructor and TA before due date

Why linear algebra?