# IISER Pune - Course Content

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| Semester | JAN 2025 |
| Open to Semester | 6,8,12,14,22,32,34 |
| Course Code | DS3244 |
| Course title | Numerical Linear Algebra |
| Nature of Course | LL - Lecture and Lab |
| Credit | 4 |
| **Coordinator** and participating faculty (if any) | **Dr. Amit Apte** |
| Pre-requisites | Proficiency in python, calculus, linear algebra, probability and statistics |
| Objectives | Equip students with tools and skills to develop computational solutions to practical problems, to understand computational complexities, and to bridge theory and practice* Develop oral and written communication skills relevant for mathematical discourse. |
| Course content | 1. Motivating examples: data, approximations and projections<br>2. Floating point representation, conditioning, stability<br>3. Factorizations and iterative methods: QR, LU, Cholesky, Schur, eigenvalue<br>4. Singular value decomposition: analysis and applications<br>5. Under- and over-determined systems of equations<br>6. Advanced topics: FFT, image processing, inverse problems, optimization, randomized algorithms |
| Evaluation / Assessment | End Sem % = 40%<br>Mid Sem % = 30%<br>Assignments and quizzes = 30% |
| Suggested readings | 1. Numerical Linear Algebra by Lloyd Trefethen and David Bau<br>2. Applied Numerical Linear Algebra by J.W. Demmel<br>3. Analysis and Linear Algebra: The Singular Value<br>4. Decomposition and Applications by James Bisgard<br>5. Matrix Computations by Gene Golub and Charles Van Loan<br>6. Matrix Analysis by Roger Horn, Charles Johnson |
| When Next | January 2026 |
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