

Information Sheet for AMTL 101 (Linear Algebra and Differential Equations)

Course Instructor:

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Syllabus:

Linear Algebra:

- Systems of linear (homogeneous and non-homogeneous) equations, matrices and Gauss elimination, elementary row operations.
- Vector spaces over \mathbb{Q} , \mathbb{R} and \mathbb{C} , subspaces, linear independence, linear span of a set of vectors, basis and dimension of a vector space, sum and direct sum.
- Row space, column space, null space and rank of a matrix.
- Linear transformation, rank-nullity theorem and its applications, matrix representation of a linear transformation, change of basis and similarity.
- Eigenvalues and eigenvectors, characteristic polynomials, Diagonalizability, Cayley-Hamilton theorem (without proof) and its applications.

Differential Equations:

- Review of first order differential equations, Picard's theorem.
- Wronskian. Dimensionality of space of solutions of homogeneous linear ODE.
- Linear ODE with constant coefficients of second and higher order, Cauchy-Euler equations.
- Method of undetermined coefficients and method of variation of parameters.
- Power series solutions.
- Laplace transform and its applications.
- System of first order linear differential equations with constant coefficients.

Textbook:

1. G. Strang, Introduction to Linear Algebra, 6th Edition, Wellesley-Cambridge Press, 2023.
2. E. Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley, 2023.

Attendance Policy: Attendance is compulsory in lecture as well as tutorial classes. At least 75% attendance is mandatory in the lectures as well as tutorial classes.

Evaluation: There are three components.

1. Minor Exam 30%
2. Major Exam: 40%
3. Quizzes: 30% (best two out of three, 15 marks each).

Suggestions: Please try to attempt all the problems in the tutorial sheet before coming to the tutorial classes. Necessary help will be provided in the tutorial classes. If any student is having any problems related to this course (e.g., not able to understand, requires extra attention), they may approach the instructor by writing an email. Some help sessions will be scheduled for those who need them. Never delay in approaching your teachers once you feel you need help. We request you to work hard from the first day itself. Since there is no extra time available to prepare for tests, it is expected that one studies regularly, solves the tutorial problems, clear the doubts in time and does not leave any work pending. Don't risk to copy/help others or adopt any other unfair means in quizzes or exams. Such cases will be dealt according to the institute policy.