

Mid-term syllabus:

Week: 1

- Introduction to Calculus and applications of calculus in real life and physics.
- Introduction to Analytical geometry and vectors. Applications of Analytical geometry.
- What is coordinate system? Types of coordinate system
- Assignment to search applications of math in real life and physics.
- Introduction to line and slope of a line.
- Equation of line.

Week: 2

- Derivation of Various form of equation of line
- Exercise

Week: 3

- Intersection of two lines + Exercise
- Angle between two lines + Exercise

Week: 4

- Distance between two points + Exercise
- Distance between a point and a line + Exercise

Week: 5

- **Circle:** Equation of a circle, circles determined by various conditions + Exercise
- Intersection of lines and circles, locus of a point in various conditions + Exercise

Week: 6

- **Parabola:** Definition, derivation of equation parabola, equation of density of states in semiconductors
- Exercise

Week: 7

- **Ellipse:** Definition, derivation of equation ellipse, Kepler's Laws, problems related to Physics
- Exercise

Week: 8

- **Matrices and Vector spaces:** Introduction to matrices, types, matrix inverse, determinants, system of linear equations, Cramer's rule, The complex and Hermitian conjugates of matrix, The determinant of a matrix, Properties of determinants.
- Exercise

Teaching material:



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Final term syllabus:

Week: 1

- **Hyperbola:** Definition, derivation of equation hyperbola, the general-second-degree equation
- Exercise

Week: 2

- **Matrices and Vector spaces:** The inverse of a matrix, The rank of a matrix, Simultaneous linear equations, Exercise

Week: 3

- N simultaneous linear equations in N unknowns
- Special square matrices, Vectors spaces
- Exercise

Week: 4

- Basic vectors; the inner product; some useful inequalities
- Exercise

Week: 5

- **Diagonaization:** symmetric and antisymmetric; orthogonal; Hermitian
- Exercise

Week: 6

- unitary normal and eigenvectors and eigenvalues of a normal matrix; of Hermitian and anti-Hermitian metrics
- Exercise

Week: 7

- eigenvectors and eigenvalues of a unitary matrix of a general square matrix
- Exercise

Week: 8

- Determination of eigenvalues and eigenvectors Degenerate eigenvalues
- Exercise

Teaching Book:



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