

## ***List of Topics***

### ***Differential and Integral Equations Basic Course***

#### **I. Linear Spaces**

1. Linear transformations, diagonalization and eigenvalues
2. Banach and Hilbert Spaces
3. Orthogonal polynomials, Fourier series
4. Bounded operators, compact operators

#### **II. Linear Integral Equations**

1. Successive approximation method
2. Hilbert-Schmidt Operator
3. Classical Fredholm operators
4. Volterra Equations

#### **III. Ordinary Differential Equations**

1. Differential operator Domain and adjoint
2. Green Functions
3. Elements of Distribution theory

#### **IV. Partial Derived Equations**

1. String, potential and heat equations
2. Fundamental solutions, characteristic curves, Green functions
3. Free Boundary Numerical Solution for the Heat Equation: finite differences, stability, Crank-Nicolson method, over-relaxation methods.

#### **Reference**

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|------------------------------|--|
| Arnold, V.I.                 | Ordinary differential equations                                      |
| Brower, F., Nohel, J.A.      | The qualitative theory of ordinary differential equations            |
| Birkhoff, G., Rota, G.C.     | Ordinary differential equations                                      |
| Coddington, E., Levinson, E. | Theory of differential equations                                     |
| Guzman, M.                   | Ecuaciones diferenciales ordinarias, Teoría de Estabilidad y Control |
| Hale, J.                     | Ordinary differential equations                                      |
| Hartman, P.                  | Ordinary differential equations                                      |
| Hirsch, M., Smale, S.        | Differential equations, dynamical systems and linear algebra         |
| Imaz, C., Vorel, Z.          | Ecuaciones diferenciales ordinarias                                  |
| Lefschetz, S.                | Differential equations: Geometric Theory                             |
| Miller, R.K., Michel, A.N.   | Ordinary Differential Equations                                      |
| Sotomayor, J.                | Licções de ecuações diferenciais ordinárias                          |
| Walker, J.A.                 | Dynamical systems and evolution equations                            |
| Waltman, O.                  | A second course in elementary differential equations                 |