

**Mathematics Department**  
**Brooklyn College, City University of New York**  
**Math 2206 (Introduction to Differential Equations)**  
4 hours; 4 credits

Standard methods for solving ordinary differential equations; geometric interpretations; problems in physics leading to ordinary and partial differential equations; elementary techniques for partial differential equations and separation of variables; Fourier series

**Ordinary Differential Equations (ODE)**

Introduction to classification  
Examples

**Initial Value Problems**

Boundary value problems  
Phase line

**Theory and Methods To Solve ODE**

Separable and first order linear equations  
Exact equations, integrating factors  
Substitutions (Bernoulli, Homogeneous, etc.)  
Reduction of order  
Applications of first order ODE  
Direction field, existence and uniqueness of solutions

**Linear ODE**

Fundamental theory of 2<sup>nd</sup>-order linear equations  
Homogeneous linear equations with constant coefficients  
Method of undetermined coefficients  
Variation of parameters  
Euler equations

**Harmonic Oscillator**

Free vibrations in mechanical systems  
Forced vibrations

**Power Series Methods**

Solution by power series of linear equations with variable coefficients  
Solution near a singular point

**Linear Systems**

Examples of systems of linear equations  
The Laplace Transform, application to linear equations

**Introductory Dynamics**

Singularities and the phase plane  
Euler's method

**Introduction to Partial Differential Equations**

Homogeneous boundary value problems  
Eigenvalue problems  
Fourier series