

**Mathematics 6410**  
**Ordinary Differential Equations**

Grant Gustafson  
Department of Mathematics  
The University of Utah  
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The course will be based on the lecture notes *Nonlinear Analysis and Differential Equations: An Introduction* by Klaus Schmitt and Russell C. Thompson. These notes are available at the author's webpage

<http://www.math.utah.edu/~schmitt/>

The course begins by studying solution methods for nonlinear equations defined in Banach spaces. These include: the implicit function theorem, the inverse function theorem, the contraction mapping principle, Brouwer and Leray–Schauder degree theory, and the method of Lyapunov–Schmidt. Elementary examples to illustrate these methods will be studied. These ideas will be followed by studying the fundamental existence and uniqueness results for initial value problems, the theory of linear differential equations, stability theory, periodic oscillations, the theory of invariant sets and finally the classical Poincaré–Bendixson theory and the Hilbert space theory motivated by Sturm–Liouville problems.

Throughout the course exercises will be assigned and discussed. There will be one midterm and one semester project. The dates for the examination and the semester project will be determined during the semester. Office hours are directly after class, 113 JWB. Call 581-6879 to confirm other times.