



# Math 942 – I

## Foundations of Applied Math



# Fall 2007 Syllabus

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**Professor:** Keith Promislow, D212 Wells Hall, 432-7135, kpromisl@math.msu.edu

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**Text:** M. Holmes, *Introduction to Perturbation Methods*,  
Texts in Applied Mathematics **20**, Springer

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### Topics

Regular and singular perturbation expansions are core techniques of applied mathematics. They are essential in determining the singular structure of solutions of PDEs with boundary layers. The course will introduce matched asymptotic expansions, multiple scales, and WKB methods. The following applications will be pursued:

Ch 1	Regular Perturbation Expansions: Polynomial and transcendental roots, eigenvalues of matrices and linear operators	3 weeks
Ch 2	Matched Asymptotic Expansions: boundary layers in ODEs and elliptic PDE, front evolution in parabolic PDE.	4 weeks
Ch 3	Multiple scales: geometric front evolution	4 weeks
Ch 4	WKB methods and steepest descent: wave propagation	4 weeks

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**Prereq.:** Math 849 (PDE)

**Grading:** Homework 60%, Course Project 40%