

THE MATHEMATICS DEPARTMENT PRESENTS

A MATHEMATICS COLLOQUIUM

WEDNESDAY, May 13, 2009

BOND HALL 217

4:00 pm

Title: The Technique of Matched Asymptotic Expansions

Speaker: Eric Bortel, Western Washington University

Abstract:

When using a regular perturbation technique to approximate the solution of an ODE, one usually looks for a Poincaré expansion that is uniformly valid over the domain of interest. This technique usually fails if the problem is singular. This talk will focus on constructing approximations to singularly perturbed layer-type problems, where no single Poincaré expansion is uniformly valid on the entire domain. The technique of matched asymptotic expansions provides a method to construct an approximation that is uniformly valid over the entire domain of interest by stitching approximations together. We will consider how the matching of approximations is achieved depending on whether layers exist at the boundary of the region, inside the region, or if the approximations meet discontinuously. Furthermore, we will demonstrate the usefulness of this technique by examining a case of cellular membrane regulated active nutrient uptake described by the Michaelis-Menten model of enzyme kinetics. The talk will be accessible to those with a basic knowledge of ordinary differential equations.

Refreshments will precede the talk at 3:30pm in Bond Hall 300
courtesy of Dr. Tilmann Glimm