Instructor: Yoichiro Mori (www.math.umn.edu/~ymori)
Office: VinH 539; email: ymori@math.umn.edu
Office Hours: MW 11am-noon
Textbooks: We will closely follow the textbook: Introduction to Perturbation Methods, Mark H. Holmes, Springer, 2013. The book is available online through the University of Minnesota library. This text will be supplemented with other material as needed.

Prerequisites: Advanced calculus, linear algebra, some familiarity with ODE/PDE.

Grading: There will be biweekly homework assignments and two midterms, the dates of which will be announced later. There will be a take-home final.

Course Description: This is the second part of a two-semester sequence introducing the ideas and methods of applied mathematics. The second semester focuses on perturbation methods, in which the presence of a small parameter is exploited to gain insight into a problem. After a discussion of non-dimensionalization and conservation laws, we start our discussion of perturbation theory with regular perturbation expansions. We shall then go on to discuss matched asymptotic analysis (boundary layers), multiscale methods, the WKB approximation and homogenization theory. Time-permitting, we will also discuss thin-domain asymptotics and lubrication theory and applications of the above techniques to problems mathematical biology and material sciences.