

Seminar in Computational Mathematics: Math 9601 – Spring 2016

Title: Computing with Splines

Instructor: Larry Schumaker

This course is a natural extension and complement to an introductory numerical analysis course such as Math 3620 (formerly Math 226). It is also related to and complements a course in finite difference methods such as Math 6600, or any course in finite element methods. However, none of these courses is a prerequisite. It should be of interest to anyone interested in applications of mathematics, and should be particularly valuable to students in all branches of science and engineering.

The course deals with a powerful and relatively new class of approximating functions called Spline Functions which have many applications in numerical analysis. These include data fitting and approximation, numerical quadrature, curve and surface design and representation, and the numerical solution of PDE's (the FEM method and more recent IGA methods).

The purpose of this seminar is to investigate best available algorithms for solving these problems based on splines. There will be no written homework problems (and no exams), and students will not be doing proofs. However, they will be asked to carry out a number of programming exercises.

It is not necessary to have had any specialized courses in numerical analysis, partial differential equations, or approximation theory. No background in splines will be required since any needed concepts and results will be introduced as needed. However, students should have some familiarity with basic numerical analysis, and some programming skills, preferably with Matlab.

The course will be based on my recently published book *Spline Functions: Computational Methods*, SIAM (Philadelphia), 2015, 422 pp. This book comes with a full set of Matlab software for working with splines.

Although the course is a graduate level math course, I would be happy to consider including qualified undergraduates. If you are an undergraduate and would like to get into the course, you need to come by to see me to get permission to enroll.

For further information, please stop by my office (SC 1532), or send me an email at larry.schumaker@vanderbilt.edu