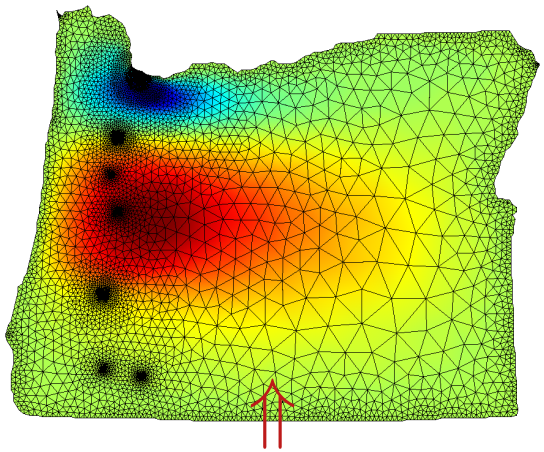
MTH 654/9 (Fall 2021)
FINITE ELEMENT METHODS (FEM)

FEM provides a mathematically elegant foundation for solving (partial) differential equations based on variational calculus in Hilbert spaces. Once you learn FEM for linear model problems, it becomes a powerful tool for nonlinear, singular, and heterogeneous problems on irregular domains, since the FE mesh and approximating spaces can be tailored to the particular challenges. Its many variants and "dialects" are widely popular in various scientific and engineering applications.

Audience: Graduate students of mathematics and other disciplines with solid skills in real variable, linear algebra, and (partial) differential equations will benefit most from the class; experience with numerical methods is recommended. Strong motivation can substitute (some of) the above.

Instructor:
Małgorzata Peszyńska
Department of Mathematics
MWF 15:00-16:00



Group class project from F13

FEM is to computational mathematics & science like advanced calculus to mathematics. Yes, you can live without it, but why would you want to?

Content: In MTH 654/9 we will cover introductory material on theory, algorithms, and implementation of FEM for linear second order elliptic PDEs such as the stationary heat equation and linear elasticity. We will also consider time-dependent and flow problems such as Stokes flow, as well as algorithms beyond the classical FE.

Assignments: basic and advanced theoretical exercises will be tailored to the students' background and interest. For computational exercises MATLAB templates will be provided; experienced students can use selected C++/Python libraries available in public domain. In addition to individual work, the students will be encouraged to participate in group projects.