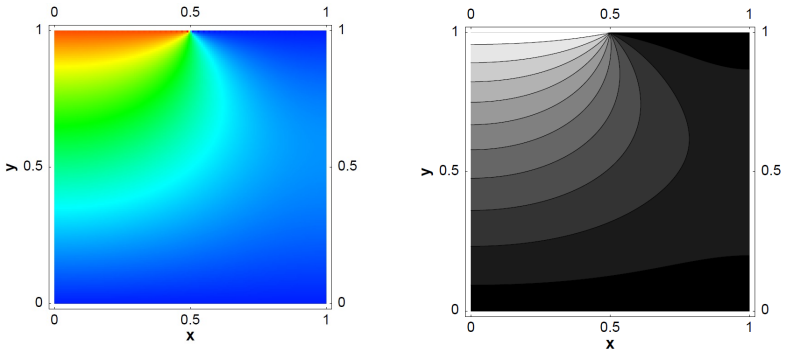
ENGM6612 – Methods of Applied Mathematics I

Graduate students often need to use analytical solutions of partial differential equations (PDE's). Such solutions are often readily available in the literature, and it would seem that using them to analyze a system's behaviour is something very simple and easy to do. However, this is very far from being true – one soon discovers that there is much more involved in using such solutions than simply "coding the equations found in a paper". And when graduate students lack the necessary skills, they often face a roadblock that can prevent them from successfully progressing with their thesis work.

For example, here is one of the classical solutions of an equation that occurs in many areas of engineering:

$$u(x,y) = \sum_{n=1}^{\infty} G_n \sin \lambda_n x \cosh \lambda_n y$$

But how does one turn this equation into visually appealing pictures like these, while being confident that the results are accurate? And how does one decide what visualization options are most suitable and beneficial for a particular situation?



In this course, you will learn exactly that – the skills necessary to confidently deal with analytical solutions of PDE's and to efficiently use such solutions to produce accurate numerical results illustrated by meaningful visual representations. The essential theoretical background will be exposed as well.

The main software used in the course is Mathematica by Wolfram Research – the world's most advanced mathematical software package. The classes will be accompanied by live Mathematica programming sessions and presentations. The template files will be provided to facilitate mastering the software, so that even the students who have no prior experience with the package will be able to fully benefit from it from the very first day of the class.

What do the students who took the course in the past say?

"The combination of theory and applications with [...] live Mathematica demonstrations were extremely valuable as they helped to understand the direct application of the theory to real engineering problems."

"The focus on results presentation, style and clarity was for me the highest point of the course [...] these are among the most important features in consultancy."

Course description:

Classical boundary-value problems of mathematical physics. Classical analytical solutions of boundary-value problems. Special functions. Numerical aspects of the classical analytical solutions. Integral transforms and their application to classical problems of mathematical physics.

You are welcome to contact the professor directly if you have any questions:

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