# MATH 330: Partial Differential Equations

**Description:** *Theory of, and solution techniques for, partial differential equations of first and second order, including the heat equation and wave equation in rectangular, cylindrical, and spherical coordinates. Tools include Fourier series, Bessel Functions, Legendre Polynomials, and transform techniques.*

**Credit Hours:** 3.

**Time and Place:** MWF 12:30 – 1:20pm, GEM 230

**Instructor:** Kenneth Luther

**Contact Info:** Office: GEM 110.
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**Office Hours:** MWF 9:00am – 11:30am, plus anytime I am in my office!  These hours may vary due to meetings, etc.

**Audience:** Taken as upper level elective by a variety of STEM majors.

**Prerequisites:** Math 253 and Math 270.

**Textbook:** The textbook for this course *is Fourier Series and Boundary Value Problems*, by Brown & Churchill.   The current edition is the 8th Edition.

**Technology:** Course material and grades are maintained on Blackboard.  You can expect to use a variety of technological resources as needed, such as Maple or Wolfram Alpha.

**Access & Accommodations :** The Access & Accommodations Resource Center (AARC) is the campus office that works with students to provide access and accommodations in cases of diagnosed mental or emotional health issues, attentional or learning disabilities, vision or hearing limitations, chronic diseases, or allergies. You can contact the office at aarc@valpo.edu or 219.464.5206. Students who need, or think they may need, accommodations due to a diagnosis, or who think they have a diagnosis, are invited to contact AARC to arrange a confidential discussion with the AARC office. Further, students who are registered with AARC are required to contact their professor(s) if they wish to exercise the accommodations outlined in their letter from the AARC.

**Notice of Cancellation:** Notifications of class cancellations will be made through Blackboard with as much advance notice as possible. It will be both posted on Blackboard and sent to your Valpo e-mail address. If you don't check your Valpo e-mail account regularly or have it set-up to be forwarded to your preferred e-mail account, you may not get the message. Please check Blackboard and your Valpo e-mail (or the e-mail address it forwards to) before coming to class.

### Course Goals:

A. Students can perform exact procedures for finding solutions to certain types of partial differential equations.
B. Students interpret and present graphical and qualitative representations of solutions to problems.
C. Students understand fundamental concepts of partial differential equations.
D. Students prepare for success in disciplines which rely on partial differential equations

### Topical Objectives.     Preface: *Students will be able to ...*

1. Model various physical problems with PDEs and BVPs.
2. Identify, and understand the different characteristics of solutions to, linear and non-linear PDEs.
3. Identify, and understand the different characteristics of solutions to, steady state and transient BVPs.
4. Understand the derivation of the heat and wave equations in 1, 2, and 3 dimensions.
5. Find Fourier series expansions for simple functions.
6. Understand the origin of Bessel Functions and Legendre Polynomials.
7. Use Fourier series, Bessel Functions, and Legendre Polynomials to solve BVPs in rectangular, cylindrical, and spherical coordinates
8. Understand transform techniques (Fourier and Laplace) and use them to solve BVPs.