Course Announcement:
MAT 453
Partial Differential Equations I
Fall 2023

Schedule: MWF 1:00-1:50 PM
Instructor: Neel Patel

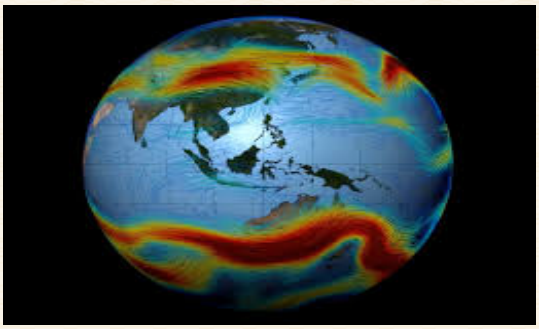
Description:

Partial differential equations (PDE) describe various physical and societal phenomena using the language of multivariable calculus. PDE models appear in physics, engineering, finance, music, chemistry and other fields. The four fundamental PDE (heat, wave, transport, Laplace) form the linear PDE basis for studying nonlinear or inhomogeneous models. In this course, we will use various techniques (Fourier series, separation of variables, fundamental solutions, Duhamel's principle, etc.) to study these fundamental solutions. These equations will be considered both on bounded and unbounded regions. We will show how these four equations appear in fluid dynamics, heat diffusion, acoustics, traffic flow, plasma physics or other models that may be of interest to the students who enroll.

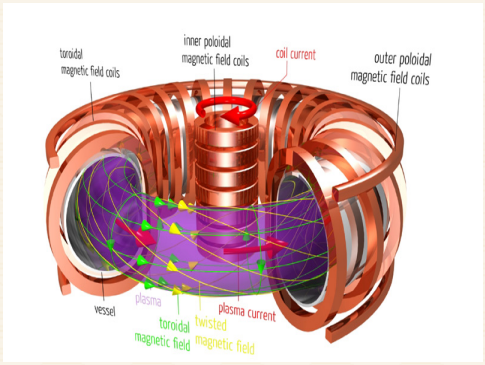
Prerequisites: A grade of C or better in MAT 259 (or equivalent by **departmental permission**)

PDE Models:

Traffic flow: A transport problem with shocks created by red lights



Jet Streams and Cold/Warm Fronts:
A "free boundary" PDE model



Tokamaks: Plasma particles move according electromagnetic forces give by Maxwell's inhomogeneous wave equations

Epitaxial Growth of Crystalline Layers:
A heat equation like model for describing crystal growth used in semiconductor production