Overview: The Earth’s potential fields (gravitational and magnetic field) and its surface heat flow provide strong constraints on the structure, composition, density and magnetic susceptibility of the planet’s interior and its state of isostasy. Topics will include:

- The Earth’s Gravitational Potential and Fundamental Identities
- The Geoid, Deflection of the Vertical, and Vertical Gravity Gradient
- Satellite Altimetry and the Sandwell/Smith Global Gravity Solutions
- Modeling of Gravity Anomalies
- Plate Flexure and Models for Isostasy
- The Earth’s Magnetic Field
- Modeling of Magnetic Anomalies
- Fourier Domain Modeling
- Fourier’s Law of Conduction of the Heat Flow Equation
- Thermal Evolution of Oceanic Lithosphere
- Thermal Convection

Assignments: Weekly homework sets will be given that includes both theoretical problems and MATLAB exercises. Class meetings will be a mix of lectures, discussion of homework, and MATLAB applications. Grades will be based evenly on homework (50%) and two exams (50%).

Student Learning Objectives (SLOs): GG 652 directly addresses four SLOs of our MS and Ph.D. program: (1) Students will learn how to apply technical knowledge (particularly mathematical and physical analysis) to geophysical problems, especially those related to gravity, magnetics, and heat transfer. (2) Students will gain expertise in the sub-disciplines of geophysics and tectonics, (3) Students will practice the analysis and synthesis aspects of the scientific method through homework problems, and (4) class discussions are aimed to improve student abilities in effectively communicating geologic knowledge.

Prerequisites: Phys 170,272, Math 307, GG 312 Geomathematics, or consent.

Required texts: