Course Objective: The objective of this course, the first in a two-course sequence, is to familiarize the student with the analytical means for accurately describing transient wave propagation in solids, using fundamental mathematical treatment of stress wave motions in elastic media. Starting with the simplest example of wave motion in solids, that of the vibrating string, the student will learn techniques for construction and solution of governing wave equations in progressively more complex elastic solids: thin rods, membranes, plates, shells, infinite and semi-infinite solid media. The course will also include practical examples of stress wave transients in solids encountered in laboratory experiments as well as in use of military and civil explosive loadings. The study of stress transients in solids is of particular relevance to those working in the field of energetic materials because explosively generated shocks, such as occur in use of military ordnance, as well as civil explosives used in construction and mining, deliver high magnitude impulsive loading to their surroundings. Within about a 10 charge-diameter distance from an explosive source, the shock loading magnitude typically has reduced sufficiently such that the response of surrounding solid media beyond that distance is a propagating elastic stress wave transient. These explosively generated stress transients can be analysed generally in the same way that earth quake stress transients and impulsive loading stress waves are treated.

Prerequisites: The students should have completed courses in Partial Differential Equations and Boundary Value Problems. Familiarity with integral transformation methods (e.g., Laplace, Fourier, etc.) for solution of partial differential equations, as well as with mathematical theory of elasticity, are also very helpful.

Textbook(s)

-Required? - Yes

Course Outline
Wave phenomena – historical background, typical examples

Waves and vibrations in “strings”

Thin Rods
- Simple longitudinal waves in thin rods
- Flexural waves in thin rods

Waves in Membranes, Thin Plates, and Shells
- Transverse motion waves
- Flexural waves in thin plates
- Waves in shells

Waves in Infinite Media
- Dilatational waves (“P” waves)
- Distortional waves (“S” waves)
- Cavity sources

Code of Academic Integrity

The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity of the Student Honor Council, please visit http://shc.umd.edu/SHC/HonorPledgeInformation.aspx.