



## Seminar Series in Applied Mathematics

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Dr. Alexander Sutin

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### *Inverse problems of Nonlinear Wave Modulation Spectroscopy*

Wednesday, March 7, 2001

3:15 pm

Pierce 116

*Abstract:* Nonlinear Wave Modulation Spectroscopy (NWMS) is based on ultrasonic probe signal modulation by low frequency vibration, i.e., nonlinear mixing of the probe and impact signal. Such a modulation manifests itself as side-band (intermodulation) components in the spectrum of the received ultrasonic signal. The developed technique provides high sensitivity for "pass-fault" test but can not give information regarding crack size and position.

Different approaches to get quantitative parameters of the cracks and damage will be discussed:

1. The crack location can be determined using Impulse Modulation and Mode Tomography. Results of crack location using Impulse Modulation will be presented. Direct and inverse problems for Mode Tomography will be discussed.
2. Application of NWMS to crack parameter determination requires development of models both for the cracks and the damaged material. Several different crack models and cracked media will be presented.

New phenomena of temporary variation of nonlinear interaction have been observed for cracked materials and for a broad class of materials called nonlinear mesoscopic elastic materials. The elastic wave transmission characteristics can be temporarily and significantly altered, from tens of minutes to hours, due to excitation by an acoustic signal. There are no models for this phenomena and some approaches to model development will be discussed.

*Refreshments will be available starting at 3:00pm.*

*For additional information contact Yi Li (216-5433) or Patrick Miller (216-5452).*

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