CIMS SPRING SEMINAR SERIES:

"Brillouin Optical Time-Domain Reflectometry for NTT telecommunications" by Dr. Naruse

"Development of sensitive and active structural material systems" by Prof. Asanuma

Date: March 19, 2003
Time: 3:00pm – 4:00pm
Where: MEB 134
Speaker: Dr. Naruse & Dr. Asanuma

Coffee and cookies will be served.
All are welcome to attend.

Seminar A: 3:00pm “Brillouin Optical Time-Domain Reflectometry for NTT telecommunications” – Dr. Naruse

Brillouin Optical Time-Domain Reflectometry (BOTDR) is a technology that has been studied and developed by NTT Telecommunication Laboratories. The BOTDR system consists of a single-mode optical fiber installed in/on the target being used as a sensor and equipment to measure the strain by launching light into the sensor fiber and observing its scattered light. This system permits continuous strain measurement over several kilometers along the fiber, in addition to common advantages of optical fiber sensors, such as being immune to electromagnetic noise and not needing electric power for the sensor. Because of these strong points, in particular, the continuous and long-distance measurement, the BOTDR system is considered to be promising for monitoring various structures and natural environments such as buildings, bridges, tunnels, and inclined ground, and it is expected to enter practical use soon.

I would like to introduce the outline of the above BOTDR system, some demonstration experiments and telecommunication tunnel monitoring system used practically in NTT facilities by short presentation and video.

Seminar B: 3:30pm “Development of sensitive and active structural material systems” – Dr. Asanuma

An overview of some new concepts proposed and demonstrated to realize metal and polymer based sensitive and/or active structural material systems useful in the field of “Smart Materials and Structural Systems” for health monitoring and/or actuation will be presented. The following topics will be mainly introduced and examined: (1) Embedding an optical fiber in an aluminum matrix and SiC fiber reinforced aluminum composites by the interphase forming/bonding (IF/B) method to use as a sensor for fracture process monitoring and so on; (2) forming an optical interference type strain sensor and an optical loss type one in an epoxy matrix and a CFRP (Carbon Fiber Reinforced Plastics) layer simply by embedding a pre-notched optical fiber and fracture of it in them; (3) embedding a FBG sensor in an aluminum matrix by the IF/B method; (4) forming multifunctional sensors in an aluminum matrix and its composites for temperature and strain monitoring by embedding surface-oxidized nickel and titanium fibers (NiO/Ni and TiO2/Ti composite fibers) in them; (5) fabricating an active laminate of CFRP (works as "bone" and "blood vessel")/epoxy (works as insulator)/aluminum (works as "muscle")/electrode (applies voltage on the CFRP layer), of which unidirectional actuation is realized by the electrical resistance heating of the carbon fiber in the CFRP layer, and the curvature change can be monitored using the fractured optical fiber (works as "nerve") mentioned above; (6) fabricating active fiber-reinforced metals such as SiC/Al and SiC/Ni systems by laminating a reinforced layer with an unreinforced layer to cause thermal deformation. In the case of SiC/Al composite, actuation was performed only in the fiber direction and is useful for making a light-weight active panel. In the case of SiC/Ni composite, actuation took place up to above 1200K and is useful for making a high temperature actuator.