Spring 2004 Special-Topics Course on FSI - First Announcement

ASEN 5519–006 - Fluid-Structure Interaction: Acoustics, Hydrodynamics and Media

Note: ASEN 5107, Nonlinear FEM, will be moved to Fall 2004 or Spring 2005

A new graduate course dealing with modeling and computational issues in fluid-structure interaction (FSI). It will be taught as a seminar level course. Ideal enrollment: 8–12 students, maximum 15.

Intended Audience

MS and PhD students in Aerospace, Civil and Mechanical Engineering who plan to use computational methods in FSI (or more generally, multiphysics) in their research work.

Course Work

Seminar format. Students will periodically prepare presentations from material in journals, or books on selective topics. Assembled presentation material must be word processed by presenters and supplied to instructor, who will use it to configure a web site. Instructor will also contribute presentations on general topics such as partitioned solution procedures and treatment of silent boundaries.
No homeworks or exams. Term project required with a final presentation and written report. TP can be done by individual students or by a group of 2–3 students with common interests.

Topics

These are tentative. Some may be added, others removed depending on interest of enrolled students.
Acoustics. Interaction of a structure with external or internal acoustic media modeled as a fluid. Sample applications: shock from explosions, object signatures, fluid-induced vibrations, architectural acoustics, noise propagation, noise mitigation.
Hydrodynamics. Interaction of structure with external or internal hydrodynamic flow. Sample applications: ship maneuvering, wave effects on offshore structures, tank sloshing, fluid induced vibrations.
Structure-Media. "Media" refers to a continuum that displays a mixture of elastic and flow properties, which surrounds or supports a structure. It may include granular media and substrates. Examples: seismic soil structure interaction, soil penetrators, anchors, MEMS devices on silicon substrates.
Silent Boundaries. Methods for truncating infinite domains: boundary elements, infinite elements, perfectly matched layers.
Note: *Aeroelasticity* (interaction of gas flow and a flexible structure) is excluded as there is a separate graduate course dealing with this topic.

Course Information

Instructor:	Carlos A. Felippa Department of Aerospace Engineering Sciences
Office/Phone:	ECAE 187, 492-6547
Credit hours:	3
Time/Place:	TuTh, 5-6:15 pm, ECCR 105 (same as cancelled Nonlinear FEM, which will not be offered this spring) Call #: 24575
Textbook:	None. Instructor may supply book material or recommend journal articles. Course presentations posted on web site.
Prerequisites:	Introductory course in FEM and a first level graduate course in mechanics. Recommended: computational fluid dynamics, structural dynamics, numerical methods.
Programming:	Students can choose any programming language to do computational part of project. Matlab and Mathematica are recommended for prototyping convenience. In addition, commercial FEM codes such as ANSYS or ABAQUS are fine for extracting models or submodels (usually of the structural part).