数学与系统科学研究院

计算数学所系列学术报告

系列专题报告题目：**Modeling and Control of Thin Structures Elastic or Piezo Electric Shells**

特邀报告人： **Prof. Bernadette Miara**

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邀请人： 曹礼群研究员

内容摘要：

This course aims at mathematically justifying the modeling of elastic shells and give some applications in control and contact theories.

MODELING

1. Three dimensional linearized elasticity in curvilinear coordinates

Three dimensional metric tensor. Existence theorem (Korn's inequality in curvilinear coordinates)

2. Introduction to surface theory

Fundamental forms of a surface (Gauss-Codazzi-Mainardi condition, Weingarten formulas) . Existence theorem (Korn's inequality on a surface)

3. Modeling of shells

Formal asymptotic approach (Membrane or flexural shells). Convergence theorems. Extensions to geometrically nonlinear shells

Shallow shell: Novozilov model

Second order energy: Reissner-Mindlin model of plates and Nagdhi's model for shell

4. Extensions

Constitutive laws for piezo-electric materials.

APPLICATIONS

Control of elastic and piezoelectric shells

Obstacle problem for shallow shell

REFERENCES

In addition to classical references to theory of shells here are some others related to this course:

[1] B.MIARA, E. SANCHEZ-PALENCIA (1996), ``Asymptotic analysis of linearly elastic shells'', Asymptotic Analysis, 12, 41-54.
[2] B. MIARA (1998), ``Nonlinearly elastic shell models: A formal asymptotic approach I.The membrane model'', Archive for Rational Mechanics and Analysis, 142, 331-353.
[3] V. LODS, B. MIARA (1998), ``Nonlinearly elastic shell models: a formal asymptotic approach II.The flexural model'', Archive for Rational Mechanics and Analysis, 142, 355-374.
[4] C. COLLARD, B. MIARA (1999), ``Asymptotic analysis of the stresses in thin elastic shells'', Archive for Rational Mechanics and Analysis, 148, 233-264.
[5] B. MIARA, P. PODIO-GUIDUGLI, (2007), `` A Unified Approach to Classic Plate and Rod Theories'', Asymptotic Analysis, 51 (2), 2007.
[6] B.MIARA, V. VALENTE (1999), ``Exact controllability of a Koiter shell by a boundary action'', Journal of Elasticity, 52, 267-287.
[7] B. MIARA (2002), ``ÊExact Controllability of Piezoelectric Shell'', in Fourth Conference on elliptic and Parabolic Problems, Gaeta, 434-441.
[8] A. LEGER, B. MIARA, (2008), ``Justifying the obstacle problem in the case of a shallow shellÓ, Journal of Elasticity, Volume 90 (3), 241-257.
[9] L. SHUMIN, B. MIARA, Y. MASAHIRO, (2008), ÒA Carleman estimate for the linear shallow shell equation and inverse source problemÓ, Discrete and Continuous Dynamical Systems, Volume 23, (1-2), 367-380.
[10] B. MIARA, A. MUNCH, (2009), ``Control of a piezoelectric body. Theory and numerical simulation'', Applied Mathematics and Optimization, Volume 59, (3), 383-412.
[11] I. LASIECKA, B. MIARA, (2009), `Exact controllability of a 3D piezoelectric bodyÓ, C. R.

Programme

Wednesday 9th June
Course: 1. Modelling of thin structures Kirchhoff-Love and Reissner-Mindlin plates
Time: 9:30 am-10:15 am
10:15-10:30: take a break
10:30-11:15
Venue: Lecture Hall 311 (this building)

Friday 11th June
Lecture on phononic crystals
Time: 9:30 am-10:15 am
10:15-10:30: take a break
10:30-11:15
Venue: Classroom 301 (this building)

Wednesday 16th June
Course: 2. Modelling of thin structures shallow shells in Cartesian and curvilinear coordinates
Time: 9:30 am-10:15 am
10:15-10:30: take a break
10:30-11:15

Venue: Lecture Hall 311 (this building)

Friday 18th June

Lecture on control of elastic and piezoelectric plates and shells

Time: 9:30 am-10:15 am

10:15-10:30: take a break

10:30-11:15

Venue: Classroom 301 (this building)

Monday 21st June

Course: 3. Modelling of thin structures general shells in curvilinear coordinates

Time: 9:30 am-10:15 am

10:15-10:30: take a break

10:30-11:15

Venue: Lecture Hall 311 (this building)

欢迎大家参加!