Одељење за механику Математичког института САНУ

Семинар Математичке методе механике у примени

Matematičke metode mehanike u primeni (ММММП)

Mathematical Methods of Mechanics and Applications (ЗММА)

Projekat OI 174001 Dinamika hibridnih sistema složenih struktura (2011-2014)

Serija predavanja za istraživače pripravnike i doktorante iz oblasti Kinetike, Elastodinamike, Analitičke mehanike, Primene tenzorskog računa u mehanici, Teorije oscilacija i Nelinearne dinamike

28-mi blok predavanja

(od 11h do 17h)

Phase–Field Models for Moving Solid and Fluid Interfaces

Predavač

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Sreda, 21 decembar 2011 u 11 časova

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Predavanja se održavaju svake srede od 11 do 17 časova u Biblioteci Matematičkog instiuta SANU, ul. Knez Muhalova 36, treći sprat

Prijava potencijalnog slušaoca se dostavlja Upravniku Odelenja za mehaniku na adrsu khedrih@eunet.rs *sa naznakom oblasti interesovanja.*

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Phase–Field Models for Moving Solid and Fluid Interfaces

This short course was designed to gradually introduce increasingly complex material. With that in mind, the following three parts were defined.

(1) Lower order phase-field models with the primary example being melting/solidification problems. The simplicity of this problem (two scalar fields, low order governing equations) allowed for simplest introduction to this class of models. The emphasis was on the mathematical description of the underlying physics and basic concepts related to the propagation of the diffuse interface described by this model.

(2) Higher order models for problems where phase variable must obey the conservation law. Here, the primary example were the phase transformations in binary alloys coupled with elasticity-driven diffusion of components. Here, in addition to mathematical formulation, the emphasis was on numerical treatment using Galerkin finite element method. Recent results regarding growth of the intermediate phase and coarsening of thin multilayers were shown. The recently developed finite element software was provided for students to gain some experience.

(3) Finally, as an "advanced topic", the problem of multiphase fluid flow in contact with solid was discussed. A long-standing problem of triple line motion was introduced and reformulated using the phase field formulation. The notion diffusive fluid motion at the interface with the solid appears naturally in this formulation and alleviates the notorious problem of singularity at the triple line (caused by no-slip boundary condition in classical formulation).

The abundant literature was provided in the electronic form and some of it was discussed in the class.