

Advanced Workshop on Mathematical Foundation of Advanced Finite Element Methods (MFAFEM-2013) at

Birla Institute of Technology & Science, Pilani-K K Birla Goa Campus

26th December 2013 – 3rd January 2014

Numerical analysis, simulation, and scientific computing for the solution of partial differential equations (PDEs) have been cornerstones of applied mathematics over the last fifty years. Indeed, the study of computational methods for PDEs is a key tool for the development of science and technology. For that reason, it is important to have a deep understanding of the classical and new methodologies used in numerical PDEs.

Although India has been continuing to grow both technically and scientifically, there is a significant shortage of man power in this important scientific area. Thus, there is an urgent need to boost the research in computational PDEs in India.

AIM:

The aim of this workshop is :

- To motivate research students towards a career in computational mathematics through the lectures from the national & international experts in this area.
- To provide an overview of the techniques that allow one to address the computational challenges that are encountered in different applications.
- To provide a common platform for exchanging ideas and results pertaining to the challenges in these front line areas of FEMs.
- To expose participants to hands-in-computing through Computational Lab Sessions.

TARGENT AUDIENCE:

Research Scholars, faculty members working in Finite Element Methods with familiarity in functional analysis, weak solution to elliptic PDE and MATLAB.

MAIN TOPICS:

- A quick introduction to Sobolev spaces; Lax-Milgram Lemma; Review of Elliptic PDE: existence of unique weak solution, regularity.
- Quick review of FEM: Cea's Lemma Mixed FEM, Aubin-Nitsche duality technique, convergence rates.
- A posteriori error analysis, reliability, efficiency, adaptive mesh refinement, contraction property, discrete reliability, optimality of closure algorithm, approximation classes, optimality of adaptive finite element algorithms. Adaptive finite element methods for elliptic PDEs: basic concepts and aposteriori estimators, Adaptive Galerkin discretization of mixed finite element methods.
- Discontinuous Petrov Galerkin Methods (DPG) Introduction of the DPG method as a Petrov-Galerkin method, connection to least squares methods, a mixed method reformulation, theory of a priori error estimates for the DPG method, Application to the Laplace operator.
- Scientific Labs : MATLAB Implementation of the FEM and Adaptive FEM

RESOURCE PERSONS:

Amiya K. Pani, Neela Nataraj (IIT Bombay); P. Dhanumjaya (BITS-Pilani); Thirupati Gudi (IISc Bangalore); Carsten Carstensen, Mira Schedensack, Dietmar Gallistl (Humboldt University of Berlin, Germany); Jay Gopalakrishnan (Portland State University,U.S.).

COORDINATORS:

Carsten Carstensen (Humboldt University of Berlin, Germany); P. Dhanumjaya (BITS-Pilani); Neela Nataraj, Amiya K. Pani (IITB).

PARTICIPATION:

To participate in the workshop, fill in the required form which can be downloaded from the website: **http://www.math.iitb.ac.in/~npde-tca/** and email to: **npde.2012@gmail.com** or by post together with your CV and recommendation letter(s) from your supervisor / HOD to the following address :

Convener, NPDE-TCA, Advanced Workshop (NFAA-2013), Department of Mathematics, Indian Institute of Technology, IIT Bombay, Powai, Mumbai – 400076, Phone : 0222576 4765

CONTACT:

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Last Date of receipt of application: 27th October, 2013

Selection of participants will be based of their academic records and recommendation letters. List of selected participants will be put on the web page by 31st October, 2013 Note : TA will be provided subject to receipt of funds from funding agencies.