About Prof JN Reddy

Prof JN Reddy is a Distinguished Professor and inaugural holder of the Oscar S. Wyatt Endowed Chair in Mechanical Engineering at Texas A&M University, College Station, Texas, USA.

Prof Reddy has authored over 450 journal papers and 16 text books on theoretical formulations and finite-element analysis of problems in solid and structural mechanics (plates and shells), composite materials, computational fluid dynamics, numerical heat transfer, and applied mathematics.

He is internationally known for his research on mechanics of composite materials and for computational methods. The shear deformation plate and shell theories that he developed and bear his name in the literature are well known, and finite element models he developed have been implemented into commercial software like ABAQUS, NISA, and HYPERFORM.

Such an eminent record of research has earned Prof Reddy numerous national and international awards, including the Charles Russ Richards Memorial Award and the Worcester Reed Warner Medal of the American Society of Mechanical Engineers. Prof Reddy presented the prestigious 'The 2009 Landis-Epic Lecture' at the University of Pittsburgh, and received Honoris Causa, Honorary degree, from the Technical University of Lisbon, Portugal.

Dr JN Reddy can be contacted by email on **jn_reddy@yahoo.com** and **jnreddy@tamu.edu**

About Dr. A. Rajagopal

Dr. A. Rajagopal's research expertise is on computational in elasticity, finite element and mesh free methods. Earlier to joining IIT Hyderabad he worked as a post doctoral researcher at the Chair of applied mechanics, University of Erlangen, Nurenberg, Germany, under the guidance of Prof. Paul Steinmann. During this time he has worked in the area of polygonal finite element and mesh free methods applied to nonlinear gradient elasticity and phase field simulations. Earlier he has obtained his PhD from IIT Madras, on developing Finite Element Mesh adaption techniques based on mechanics of material / configurational forces for plane problems, bimaterial interfaces and composite plates under guidance of Prof. C.S. Krishnamoorthy and Prof M. Sivakumar. He has authored several papers in these areas in leading journals.

About IIT Hyderabad

Inventions and innovations are key words on which the foundation of IITH is based. One of India's eight new IITs – IITH started functioning in August 2008. Currently it has 1050 students in total and offers undergraduate programs in four disciplines, M.Sc in Chemistry and Physics, M.Tech in six disciplines and PhD in 11 disciplines.

The first faculty at IITH joined in 2009 and as of today IITH has 150 faculty members. In a short span of three years, IITH has developed state-of-the-art infrastructure for advanced research and produced more than 400 publications in internationally reputed journals.

Research is a culture among the faculty and students of IITH. This is evident from the several research projects that are ongoing at IITH. On top of the gamut of sponsored projects from various funding agencies, IITH has active collaboration with industry as well.

IITH also has an innovative academic program where the students are offered fractional credits and the first semester undergraduates are allowed to do a project of their choice. Many more innovations in the academic front are in the offing. IITH always strives to offer an innovative environment where one is not afraid to experiment with high-risk ideas.

http://www.iith.ac.in/

For details please contact:

Dr Amirtham Rajagopal
Coordinator - GIAN Course on FEM

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GLOBAL INITIATIVE ON ACADEMIC NETWORK (GIAN)

10 Days Course on

Finite Element Method

Theory and Programming
(With Applications to Solid Mechanics, Heat Transfer and Fluid Mechanics)

14-24 July 2016

Venue

INDIAN INSTITUTE OF TECHNOLOGY HYDERABAD
http://www.gian.iitkgp.ac.in/

Overview

The Finite Element Method (FEM) is a numerical and computer-based technique of solving a variety of practical engineering problems that arise in different fields. It is recognized by developers and users as one of the most powerful numerical analysis tools ever devised to analyze complex problems of engineering.

The underlying theory of the method is now well established, with many books and courses providing adequate explanations of the theory. However, most people using the method via commercial software or in-house codes do not often understand the method as applied to engineering problems, especially in generating input data and interpreting the results.

Course Objectives

The major problem facing the engineering analyst contemplating the use of the technique lies in acquiring appropriate knowledge to provide assurance that the finite element model produced gives a reasonably reliable representation of the 'real life' problems being analyzed.

The present course is designed to bridge the gap between the theoretical finite element knowledge and its industrial applications by providing sufficient insights into the relationship between the physical data (e.g., loads, boundary conditions, constitutive behavior, etc) and the finite element model. The lecturer will address the issues of element selection, mesh design, convergence and response characteristics.

This course is intended to provide graduate students, engineers, and researchers working in aerospace, automotive, civil, mechanical engineering, and information technology industries as well as numerical analysts and materials scientists with the theory and applications of linear finite element analysis of problems from heat transfer, fluid mechanics, and solid and structural mechanics.

Profile and Number of Participants

The course is aimed at students, analysts and researchers who are involved with the analysis of differential equations arising in engineering and applied science, and who are using or plan to use commercially available finite element packages to analyze problems in the aeronautical, automobile, mechanical, civil and other engineering industries. The course will also enable participants to be able to write their own FEM software. Participants are assumed to have knowledge of the basic principles of engineering (i.e., undergraduate degree in engineering). Some knowledge of the finite element method is an advantage, but not essential. The maximum number of participants for the course shall be limited to 40.

Benefits of Attending the Course

Persons who have attended the course and followed the material should benefit in strengthening their background in the following areas:
- A strong understanding of the formulative steps involved in the finite element model development of the equations of engineering and applied science, including certain heat transfer and fluid flow problems.
- Generation of finite element data (e.g., selection of elements and mesh, computation of nodal forces), imposition of boundary conditions, post-computation of stresses and strains, etc), exploitation of problem symmetries, and interpretation and evaluation of the results.

Course Material and Reference Book

A copy of the overheads used in the presentation of the course will be provided as a part of the course material. The introductory finite element book by JN Reddy is available and the participants may purchase the book from local vendors. The reference information on the book is Reddy, J.N., An Introduction to the Finite Element Method, Third Edition, McGraw-Hill, New York, 2006.

Evaluation and Grading

There will be 3 evaluations on the understanding of the concepts by the participant made during the course. Based on the evaluations finally a letter grade will be awarded to the participant. A completion certificate shall also be issued.

Course Contents

Background: Introduction to Numerical Methods
- Overview: Basic Ingredients of FEM
- Comparison with alternative solution methodologies

Basic Concepts in FEM: One-Dimensional Problems
- Axial deformations of a bar
- Strong and weak forms
- Essential vs. natural boundary conditions
- Integral statements (Principle of the minimum potential energy)
- Methods of approximations (Ritz and Galerkin methods)
- Accuracy – error measures
- Finite element approximation functions (linear, quadratic, and cubic elements)

Assembly of element equations
- Illustrative examples and discussion of results in light of physical response

Extension of the Concepts to Higher-Order Boundary Value Problems
- Flexure of beams (Euler-Bernoulli and Timoshenko) beams
- Bending of thin and thick elastic plates

Generalization of the Basic Concepts to Two Dimensions
- Membrane and heat transfer-like problems in 2D
- Elements types (triangular and quadrilateral elements)
- Subparametric, isoparametric, and superparametric formulations
- Axisymmetric problems

Numerical / Computational Issues
- General modeling considerations
- Numerical integration
- Elasticity Problems
- Governing equations of plane elasticity problems
- Elements types (triangular and quadrilateral elements), Examples

Three-Dimensional Problems
- Heat transfer-type problems, Elasticity problems
- Types of 3-D Finite elements (interpolation functions)

Introduction to Viscous Flow Problems
- Governing equations (Navier-Stokes Equations)
- Mixed finite element model (2D), Penalty finite element model (2D)
- Numerical examples, Coupled fluid flow and heat transfer formulations
- Applications

The Course will have a strong emphasis on solving several numerical examples. There will also be strong emphasis on programming aspects of FEM.

Important Dates

Last date for receiving applications	01 June 2016
Intimation to participants	15 June 2016
Course Dates	14-24 July 2016

Registration Fee**

For participants from academic institutions :	Rs 5,000
For participants from industry :	Rs 7,000
For students*	Rs 2,000
Foreign Delegates	USD 500

*(*ID proof to be submitted)*

**The Registration Fee includes access to attend all the lectures/tutorials, and a hardbound copy of the course material.

An additional fees of Rs. 2000/- has to be paid for providing Mineral water bottle / Lunch / 2 Coffee/Tea with snacks on all 10 days.

All payments should be made in the form of Demand Draft in favor of to be paid in favor of Registrar **IIT Hyderabad.**

The DD together with registration from should be sent to

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