

**TWO-DAY WORKSHOP ON
ADVANCES IN FINITE ELEMENT METHOD**

February 24-25, 2020

REGISTRATION FORM

Name: Mr/Ms/Mrs/Dr: _____

Academic Qualification: _____

Designation: _____

Organization: _____

Institution Address: _____

Mobile: _____

E - Mail: _____

Registration Fee Details:

D.D. No.: _____

Bank Name: _____

Accommodation Requirement : YES / NO

Date: _____ Signature _____

The above information along with D.D may be sent to the coordinators on or before **Feb 14, 2020**

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REGISTRATION FEE

Academic / Industry Participants: Rs.1000/-
(Includes participation certificate, course material, workshop kit, lunch, tea & snacks)
Please fill the Registration form and send it before the due date with the DD in favour of "Mechanical Engineering Association" payable at Chennai.

The fee can also be paid online to the below account:

Account name: Mechanical Engineering Association

Account number: 459777734

Bank name : Indian Bank

IFSC code : IDIB000S181

MCIR No : 600019171

Registration Online:

<https://docs.google.com/forms/d/101ngiZCH199JwZmtR3ubSIEI2ivgXeMpZqZ4VXS6fZQ/edit#responses>

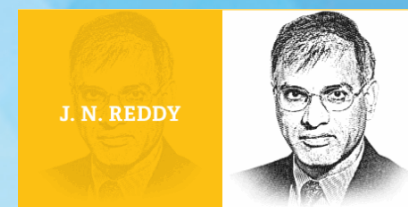
Last date for Registration: Feb 14, 2020

CONTACT :

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**3rd International Conference on
Advances in Mechanical Engineering ICAME 2020
February 24-29, 2020**



TWO-DAY WORKSHOP ON

**ADVANCES IN
FINITE ELEMENT METHOD**

LECTURER

J. N. Reddy

Texas A&M University, USA

February 24-25, 2020



SRM
INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University u/s 3 of UGC Act, 1956)

Organized by

**Department of Mechanical Engineering
SRM Institute of Science and Technology**

Convener

Dr. S. Prabhu

Professor and Head

Co-Convener

Dr. P. Nanda Kumar

Head - Design Division

Co-Ordinator

Dr. P. V. Jeyakarthykeyan

Mr. S. Arokya Agustin

Assistant Professor

Department of Mechanical Engineering
SRM Institute of Science & Technology
Kattankulathur -603203, Kancheepuram (DT), Tamilnadu.
<http://www.srmist.edu.in/icame-2020>

ABOUT THE INSTITUTE

SRM Institute of Science and Technology (formerly known as SRM University) is one of the top-ranking Universities and most premier engineering destinations in India, which was established in 1985 by the Founder Chancellor, Dr. T.R. Paarivendhar. Now it is functioning in four campuses located at Kattankulathur, Vadapalani, and Ramapuram in Tamilnadu and Modi Nagar in Ghaziabad with over 55,000 students and 3000 faculty members. It offers a wide range of programs to students applying for undergraduate, post-graduate and doctoral programs in Engineering, Management, Medicine & Health Sciences, Law and Science & Humanities.

The Institution has moved up through international alliances and collaborative initiatives to achieve global excellence. SRMIST International Advisory Board (IAB) is actively involved in building a stronger international dimension in research and teaching methodology, which creates avenues for research and successful careers. The SRMIST also collaborates with foreign Universities like MIT, Carnegie Mellon University (CMU), Pittsburg University, etc..

Over 150 students sponsored to 35 foreign Universities like MIT, Carnegie Mellon, UC Davis, Warwick, and Western Australia. SRMIST has been categorized as grade A University by the Ministry of Human Resources Development (MHRD), Government of India. SRMIST is accredited by NAAC with A+ + Grade and placed in top positions in ARIIA and NIRF Ranking in the academic year 2018-19. Our University hosted 98th Indian Science Congress in 2011.

Recently, our SRMIST bagged the following awards: QS-STARS 4-star rating award, The most prestigious National Intellectual Property award, STEM impact award, Green metric award, AICTE-CII INDPACT award, university of the year award 2019 by FICCI and three SWACHHATA awards.

ABOUT THE DEPARTMENT

The Department of Mechanical Engineering is one of the pioneering department of SRM Institute of Science and Technology. The present faculty strength is 130. About 600 research papers have been published in international journals and about 800 papers in international / national conferences. The department is functionally divided into three broad areas of specialization: (i) Design (ii) Manufacturing and (iii) Materials and (iv) Thermal Engineering. The National Board of Accreditation had accredited the Mechanical Engineering program in 1997. The B.Tech- Mechanical Engineering program at Kattankulathur campus is accredited by ABET, USA.

The department also offers Doctoral programs in these Four areas of specializations. The department periodically organises technical talks, workshops, FDPs and national and international conferences. Some of the important events organised are : International Conference on Advances in Mechanical Engineering 2006 and 2018,

National Workshop on fuel cell technology 2008, 10th Asian symposium of visualization 2010, Short Course on Mechanics of Composite Materials and Structures 2015, Workshop on Development, Manufacturing and Analysis of Advanced Composites 2015, Short term Course on FEM2015, NCAME 2016, Research perspectives on 2016 and IPR & Innovations on 2017. Various Research facilities available in the department are 5 axis CNC Machine, IRB1410 ABB industrial robot, IRB360 Flex Picker Vision ABB robot, wear and friction monitor Apparatus, thyristor controlled 64 – segment program electric furnaces, 7 Mill volt He - Ne with spatiallter, vision systems, computerized surface roughness tester, Fazo portable CMM, Carlzess size CMM, six axes spine simulator, Differential scanning calorimetry, computerized CRDI VCR IC engine test Rig, gas analyzer, steam power plant, Kistler Impact hammer, RPT, solar steam cooking plant and FMS systems.

COURSE OBJECTIVES

The major problem facing the engineering analyst contemplating the use of finite element software lies in acquiring appropriate knowledge to inner workings of the FEM so that they have the understanding and confidence of evaluating the results obtained from commercial programs. The present course is designed to introduce a basic understanding of the finite element method and its applications by providing sufficient insights into the relationship between the physical data (e.g., loads,

boundary conditions, constitutive behavior, etc.) and the equations governing physical phenomena being modeled. The lecturer will present the details of underlying theories and the derivation of the governing equations, finite element model development, and applications.

This introductory course is intended to provide graduate students, engineers, and researchers working in aerospace, automotive, civil, mechanical engineering, mathematics, 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, solid and structural mechanics, and general field problems.

PROFILE 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 on using commercially available finite element packages to analyze problems in the aeronautical, automobile, mechanical, civil and other engineering industries. 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.

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 ("knowing is believing"):

- * 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, knowledge about the post-computed stresses and strains, 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.

COURSE CONTENTS

- The basic concepts in FEM – one-dimensional problems
 - ✧ General introduction
 - ✧ Axial deformation of bars/one-dimensional heat flow
 - ✧ Strong and weak forms
 - ✧ Essential vs. natural boundary conditions
 - ✧ Finite element approximation functions (linear, quadratic, and cubic elements)
 - ✧ Assembly of element equations
 - ✧ Illustrative examples and discussion of results considering physical response
- Bending of straight Euler-Bernoulli beams
 - ✧ Derivation of governing equations of the Euler-Bernoulli beam theory
 - ✧ Weak form development
 - ✧ Finite element model
 - ✧ Numerical examples
- Eigenvalue and Time-Dependent problems
 - ✧ Free vibration of elastic systems (natural frequencies)
 - ✧ Numerical examples
 - ✧ Transient analysis for parabolic and hyperbolic equations
 - ✧ Numerical stability and explicit formulations
 - ✧ Numerical examples

- Finite element models of two-dimensional problems
 - ✧ Model (i.e., typical) governing equation in 2D
 - ✧ Weak form development
 - ✧ Finite element model development
 - ✧ Assembly of elements
 - ✧ Numerical examples
- Elasticity Problems
 - ✧ Governing equations of plane elasticity problems
 - ✧ Shear locking and its remedy
 - ✧ Assembly of elements and load calculation
 - ✧ Numerical examples

- Introduction to viscous flow problems
 - ✧ Governing equations
 - ✧ Mixed finite element model (2D)
 - ✧ Penalty finite element model (2D)
 - ✧ Locking phenomena
 - ✧ Numerical examples



PROFESSIONAL HIGHLIGHTS OF J. N. REDDY

Dr. J.N. Reddy is a Distinguished Professor, Regents' Professor, and inaugural holder of the Oscar S. Wyatt Endowed Chair in Mechanical Engineering at Texas A&M University, College Station, Texas. Dr. Reddy, an ISI highly-cited researcher, is known for his significant contributions to the field of applied and computational mechanics through nearly 700 journal papers and 21 textbooks.

Dr. Reddy received B.E. (Mech) from Osmania University, Hyderabad, India in 1968, and M.S. (Mech) from Oklahoma State University, Stillwater, in 1970. He obtained his Ph.D. (Engineering Mechanics) from University of Alabama in Huntsville in 1974. He worked for a short period for Lockheed Missiles and Space Company in Huntsville, Alabama, and was on the faculty of the University of Oklahoma (1975-1980), Virginia Polytechnic Institute and State University (1980-1992), and Texas A&M University (since 1992); he holds many honorary appointments visiting professorships, including the A.P. Abdul Kalam Professorship at SRM <http://mechanics.tamu.edu>.

His pioneering works on the development of shear deformation theories (that bear his name in the literature as the Reddy third-order plate theory and the Reddy layerwise theory) have had a major impact and have led to new research developments and applications. His works have been implemented into commercial software NISA (Engineering Mechanics Corporation) and HyperXtrude (Altair). Professor Reddy has had profound influence on the careers of many students and young researchers who he encountered during his professional career (not only as students and collaborators but also as participants in his short courses, workshops and seminars during his visits to various institutions and conferences). Some never met him but were influenced by his writings.

Recent Honors include: 2019 Timoshenko Medal from the American Society of Mechanical Engineers, 2018 Theodore von Karman Medal from the Engineering Mechanics Institute of the American Society of Civil Engineers, the 2017 John von Neumann Medal from the U.S. Association of Computational Mechanics, the 2016 Prager Medal, Society of Engineering Science, and the 2016 ASME Medal from the American Society of Mechanical Engineers. He is a member US National Academy of Engineering and foreign fellow of Indian National Academy of Engineering, the Canadian Academy of Engineering, the Brazilian National Academy of Engineering, the Chinese Academy of Engineering, and the Royal Academy of Engineering of Spain.