INDIAN INSTITUTE OF TECHNOLOGY INDORE

Discipline of Mechanical Engineering

Organizes

6-Days Online Short Term Course on

Micro- and Nano-Mechanics of Solids: Fundamental & Applications

December 14-19, 2020

Under Quality Improvement Programme (QIP), AICTE, MED

NEED AND NOVELTY OF COURSE:

This is a first of its kind course and its novelty lies in the following in view of the multi-scale nature of real-world problems, spanning from sub-nano to millimeters in spatial dimensions, and from femto- to milli-seconds in the time domain. Ideally, engineer/scientist would like to predict the behavior of new material systems in an attempt to reduce laboratory expenses and to obtain quick predictions with a prime goal of being accelerate the trial-and-error experimental findings. The dramatic increase in computational power in the last two decades for modeling and simulations increased the possibility of modern methods that can play a major role in the analysis of solids on micro- and nano-scale levels. This fact motivated the course that will comprehend the modeling of advanced engineering materials such as composites, 1D, 2D and 3D structures etc. with varied dimensions from mm to nm and model/study their multifunctional behavior. Keeping the interest of faculty participants from various backgrounds in mind, the contents of the course were developed which will be covered by the experts with interdisciplinary expertise and multi-institutional experience as well as from industry.

COURSE SYLLABUS

The first part of the course shall include: Fundamentals of equations of elasticity; Basics of solid continuum: kinematics of deformation, kinetics of solid continuum and material symmetry; Fundamentals of weak formulations; Fundamentals of micro-macro concepts: Average strain and stress theorems, the Hill-Reuss-Voigt bounds, classical micro-macro mechanical approximations and micro-geometrical manufacturing idealizations; Aim of micromechanics; Homogenization; Representative volume element; Eigenstrains; Inclusions, inhomogeneities, cracks and dislocations; Micromechanics of composites; Different micromechanical techniques for predicting thermomechanical behavior of solids. **The second part of the course shall include** modules on useful concepts in molecular modeling; Basics of atomistic, interatomic potentials and lattice defects; Multiscale modeling; Atomistic elasticity: Linking atoms and continuum; Structural mechanics of carbon-based and boron nitride-based nanomaterials. The course shall also include problem solving sessions on the listed topics as well as lab modules on modeling of carbon-based as well as boron nitride-based nanostructures. A number of basic research studies from advanced materials will be presented in detail.

COURSE FACULTY

- Dr. Igor Sevostianov, New Mexico State University, USA
- Dr. Nuwan Dewapriya, Carleton University, Canada
- Dr. A. Alian, Nuclear Energy Services, Tetra Tech, Canada
- Dr. Xue Chen, Northumbria University, UK
- Dr. Srimanta Pakhira, IIT Indore
- Dr. Shailesh I. Kundalwal, IIT Indore (*Lead Expert & Coordinator*)

COURSE OBJECTIVES

- To provide the participants with a working knowledge of microstructure-property relations and molecular modeling of nanostructures.
- To provide the participants with a working knowledge of the various tools and techniques needed to characterize and design heterogeneous materials using both micro- and nano-mechanics techniques.
- To introduce the participants into practical problems of micro- and nano-mechanics, and their solutions, through case studies and live projects
- To provide the participants with a training of use of GNU General Public License-based simulation tools needed for quantitative nanomechanical characterization of structures.

COURSE MODULE

This is an active learning-based course and comprised of lectures, tutorials, and hand-on training/demonstrations using most of **GPL-based software** which will tremendously help participants to immediately kick-start application of course with minimum resources.

CERTIFICATE

Participants who successfully complete the course will be awarded with a certificate.

ELIGIBILITY

- All teachers of degree level technical/engineering Colleges/Institutions/ Universities are eligible to attend this course.
- **For other participants from any Inst/Organization:** UG in Science/Engineering Degree with basic training on computer systems.

REGISTRATION PROCESS

Online Mode: Registration link **"Micro- & Nano-Mechanics of Solids"**
Via E-mail: The below particulars can be sent to kundalwal@iiti.ac.in along with a scanned copy of your institute/organization identity card.

Name:
Designation:
Institution/Organization:
Address of Institution/Organization:
Academic qualification:
Are you a faculty member from AICTE approved College/Institute? (**Yes or No**):
E-mail id:
Phone/Mobile No.:
(Payment details for participants from other Govt./Private organizations. Only "faculty" participants from AICTE approved institutes are exempted from the registration fees)
Bank name:
Payment reference No.
Amount transferred:
Date of transaction:
Any other relevant information:

REGISTRATION FEE

- **No fee for faculty participants from AICTE approved Colleges/Institutes/Universities**.
- The fee is ₹ 2500 for teachers and non-teachers from other government organizations.
- The fee is ₹ 5000 for participants from private organizations.

Note: The fees includes service tax.

Online Registration Link: 'Micro- & Nano-Mechanics of Solids'
Registration Deadline: December 10, 2020
Notification of Acceptance: By December 11, 2020
Duration of Course: December 14-19, 2020

Note: Technically the course will be started from **Dec 11, 2020** by providing systematic instructions to the registered participants on installing free and open-source software such as LAMMPS, NanoEngineering-1, VMD, etc. in their laptops/computers (any version). It is expected that the essential software required for the course are running in their systems by the start of course.

MODE OF CONDUCT OF COURSE: ONLINE

Mode of payment

Online Payment: Please click or copy & paste below link.
https://forms.eduqfix.com/indoreiit/add?formType=9263526567614218

Bank Transfer: Registration fee can be paid through NEFT/IMPS to the below A/c number:
Name of the Beneficiary: Registrar, IIT Indore
Name of Bank: Canara Bank
Branch: Simrol, Indore
Account No. 1476101027440
IFSC Code: CNRB0006223

COURSE COORDINATOR:

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