



Government of India
Ministry of Human Resource
Development



MHRD – Global Initiative on Academic Network (GIAN)

A Six-day course

INTEGRATED COMPUTATIONAL MATERIALS ENGINEERING FOR METALS

8-13TH, JULY 2019

Organized by Department of Mechanical and Aerospace Engineering, Indian Institute of Technology
Hyderabad

Overview:

The next-generation structures will all be based on the paradigm of simulation-based design concepts. Engineers and Research students need to know the various computational tools to be competitive in the workforce. By integrating various length scale tools, it is possible to develop a comprehensive understanding of structure-property correlations, theory-experiment relationships, and process-performance relationships. This fundamental knowledge base will position them for advantages in higher fidelity computations and designs. This course on Integrated Computational Materials Engineering (ICME) for metals is designed to provide insights into the various computation tools used across different materials length and time scales with an aim to develop a holistic understanding of materials processing-structure-properties-performance relations.

Besides introducing various computation tools and the physics behind them, this course will have a host of case studies which are beneficial for the students to gain experience in scale-bridging problems. Students will also be familiarized with current research studies and experimental techniques in the fields of Computational materials to develop a better understanding of the current breakthroughs and challenges in the field. We expect a diverse set of students across several engineering and science disciplines to benefit from this course.

Objectives of the course:

The primary objectives of the course are as follows:

- i) Analyze and understand the computational tools at Macro, Meso, Micro, Nano and Electronic scales
- ii) Scale Bridging the different levels
- iii) Review of Plasticity, Damage, Fracture and Fatigue at various length scales
- iv) Design of new metallic materials.

- v) Enhancing the capability of the participants to identify the need for multi-scale modelling of materials and apply the concepts of this course to meet their requirements.

Outcomes of the course:

The student who successfully completes this course will

1. Have a basic understanding of mechanics at different length scales.
2. Understand the deformation and failure mechanism in processes such as plasticity, damage, fatigue and fracture at various length scales.

Course Duration: July 8-13, 2019

Venue: Department of Mechanical and Aerospace Engineering, IIT Hyderabad

Course Schedule:

Day	Date	Duration	Topic	Syllabus
Day 1	8 th July 2019	8 hrs.	ICME overview	Multiscale modelling and Bridging methods
Day 2	9 th July 2019	6 hrs.	Continuum scale	Internal state variable theory (Plasticity)
Day 3	10 th July 2019	6 hrs.	Mesoscale	Crystal Plasticity
Day 4	11 th July 2019	6 hrs.	Microscale	Discrete Dislocation Dynamics
Day 5	12 th July 2019	7 hrs.	Nanoscale	Atomistic-Molecular Dynamics
Day 6	13 th July 2019	7 hrs.	Electronic scale	Density Functional Theory

Lectures: 27 hrs.

Tutorials: 8 hrs.

Quizzes: 5 hrs.

Total Contact Hours: 40 hrs.

Who can attend:

- Executives, engineers and researchers from Mechanical, Aerospace, Civil, and Metallurgy, Physics and Chemistry from service and government organizations including R&D laboratories.
- Students at all levels of MSc/MTech/PhD or Faculty from reputed academic institutions and technical institutions.

Fees:

Participants from Industry/ Research Organizations	16,000 INR*
Participants from Academic Institutions	12,000 INR*
International participants	400 USD*
Graduate Students (MSc/MTech/PhD)	1,000 INR*
Student Participants from IIT Hyderabad	No fee
Note: Registration fee is half for SC/ST students	

*The above fee includes computer use for tutorials and assignments, laboratory equipment usage charges, welcome kit (GST included). The participants will be provided with accommodation (sharing) on payment basis and as per the availability of Guest House. Additional fee of Rs. 3000 shall be paid for lunch and refreshments offered during the course. Instructional material (Book: Integrated Computational Materials Engineering (ICME) for Metals: Concepts and Case Studies 1st Edition, Editor Prof Mark Horstemeyer) is provided at an additional cost of MRP (~14000 INR).

Faculty

1. Prof. Mark Horstemeyer, Course Instructor

Prof. Mark Horstemeyer is currently the Dean of School of Engineering, at Liberty University. Prior to this, he served as a Giles distinguished chair professor (highest honor at the University) at center for advanced vehicular systems (one of the world’s premier automotive research centers), Mississippi state university. Before coming to academia, he worked as a staff scientist at the Sandia Laboratories for more than a decade. He made significant contributions to the field of Integrated Computational Materials Engineering (ICME) and safety testing in the automotive industry. Horstemeyer holds a PhD from the Georgia Institute of Technology, an MS from Ohio State University, and Bachelor of Science in Mechanical Engineering from West Virginia University. Prof. Horstemeyer has mentored over 176+ undergraduate students, graduate students, and post-doctoral researchers, supervising groundbreaking research. He published 10 books/monographs, 5 patents, 250+ Journal Articles, 44+ Technical reports, 130+ Referred Conference papers. He has received a host of awards and honors over the years of which the notable includes European Union Academy of Sciences, Fellows of ASME, ASM, SAE, AAAS, West Virginia University Distinguished Alumni Award, SURA Scientist of the Year, Sandia Award for Excellence, Honorary Professorship from Xihua University, Tuskegee Univ etc.,



2. Dr. Eswara Prasad Korimilli, Course Coordinator

Dr. Eswara Prasad is currently working as an Assistant Professor at the Department of Metallurgy Engineering and Materials Science, IIT Indore. He works in the broad research area of Mechanical Behavior of materials with a focus to understand the role of microstructure on the deformation response at different length and time scales. He earned his ME and PhD from Department of Materials Engineering, IISc Bangalore and Bachelors from the NIT Warangal. He has published about 20 articles in reputed international journals in the area of mechanical behavior of bulk metallic glasses, Mg and Mg alloys, Ti alloys and crystal plasticity of BCC metals.



3. Dr. Viswanath Chinthapenta, Course Coordinator

Dr. Viswanath Chinthapenta is Assistant Professor in Department of Mechanical and Aerospace Engineering, Indian Institute of Technology Hyderabad; His research interest is in multi scale modelling of Metal, Composites and Bio-materials. He did his PhD in solid mechanics from Brown University, Masters in Aerospace Engineering from IISc, Bangalore and Bachelors in Civil Engineering from MVSREC, Osmania University. He has published 10+ journal articles in reputed international journals in the areas of computational multi-scale mechanics.



Important dates:

Last date of Registration: May 31st, 2019

The course starts on: July 8th, 2019

Registration:

Pay registration by one of the two modes listed below:

1. Send Demand Draft taken in favor of 'IIT Hyderabad', payable at Hyderabad by May 31st to Course Coordinator.
2. Electronic Fund Transfer (Recommended): remittance using SWIFT code,
Name of the Bank: State Bank of India,
IIT Kandi: (Branch code: 14182), Hyderabad, India,
SWIFT Code: SBIN0014182,
Account No.: 30859878032. (Current A/c)
Send the Transaction detail softy copy/reference number to course coordinator by May 31st.

Note:

- Send the Name and Affiliation of the participant along with the payment details.
- Number of participants for the course will be limited to Forty (Subject to availability of GH)
- The last date to apply for the course is May 31st, 2019

Contact Details:

Dr. Eswara Prasad Korimilli, Course Coordinator

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Dr Viswanath Chinthapenta, Course Coordinator

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