

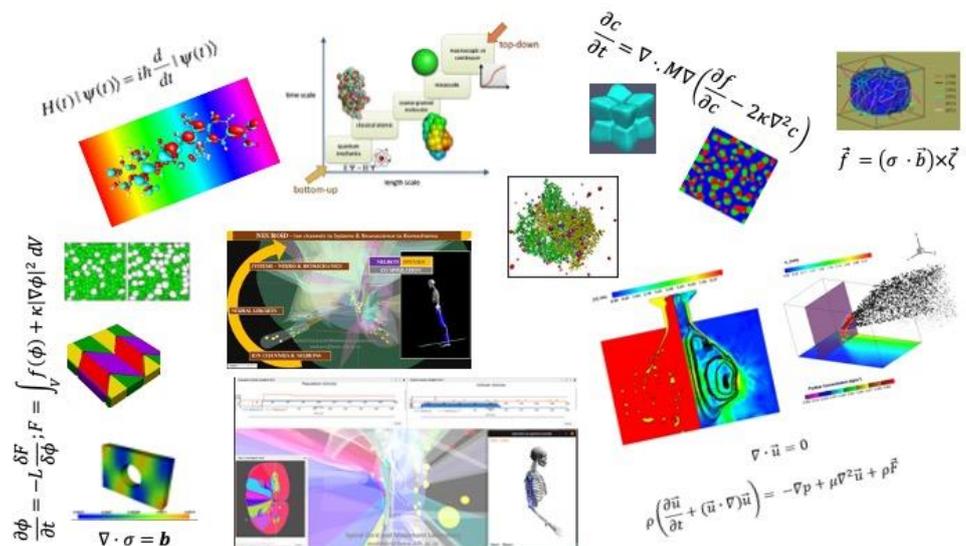
Interdisciplinary
M.Tech. Program

Integrated Computational Materials Engineering

*Learning by doing,
peer-to-peer teaching,
and computer
simulation are all part
of the same equation.*

Nicholas Negroponte

The Masters program in ICME @ IIT Hyderabad is a unique interdisciplinary program designed exclusively for professionals working in industries and research organizations. It is a 48 credit program that can be taken over a period of 4 years. Students are required to complete 24 credits of coursework in a self-defined pace within the first 3 years. Upon completion of coursework, students will do 24 credits of a Capstone Project in collaboration with the industry over a period of one year. If the student is not interested in 24 credits of capstone project, she/he can graduate with an Executive M.Tech. degree in ICME.



Aim and Scope

According to the Vision 2040 report by NASA, advances in high performance computing, high-throughput characterization of materials, integrated computational materials engineering approaches, and additive manufacturing have catalyzed modeling and simulation-based design of materials and systems. The report envisages “a cyber-physical-social ecosystem that impacts the supply chain to accelerate model-based concurrent design, development and deployment of materials and systems throughout the product lifecycle ...”. This course teaches the essential tools required to build such a cyber-physical

ecosystem and is particularly relevant when more industries are adopting Industry 4.0 and Smart Manufacturing.

The purpose of this course is to teach professionals from various industries an accelerated methodology to design materials, processes and advanced products by integrating models at various length scales with specific conditions set by the manufacturing industry. This course aims to teach principles of materials design, modeling tools at multiple length-scales and timescales and their applications in linking processing-structure-property-performance relations in materials to address issues related to product design and application.

Students will receive an interdisciplinary education where they gain expertise in various ICME techniques and tools, models at multiple length and time scales, high-performance computing, optimization, data analytics and machine learning for accelerated design of materials and processes.

The course will involve numerous examples and case studies, hands-on tutorials, computational thinking and problem-solving, and lectures from Industry experts.

Curriculum

The curriculum is designed to provide state-of-the-art knowledge of ICME with an emphasis on problem-solving and hands-on development and implementation of computational models and simulations for materials design. Some of the major courses are as follows:

- Principles of Materials Engineering
- Introduction to ICME Techniques and Tools
- Modelling and Simulations of Metallurgical Processes
- Machine Learning in Materials Science (data-driven modeling of process-structure-property-performance relations)
- Finite Element Modeling in Solid Mechanics
- Computational Thermodynamics and Kinetics of Materials
- Electronic Structure Methods for Materials Design
- Atomistic Simulations of Materials
- Mesoscale Microstructural Modeling (Phase-field modeling, Cellular Automata)
- Computational Micromechanics (Dislocation Dynamics, Crystal Plasticity)
- Materials Process Modeling (Applications of Computational Fluid Dynamics – Modeling of Casting, Forming and Joining Processes)
- Concurrent and Parallel Programming
- Information and Tools Integration for ICME (taught by Expert from Industry)

Course Mode

- There is no residential requirement at IIT Hyderabad. The courses will be offered in fully-online mode on Monday-Friday from 4 pm to 7 pm and on weekends from 9 AM – 7 PM. The time slots for each course would be sent to students beforehand so that they can accordingly decide their electives. Students will have access to recorded video lectures and tutorials through the entire duration of their coursework. All examinations will be based on analytical and problem-solving skills which will involve implementation of numerical models and algorithms and conceptualization of simulation strategies for materials and process design.
- Students can learn at their own pace and can complete the program in 4 years from the date of admission.
- The online M. Tech. program is equivalent, in all respects, to the regular M. Tech. programs offered by IIT Hyderabad.

Eligibility Criteria

1. This program is for working professionals working in public- and private-sector industries, R&D labs, and academic institutions with a minimum of two years of work experience.
2. Candidate should have a BTech/BE or equivalent degree or ME/MTech/MS or equivalent degree in Metallurgy/ Materials/ Mechanical/ Aerospace/ Production/ Ceramic Eng. or any other allied Engineering discipline and should have secured first-class in their bachelor's degree.
3. GATE score is not required.
4. Applicants are required to submit experience and no-objection certificates at the time of written test/interview.

Selection Process

1. Candidates must fill application online.
2. The selection will be based on the cut-off criteria set by the selection committee and online written test/interview.

The details of online application procedure along with fee structure is given in: <https://iith.ac.in/mtechadmissions/>

Course and thesis requirements

- Credit requirement: Candidates shall earn a total of 48 credits within 4 years from the date of admission into the program. Candidates shall complete the course credits (24 credits) within the first 3 years.

- Thesis work: Candidates shall complete the course work in full (24 credits) to start the thesis work. Thesis will have 24 credits, consists of two stages: a) Thesis Stage-I: 12 Credits and b) Thesis Stage-II: 12 Credits)).
- Exit option: After successful completion of the course work in full (24 credits), candidates may opt to leave the program and obtain an Executive MTech Degree.
- Candidates are required to carry out their dissertation work using the available facilities/infrastructure in their parent organizations. Every candidate is required to identify a guide from IITH and preferably a co-guide from his/her parent organization.

Fee Structure

Category	Fee Details
Non-government organizations	Rs. 25000/- per course credit Rs 12500/- per thesis credit Semester fee: Rs. 15000/- per semester
Government organizations, IITH alumni	Rs. 12500/- per course or per thesis credit Semester fee: Rs. 15000/- per semester