

TEACHING STATEMENT – JOBIN KOLLIYIL JOY

Teaching Philosophy

As a faculty member at Indian Institute of Technology Madras, my primary goal is to inspire and empower students to become critical thinkers, creative problem-solvers, and ethically grounded professionals. I believe that teaching extends beyond the transmission of knowledge—it involves creating an inclusive and dynamic learning environment where students are encouraged to explore, question, and actively engage with the material. Whether in the classroom or the laboratory, I see these spaces as transformative arenas where curiosity is nurtured, foundational concepts are mastered, and real-world applications are explored. As an educator tasked with training the next generation of engineers, scientists, entrepreneurs, and public servants, I see it as my responsibility to guide students through rigorous intellectual development while also fostering their personal growth. By emphasizing conceptual clarity, practical relevance, critical thinking, and ethical conduct, I aim to cultivate a passion for learning and innovation that students carry with them throughout their academic and professional journeys.

My teaching philosophy is grounded in the belief that effective engineering education should cultivate both deep conceptual understanding and practical problem-solving skills. I strive to create an inclusive, interactive learning environment where students are encouraged to think critically, ask questions, and connect theory to real-world applications. Whether teaching foundational courses like mechanics of materials or advanced topics such as computational micromechanics, I emphasize active learning through hands-on projects, simulations, and case studies that reflect contemporary challenges in materials and manufacturing. I view teaching as a collaborative process, where I act not only as an instructor but also as a mentor who guides students in developing their own scientific intuition and curiosity. By integrating research insights into the classroom, I aim to inspire students to see learning as a dynamic and lifelong pursuit—preparing them to contribute meaningfully to both industry and academia.

An effective teaching methodology blends conceptual instruction with interactive, application-driven experiences. Short quizzes are used alongside regular exams to reinforce learning and provide ongoing feedback. Class projects and coding assignments challenge students to apply theoretical principles to solve real-world problems, while hands-on experiments deepen understanding of material behavior and engineering mechanics. Incorporating research-oriented projects further encourages critical thinking, creativity, and independent exploration. This combination of methods helps students build both technical competence and confidence, preparing them for diverse challenges in academic and professional settings.

Teaching and Mentorship experience

Teaching and mentorship have been integral to my academic journey, shaped by hands-on learning and collaborative research from an early stage. As an undergraduate at IIT Madras, I led the thermal subsystem of the IITMSat Student Satellite Project, an ambitious, student-led initiative that demonstrated the transformative potential of experiential learning. My early research on contact mechanics, which resulted in a publication in *Tribology International*, underscored the value of involving undergraduate students in meaningful research. These experiences inspired my commitment to mentoring and integrating research into teaching. During my PhD, I mentored undergraduate students participating in Research Experiences for Undergraduates (REU) programs, helping them define and execute research goals while navigating new academic environments. I also worked as a part-time tutor for undergraduate students, further strengthening my ability to explain complex concepts in accessible and relatable ways. During my postdoctoral work, I contributed to two chapters in the book *Shape Memory Alloys – Materials, Modeling*

and Design, refining my ability to distill advanced topics into structured, instructional content. I also organized and taught a workshop on machine learning techniques for graduate students, providing hands-on exposure to interdisciplinary tools. These experiences have deepened my appreciation for teaching as a platform to empower students—not just to absorb knowledge, but to engage actively with it and grow as independent thinkers and future researchers.

Teaching Vision

My teaching interests lie in the areas of Solid Mechanics, Structural Mechanics, Micromechanics, and Computational Modeling with a strong emphasis on connecting these subjects to modern applications in advanced manufacturing and materials design. I am enthusiastic about teaching core undergraduate courses such as Mechanics of Materials, Numerical Methods, Optimization, and Finite Element Analysis, and I am equally committed to developing advanced graduate-level courses in topics like Micromechanics of Materials, Crystal Plasticity, Data-Driven Materials Modeling and Probabilistic Mechanics. A central component of my teaching approach involves incorporating hands-on, experiential learning through computational labs and project-based assignments that utilize tools such as finite element analysis (FEA), crystal plasticity modeling, and uncertainty quantification. These methods help students bridge theory and practice while building the technical fluency and critical thinking skills needed to address complex, interdisciplinary engineering challenges.

At IITM, I am excited to contribute to the Department of Applied Mechanics by fostering a strong integration of research and teaching. I aim to advance impactful research in solid mechanics, aerospace and energy application materials, particularly under extreme environments, while also prioritizing excellence in classroom instruction. I am deeply committed to student-centered teaching that not only builds strong theoretical foundations but also cultivates critical thinking and problem-solving skills. At IIT Madras, with its outstanding academic environment and tradition of excellence, I look forward to mentoring students across undergraduate and graduate levels, and to contributing to curriculum development that reflects the evolving needs of the mechanics, aerospace and nuclear reactor material applications.