

**Faculty:** Anil Saigal, Professor, Mechanical Engineering, School of Engineering

**Project Locations:** Mumbai, India and Medford, MA

**Dates:** early June – mid August

**Project Title:** Metal Matrix Composite Cladding via Directed Energy Deposition for Tailored Thermophysical Response

**Project Details:** Professor Anil Saigal in the Department of Mechanical Engineering has a long-standing collaboration with [Professor Ramesh Singh in the Department of Mechanical Engineering at Indian Institute of Technology Bombay \(IITB\)](#). Their project "Metal Matrix Composite Cladding via Directed Energy Deposition for Tailored Thermophysical Response" deals with the fabrication of metal matrix composite (MMC) coatings by reinforcing the metal matrix with different types and concentration of ceramic particles and characterizing the resulting microstructures. In addition, it is necessary to develop a theoretical model of thermal conductivity of the MMC coatings to be able to identify process parameters and concentration of ceramic particles that leads to the favorable combination of mechanical properties and thermal conductivity. Their work is funded by VAJRA Fellowship, Govt. of India (Anil Saigal) and Department of Science and Technology, Government of India (Ramesh Singh). Professor Saigal has spent more than 3 months at IITB in the past 3 years working on this project and will spend another month there in Summer 2023. To date, they have published three papers based on the work.

**Tasks and Responsibilities of Research Assistant:**

There are several analytical and theoretical models in the literature to determine the mechanical and thermal properties of composites. The student would be responsible for collaborating with the team to conduct a literature search and determine which of these models best fit the behavior of the materials investigated in our work. The team would assign well-defined problems to the student and mentor them closely. The team would regularly have meetings over Zoom for the 6 weeks that the student is at Tufts. When the student is in the India for 4 weeks, the meetings would be in person since Professor Anil Saigal will be residence at the same time. The student would be assigned a problem that they could take ownership of and extends beyond what he/she has done previously as part of courses or another research. Hopefully, in the long term, this could lead to a publication in collaboration with us. The student would develop and measure the thermal conductivity of the samples at IITB and develop the models at Tufts.

**Qualifications:**

The student must have taken relevant undergraduate courses in math, materials & manufacturing, and heat transfer.

**Description of Field Site:**

This is the famous monsoon season in Mumbai, which sees continuous rainfall, particularly in the months of July and August.

**Housing in India:**

The student will live in one of the two [Guest Houses](#) (with cleaning services and laundry machines) on the Indian Institute of Technology Bombay (IITB) campus. The single rooms are fully furnished and within walking distance of Department of Mechanical Engineering. The campus has several eating options including the guest house and dormitories.

