**MIN 300: Lab Based Project** (Spring 2024-25)

Department of Mechanical and Industrial Engineering, IIT Roorkee

**Project Title**: Prediction and validation of the mechanical behaviour of unidirectional composites through convolutional neural networks (CNN).

**Abstract (100-150 words):**

This study will propose a prediction model for the mechanical behavior composites using a convolutional neural network (CNN). Representative volume elements (RVEs) will be generated to simulate composite microstructures. Finite element (FE) simulations will be performed to evaluate stress-strain properties such as stiffness, strength, and toughness. The microstructural data will then be converted into binary images, which will be used to train the CNN to predict the mechanical behavior of composites. The proposed model aims to achieve high accuracy in linking microstructural features to mechanical performance, significantly reducing the time and computational cost associated with traditional FE-based evaluations. Once developed, this model is expected to serve as a powerful tool for optimizing composite material design to meet specific performance requirements efficiently.

**Group Details**:

| S. No. | Name | Branch  ME/PI | Enroll. No | Mob. No. |
| --- | --- | --- | --- | --- |
| 1 | Debabrata Chandra | ME | 22113042 | 9818545003 |
| 2 | Chirag Rathee | ME | 22113040 | 9034507668 |
| 3 | Munnaluru Ruthika | ME | 22117089 | 7075691268 |
| 4 | Riya Jindal | ME | 22117119 | 7719653405 |
| 5 | Yukta Agrawal | ME | 22117151 | 6290870995 |

**Project Area (Design/P&I/Thermal): Design**

**Name of the Supervisor: Professor Indra Vir Singh**