

Proposal for announcing seat under the Institute Internship Program

(separate form to be filled for seat under Institute funding and project funding)

1. Name of faculty member proposing: **Prof. Rajendra Kumar Goyal**
2. Department/Centre: **Department of Metallurgical and Materials Engineering**
3. Topic on which work is proposed:

Additive Manufacturing (3 D Printing) of Polymer Matrix Nanocomposites

4. Preferred period of internship (after May 20th): **Between 25th May 2024 to 20th July 2024**
5. Qualification of student (branch/semester of study): **2nd or 3rd year of B.E. (any discipline) or 1st or 2nd year of M.Sc. (Physics, Materials Science, Nanotechnology etc.)**
6. Brief description of work (300-500 words):

Owing to rapid manufacturing of complex structures, additive manufacturing (or 3D printing) industry has grown over compound annual growth rate of 25 % per year in the last one decade and its global market is projected to reach USD 61.1 billion by 2027. Therefore, the proposed project involves blending of short carbon fiber (SCF), carbon nanotubes, and/or graphene nanoplatelets (GNP) into high performance polymer using twin screw extruder which will results filament of the desired diameter. The resultant filament will be used as feeding material for 3 D printing. Thereafter, 3D Printing of the prototype product will be carry out. This process will involve optimization of several parameters. Moreover, thermal, mechanical, and electrical properties of the printed product will be studied using TGA/DSC/dilatometer, dynamic mechanical analyser, two-probe conductivity meter etc. Moreover, microstructure of the nanocomposites will be studied using optical microscope (OM)/scanning electron microscope (SEM).

7. Expected learning of student (upto 100 words):

Students are expected to learn following;

- Understanding about the type of nanomaterials, nanocomposites, fillers, 3D printing, etc.
- Selection of reinforcement and polymer matrices
- 3 D Printing of high-performance polymer and their nanocomposites
- Characterisation of polymer matrix nanocomposites by XRD, SEM, UTM, electrometer, DMA, digital multi-meter, vector network analyser etc.
- Microstructures of the filament and 3 D printed products
- Interpretation of the results and discussion.

8. Nature of work: (Experimental/simulation/mathematical modelling/data collection-analysis etc.): upto 50 words

The internship project involves experimental work on twin screw extruder and 3D printer (more than 15 experiments each), preparation of samples for all the testing and characterisation, interpretation of the results and their discussion.

9. If the seat is under project sponsored category: **No**
- If yes, number of seats announced:
 - Name and ID no. of project from which stipend is chargeable



Signature of faculty member

Name of department/Centre

Note:

- Proposing faculty member needs to be available at the Institute during the period internship is offered
- No extra space or funding than the stipend will be provided by the institute for this purpose