

I-STEM Software Request - Guide Approval Form

User Details

- **Name of Researcher:** DR. RANJAN KUMAR MISHRA
- **User Type:** ☐ Ph.D. Scholar ☒ Postdoctoral Researcher ☐ Bachelor's ☐ Masters
- **Institution Name** : _MAHINDRA UNIVERSITY, HYDERABAD_
- **Institutional Contact No:** __040-67135100
- **Research Topic:** *Development of precast concrete using Nano-enabled self-sensing cementitious composites and embedded piezo sensors.*

Software Request Details

- **Software Name:** _COMSOL Multiphysics
- **Justification for Software Request:** [Provide detailed explanation of how the software supports your research objectives]

This software allows **multi-physics coupling** when dealing with smart materials like rGO-concrete that exhibit **electrical + mechanical + possibly thermal behaviour**. COMSOL Multiphysics provides a powerful platform to support the research objective of structural health monitoring (SHM) in reduced graphene oxide (rGO) mixed concrete by enabling integrated multiphysics modeling of mechanical and electrical behaviors. In rGO-based concrete, mechanical deformation or damage such as strain and cracking leads to changes in electrical conductivity due to Piezoresistivity, which forms the basis of self-sensing capability. COMSOL allows simultaneous simulation of structural response (stress, strain, and damage evolution) and electrical response (current flow, resistance, and impedance), thereby establishing a direct relationship between structural integrity and measurable electrical signals. Additionally, the software supports user-defined material models, enabling incorporation of nonlinear conductivity behavior governed by Percolation Theory, which is critical for accurately representing rGO dispersion in concrete. Through this coupled analysis, COMSOL facilitates prediction of damage-induced electrical variations, optimization of sensor configurations, and validation of SHM strategies, making it an essential tool for developing and analyzing smart, self-sensing concrete systems.

Guide/Supervisor Approval

I, _PROF. (DR.) VISALAKSHI TALAKOKULA

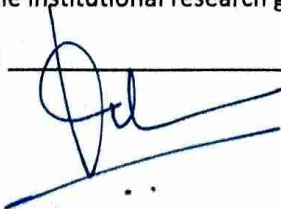
(Guide/Supervisor Name),

- Confirm that the above-mentioned researcher is affiliated with our institution
- Have reviewed the software request and its relevance to the researcher's academic work
- Approve the software request for research purposes

Approval Confirmation

- I approve the software request
- The software aligns with the researcher's research objectives
- The request meets the institutional research guidelines

Guide/Supervisor Signature: _____





Date: 16/04/2026

Official Stamp/Seal: [Space for Institutional Stamp]

Important Notes

1. This form must be signed and scanned
2. The scanned copy must be uploaded with the software request
3. Electronic signatures are acceptable if from an official institutional email

