

I-STEM Software Request - Guide Approval Form

User Details

- Name of Researcher: JATOTH VARUN
- User Type: ☒ Ph.D. Scholar ☐ Postdoctoral Researcher ☐ Bachelor's ☐ Masters
- Institution Name: National Institute of Technology (NIT), Warangal.
- Institutional Contact No: 95533 81077
- Research Topic: Design and development of silicone rubber composites for transformer bushing applications.

Software Request Details

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

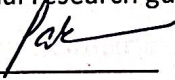
Guide/Supervisor Approval

I, Dr. Palash Mishra (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: 7/7/2026

Official Stamp/Seal: [Space for Institutional Stamp]

Assistant Professor
Dept. of Electrical Engineering
National Institute of Technology Warangal
Hanumakonda, 506 004 (T.S.), India

Important Notes

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

I-STEM Software Request - Justification

Name of Researcher: **Jatoth Varun (22EER2R04)**

Department: **Electrical Engineering (EE)**

Institution: **National Institute of Technology (NIT), Warangal**

Supervisor: **Dr. Palash Mishra, Assistant Professor, Electrical Engineering Department, National Institute of Technology (NIT), Warangal**

Research Topic

Design and Development of Silicone Rubber Composites for Transformer Bushing Applications

Detailed Justification

COMSOL Multiphysics is required for my research to design and perform advanced numerical simulations of room temperature vulcanized (RTV) silicone rubber composites developed for high-voltage transformer bushing and DC current transformer (DC CT) applications. My research mainly focuses on evaluating the performance and ageing behaviour of RTV silicone rubber under combined electrical, thermal, mechanical and chemical stresses such as transformer natural ester and mineral oil and ammonium chloride environments.

The software enables Multiphysics coupling, which is essential to study electric field distribution, field grading, designing the insulators, modeling, thermal gradients, leakage current behaviour, and chemical/moisture diffusion within insulation systems. In addition, COMSOL will be used to model direct current (DC) electric field stress in DC CT insulation systems, including space charge effects and field grading techniques, which are critical for reliable operation. It will also support analysis of tracking and erosion characteristics and the influence of micro/nano fillers such as boron nitride (BN), low melting glass (LMG), aluminum tri-hydrate (ATH), and silica (SiO_2) on insulation performance. Further, the simulation results will be correlated with experimental studies such as thermogravimetric analysis (TGA), Fourier transform infrared spectroscopy (FTIR), shore A hardness test, surface potential test and inclined plane tracking and erosion (IPT) tests. This integrated approach will help in designing improved insulation materials for transformer bushings and DC CTs under real operating conditions. Therefore, COMSOL Multiphysics is essential for achieving the objectives of my research work.

Moreover, COMSOL Multiphysics will be utilized to optimize insulation design parameters, including geometry, material composition, and field control techniques, to enhance dielectric performance and reliability. The software also enables parametric and sensitivity analysis, which is essential for understanding the influence of different filler concentrations and operating conditions on insulation behavior. This will support the development of advanced, durable, and application-specific insulation systems suitable for next-generation high-voltage and high voltage direct current (HVDC) power equipment.

 07/04/26.