

I-STEM Software Request - Guide Approval Form

User Details

- **Name of Researcher:** Dr. Manjodh Kaur
- **User Type:** ☒ Faculty ☐ Ph.D. Scholar ☐ Postdoctoral Researcher ☐ Bachelor's ☐ Masters
- **Institution Name:** Dayananda Sagar University, Bengaluru
- **Institutional Contact No:** +916360377248
- **Research Topic:** Development of AI-Driven Digital Twin Models for PEM Water Electrolyzers for Performance Prediction, Optimization, and Sustainable Hydrogen Production

Software Request Details

- **Software Name:** COMSOL Multiphysics
- **Justification for Software Request:** : The requested software, COMSOL Multiphysics, is crucial for developing a physics-informed digital twin framework for Proton Exchange Membrane (PEM) electrolyzers. The research aims to combine multiphysics modeling with data-driven and machine learning methods to enable real-time prediction, optimization, and control of hydrogen production systems. Specifically, the Fuel Cell & Electrolyzer Module will simulate electrochemical reactions and membrane transport processes, while the CFD and Heat Transfer modules will model fluid flow, species transport, and thermal effects within the electrolyzer. The Chemical Reaction Engineering module will support reaction kinetics modeling, and the Optimization module will assist with parameter estimation and system optimization. Additionally, the Porous Media Flow Module is essential for accurately modeling transport phenomena within the membrane and porous electrodes of PEM electrolyzers. The simulation data generated will be used to train and validate AI models for predictive analysis. Therefore, the software is essential for achieving the research goals, especially in connecting first-principles modeling with AI-driven methods for next-generation sustainable hydrogen energy systems.

Guide/Supervisor Approval

I, **Dr. Manjodh Kaur** (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 (From Head of the Department (HOD))

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

HOD Signature: Dr. Venkataramanan N S 7/4/26

Dr. Venkataramanan N S, Head of the Department, Department of Chemistry, School of Engineering, Dayananda Sagar University, Harohalli, Bengaluru, Karnataka 562112.

Date: April 7, 2026

Official Stamp/Seal:

CHAIRPERSON
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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