

I-STEM Software Request - Guide Approval Form

User Details

- Name of Researcher: THARUN KRISHNA R.K
- User Type: ☐ Ph.D. Scholar ☐ Postdoctoral Researcher ☐ Bachelor's ☒ Masters
- Institution Name: GOVERNMENT COLLEGE OF TECHNOLOGY
- Institutional Contact No: 0422 2432221
- Research Topic: ANALYSIS OF THE PERFORMANCE OF PEM FUEL CELL -
-USING COMSOL.

Software Request Details

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

Guide/Supervisor Approval

I, Dr. K. RAMESH (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: 03/03/2025

Official Stamp/Seal: [Space for Institutional Stamp]

Dr. K. Ramesh, M.E., Ph.D.,
Professor and Head
Dept. of Mechanical Engineering
Govt. College of Technology
Coimbatore - 641 013.

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

JUSTIFICATION

The research focuses on enhancing the efficiency and durability of Proton Exchange Membrane (PEM) fuel cells by systematically optimizing various critical parameters. This includes refining flow channel designs to improve reactant distribution, selecting advanced materials such as magnesium oxide (MgO) and titanium dioxide (TiO₂) for better conductivity and stability, and modifying catalyst layers to enhance electrochemical reactions.

A major challenge in fuel cell research is the high cost associated with experimentation. Conducting physical experiments requires expensive materials, instrumentation, and labor, significantly increasing research expenditure. Additionally, the cost of purchasing commercial catalysts, membranes, and other essential components further adds to the financial burden, limiting the feasibility of extensive trial-and-error approaches.

To overcome these challenges, employed COMSOL Multiphysics, a cutting-edge simulation tool that allows for a detailed analysis of the complex interactions occurring within the fuel cell. By leveraging computational modeling, that can predict performance outcomes, optimize designs, and significantly reduce the dependency on expensive experimental trials, thereby making the research process more efficient and cost-effective.

The research aligns with the broader goals of developing cost-effective, high-performance PEM fuel cells by minimizing material costs, reducing the need for excessive experimentation, and optimizing design parameters through simulations. With adequate financial and institutional support, the work has the potential to contribute to the advancement of sustainable energy technologies, paving the way for more efficient fuel cells in electric vehicles, renewable energy storage, and stationary power applications.


3/3/25
Project Supervisor/Guide
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