

I-STEM Software Request - Guide Approval Form

User Details

- Name of Researcher: D. Sarath Kumar
- User Type: ☒ Ph.D. Scholar ☐ Postdoctoral Researcher ☐ Bachelor's ☐ Masters
- Institution Name : National Institute of Technology, Karnataka.
- Institutional Contact No: 0824 247 4000
- Research Topic: Thermosensitive injectable hydrogel.

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. Pavan Girish Pandit (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

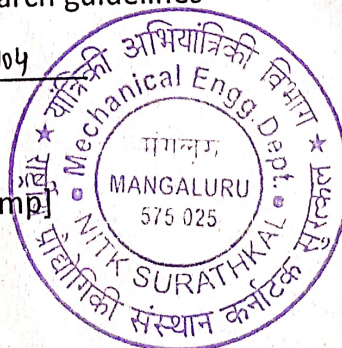
Guide/Supervisor Signature: _____

Date: 10.04.2026

Official Stamp/Seal: [Space for Institutional Stamp]

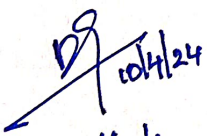
Important Notes

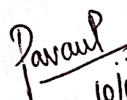
1. This form must be signed and scanned
2. The scanned copy must be uploaded with the software request
3. Electronic signatures are acceptable if from an official institutional email



Justification for Software Request

COMSOL Multiphysics plays a crucial role in achieving the research objectives of this work by enabling detailed simulation of complex, coupled physical phenomena in chitosan- β -glycerophosphate hydrogels. It allows the modelling of non-Newtonian fluid behaviour, which is essential for understanding injectability and shear-thinning properties during syringe extrusion. The software helps predict temperature-dependent sol-gel transition under physiological conditions, supporting the study of thermo-responsive gelation. It also enables analysis of mass transport, particularly drug diffusion and controlled release from the hydrogel matrix. In addition, COMSOL provides insights into the mechanical stability and deformation behaviour of the hydrogel under applied stress. By integrating multiple physics such as fluid flow, heat transfer, and diffusion within a single platform, it closely mimics real biological environments. The simulation capability reduces the need for extensive experimental trials by allowing virtual optimization of formulation parameters like chitosan concentration and β -GP content. It generates detailed spatial and temporal profiles that are difficult to capture experimentally. Furthermore, COMSOL improves the accuracy and reliability of research findings through predictive modelling. The visual outputs, such as contour plots and flow profiles, enhance data interpretation and presentation. It supports hypothesis validation by correlating simulation results with experimental data. The software also aids in understanding internal mechanisms governing hydrogel behaviour. This leads to better design and performance optimization of injectable systems. Overall, it strengthens the scientific quality of the research by providing both mechanistic insight and quantitative validation. Consequently, the use of COMSOL significantly enhances the potential for high-impact and publishable research outcomes.


(Dr. Sarath Kumar)
C257ME005 Research
scholar.


10/04/26.
(Dr. Pavan G. Pandit)
Research guide.

