INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

The main objective of this thesis is to study a priori error analysis of finite element Galerkin methods for some interface problems arising in biological media. Interface problems are often referred to as differential equations with discontinuous coefficients. The discontinuity of the physical coefficients is due to the presence of different material properties across the interface. In biological system it is natural to have heterogeneity in the underlying medium as properties of biological media vary between different layers. Due to the presence of discontinuous coefficients across the interface, interface problems usually lead to non-smooth solutions. Owing to its mathematical complexity and low regularity of its solutions, the study of interface problems has remained a major part of the mathematical study up to the present day. In this thesis we attempt to study the a priori error analysis of some of the interface problems arising in biological media using fitted finite element method.

A fitted finite element method with straight interface triangles is proposed to approximate the actual solution of general linear second order hyperbolic equation with discontinuous coefficients. As a model, we consider pulsed electric field model, non-Fourier bio heat model and dual-phase-lag (DPL) bio heat model problems in non-homogeneous media.

The new results and finite element schemes can be applied to solve a wide variety of physical models in the fields of engineering, medicine and biotechnology with non-homogeneous inner structures.