Basics and application of phase-field modeling in materials science

Overview

Phase-field modeling has become a potent method for getting insights into aspects of pattern-formation (micro-structural evolution) during materials processing. Over the past three decades it has been utilized for investigating reactions like solidification, precipitation, grain-growth, electrochemical reactions, spinodal decomposition, deformation induced phase transformations, ferro-electric and ferro-magnetic domain formation. The method has also got wider applicability in problems having complicated geometrical morphological evolution such as failure processes involving fracture and corrosion.

In this course, a series of lectures is planned which detail the historical evolution of the method with emphasis on the thermodynamic fundamentals behind the formulation of the different phase-field models. During the course, the participants will not only get a thorough understanding of the model formulation, but also hands-on experience on the computational implementation of the models and interpretation of the results. The aim is to reach a state of understanding among the participants wherein, they would be able to appreciate future developments of the method, as well as develop phase-field modeling solutions for their own problems that they encounter during their research. The developed lecture and tutorial series, will also be utilized for future demonstrations during regular lecture courses in the department and also academic sessions elsewhere.

Dates for the Course	**5 th December, 2016 to 9th December, 2016**
Host Institute	**Indian Institute of Science**
No. of Credits	**1**
Maximum No. of Participants	**40 (Max. 25 students)**
You Should Attend If…	▪ You are a PG student studying physics, maths, metallurgy, materials science, mechanical, chemical, civil engineering and interested to know and learn about the phase-field method and its applications

- You are an engineer in the industry that is interested in the application of the phase-field method in their research and development
- You are a scientist in an Government R&D laboratory or institution and use phase-field modeling or are interested to learn about it
- You are a research scholar or faculty in an academic institution and want to explore the phase-field method

Course Registration Fees

The participation fees for taking the course is as follows:

Student : Rs.1000

Faculty : Rs.5000

Government R&D Organization, institutions and labs: Rs.5000

Engineers from Industry: Rs.10000 (Possibility of bulk participation of 5 participants for an industry sponsorship of the event)

The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges.

Mode of payment: Demand draft in favor of "Registrar, Indian Institute of Science" payable at Bangalore

The demand draft is to be sent to the Course Coordinator at the address given below.

Accommodation

The participants may be provided with accommodation, depending on the availability, on payment basis.

Course Faculty

Prof. Dr. Mathis Plapp is the Director of the Condensed Matter Physics (PMC) group in Ecole Polytechnique, Paris. He is interested in the spontaneous emergence of complex structures during growth far from equilibrium. Some of his principal fields of interests include, phase-separation, pattern formation during dendritic solidification as well as self-organizing structural formation such as eutectic solidification, dendritic aggregate formation during electrochemical deposition, spiral growth during molecular beam epitaxy etc. The goal of his research lies in investigation of pattern-formation in simple systems and thereby gain an understanding of the control mechanisms in processing techniques for the development of newer materials and processes.

Dr. Abhik Choudhury(course co-ordinator) is an Assistant Professor in the Department of Materials Engineering, Indian Institute of Science. He works on the phase-field modeling of varied materials phenomena ranging from solidification, electro-chemistry and solid-state phase transformations.

Address: Room no. 112 A, Department of Materials Engineering, Indian Institute of Science, Bangalore 560012. *email: abhiknc@materials.iisc.ernet.in*