Rolls-Royce Strategic Partnership

DTC in High-Performance Structural Metallics

UNIVERSITY OF CAMBRIDGE

Course Title:	*Phase-field modelling of solidification*

CONTACT INFORMATION	
Course Leader	*Laszlo Granasy/Tamas Pusztai/Gyula I Toth*
COURSE DETAILS	
Level	*Masters*
Pre-requistites	*None*
Linked courses	*None*
Credits	*10 (for Swansea and Birmingham)*
Total student effort	*100 h approx*
Delivery	*Preliminary reading and computational exercises*
Assessment method(s)	*Written exercise after delivery*
Resources needed	*Matlab (or Octave) software*
Texts	*Granasy, Pusztai & Borzsonyi: Chap. 11 in Handbook of Theoretical and Computational Nanotechnology, Vol. 9.*

Course Description: ~150 Words

Briefly describe areas covered indicating depth of coverage

The aim of this course is to give a broad knowledge on various phase-field techniques (including coarse-grained Cahn-Hilliard/Landau type models and atomistic approaches), their application to crystalline solidification, their virtues and limitations. Emphasis will be put on understanding the general principles, a basic understanding of the relevant numerical methods, and techniques required in quantitative phase-field modelling. Selected applications will be discussed including the modelling of dendrites, eutectic patterns, and polycrystalline solidification. Teaching will be by theoretical lectures in the mornings and supervised exercises in the afternoons. The latter will include the use of Matlab codes distributed on CDs and adapting them for specific problems, such as dendritic and eutectic solidification, homogeneous and heterogeneous nucleation, and growth in channels.

Learning Outcomes: Max 50 words

On completion the student should be able to:

- Understand the main principles and various realizations of the phase-field method, their virtues and limitations.
- Understand the relevant numerical methods and their limitations.
- Develop simple phase-field codes for dendritic and eutectic growth, and crystallization in the presence of walls.