



## INTERNSHIP PROGRAM FOR INTERNATIONAL STUDENTS

### INTERNSHIP SUBJECT FORM

Name of the Host Laboratory	Laboratoire de physique de la matière condensée (Condensed matter physics, PMC)
Website of the Host Laboratory	pmc.polytechnique.fr
Research Group	Physics of irregular systems
Internship Supervisor	Mathis Plapp
Internship Subject	Phase-field simulations of crystal growth and solidification
Student's level	<input checked="" type="checkbox"/> Advanced Undergraduate Students (3 <sup>rd</sup> or 4 <sup>th</sup> year) <input checked="" type="checkbox"/> Master's students (1 <sup>st</sup> or 2 <sup>nd</sup> year) <input checked="" type="checkbox"/> PhD students
Proposed Duration	<input checked="" type="checkbox"/> 3 months <input checked="" type="checkbox"/> 4 months <input checked="" type="checkbox"/> 5 months <input checked="" type="checkbox"/> 6 months
Prerequisites	Knowledge in at least one of the following areas: statistical physics (phase transitions), solidification (materials science, thermodynamics), partial differential equations, computer simulations.
Internship description (max. 15 lines)	The solidification of alloys can produce a huge variety of complex microstructures, such as dendrites (tree-like structures, similar to snowflakes), lamellar or fibrous composites, or polycrystalline grain structures. The phase-field method has emerged in recent years as a comprehensive tool for the modelling and simulation of such structures. This method uses phenomenological equations of out-of-equilibrium thermodynamics, a system of coupled nonlinear partial differential equations that can be integrated in time using standard numerical methods. In this internship, the student will learn the fundamentals of this method and use or modify existing codes to explore aspects of pattern formation in solidification or fluid mechanics.