



<b>Course Title:</b>	Nanostructured Steels
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CONTACT INFORMATION	
Course Leader	<i>Pedro Rivera</i>
COURSE DETAILS	
Level	<i>Masters</i>
Pre-requisites	<i>None</i>
Linked courses	<i>None</i>
Credits	<i>10 (for Swansea and Birmingham)</i>
Total student effort	<i>100 h approx</i>
Delivery	<i>Preliminary reading, interactive lectures and classes</i>
Assessment method(s)	<i>Written exercises during and after delivery</i>
Resources needed	<i>Thermocalc software</i>
Texts	<i>Collected papers and reviews to be supplied during the course.</i>

**Course Description:** ~150 Words

Briefly describe areas covered indicating depth of coverage

This course provides an introduction to the latest developments in nanostructured steels; it will focus on the next topics:

- Definition of a nanostructured alloy.
- Stable and metastable nanoprecipitation strengthened alloys.
- Nanobainitic, nanograined and nanotwinned steels.
- Need for new experimental approaches and modelling techniques.
- Trends and future developments.

A wide range of nanostructures is available for ferrous alloys. When the surface to volume ratio of the nanostructure increases, interesting interactions between defects in the crystal structure such as dislocations, vacancies and interstitial atoms occur. These allow for the combination of extraordinary properties, such as tensile strength and ductility exceeding 2.5 GPa and 10%. However, phase stability and low cost heat treatments become a challenge, especially for high temperature applications. Strong emphasis is placed on developing computational skills aiding in conceiving the new emerging families of nanostructured steels.

**Learning Outcomes:** Max 50 words

The student will become familiar with the different structures present at the nanometre scale in steels, the processing routes required to obtain them, their advantages and disadvantages.

Developing the necessary understanding and skills for designing new alloy grades using computational tools.