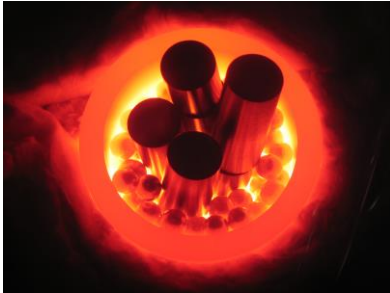


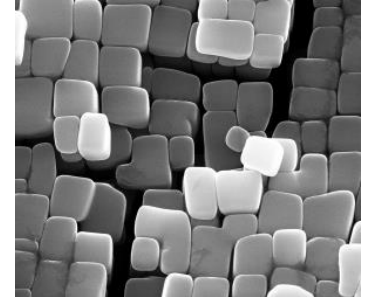
## LECTURE ANNOUNCEMENT SS 2015

### Theoretical Analysis of Engineering Materials Challenges (TAEMC)



**Prof. Dr.-Ing. Gunther Eggeler**

**Tuesdays, 13:00 – 16:00 h  
Room IC 04/408**



The course “Theoretical Analysis of Engineering Materials Challenges” builds on basic materials science knowledge and introduces into the area of solid state phase transformations and advanced topics of mechanical behaviour. We discuss the formation of microstructures in a few important systems (including nickel-based superalloys, aluminium alloys and steels). The course will discuss a number of important concepts (the order of transformations, Landau theory and molecular dynamic simulations). We will also discuss microstructure sensitive mechanical properties like creep of Ni-base superalloys and fracture mechanics and fatigue of shape memory alloys.

- |      |                 |                                                                                                                                                                             |
|------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1)  | 14. April 2015: | Introduction, elastic strain energy, phase transformations in pure metals, precipitation vs. spinodal decomposition                                                         |
|      | 21. April 2015: | No Lecture                                                                                                                                                                  |
| (2)  | 28. April 2015: | Particle strengthening in superalloys and light metal, Formation of pearlite I                                                                                              |
| (3)  | 05. May 2015:   | Formation of pearlite II                                                                                                                                                    |
|      | 12. May 2015:   | No Lecture                                                                                                                                                                  |
| (4)  | 19. May 2015:   | The martensitic transformation – from hardening of steels to shape memory alloys with Landau theory and a brief outline of molecular dynamic simulations (“MD”-simulations) |
| (5)  | 26. May 2015:   | First exercise                                                                                                                                                              |
|      | 02. June 2015:  | No Lecture                                                                                                                                                                  |
| (6)  | 09. June 2015:  | The bainitic transformation, order/disorder transformations, classification of phase transformations                                                                        |
| (7)  | 16. June 2015:  | The evolution of microstructure during high temperature exposure                                                                                                            |
| (8)  | 23. June 2015:  | Elementary softening & deformation processes during creep of single crystal superalloys                                                                                     |
| (9)  | 30. June 2015:  | Second exercise                                                                                                                                                             |
| (10) | 07. July 2015:  | Mechanical properties of shape memory alloys I – Fracture mechanics & structural fatigue <u>AND</u> Mechanical properties of shape memory alloys II – Functional fatigue    |
| (11) | 14. July 2015:  | Third exercise                                                                                                                                                              |

Lectures will be given by Prof. G. Eggeler ([gunther.eggeler@rub.de](mailto:gunther.eggeler@rub.de)). Exercises will be held and teaching assistance will be provided by Hannah Sommer (IC 04-307, [hannah.sommer@rub.de](mailto:hannah.sommer@rub.de)).