TH Aschaffenburg
university of applied sciences

# Introduction to Materials Science and Engineering

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| Course number: | 4831 |
| Hours per week: | 2 |
| ECTS: | 2 |
| Scheduled: | Winter Semester |
| Format: | Lecture / lab course (experiments) |
| Examination: | Oral exam (30 minutes) |
| Lecturer: | Prof. Dr Simon Pauly |
| Objectives: | The students become acquainted with the fundamental concepts regarding the different classes of materials, such as polymers, ceramics and metals. Moreover, the students get an overview of a variety of processing techniques used in industry. Ultimately, the students develop an understanding for the intricate interrelations between processing, (micro)structure across various length scales and materials properties. This expertise shall enable the students to better assess materials behaviour and to identify the proper materials for a given application. |
| Contents: | ▪ Brief history of materials<br>▪ Classes of materials and concepts of materials selection<br>▪ Atoms and chemical bonds<br>▪ Structure of solid matter (crystal structures)<br>▪ Functional and mechanical properties in materials<br>▪ Phase diagrams<br>▪ Transport phenomena in materials<br>▪ Processing routes and processing technologies for materials<br>▪ Sustainability aspects related to materials selection and processing<br>▪ Structure-property relationships in materials<br>▪ Selected applications of materials |
| Pre-requisites | Ideally: basic knowledge in natural sciences (Physics, Chemistry etc.) |
| Recommended Reading: | ▪ W.D. Callister, Materials Science and Engineering (Wiley)<br>▪ W.F. Hosford, Elementary Materials Science (ASM Intl.)<br>▪ D.R. Askeland, The Science and Engineering of Materials (Cengage)<br>▪ J.F. Shackelford, Introduction to Materials Science for engineers (Pearson)<br>▪ M.F. Ashby, Materials (Butterworth-Heinemann)<br>▪ R.J.D. Tilley, Understanding solids, the science of materials (Wiley)<br>▪ S. Kalpakjian, Manufacturing Engineering and Technology (Pearson) |