

# 1. Introduction

## 1.1 Scope of the Course

### 1.1.1 Goals and Contents

- This course tries to do something next to impossible: Give a review of all important or interesting semiconductor materials, products and technologies, *excluding only Silicon* as far as it is used for microelectronics! Moreover, the course aspires to go into some detail with respect to the fundamental material properties of semiconductors, i.e. it requires a heavy dose of semiconductor physics.
- The course is intended for Materials Science and Engineering students pursuing a Master's degree. A number of problems come to mind:
  - One term is surely not sufficient to cover this field adequately. We will therefore focus on whatever seems most interesting for the last third of the course (and then, maybe, finish the still open chapters).
  - All semiconductor physics text books above a very basic level invariably assume that the reader is thoroughly familiar with quantum theory and at least some solid state physics and thermodynamics. This is not true for the average Materials Science and Engineering student with a Bachelor degree. We will try to cope as best as we can.
  - There is no book (as far as I can tell after searching around for a while) that comes even close to what is intended here, so you must be content with this script.
- Fortunately, there are some helpful circumstances, too:
  - By the time they take this course, *all* materials science students should be well acquainted with **Si** technology as far as it relates to microelectronics, with solid state physics in general, and with classical thermodynamics.
  - Some, if not most, also took the electives "Quantum theory" and "Statistical Thermodynamics" - that will help.
  - Moreover, all Materials Science Bachelors in Kiel had a heavy dose of basic semiconductor physics and devices in their 4th semester where they had to take "[Introduction to Materials Science II](#)".
- What will be the content? Who knows before actually doing it? What will be attempted can be seen in the [link](#), which gives a reasonably detailed outline of the intentions.
  - What will be really presented will depend on how fast we will be able to move and on the questions and problems coming while teaching the course.
- All things considered, the general background should be sufficient to understand the basic concepts and to translate that understanding to an appreciation of general semiconductor physics, products and technology. In summary:

**Let's go!**