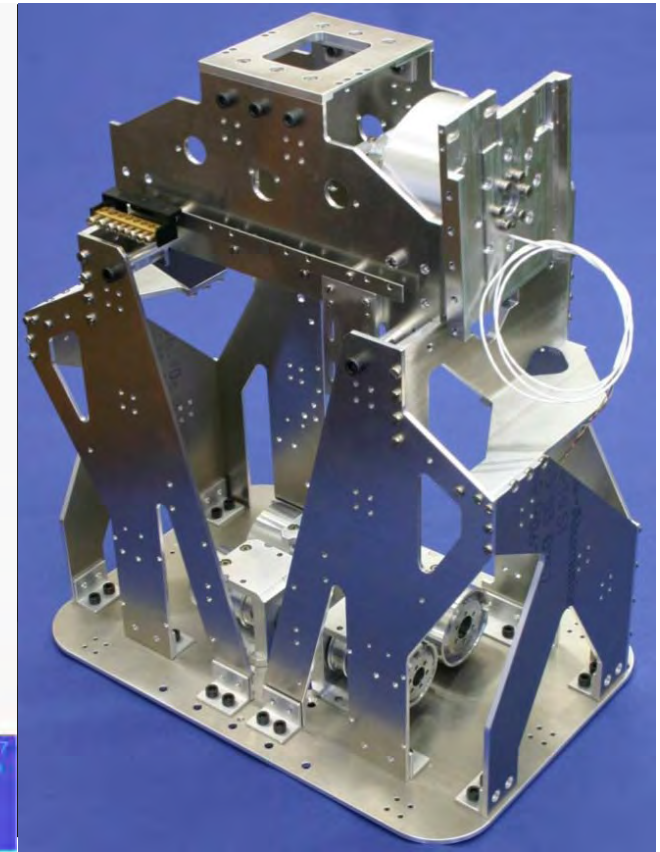
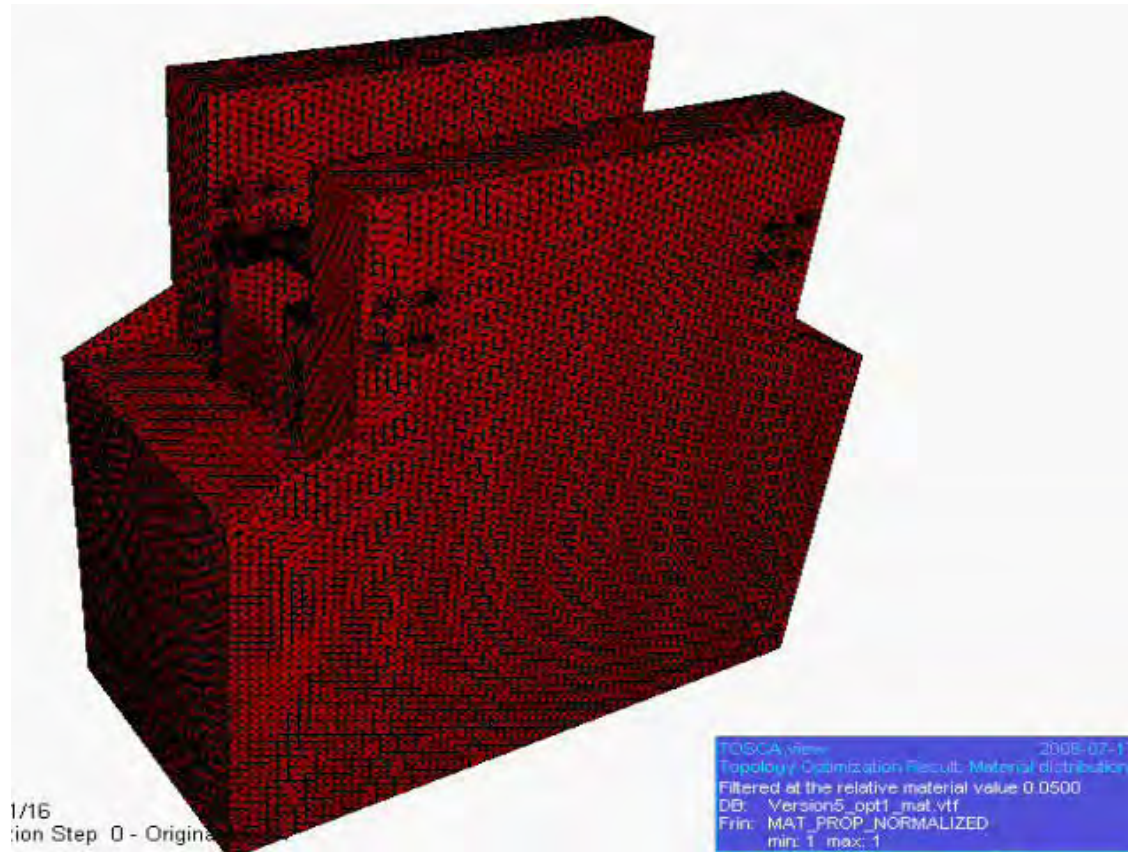


Example Optimization Methods

Development of a Humanoid Robot

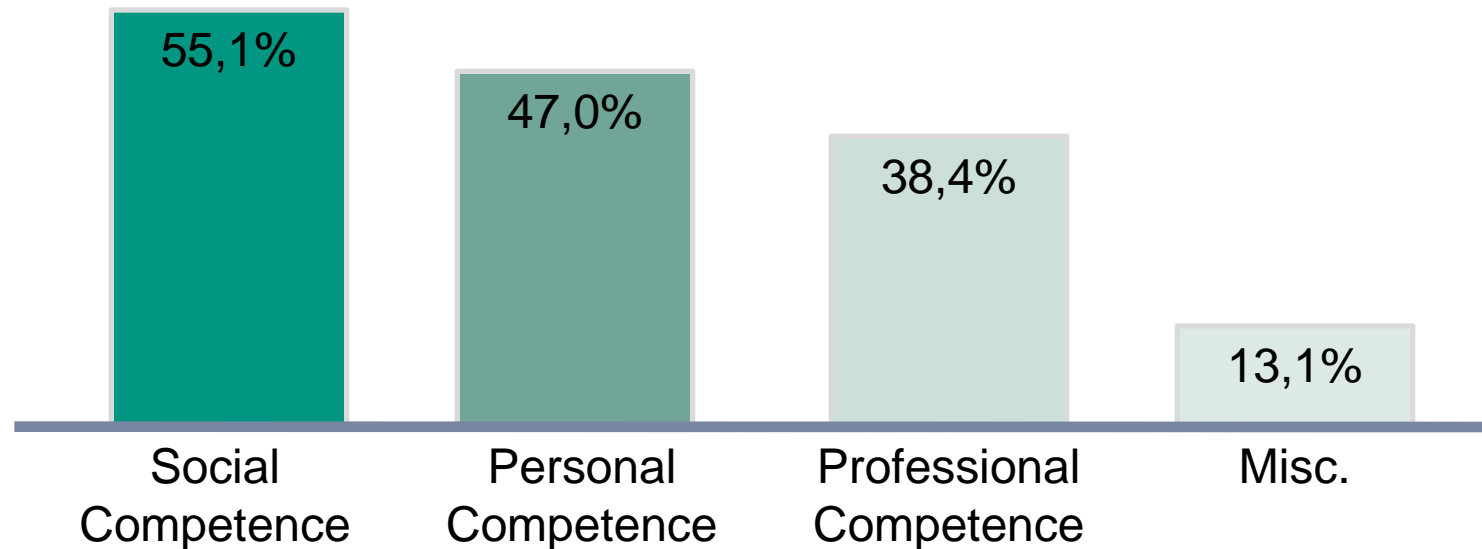


Optimization and realization of a robot torso



Deficiencies in Academic Education

Which are the predominant deficiencies of applicants?



The Association of Chambers of Industry and Commerce DIHK, 2004:
Expectations of the Industry Concerning Graduates

Karlsruhe Education Model for Product Development

Example for

- Integration of **competence development** into teaching
- Objective: **employability** of engineering graduates

Approach:

- Problem-based learning
- Company-like structure
- Process organization: Project character
- Team work
- Real cases from industry partners
- Intense coaching & feedback

Karlsruhe Education Model for Product Development

Karlsruhe Education Model for Product Development (KaLeP)

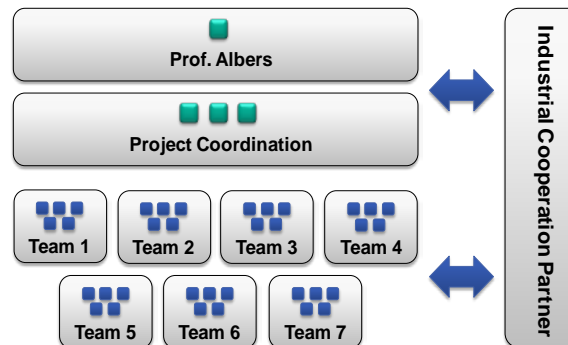
Courses

**Lecture
Tutorial
Project**



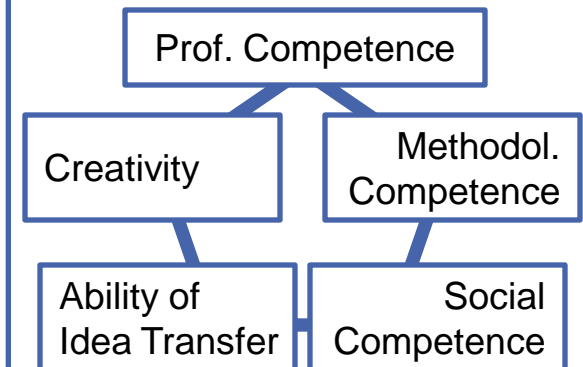
Environment

Generation of a realistic environment



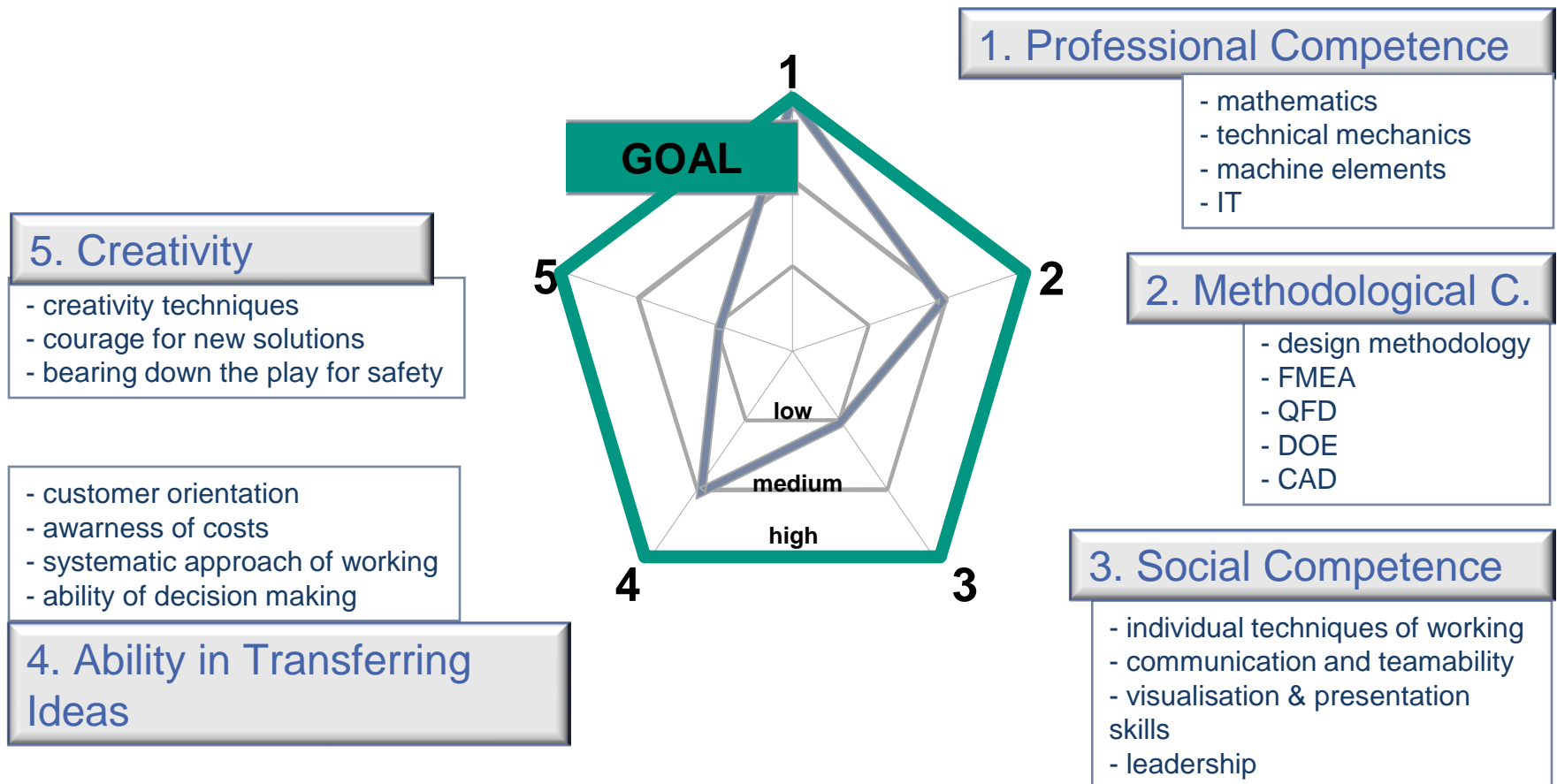
Key Competencies

Integration into project work



Karlsruhe Teaching Model for Product Development

Competence Orientation



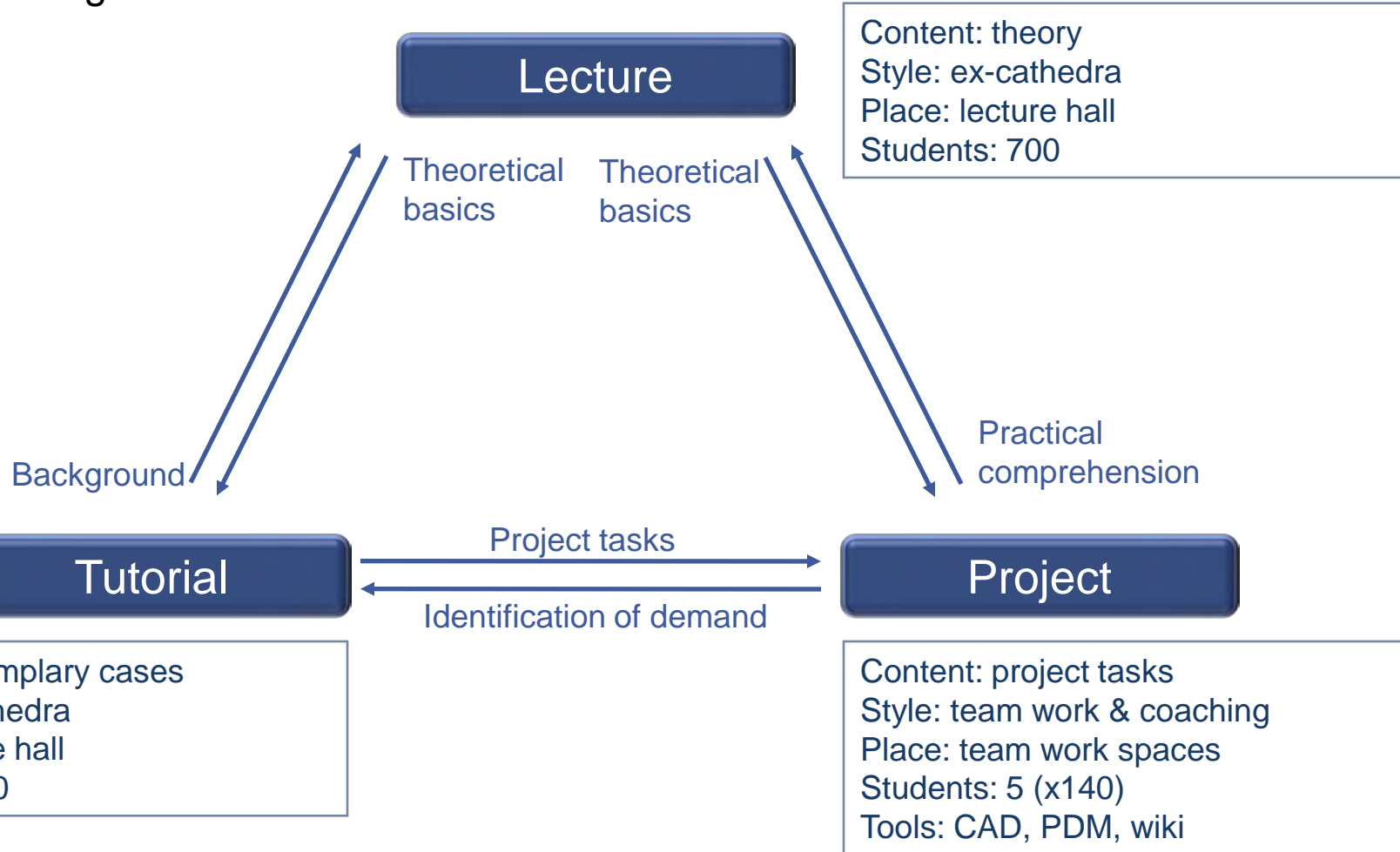
Karlsruhe Education Model for Product Development

Three Elements of the KaLeP:

| | Systems | Methods | Processes |
|------------------------|---|--|---|
| Course Title | Machine Design | Methods of Product Development | Integrated Product Development |
| Settings | <ul style="list-style-type: none">- Lecture- Tutorial- Project | <ul style="list-style-type: none">- Lecture- Tutorial | <ul style="list-style-type: none">- Lecture- Workshops- Project |
| Competence Acquisition | High | Medium | Very high |
| Course Contents | <ul style="list-style-type: none">- team work- self organization- communication- idea transfer | <ul style="list-style-type: none">- Design methods- Creativity techniques | <ul style="list-style-type: none">- Team developm.- Team leading- Proj. management- Presentation |
| Number of Students | 700 | 400 | 30 |
| Curriculum | Bachelor | Bachelor | Master |

Undergraduate Studies: Machine Design

Course Settings



Undergraduate Studies: Machine Design



Analyzing
gear boxes



sketching



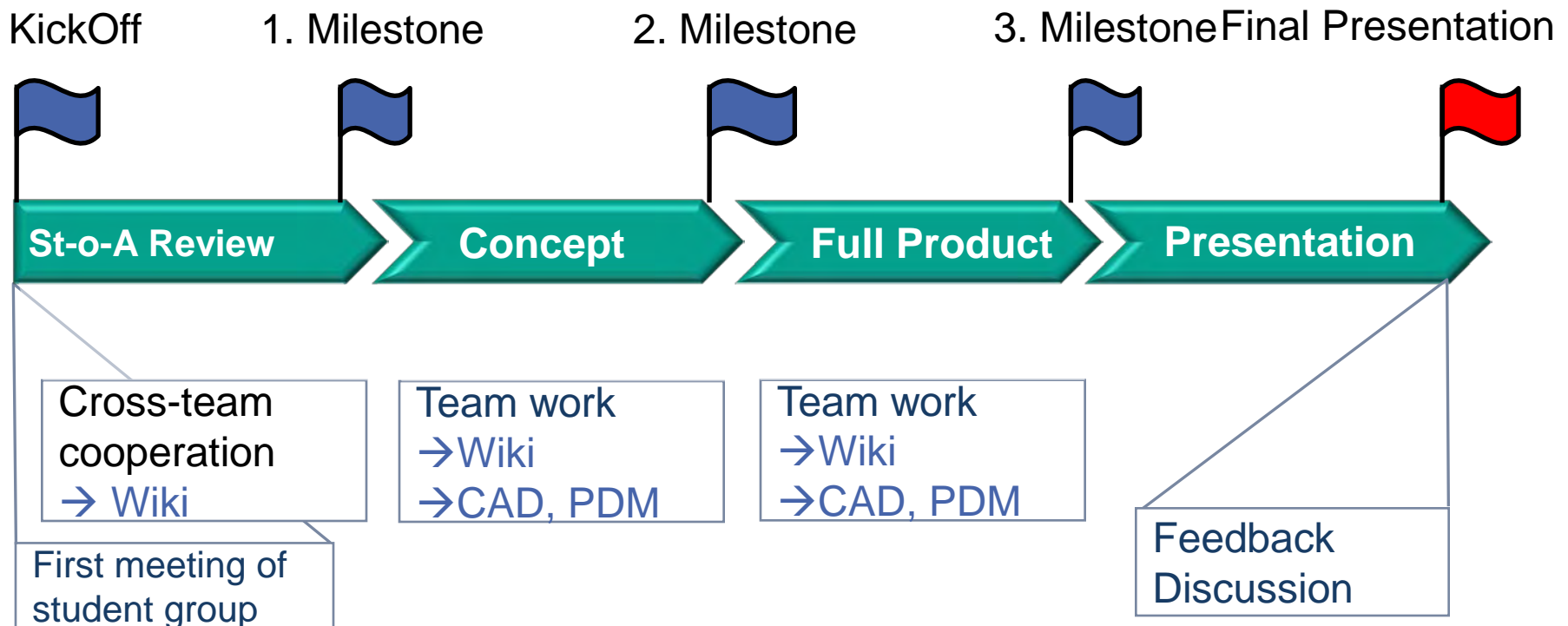
Project work



Design review

Mechanical Design: Design Project

- Lectures covering the basics of Mechanical Design with >700 students (Systems Engineering, Bearings, Gears, Clutches, etc.)
- Tutorials and workshops to gain practical experience
- Accompanying 4 months of project work derived from design tasks delivered by industrial partners or typical fields of mechanical engineering



GEARE - Global Engineering Alliance for Research and Education

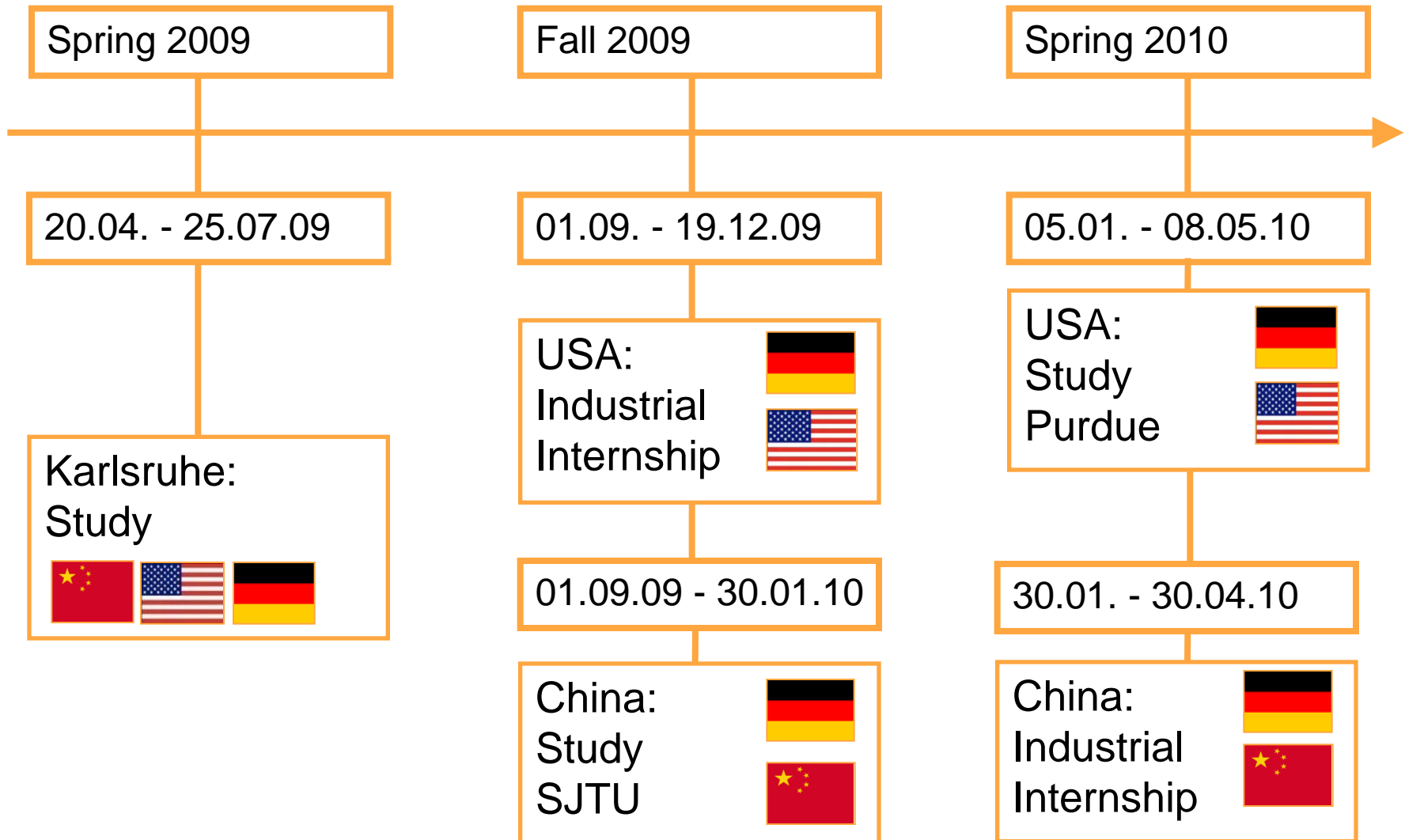


- University Karlsruhe (TH), Karlsruhe, Germany
- Purdue University, West Lafayette, IN, USA
- SJTU Shanghai Jiaotong University, Shanghai, China
- Exchange program for undergraduate students (internship and study abroad)
- Exchange program for graduate students (thesis research in international teams)
- Long distance project-work

Exchange program for undergraduate students (internship, study and international project work abroad)

- Corresponding to the first level of KaLeP
- Concentrating on the course Mechanical Design III
- Duration of about 12 months scheduled in three thirds lasting about 4 months each
 - One semester of study at the home university with students from international partner universities
 - One semester of study abroad
 - A two-semester multi-national design-team project (one semester at home university, one abroad) with students from international partner universities working on industry-inspired projects
 - Part1- Mechanical Engineering III Project Work at University Karlsruhe (TH)
 - Part 2 – Senior Design Project at Purdue University, USA or SJTU, China
 - A three month industrial internship abroad in an international company

Exchange program for undergraduate students: Exemplary Timetable 2009/2010



Unique Aspects in GEARE

| Comprising KaLeP | Embedding into the curriculum |
|---|--|
| GEARE comprises the elements of KaLeP by embedding elements of KaLeP into the different kinds of Student Exchange Programs. Different stages of KaLeP are matched with different stages of GEARE. | GEARE fits the curriculums of the partner universities. The classes are geared to match the courses taking place at the home university. Due to this the time to graduation for the students is not affected . |
| Full transfer of course credits | Exemption of tuition fees |
| The student's course achievements at the partner universities are fully transferable to the home university. The acceptance of the course credits is arranged previously by the universities since these courses satisfy the home universities plan of study. | Students stay being registered at their home university for the duration of the exchange program. In addition they are registered at the partner university. The partner universities committed to exempt the partner university students from tuition fees. |

Two Semester Global Design Team Project

- Two consecutive parts taking place during the two semester of study at University Karlsruhe (TH) and the partner university in the USA or China
- Part1- Mechanical Design III Project Work at University Karlsruhe (TH):
 - multi-national student teams consisting of students from all three countries
 - Training, coaching and supervising by student helpers and faculty staff
 - General project tasks:
 - Complex design task where teamwork is absolutely necessary
 - The tasks vary and pose new challenges for the students each year, this helps keeping up the high quality of the tasks.
 - The tasks encompass the development and the design of a technical system.
 - Not only hand drawings but also CAD models and real prototypes can be built by the student teams.
 - Example project task:
 - Design of a transportable carrousel for private garden parties mounted on a car trailer

Mechanical Design: Design Project – Virtual prototype



Two Semester Global Design Team Project

- Part 2 – Senior Design Project at Purdue University, USA or SJTU, China:
- Building of partly new multi-national student teams
- Continuing working on the design task which was worked on during the project work in Mechanical Design III
- Project tasks:
 - Resuming working on the virtual prototypes is resumed
 - Developing a more detailed design of the technical system
 - Building a real prototype of the system which can be used under realistic conditions
 - Planning the manufacturing of the real prototype and the acquisition of all needed parts for the prototype
 - Manufacturing of the planned prototype
- Finally: testing of the prototype by the student teams and the faculty members