UNIVERSITY OF HRADEC KRÁLOVÉ
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APPLICATION KNOWLEDGE OF MODELING AND SIMULATION IN TEACHING OF ENGINEERING

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Abstract

The level of professional skills of engineering graduates of secondary schools is an important factor in their careers. Industrial experience requires to apply theoretical knowledge to solve designer problems through computer tools for modeling and simulation. The text provides an approach for teaching of engineering design, supported by the deployment of computer tools for modeling and simulation. Methods and procedures are linked to industrial practice, for which students are primarily prepared. At the same time the relationship of general knowledge of Informatics, knowledge of work with tools for modeling and simulation and application of knowledge to solve designer tasks is defined. Results of the survey of application knowledge of modeling and simulation in the school environment and in industrial practice are also presented in the text. Research is used to verify the benefits of the teaching methods.

Key words: Computer Aided Design, Computer Aided Engineering, Educational Project, Industrial Practice.

Introduction

The topic is based on the requirements of industrial practice on knowledge and intellectual skills of graduates of secondary schools, colleges and universities. It solves following interdisciplinary problems:

- Knowledge of engineering design.
- Intellectual skills of work with the tools for modeling and simulation and its use in solving designer tasks.
- Competences for individual solutions of complex design engineering tasks.

Tools for modeling and simulation

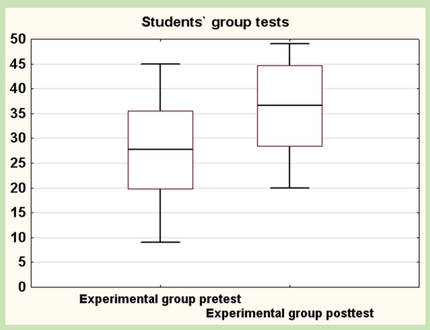
It is a group of applications for creating 2D and 3D digital models of objects. Following tools are deployed for the realization of physical experiments and demonstration of geometric problems:

CAD – ***Computer Aided Design***, modeling and implementation of core analyzes.

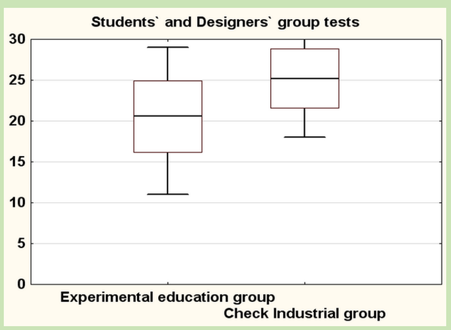
CAE – ***Computer Aided Engineering***, processing of analyzes and simulations on 2D and 3D digital models, created in CAD.

Tools are collectively referred as **CAx**.

Knowledge research of solving of educational designer projects by students of informatics – engineering field:



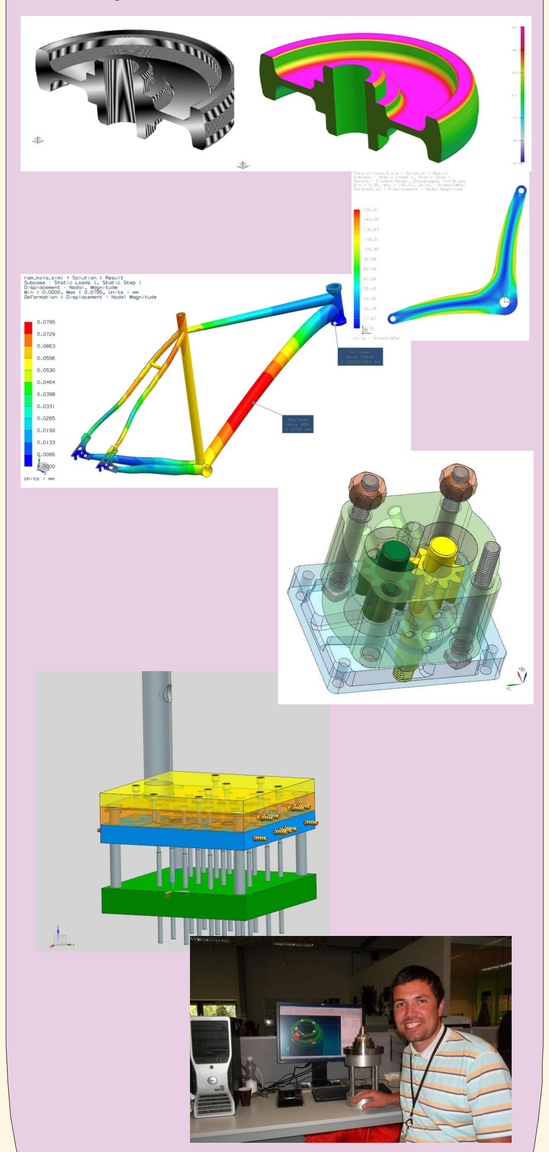
Research of achieving designer competencies by students of colleges and designers from industrial practice :



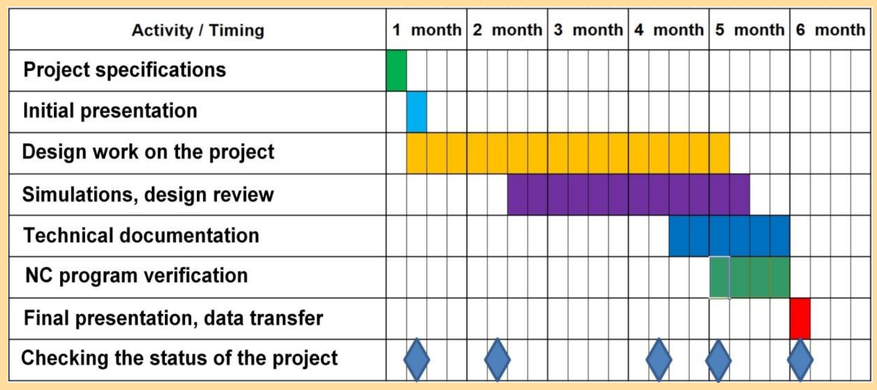
Application knowledge represent competencies of independent solving of designer projects according to the sequence:

1. Task assignment.
2. Evaluation of resources - information, tools.
3. Design and optimization of solutions.
4. Output solution in the form of technical documentation.
5. Implementing the proposal - if feasible.

Examples of results of solved tasks



Term plan for the project solving



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Visualization as a tool for motivating students of technical disciplines

Conclusion:

Application knowledge of the use of tools for modeling and simulation for students and graduates of engineering disciplines represent a high level of professional competence. The survey showed achieved solutions through educational projects, whose structure corresponds to the timing and content of problem solving in industrial practice.
The essence of application of knowledge lies in the unification of general knowledge of engineering design, knowledge of the principles of digital models, virtual prototyping and intellectual skills to implement structural solutions through engineering software tools to support the pre-production stages. Teaching methods optimized based on the results of the research and deployment procedures presented in the text, can be applied in teaching at secondary schools, colleges and technical colleges. Continuous training of technical staff in the workplace development and design engineering department in industry can be presented at the same time based on the implementation of the principles. Achieving the level of application of knowledge engineering structures can be considered as one of the pathways linking education sector and industrial practice.