Learning System Thermopractice for the Calculation of Exercises with Mathcad

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Outline

Didactic Concept
Example - How to Use Thermopractice
Technical Realization
Application Concept and Use in Teaching
Effects on Study
Application Horizon

www.technische-thermodynamik.de
Interactive learning system
Thermopractice

System for the
individual calculation of exercises
with Mathcad

Supplement to the lecture
Technical Thermodynamics
Initial Situation for Calculating Exercises

- Laptop with online property calculations and property libraries for Excel®
- Personal lecture notes
- Property collections
- Formula collection
- Exercise collection
- Paper worksheet and writing instruments
- Pocket calculator with property-calculation software

Calculation of exercises „by hand" on a paper worksheet
Criteria of the decision for Mathcad

- The notation of Mathcad is as much as when handwritten.

- Use of units
- Coupling options for DLLs

At Zittau/Goerlitz University: PC-pool licenses for Mathcad and Home-use-Licenses for Students
Didactic Concept

Selection of an exercise from the exercise collection and transfer it via Internet

Mathcad working screen

Formulas from the formula collection

Property data from the property collection

Calculation of property data using the property libraries in Mathcad

Organization of the interfaces by Thermopr@ctice

Transfer of results to server via internet
The system evaluates the results and gives feedback to the student.
Windows Client (student)

- WWW-Browser
  - Internet Explorer or Firefox etc.

Mathcad

Optional:
Property calculation libraries
(free of charge)

Communication via Internet

Internet Server

Systemsoftware

- WWW-Server
- Apache

- Data base system
- MySQL

- PHP 5 interpreter

Thermopractice

- Execise collection
- Formula collection
- Property collection
- Data base
- PHP scripts
Application Concept for Thermopr@ctice

- Workshop with a simple example (2 hours)
- Installation of Mathcad on student’s personal computer or laptop
- Exercises in PC-pools parallel to traditional exercises
- Calculation of the remaining tasks at home on the own computer
- Exams using Thermopr@ctice in PC pools

Use of Thermopr@ctice in Teaching

- Successful use of Thermopr@ctice since 2002
- Use of Thermopr@ctice in the subjects
  - Technical Thermodynamics I, II, III and
  - Refrigeration Technologies
- Thermopr@ctice comprises 230 exercises
- Use in continuing education for Siemens
• Students independently execute exercises in individual variants and with individual values.

  ➔ Active and independent learning is encouraged.

• Processing of tasks via Internet on student’s own laptop corresponds to the interest of students.

  ➔ The attractiveness of learning increases.

• Study tasks are processed at home.

  ➔ The student’s own laptop is used for learning purposes.

• Get to know a computer algebra system and use of modern tools, such as property calculation libraries are important for the course of study.

  ➔ Modern working methods of the engineer are introduced.

As a result, on average, only 8.2% of the students failed the their first exams in Technical Thermodynamics during the last 5 years.
The technology of Thermopractice can be applied for further subjects in which the acquisition of knowledge takes place by calculating exercises:

- Thermodynamics
- Fluid Mechanics
- Technical Mechanics
- Machine Elements
- Electrical Engineering
- Mathematics
- Physics
- Investment and Financing
• The eLearning system Thermopr@ctice was presented. It is intended as a supplement to the lectures.
• The conventional way of calculating exercises on the sheet of paper is replaced by calculation on the working screen of Mathcad.
• The learning materials in Mathcad format can be comfortably used via Internet.
• Students independently execute exercises in individual variants and with individual values.
• The students get feedback whether their calculation results are OK or not. If not, interim results are queried to facilitate the processing.
• The use of Thermopr@ctice was demonstrated using an example of Technical Thermodynamics.
• Application of Thermopr@ctice is possible to study subjects in which the acquisition of knowledge takes place by calculating exercises.
• Modern working methods of the engineer are introduced to students.
Thank you for your attention.