

KRAFTWERKSSCHULE E.V. – TRAINING FOR THE FUTURE

KWS
POWERTECH
TRAINING CENTER

KRAFTWERKSSCHULE E.V.

POWERTECH TRAINING CENTER FOR POWER PLANT PERSONNEL AROUND THE GLOBE

TRAINING FOR THE
FUTURE



State: 31.12.2010

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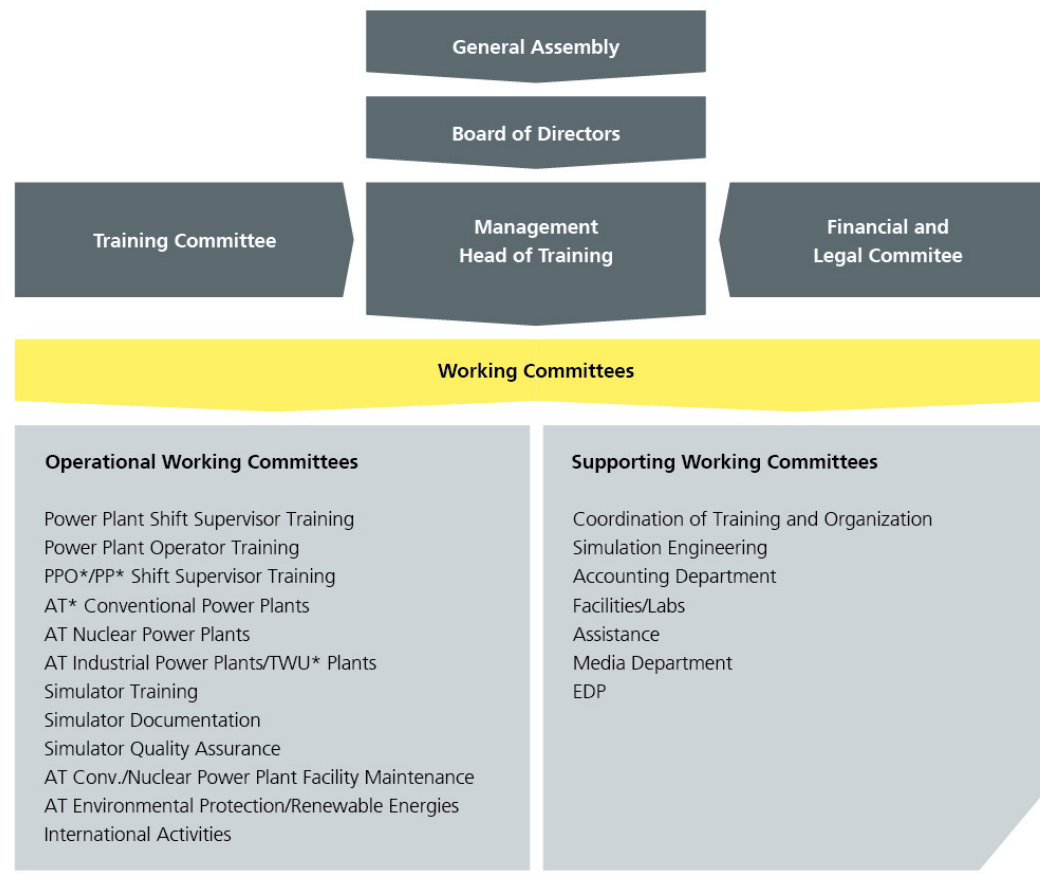
HISTORY

- 1957 First training course for „Kraftwerksmeister“
- 1963 Foundation of the association „KRAFTWERKSSCHULE E.V.“
- 1968 Own training rooms in the VGB - building in Essen
- 1977 Simulator training for nuclear power plants
- 1978 Theoretical training of “Kraftwerker” (power plant operators) at KWS
- 1986 Simulator training for fossil-fired power plants
- 1996 New training centre in Essen-Kupferdreh
- 2010 the expansion section of the KWS building



ORGANIZATION CHART

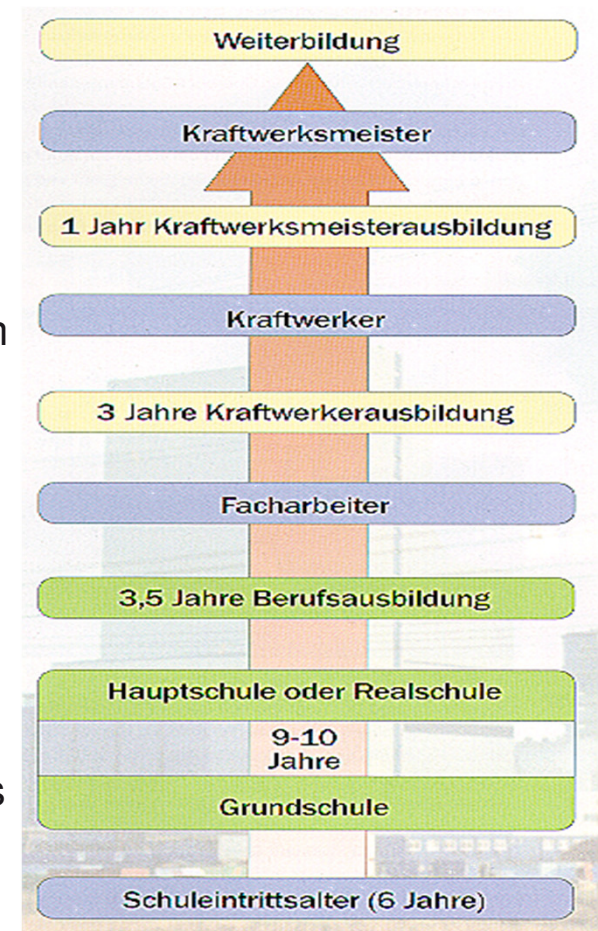
COMBINED KNOWLEDGE MANAGEMENT



*PPO = Power Plant Operator *PP = Power Plant *AT = Advanced Training *TWU = Thermal Waste Utilization

ACTIVITIES UP TO NOW

- Approved training according to the VGB-guidelines
- 194 members with a steam production of approx. 420.000 t/h
- 9171 Plant operators (operators) certified
- 3240 Plant operators theoretically trained
- 4010 Unit and shift supervisors prepared for the examination
- Advanced training courses and seminars
- 6420 man weeks at the simulator for fossil-fired power plants



ACTIVITIES 2011/2012

- 432 courses
- 4.235 participants
- 230 arrangements out of the standard program
- 202 tailored courses

PRESENT SITUATION

- Liberalisation of the energy market
- Rigorous cost management
- Automation of power plants
- Reduction of personnel
- Trend towards all-rounder
- Wide range of qualification
- Reduction of training costs
- Training time should bring more benefits by using modern training tools



STRENGTHS OF KWS

- An experienced, co-operating team of about 250 instructors
- Practice-oriented instructors teach practice-oriented trainees
- High demands; good examination results
- Centre of exchange of experiences
- Modern training centre
- Extensive training laboratories
- Full scope power plant simulators
- Textbooks oriented to learning objectives
- Orientation to the market

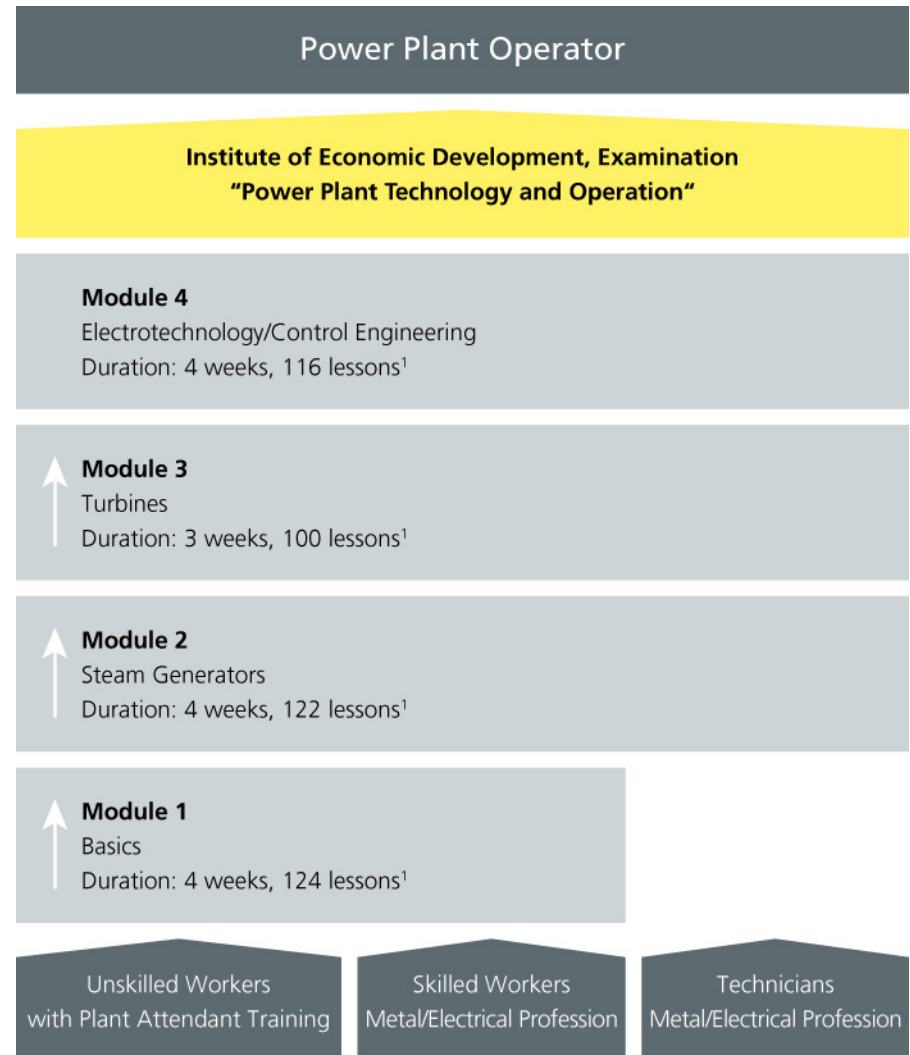


QUALIFICATION

POWER PLANT OPERATOR FOR THE AUSTRIAN INDUSTRY

Performed

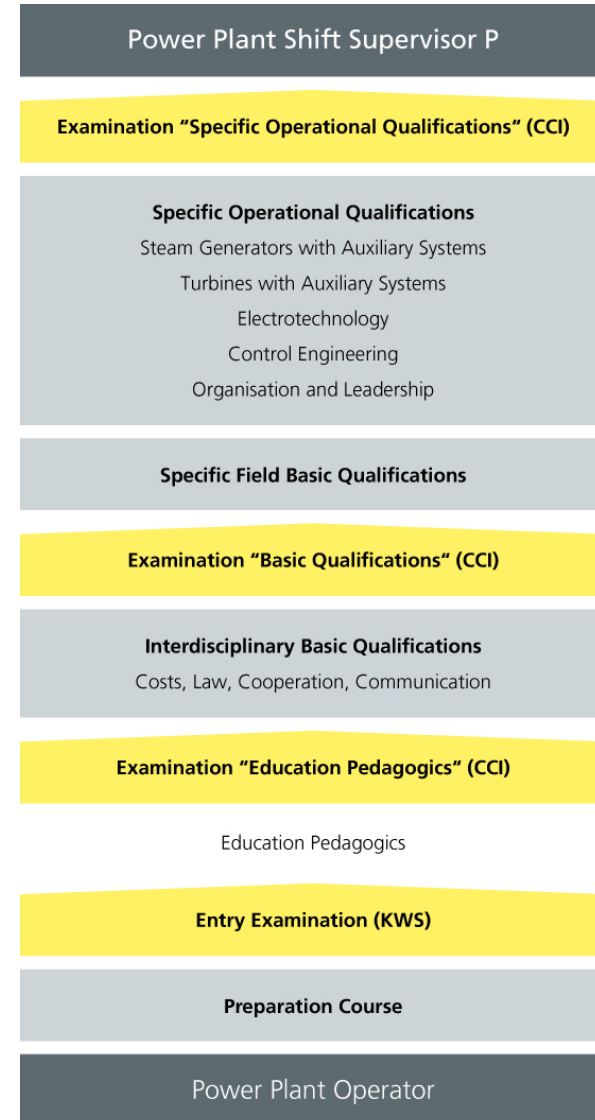
- in Steyrermühl/Austria



¹Lesson = 45 min.

QUALIFICATION

POWER PLANT SHIFT SUPERVISOR „PRODUCTION“



■ KWS Training Course

QUALIFICATION

POWER PLANT SHIFT SUPERVISOR „PRODUCTION ELECTROTECHNOLOGY/ CONTROL ENGINEERING“



■ KWS Training Course

SKILLS

POWER PLANT SHIFT SUPERVISOR „PRODUCTION“

- Person in charge (leader) of the procedural plant operation
- Shift supervisor for the whole power plant
- Person in charge for safety-related and legal plant operation
- Person in charge for the maintenance and repair works
- Contact for economical issues
- Team leader and disciplinarian

SKILLS

POWER PLANT SHIFT SUPERVISOR

„PRODUCTION ELECTROTECHNOLOGY/CONTROL ENGINEERING“

- Electrical technician
- Competent person for the electrical part of the power plant
- Person in charge for safety-related and legal electrical plant operation
- Person in charge for the maintenance and repair works
- Contact for economical issues
- Team leader and disciplinarian

SKILLS

BACHELOR OF MECHANICAL ENGINEERING – POWER PLANT TECHNOLOGY

Studies of mechanical engineering –
power plant technology

Graduation

International accepted graduate degree of the
Aachen University of Applied Sciences in
cooperation with the
KRAFTWERKSSCHULE E.V. Bachelor of
Mechanical Engineering Power Plant
Technology

Prerequisites

- Abitur/technical college entrance qualification
- 3 month practical training or apprenticeship
- Internship or trainee contract

Professors and college lecturers

Fulltime professors of the FH Aachen and
selected lecturers of the KWS with
longtime experience in the power
industry

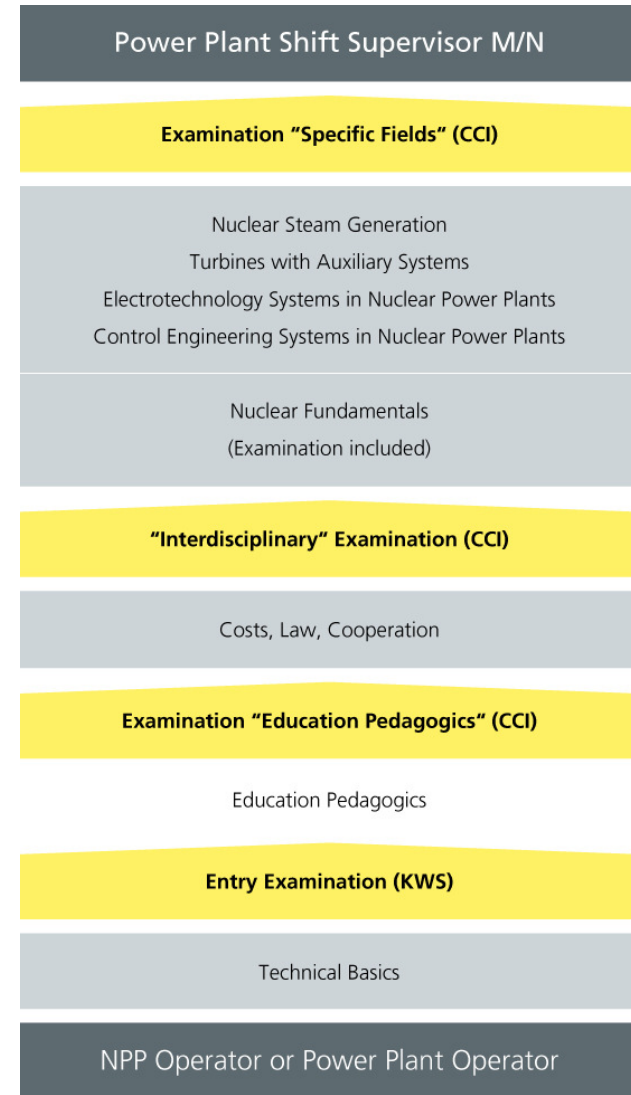
Duration

6 semesters (3 years)

SKILLS

POWER PLANT SHIFT SUPERVISOR MECHANICAL/NUCLEAR ENGINEERING

- 15 months training



■ KWS Training Course

SKILLS

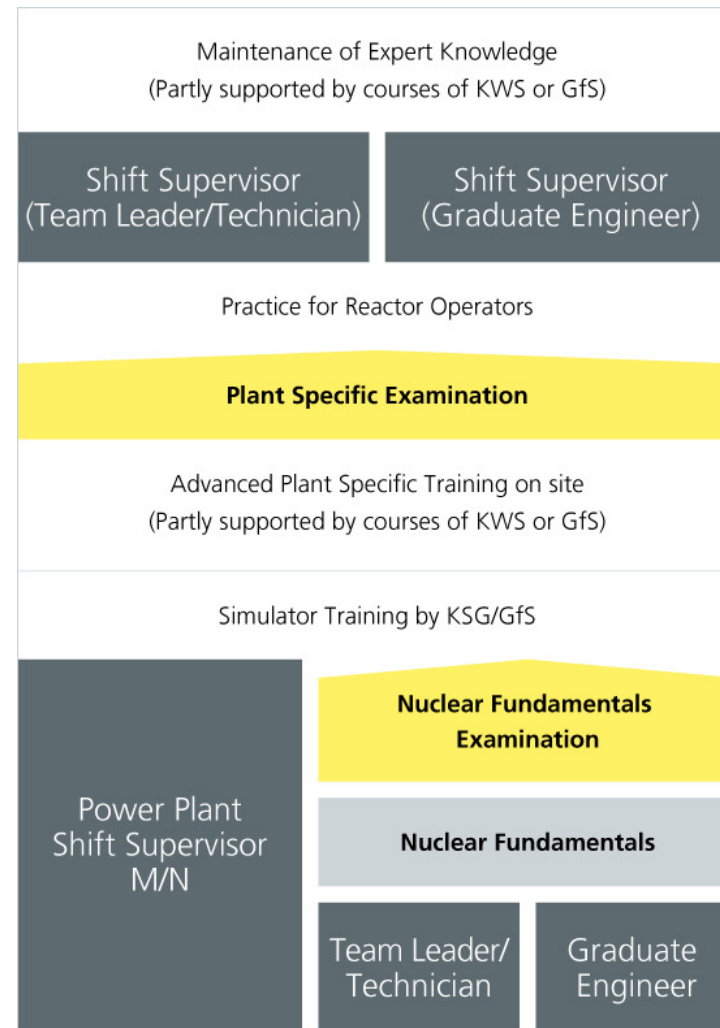
NUCLEAR FUNDAMENTALS FOR SHIFT SUPERVISORS AND REACTOR OPERATORS

Minimum requirements:

- Reactor Operator: skilled worker – technical profession or NPP Operator
- Dep. Shift Supervisor: certified engineer, „Meister“ of mechanical engineering or „Kraftwerksmeister M/K“
- Shift Supervisor: graduated degree or tertiary education

SKILLS

MAINTENANCE OF EXPERT KNOWLEDGE

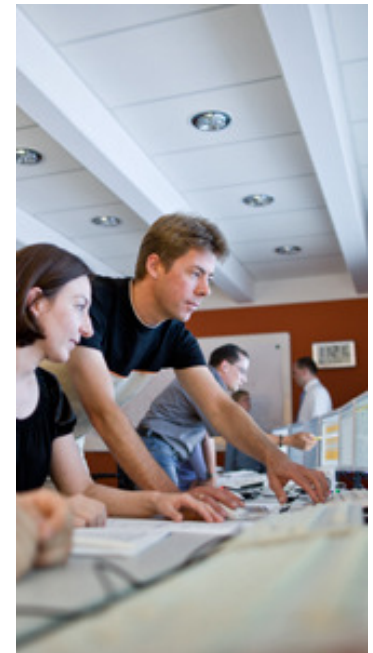


■ KWS Training Course

SKILLS

CUSTOMIZED COURSES

- Specific courses tailored to the individual needs of the customer, regarding the specific design and operation of the power plant, if necessary by means of mobile simulators and laboratories.
- We offer these courses on-site around the globe.



SIMULATOR

FOKS: FOSSIL-FIRED POWER PLANT SIMULATORS

- 4 different steam generators
- 4 kinds of fuel
- Once trough and drum boilers
- Condensation steam turbine with district heating extraction
- Generator, H₂ cooled, 414 MVA
- One turbine driven feed water pump, 2 electrical driven feed water pumps
- House load, island and interconnected grid operation
- Control engineering, H + B conronic E
- Operation via
 - hard panel (Siemens)
 - DCS (ABB und H&B)
- Over 300 malfunctions
- More than 2000 overwrites
- Real time operation



SIMULATOR

MOBILE CCGT-SIMULATOR WITH DISTRICT HEATING AND PROCESS STEAM EXTRACTION

- Multiple shaft gas and steam turbine power plant
- Natural gas combustion
- 2 SGT5-3000E Siemens gas turbines, 659 MJ/s heat input
- 3 three pressure level heat recovery steam generators, 110 bar, 30 bar, 4,8 bar
- 2 reheaters, 28,5 bar
- 1 steam turbine SST5-5000, one HD/MD- and one ND casing, 250 MW
- 3 H₂ cooled generators (293 MVA, 15,75 kV)
- 2 hybrid cooling towers
- Efficiency without steam extraction 57,3% at 755 MW
- Additional steam extraction 30 bar, 15 bar, 5 bar, up to 100kg/s
- Real time operation
- Siemens SPPA-T2000 control technology
- Siemens OM 650 with 5 operator spaces
- 2 large-scale screens

MOBILE SIMULATORS

TRAINING ON-SITE AROUND THE GLOBE

- Due to constant enhancements KWS simulators have been mobilized and are thus available anywhere around the world.
- KWS will keep on supporting its members all over the world.
- Simulator training can be carried out in German, English, Dutch and Russian.



SIMULATORS

NEW DEVELOPMENT OF SIMULATORS AND THEIR AVAILABILITY

I. Simulator of the new 800 MW hard coal class

- reference power plant: RWE Westfalen unit D
- control technology: SPPA-T3000, Siemens

II. Simulator of 1.100 MW hard coal class for E.ON Kraftwerke GmbH

- for training purposes taking over by KWS is intended
- reference power plant: the new Datteln hard coal-fired power plant
- control technology: 800xA/AC870P, ABB

III. Simulators for lignite-fired power plants: 600 MW capacity version for the power plant Niederaußem and 1.100 MW capacity version for the power plant Neurath

- reference power plants: Neurath power plant units 2/3 and Niederaußem power plant units G/H
- control technology: SPPA-T3000, Siemens
- 600 MW capacity version is available for training since October , 2009

SIMULATOR TRAINING COURSES

Following aims to achieve by simulator training:

- efficient training without a risk
- optimization of operational modes
- reducing plant malfunctions
- enhancing team behavior
- opening for new technologies

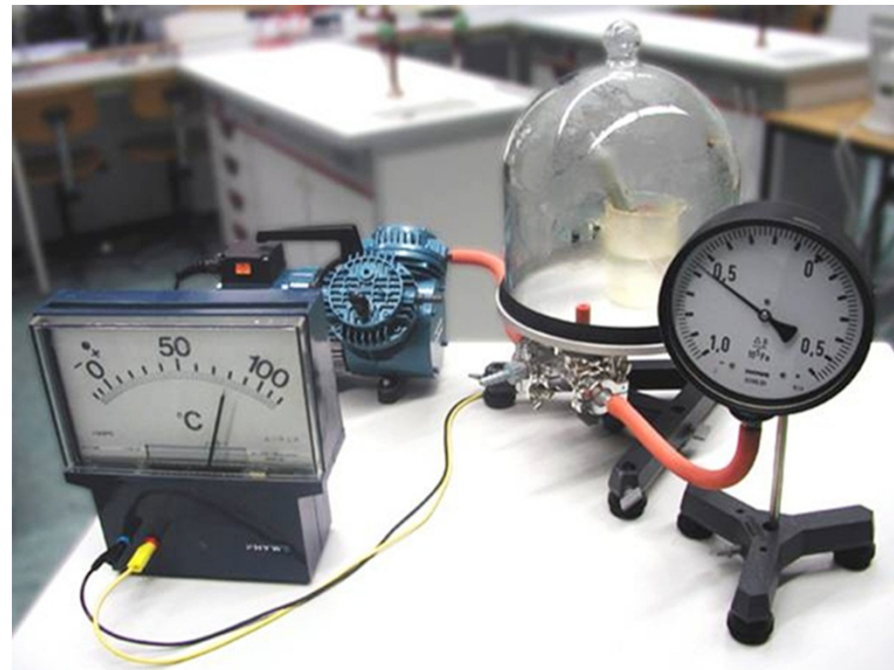


INFRASTRUCTURE, LABORATORY

ENGINEERING THERMODYNAMICS

Exercising:

- Boiling curves
- Degasification of liquids
- air humidity, dew point



INFRASTRUCTURE, LABORATORY

ELECTROTECHNOLOGY

Electrical engineering components

- Generator: synchronization, load characteristics, islanding, integrated grid
- Electric motor: load characteristics
- Electric current, voltage in a three-phase system
- Transformer: load characteristic, short-circuit voltage
- Induction, magnetism

Electronics

- Properties and characteristics recording of specific components
- Oscilloscope exercises

Power electronics

- Rectifier circuits, inverter, frequency converter



KWS - APARTMENT HOUSES

MAKE YOURSELF AT HOME!

Furnishing

- Telephone, TV set
- Internet access
- Common rooms for cooking, eating and studying
- Garden with BBQ and leisure activity areas
- Recreation rooms with TV and hi-fi set, chess, billiard

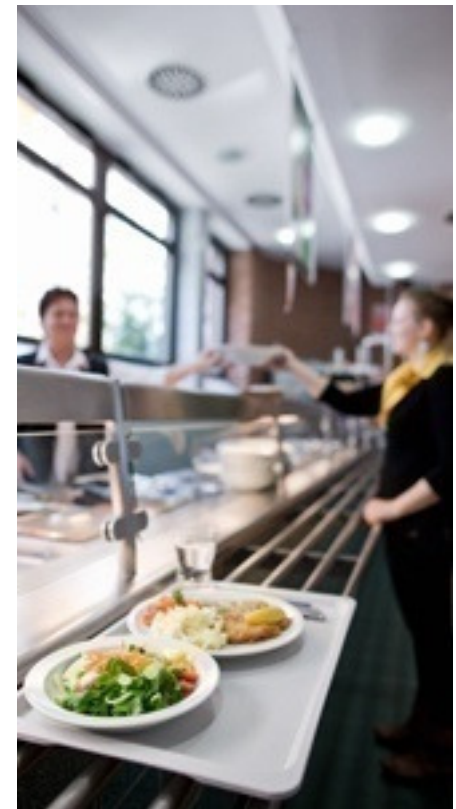


SERVICE

CAFETERIA

Daily varying offers

- Lunch menu with individual choice of side dishes
- Choice of starters
- Rich salad bar
- Choice of desserts
- Vegetarian and pork-free dishes for international guests



Thank you for your attention

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