

Scope of School

Scientific Background

Neutron and photon sources offer unique possibilities by complementary use of the radiations for structural analyses of advanced engineering materials. By using neutrons and photons information about materials microstructures can be obtained non-destructively in the near-surface region as well as in the bulk of samples and components. Compared to conventional laboratory X-rays the spatial resolution achievable using synchrotron radiation can be improved by up to several orders of magnitude.

Diffraction methods reveal information about crystalline phase volume fractions, texture and residual stresses, while tomography provides complementary 3-dimensional images of the material's microstructure. Both diffraction and tomography have increasing impact in the fields of design of tailored materials, their processing and lifetime assessment. The current situation regarding the exploitation of photons and neutrons for engineering materials science is characterized by rapid developments: flux increase of photon and neutron sources, refurbishment of existing as well as design and construction of new beamlines and instruments with optimised beam optics and position sensitive detectors as well as increasing quality and quantity of data.

These new possibilities for microstructure analyses for advanced materials and multi-material systems meet with increasing demands from the materials engineering point of view. In materials engineering, the establishment and refinement of relationships between microstructure parameters and macroscopic properties require information on different length and time scales, both covering several orders of magnitude.



Our school "Application of Neutrons and Synchrotron Radiation in Engineering Materials Science" is designed to provide a systematic overview in this field to students from all over Europe. The programme will touch all methods mentioned above.

This school is the continuation of 11 very successful MATRAC schools with the same title which took place from 2005 to 2024.

Organisational Details

After an introduction lecture and get-together on Sunday evening, the school starts on Monday with one day of lectures with a first poster session in the evening. The manuscripts of all lectures will be provided in digital form.

The following day will be spent at PETRA III at DESY in Hamburg with practical training at the GEMS/DESY instruments. Afterwards all participants will be transferred by bus and ferry (dinner and cabin on the ship) to Malmö and then to Lund.

On Wednesday the school will be devoted to further lectures as well as a second poster session in Lund. Thursday will be spent at MAX IV in Lund with practical training at the beamlines and guided tours to ESS. On Friday there will be further talks, the presentation of the results of the experiments at PETRA III and MAX IV by the students as well as summing-up and final discussions. Afterwards there will be a bus transfer to Hamburg. There is the possibility to take an exam to get ECTS credit points.

The MATRAC 1 School is significantly funded by German and Swedish authorities. The participation fee is therefore only €120 which includes all school expenses, accommodation, meals, bus, ferry as well as travel expenses for German, Swedish and other European students.

Interested parties from non-European countries can only participate as self-payers. Unfortunately, they cannot be offered financial support of any kind.

Tentative Programme

Sunday, 23.03.

- Introduction lecture and get-together at "Der Sunderhof"

Monday, 24.03.

- Lectures (Fundamentals, Scattering Theory, Correlation on Function, Structure Determination, Real Structure, Defects and Residual Stress, Nanodiffraction, Imaging, Engineering Materials Science, Strain Scanning, etc.)
- Poster session

Tuesday, 25.03.

- Practical experiments at PETRA III
- Transfer to Lund (Bus/Ferry)

Wednesday, 26.03.

- Lectures (SAXS, Reflectivity, Imaging combined with Scattering Techniques, Coherent Imaging, Synchrotron techniques for surfaces, etc.)

Thursday, 27.03.

- Practical experiments at MAX IV
- Guided tours of ESS

Friday, 28.03.

- Lectures (Diffraction and Debye Temperature, etc.)
- Presentation of results of experiments at PETRA III and MAX IV
- Final discussions
- Bus transfer to Hamburg