

Faculty common course 2021

English course title: Ion Beam Materials Analysis

Swedish course title: Jonstrålebaserad Materialanalys

Extent (credits): 5 ects

Language of instruction: english

Recommended prerequisites: Basic Physics (mechanics, electrostatics, some basic quantum mechanics), basic mathematics, basic computer skill & data treatment

Learning outcomes of the course: The course aims to instruct interested students about the analytical potential of non-destructive ion beam based material analysis. It will present and interactively explain the underlying fundamental physics necessary to enable PhD-students to plan and perform experiments using energetic ion beams and to make decisions on the applicability of the individual methods for their research problems. They also learn to analyze data from the experiments and put it in context with results from different other experimental approaches.

Specify which learning outcomes of the doctoral degree that are address/covered (see appendix 1 of the call or the template of ISP). Describe how: The course provides specific knowledge for researchers in need of materials analysis methods (addressing "methods and understanding"). The set-up of the course with in particular lab-exercises, where students are expected to bring samples from their own research projects addresses also the upper points in the list on "Competence and skills " as students have to assess, how the available methodology contributes best to their specific research question. They are also expected to learn on capabilities and limitations of the broad portfolio of methods discussed with respect to their own projects and science in general. As also many other common materials science methods are assessed in the course, this is expected to contribute to the development of a broad overview of available technologies. As they are, upon completing the course also "trained users" of the facility who can independently apply for beam time - also for others, this permits them also to take responsibility for others.

Course contents: Fundamentals of Ion-Surface interaction: interaction with target nuclei, interaction with target electrons; Rutherford backscattering spectrometry (RBS), Medium-energy ion scattering (MEIS), Elastic recoil detection analysis (ERDA), Particle induced X-ray emission (PIXE), micro beam applications, Nuclear reaction analysis (NRA), Software for evaluation of IBA experiments, Instrumentation for IBA experiments, RBS and ERDA laboratory exercises (preferably using samples from the course participants), exercises, short quizzes and presentations (assignments) of selected topics by the participants.

Instruction (course structure): Lectures with interactive moments, group-works on simulation programs with 3 teachers (2x2 hours), Lab-visit (2h), 2 half-3/4 day lab-exercises at the tandem accelerator .

Assessment (form of examination): Lab reports, hand-in exercises.

Course examiner (name, e-mail): Daniel Primetzhofer,
daniel.primetzhofer@physics.uu.se

Department with main responsibility: Physics and Astronomy

Contact person/s (course responsible teacher) (name, e-mail): Daniel Primetzhofer,
daniel.primetzhofer@physics.uu.se

Course dates/period: As the 2020 course was delayed (and will be most probably given in autumn now) we aim for October/November 2021

Maximum number of participants: 15-20

Submit the application for admission to: daniel.primetzhofer@physics.uu.se

Submit the application not later than: 1st of october 2021