Kursnamn Elektronmikroskopi
Name of course

Kursnamn på engelska Electron Microscopy
Englisk course title

Omfattning (högskolepoäng) 5
ECTS credits

Undervisningsspråk Engelska
Language of instruction

Rekommenderade förkunskaper
Recommended prerequisites
Knowledge taught in engineering, materials’ science, physics, chemistry, medicine, pharmacy and biology curriculae is sufficient to follow this course.

Kursens syfte samt motivering till varför den bör vara fakultetsgemensam (max 150 ord)
Aim of course and motivation as to why it should be considered “multidisciplinary” to the extent that the faculty should allocate extra financing.
Aims:
Overall:
Wake the curiosity to analyse materials down to single atom scale with microscopy techniques and foster the wish to relate this knowledge to our macroscopic properties of materials and biological objects.
Concrete:
1) Develop skill to evaluate the impact of nano- and atomic level characterization and structuring on development of novel materials. 2) Understanding of basic principles of electron/ion-matter interaction. 3) Methods in electron microscopy and focused ion beam technique. 4) Learn how and in which topics electron microscopy can help to understand and solve problems in biology.
The course addresses PhD students from Biology, Geology, Chemistry, Physics and Engineering department and is cross disciplinary. The course is shared between hard matter and biological matter study. The inclusion of topics on electron microscopy on soft matter gives insight for students with a materials’ science background in characterisation methods of biological materials. Students from biology and chemistry are welcome to learn the basics of electron microscopy which has a strong presence in both, materials and life science. In 2017, we have launched a novel EM centre (CEM4MAT) between UU, SU, KTH and plan to involve teachers from these sites to the course.

Kursinnehåll, kursens uppläggnings samt examinationsform (max 150 ord)
Contents, study format and form of examination
In this course we will teach the methodology that is needed to use electron microscopes and focused ion beams for characterization of materials and to make an active contribution to the development of modern materials. The course contains the following parts: 1) Electron microscopy techniques spanning across several disciplines such as physics, biology, medicine, materials science, their basis and electron-sample interaction. 2) We will illustrate the use of electron microscopy with
the corresponding applications in materials science, physics, chemistry and biology.  
3) The focused ion beam device is presented with its capacity sputter samples with a nanometer precision as well as to use it for a local TEM sample lift-out. 4) The students will be confronted to selected problems/techniques in the laboratory course sessions in several state of the art Electron Microscopy laboratories in Uppsala.

**Undervisning (kursens uppläggning)**  
Instruction (course structure)  
We build a special tutorial program to improve the student centered learning and group work.  
The course is a block course in 2 times one week. Week 1 is dedicated to SEM and FIB teaching and laboratory course, week 2 is dedicated to TEM. Physical and biological science are taught across the two weeks. The theory is in the morning, laboratory course is in the afternoon.  
The students will work together in groups both in the laboratory course and the same groups will elaborate together the assignments. To foster knowledge and also to build a creative assignment group environment, the groups will be accompanied by tutors.  

**Examination**  
Assessment (form of examination)  
The course will be evaluated by assignments that are related to course (both theory and laboratory course) contents as well as by a final oral exam.

**Huvudansvarig institution:** Teknikvetenskaper/tillämpade materialvetenskap  
**Kontaktperson/er (namn, e-postadress)**  
Contact person (name, e-mail address)  
Klaus Leifer, klaus.leifer@angstrom.uu.se  

**Kurs datum/period** February-Mars 2019  
Course dates/period  
**Antal platser 32**  
Maximum number of participants  

Application from course participants should be sent to  
Klaus Leifer  

**Senast 30th January 2019**  

**Målgrupp/er (om möjligt, specifera ämnen/inriktningar)**  
Target group/s (specify, if possible, subject/specialization)  
Physics, Biology, Materials Science, Chemistry, Electricity, Electronics, Medicine. The course is aimed to teach all PhD students interested in the analysis of hard and soft matter by electron microscopy techniques.