GÖTEBORGS UNIVERSITET

Lasers and Mass Spectrometry, 2.5 + 5 hp

Course period:	Last day for application:
April 2015- June 2015	April 15, 2015

Course leader / Address for applications:

Erik Thomson / erik.thomson@chem.gu.se

Course description (Advertisment for Ph.D. students):

This is a specialized 2-component course for graduate level students interested in a broad view of lasers and mass spectrometry (MS) and their diverse applications within modern science. Students are encouraged to participate in both course components but the flexible format allows some students to take single components. See below for details. Target groups of students include both those interested in the fundamental physics that underlies laser and MS applications, and those students with `end user' interest. That is, students who utilize laser and/or MS techniques in their research but might to-date lack a strong background in the underlying physics. One goal of the course is an active exchange between these two groups, vis-a-vis direct exposure to various laboratories and research environments.

The course will be composed of two distinct components. Beginning in April 2015, a set of introductory lectures will be held to introduce students from varying fields to the fundamental physical principles that underlie laser and mass spectrometry techniques (e.g., optics, EM fields, ionization, etc.). There will be five 90 minute lectures scheduled to avoid conflict with ordinary course schedules. The introductory lectures will be followed by two weeks of intensive study beginning June 1, 2015 (weeks 23, 24). Those two weeks will utilize a `summer school' type format of in-depth lectures given by distinguished scientists involved in developing and utilizing laser and mass spectrometry technology. Those lectures will be used to motivate quantitative student exercises and experimental studies that will utilize laboratories across the GU and Chalmers community. Each student will complete several laboratory exercises utilizing multiple laser and mass spectrometry techniques. Laboratories will be based in Chemistry, Physics, Geoscience, and Conservation departments.

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Responsible department and other participation departments/organisations: Chemistry and Molecular Biology, Physics, Earth Sciences
Teachers: Dr. Erik S. Thomson , Prof. Jan Pettersson, Prof. Dag. Hanstorp, Prof. Dinko Chakarov, Dr. Thomas Zack
Examiner: Erik Thomson

Faculty of Science; Department of Chemistry and Molecular Biology, Department of Physics, and Department of Earth Sciences

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Third cycle education

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1. Confirmation

The syllabus was confirmed by the Head of the Department of Chemistry and Molecular Biology 2015-01-22.

Disciplinary domain: Science
Department in charge: Department of Chemistry and Molecular Biology, Department of Physics, and Department of Earth Sciences

2. Position in the educational system

Elective course; third-cycle education.

3. Entry requirements

Students should have a self-motivated interest in laser and mass spectrometry techniques.

4. Course content

The course will be composed of two distinct components. Beginning in April 2015, a set of introductory lectures will be held to introduce students from varying fields to the fundamental physical principles that underlie laser and mass spectrometry techniques (e.g., optics, EM fields, ionization, etc.). There will be five 90 minute lectures scheduled to avoid conflict with ordinary course schedules. The introductory lectures will be followed by two weeks of intensive study beginning June 1, 2015 (weeks 23, 24). Those two weeks will utilize a `summer school' type format of in-depth lectures given by distinguished scientists involved in developing and utilizing laser and mass spectrometry technology. Those lectures will be used to motivate quantitative student exercises and experimental studies that will utilize laboratories across the GU and Chalmers community. Each student will complete several laboratory exercises utilizing multiple laser and mass spectrometry techniques. Laboratories will be based in Chemistry, Physics, Geoscience, and Conservation departments.

5. Outcomes

Student evaluations will be based on: (1) Participation in course lectures, (2) completion of course exercises and (3) completion of laboratory `mini-projects'. Students will be given pass/fail marks.

After completion of the course the Ph.D. student is expected to have improved

1. Knowledge and understanding
- of the fundamental physical principles underlying laser and mass spectrometry techniques, including but not limited to: electro-magnetic fields, laser ablation, ionization, ion detection, laser scattering etc.

2. Exposure to and experience with multiple laser and mass spectrometry instrumentation, like TOF-CIMS, HR-TOF-MS, laser ablation etc.

6. Required reading
The reading list is supplied separate to the syllabus. (Where necessary also state other types of course material.)

7. Assessment
Student evaluations will be based on: (1) Participation in course lectures, (2) completion of course exercises and (3) completion of laboratory `mini-projects'. Students will be given pass/fail marks.

8. Grading scale
The grading scale comprises Fail, (U), Pass (G)

9. Course Evaluation
The course evaluation is carried out together with the Ph.D. students at the end of the course, and is followed by an individual, anonymous survey. The results and possible changes in the course will be shared with the students who participated in the evaluation and to those who are beginning the course.

10. Language of instruction: The language of instruction is English.