COURSE DESCRIPTION

Chemistry 625 **Fall 2012**
Separations in Chemical Analysis **Professor Lloyd M. Smith**

This course will cover the basic theory and practice of chromatographic and electrophoretic separations used in chemical and biochemical analysis. Hands-on experience will be strongly emphasized, and will be obtained in the weekly laboratory. Topics to be covered include thin-layer chromatography, gel filtration, ion exchange, gas chromatography, high performance liquid chromatography, SDS polyacrylamide gel electrophoresis, isoelectric focusing, agarose gel electrophoresis of DNA, pulsed field gel electrophoresis, and capillary electrophoresis.

The semester will be divided into two parts. In the first part, the class will follow a classic "lecture, listen" model. Lectures will be given on the basic principles of chromatography and electrophoresis. Occasional problem sets will be assigned and in-class exams will be given on both topics. For the second half of the semester, students will be responsible for researching a topic of their choice in the area of separations and will present a lecture on the material to the rest of the class. They will also prepare a ~10 page paper on the subject, to be distributed to the class a week before their lecture. All students will be responsible for providing written feedback on the paper to the lecturer, covering its strengths, weaknesses, and any notable insights or comments on the topic or presentation.

In the laboratory, the first 6 laboratory periods will be devoted to preplanned experiments. Labs will start the 2nd week of classes (the first lab will be Friday September 14). A brief write-up will be required for each experiment that should include a description of the experiment, the data obtained, and the conclusions that can be drawn from the data. A short section describing the basic principles of the separation method and the manner these principles are illustrated in the experiment should be included as well. The list of experiments and timetable is: Weeks 2-3: Introduction to Separations (size exclusion chromatography (SEC), thin layer chromatography (TLC), microfluidic capillary electrophoresis (CE), reverse phase liquid chromatography (RPLC), gel electrophoresis); Weeks 4-5: problem solving with TLC; Week 6-7: Separations Instrumentation (LC/GC/CE). The last 6 lab periods will be devoted to individual projects executed by the students. These projects are to explore either some separation principle, or a particular separation problem, and are to be presented in a final report.

Grading for students taking the course for two credits (no laboratory) will be based upon the two midterm exams (25% each), homework (10%), and the presentation/paper (20% each). Grading for students taking the course for three credits will be based upon the midterm exams (20% each), homework (10%), the presentation/paper (15% each), performance on the preplanned laboratory experiments (10%), and performance on the final lab project and report (10%). There will be no final exam.