

Chemistry 4015/6015
Separation in Biosciences Spring 2018 (MM1)
Langdale Hall 401 (Mon/Wed 5:30-8:15, Lectures), Lab in Room 429 NSC
Jan 8- Feb 24, 2018

Instructor: Office: Shahab A. Shamsi, Room 573 NSC,
Phone (404)-413-5512; E-mail address: sshamsi@gsu.edu
Monday and Wednesday
Office Hours (immediately after the class till 9:15 P.M, or TBA by appointment)

Reference text and resources: (1) Lecture notes (to be provided in class);
(2) Reference book (to be available in D2L), reference textbook in library

Course Objective: *To learn fundamentals of capillary electrophoresis
* To learn basic principles of various modes of capillary electrophoresis
*To learn to apply theoretical principles in order to develop a capillary electrophoresis method to achieve a particular separation/analysis of compounds or mixtures of compounds
*To improve oral communication skills in scientific reading and data presentations

Tentative Lecture Content: (This schedule is a general guide and may be modified as needed)

Unit 1-The Basics of Capillary Electrophoresis (Total 4 lectures + Lab I)

| Date | Reading | Module sub-topic |
|-------------|--|--|
| | | Module I |
| Jan 8 | Lecture Notes Reference books Module 1 | Introduction and History of Capillary Electrophoresis (CE) Classification of CE Methods Basic Separation Mechanism and Fundamentals of CE Electroosmotic flow and how it is generated |
| | | Module I (Contd) |
| | Lecture Notes Reference books Module 1 | Concept of Effective and Apparent Mobility Efficiency and Resolution in CE (contd) Sources of Zone Broadening Capillary Electrophoresis Method Development |
| Jan 10 | Lecture Notes | Module II -Capillary Electrophoresis (CE) Instrumentation Capillary Electrophoresis Method Development (Laboratory + lecture session) |
| Jan 15 | | Martin Luther King Holiday (No Class) |

Jan 17 Lecture Notes Detection in CE, Capillary Zone Electrophoresis (CZE)
Introduction, Mechanism of Separation, Buffer Systems
Practical Considerations in CZE

Unit 2-Modes of Capillary Electrophoresis (Total 7 lectures + 1 Lab)
Module III

Jan 22 Exam I For the first 90 minutes
Capillary Ion Electrophoresis (CIE)

Jan 24 Lecture Notes Capillary Ion Electrophoresis (CIE)
Reference books Introduction, Mechanism of Separation, Buffer System
Detection Modes, Application to Anions and Cations

Module IV

Jan 29 Lecture Notes Micellar Electrokinetic Chromatography (MEKC)
Reference Book Introduction (Concept of Surfactants and Micelles)
(Group I experiment on MEKC)

Jan 31 Lecture Notes MEKC (contd)
Reference books Mechanism of Separation, Capacity Factor, Elution Range
In MEKC (Group II experiment on MEKC)

Feb 5 Lecture Notes **Module V**
Reference books Capillary Gel Electrophoresis (CGE)
Mechanism of Separation, Theories of Migration of
Macromolecules in Polymer Gels,
Parameters affecting CGE separations, Applications

Feb 7 Lecture Notes **Module VI**
Reference books Capillary Isoelectric Focusing (CIEF)
Concept of Isoelectric point, CIEF procedures
Types of Mobilization, Capillary isotachopheresis (CITP)

Module VII

Feb 12 Lecture Notes Chiral Capillary Electrophoresis (CCE)
Reference books Importance of Chirality, Chiral selectors, Principle and
Separation Mechanism, Migration order in CCE,
Applications

Unit 4-Advances in Separation/Detection in Capillary Electrophoresis

| <u>Date</u> | <u>Reading</u> | <u>Module sub-topic (2-lectures)</u> |
|-------------|----------------------------------|---|
| Feb 14 | Lecture Notes Reference books | Module VIII CCE (contd) Capillary Electrochromatography (CEC) Fundamentals and Instrumentation in CEC Mechanism of Separation, Buffer Systems, Applications |
| Feb 19 | Lecture Notes Reference books | Module IX Capillary Electrophoresis-Mass Spectrometry, CEC-MS, MEKC-MS, Capillary Array Electrophoresis |
| Feb 21 | | Exam II (3 hr exam) |

Final Exam Friday Feb 23 at 4:15-6:30 P.M (Comprehensive)

GRADING CRITERIA

UNDERGRADUATE(4015)

Short exams 50%
(Exam 1 = 20%, Exam 2 = 30%)
Laboratory I and II = 25%
Homeworks = 5%
On line Quizzes = 5%
Chat board discussion = % bonus
*Final exam 15%

*GRADUATE (6015)

Short exams 50%
(Exam 1 = 20%, Exam 2 = 30%)
Lab I and II = 20%
Homeworks= 5%
Online Quizzes = 5%
Chat board discussion = % bonus
*Final exam = 20%

***Final exam will be 75% comprehensive and 25% will cover part of Model VII-IX**

***Student can take at least two final exams within 24 hours. However, if a student has more than two exams please let me know in writing at least 7 days before the final to reschedule. No special administration of final exams will be made if the above rule is not followed**

GRADING SCALE: The grading scale may be curved, but the most probable breakdown will be:

| | |
|----------|----------------|
| 95-100 | A ⁺ |
| 90-94 | A |
| 85-89 | A ⁻ |
| 80-84 | B ⁺ |
| 75-79 | B |
| 70-74 | B ⁻ |
| 65-69 | C ⁺ |
| 60-64 | C |
| 55-59 | C ⁻ |
| 50-54 | D ⁺ |
| 45-49 | D |
| 40-44 | D ⁻ |
| below 40 | F |

PLEASE READ THE IMPORTANT POLICIES AND PROCEDURES:

1. **No makeup exams will be given** (unless the situation is such that the whole class did poorly in the exam).
2. If a student misses one exam **without a legitimate excuse**, s(he) will receive a grade zero for that exam.
3. If a student misses one exam **with a legitimate excuse**, s(he) can either choose to receive a grade of zero for that exam or apply the grade to the final exam.
4. If you miss exam III there (with or without legitimate excuse) you will receive grade zero on that exam

*Legitimate reasons for excuse are the following:

| Cause | Required |
|-----------------|------------------------------------|
| Due to illness | illness note from the doctor |
| Due to business | business note from the supervisor |
| Death in family | note of death from a family member |
| Other | On a case by case basis |

* I must be informed **before the exam** to count as an excused absence. If you cannot reach me, leave a message on my answering machine at my office (Indicate the time and the day), or notify the departmental receptionist (Indicate the time and the day).

Please note that notifying me after the exam will result in a grade of zero for that exam.

5. Although I do not expect cheating in my classroom, the penalty is an **F for the course**. Plagiarism is also considered cheating, therefore, copying large sections of another author's material without paraphrasing and referencing it will result in grade F.
6. Attendance will be taken regularly. I strongly urge to attend class. Otherwise you may miss the pop quizzes and lecture part (that may not be there in your textbook).
7. Although I will try to maintain the class schedule and objectives, I may need to make adjustments.

Course Withdrawl Date

The last day to withdraw from the course and possibly receive a "W" is **Friday Jan 26**

Professional Behavior Guidelines:

1. **Tardiness:** Please arrive on time. If you are late please enter the class without disturbing your class mates and my concentration.
2. **Side Conversation:** Side conversations make it difficult for your class mates to actively listen and learn. If you have trouble reading the board please ask me without any hesitation.
3. **Sleeping:** Falling asleep in class (unless the course focuses on dysfunctional sleep

behaviors) is not considered professional attitude.

4. **Lack of attention/Boredom:** Please do not read other books or newspapers or study for other courses during my class. It is not polite. If the material that you are taught is familiar to you please write down some specific questions in your notebook and discuss with me about the advances in this topic (**only after the class**).
5. If you cannot see me during my office hours please send me an e-mail (sshamsi@gsu.edu) for help any day.
6. You may audio tape my lectures.