

**Chemistry 4010/6010 Chromatography**  
**Spring 2018**  
**1:00-2:15 (Tue/Thurs) Class Room South 327**  
**Lecture Instructor: Ning Fang**  
**Office: Room 308 Petit Science Center (PSC)**  
**Email: nfang@gsu.edu; Phone: (404) 413-5513**  
**Office Hours (Tue/Thurs 2:15 - 3:30 P.M.) in Room 308 PSC**

**Reference Textbook and Resources**

“Chromatographic Methods” written by A. Braithwaite and F. J. Smith (available in GSU Book Store); Lecture Notes (All notes will be provided via e-mail).

**Appointment Time**

**You can see me right after the class or set an appointment time by e-mail.**

**Learning Objectives**

- To learn basic principles governing separation techniques.
- To learn fundamentals of chromatographic techniques.
- To learn to apply basic principles, which may help develop chromatographic methods to achieve a particular separation and analysis of real world chemical compounds

\*Laboratory schedules and experimental issues are generally handled by the laboratory personnel. If you have any questions related to experimental problems, instrument malfunctioning, lab write up and lab grades, please contact the laboratory personnel first. Dr. Fang may review the lab grading for any issues that students may have. Graded lab reports may be requested by Dr. Fang for review and to improve learning outcomes for final assessment.

**Tentative content and schedule: This is a tentative schedule and may be modified as needed.**

| <b>Module I:</b>   | <b>Basic Theory of Chromatography</b> |   |
|--------------------|---------------------------------------|---|
| <b><u>Date</u></b> | <b><u>Suggested Readings</u></b>      | <b><u>Sub-Topic</u></b>   |
| <b>Jan 9, 11</b>   | Chapter 1, Lecture Notes              | Introduction, History and Type of Chromatography, Plate Theory, Calculation of Zone Spreading, Theoretical Plates, Shortcomings of Plate Theory |
| <b>Jan 16</b>      | Chapter 1, Lecture Notes              | Chromatographic Parameters (Retention, Capacity Factor, Resolution, Symmetry and Peak Capacity), Factors Affecting Resolution                   |
| <b>Jan 18, 23</b>  | Chapter 1, Lecture Notes              | Rate Theory of Chromatography, van Deemter Equation, Factors Affecting the van Deemter Plot and Equation  |
| <b>Jan 25</b>      | Chapter 1, Lecture Notes, Homework    | Problem Solving   |

**\*Jan 30 (Tuesday) Exam I (100 pts) (Module I)**

|                   |   |  |
|-------------------|---|--|
| <b>Module II:</b> | <b>Qualitative and Quantitative Analysis in Chromatography/Basic GC Instrumentation</b> |  |
| <b>Feb 1</b>      | Chapter 2, Lecture Notes  | Qualitative Methods, Kovats Retention Index  |
| <b>Feb 6</b>      | Chapter 5, Lecture Notes  | Quantitation Methods in Chromatography   |
| <b>Feb 8, 13</b>  | Chapter 5, Lecture Notes  | Temp Effects in Chromatography   |
|                   |   | Principles and Instrumentation in Chromatography   |
|                   |   | Choice of Mobile Phases and Stationary Phases in Gas Chromatography, Carrier Gas and Injection Modes |
| <b>Feb 15, 20</b> | Chapter 5, Lecture Notes  | Detector Properties, Types of GC detectors   |

**\*Feb 27 (Tuesday) Exam II (100 pts) (Module II)**

|                      |  |  |
|----------------------|--|--|
| <b>Module III:</b>   | <b>Principles and Methodologies in Liquid Chromatography</b> |  |
| <b>Feb 22, Mar 1</b> | Chapter 6, Lecture Notes                                     | HPLC Detectors                           |
| <b>Mar 6</b>         | Chapter 6, Lecture Notes                                     | Instrumentation in HPLC                  |
|                      |  | Pump, Injector, Column                   |
| <b>Mar 8</b>         | Chapter 6, Lecture Notes                                     | Normal Phase HPLC                        |
| <b>Mar 20</b>        | Chapter 6, Lecture Notes                                     | Reversed Phase HPLC                      |
| <b>Mar 22</b>        | Chapter 6, Lecture Notes                                     | Size Exclusion/Gradient Elution in HPLC  |
| <b>Mar 27, 29</b>    | Chapter 6, Lecture Notes                                     | Ion Exchange HPLC and Ion Chromatography |

**\*Apr 3 (Tuesday) Exam III (100 pts) (Module III)**

|                   |               |  |
|-------------------|---------------|--|
| <b>Apr 5</b>      | Lecture Notes | Thin Layer Chromatography (TLC)          |
| <b>Apr 10</b>     | Lecture Notes | Supercritical Fluid Chromatography (SFC) |
| <b>Apr 12, 17</b> | Lecture Notes | Chromatographic Analysis of Samples      |
| <b>Apr 19</b>     | Lecture Notes | Microfluidics and Review                 |

**\*Apr 24 (Tuesday) Final Exam \*Comprehensive\* (150 Pts) 10:45 am - 1:15 pm**

**Home Work Problems:** Six (6) assigned homework problems will be given during the semester. Each homework assignment should be turned in by the corresponding due date to earn 1.5% towards the final grade. There will be late penalty for 0.1%/day. They can be discussed on the electronic discussion board or you can talk to the instructor. It should be noted that questions similar to homework problems may be asked in the exam. Hence, it should be reviewed carefully.

**Pop Quizzes:** Will be given throughout the semester at the end of the class. They are mandatory and will contribute to your overall grade of the semester. **Please understand that there will be no make-up pop quizzes that will be offered. However, you are allowed to drop two quizzes.**

## Grading Point Distribution

### **UNDERGRADUATE (4010)**

Lab reports 30%  
Exams 55% (450 total pts)  
Pop Quizzes (6%)  
Homework (9%)

### **GRADUATE (6010)**

Lab reports 30%  
Exams 55% (450 total pts)  
Pop Quizzes (6%)  
Homework (0%)  
†Literature Project (9%)

† **Literature project will be due on the day of the Final exam and is required only by graduate students.**

## Grading Scale

**Grading may be curved** (depending on the class performance), but the most probable break down will be as follows:

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

## Policy Statement Regarding Student Integrity

The Georgia State University Policy on Academic Honesty is in force in this course, including but not necessarily limited to infractions in the areas of Plagiarism, Cheating on Examinations, Unauthorized Collaboration, Falsification, and Multiple Submissions. The university's policy is published in the *On Campus: The Student Handbook*, available to all members of the university community. Therefore, all tests taken must represent your individual unaided efforts. To receive or offer information during an examination is cheating. The use of unauthorized supplementary materials during tests is also cheating. All laboratory work performed during the lab portion of a course must reflect your individual effort. Only original data obtained by your own in-lab experimentation are permitted to be used, except when specifically authorized by your laboratory professor. Data from supplementary sources (handbooks, reference literature, etc.) must be clearly referenced (title, author, volume, page(s), etc.). Falsification or destruction of data constitutes cheating. Conduct or actions that disrupt class or test periods or falsification of information related to chemistry courses by any student will be taken as violation of the policies of the Board of Regents of the University System of Georgia and the GSU Student Code of Conduct, Section 6.0. Any suspected offenses may be referred to the Department Chair or the Dean of Students for appropriate disciplinary action.

1. No make-up exam will be given unless the situation is such that the whole class did poorly in the exam.
2. If a student misses any exam (**without a legitimate excuse**), he/she will receive a grade zero for that exam.

3. If a student misses any exam (**with a legitimate excuse**), he/she should talk to Dr. Fang for a solution **before the exam**.

\* Legitimate reasons for excuse are the following:

| <b>Cause</b>    | <b>Required</b>                    |
|-----------------|------------------------------------|
| 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, send me an email or leave a message on my answering machine at my office (Indicate the time and the day).

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

4. 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.
5. Attendance will be taken regularly. I strongly urge to attend class. Otherwise you may miss the lecture part (that may not be there in your textbook).
6. Although I will try to maintain the class schedule and objectives, I may need to make adjustments.

### **Course Withdrawal**

The last day to withdraw from the course and withdrawal policies should be checked by student from Registrar Office.

### **Professional Behavior Guidelines**

1. **Tardiness:** Please arrive on time. If you are late, please enter the class without disturbing your classmates 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 or any of my slide 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 for help any day.