

**Chemistry 4330/6330
Fall Semester 2020**

Lecture - Monday & Wednesday, 3:30 - 4:20 p.m., **Classroom South 428**
Lab - Tuesday, 9:00 am – 12:45 p.m., **355 and 357 Petit Science Center (PSC)**

Course Title: Advanced Synthesis

Professor: Maged Henary, 315 PSC, 404-413-5566

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Lab Assistants:

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Office Hours: From 2 pm - 3 pm, before each lecture or by appointment.

Objectives: To learn modern synthesis, separation techniques and compounds characterization in organic and inorganic chemistry.

For additional information, see the section “General Syllabus” in the Lab Manual

Required Readings: T. Leonard, B. Lygo, and G. Procter, *Advanced Practical Organic Chemistry*, Blackie Academic and Professional, London, 1995, second edition (or equivalent); F. A. Carey and R. J. Sundberg, *Advanced Organic Chemistry, Part B, Reactions and Synthesis*, Plenum Press, New York (any edition).

Course Requirements: Bound laboratory notebook, written report from each experiment with full characterization of synthesized compounds, and submission of the samples. The report and the final product should be submitted **to your instructor within one week after completion of each experiment. Points will be subtracted for late submissions.**

Provided laboratory manual will not be allowed during the laboratory time; all details should be written in the laboratory notebook and should be well read and understand before arriving in the lab.

Attendance Policy: Lectures and labs must be attended; lab make-ups are not recommended.

It is absolutely forbidden to work in the lab without supervision.

The course syllabus provides a general plan for the course, deviations may be necessary.

Academic Honesty Agreement

The Advanced Synthesis Academic Honesty Agreement will be distributed to each student for his/her signature.

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.

Use and Distribution of Class Materials.

The materials used in this class, including, but not limited to: Lecture Videos and notes, Exams, Quizzes, Homework Assignments, etc. are the professors Intellectual Property. Any unauthorized copying/distribution of the class materials is a violation of Intellectual Property Rights and may result in disciplinary actions being taken against the student. Additionally, the sharing of class materials without the specific, express approval of the instructor may be a violation of the University's Student Honor Code and an act of academic dishonesty, which could result in further disciplinary action. This includes, among other things, uploading class materials to websites (Chegg, Course Hero, Group Chats, etc.) for sharing those materials with other current or future students. This includes the re-posting of lecture recordings. I share my material freely with my classes, there is no need to buy or sell my class notes, workshops, identity, etc.

- For face coverings, assigned seating for face-to-face, attendance, and student illness. Please check the GSU link shown below:**

<https://cetl.gsu.edu/resources/resources-for-remote-teaching-and-learning/fall-plan-keep-teaching/syllabus-statements/>

Online course evaluation.

"Your constructive assessment of this course plays an indispensable role in shaping education at Georgia State. Upon completing the course, please take time to fill out the online course evaluation."

List of Preparations (described in detail in the Lab Manual)

1. 7,7-Dichloronorcaradiene

Chemistry: Generation of a carbene, and phase-transfer catalysis.

Techniques: Distillation, IR, GC-MS, and ¹H-NMR

2. A pentamethine cyanine dye

Chemistry: Dye synthesis

Techniques: Synthesis, crystallization, use of a rotary evaporator, determination of mp, and ¹H-NMR

3. Ferrocene

Chemistry: Inorganic synthesis, generation of cyclopentadiene.

Techniques: Distillation, sublimation, use of a dry box, determination of mp, IR, and ¹H-NMR.

4. Tetraphenyltin

Chemistry: Inorganic synthesis.

Techniques: Handling of sodium and phenylsodium, crystallization, determination of mp, IR, and ¹H-NMR.

5. Sonogashira reaction using a microwave

“The Sonogashira reaction is a cross-coupling reaction used to form carbon–carbon bonds. It makes use of a palladium catalyst to form a carbon–carbon bond between a terminal alkyne and an aryl or vinyl halide.”

Chemistry: Palladium catalyst cross-coupling reaction used to form carbon–carbon bonds

6. 2-Chloro-4-(2-thienyl)pyrimidine

Chemistry: Nucleophilic addition, DDQ oxidation.

Techniques: Handling of organometallic reagents (**caution!**), titration of *n*-butyllithium, TLC and column chromatography, determination of mp, ¹H-NMR, and GC-MS.

Techniques: Handling of microwave, microwave assisted synthesis, Crystallization, use of a rotary evaporator, determination of mp, and ¹H-NMR

Schedule of Experiments:

Each experiment will be conducted as **instructed** in the lab lecture.

Each experiment, time-table and the chemistry involved will be discussed in class.

Important Dates:

- Labor Day Holiday on Monday September 7. No class.
- Last Day to Withdraw from the class on October 13 of 2020.
- Thanksgiving Holidays “the week of November 23rd- 28th of 2020”.

Tentative Exams Schedule:

- Laboratory Final Exam: Tuesday, **December 1**, 10:00 am in the in **lab room (355 and 357 PSC)**.
- Final Exam (ACS Format – 2 h): Monday, **December 7**. This exam will take place in the lecture room (**Classroom South 428**)