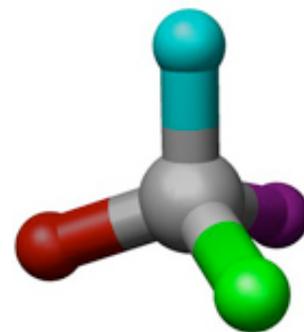


# Chemistry 745 - Organic Synthesis

Syllabus - Spring 2015



**Instructor:** Prof. Gregory Cook

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**Office Hours:** by appointment

**Course Hours:** MTWF, 10:00-10:50 am

**Webpage:** cook.chem.ndsu.nodak.edu

**Text:** A single textbook would be inadequate for this course. Consequently there is no specific required text. Instead, I will be drawing from the scientific literature and several different books for the class material. There are a few books that you may find useful to add to your personal library:

Advanced Organic Chemistry by Jerry March

Advanced Organic Chemistry by F. Carey and R. Sundberg

The Logic of Chemical Synthesis by E. J. Corey

Classics in Total Synthesis I and II by K. C. Nicolaou and E. J. Sorensen

Although no text is required, you will find it beneficial to do background reading in an upper level organic chemistry book such as March and/or Carey and Sundberg. If you find yourself lacking in basic organic chemistry knowledge, review of an undergraduate text may also be helpful. For this class I will assume you have mastery of undergraduate organic chemistry and have a solid foundation in graduate physical organic chemistry.

**Introduction:** This course is designed to cover the fascinating art of organic synthesis. We will go in-depth to cover the principle reactions leading to carbon-carbon bond formation and functional group transformations. We will discuss the strategies and methods for organic synthesis. We will cover the reactivity, methodology, and mechanisms of the reactions of alkenes and alkynes, oxidations and reductions, carbon nucleophiles, pericyclic reactions and metal-mediated reactions. Aspects of selectivity are paramount for these topics.

**Expectations:** The course will be organized with three weekly lectures on M, T, W. The Friday class period will have some lectures, but will partly consist of in-class problem sessions and discussions of classic and recent literature on total synthesis. Handouts will be given in class and everyone is expected to participate at the whiteboard solving problems. Problem solving and justifying answers is one of the best ways to learn.

Homework will be assigned periodically.

You will be asked to develop a total synthesis proposal on an assigned natural product (to be assigned later). You will be expected to develop a retrosynthetic analysis for the molecule and develop a detailed forward synthesis. This will be written in journal format and submitted by Friday, May 1, 2015.

By the end of the semester you will be expected to have a working knowledge of a significant number of reactions, a sense of context for where reactions fit in a larger synthetic scheme, a developed appreciation for reaction mechanisms, and how to locate information from various reference and on-line sources.

**Grading:** Grading will be based on the following (A 90-100%, B 80-90%, C 70-80%, D 60-70%, F <60%):

midterm exam	100 pts
final exam	100 pts
homework assignments	150 pts
total synthesis proposal written report	100 pts
in-class problem participation	50 pts

**Auditing:** Students who audit the course must attend all lectures, complete all homework and term papers, take the scheduled exams and must receive a letter grade of a D or better to receive audit credit for the course.

## Course Topics:

Introduction and Overview  
Basics of Organic Synthesis: principles of reactivity, selectivity, reaction mechanisms  
Retrosynthetic Analysis  
Nucleophilic Carbon Reagents (eg. Grignards, Wittig, etc.)  
Nucleophilic Allyl Reagents  
Enolates and Aldol Reactions  
Oxidations  
Reductions  
Protecting Groups  
Oxygen Protecting Groups  
Nitrogen Protecting Groups  
Carbocyclic Ring Formation  
Small Ring Formation (3- and 4-membered)  
5-Membered Ring Formation  
6-Membered Ring Formation  
7-Membered and Larger Ring formation  
Cross Coupling

A midterm exam will take place in early March to be scheduled later. The final exam will be held during our normal exam scheduled time during finals week (Monday, May 11, 10:30 am).

**Holidays and Breaks:** We will not have class on the following days:

Mon, Jan 19 - Martin Luther King Jr. Holiday  
Fri, Feb 6 - Dr. Cook Travel  
Mon, Feb 16 - President's Day Holiday  
Mon-Wed, Feb 23-25 - Dr. Cook Travel  
Mon - Fri, Mar 16 - 20 - Spring Break  
Mon - Wed, Mar 23-25 - National ACS Meeting  
Fri, April 3 - Spring Holiday  
Mon, April 6 - Spring Holiday  
Mon - Tue, Apr 13-14 - Dr. Cook Travel

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**Special Needs:** All students have the right to an environment that is conducive for learning. Any students who need special accommodations for learning or who have special needs are invited to share these concerns or requests with the instructor as soon as possible.

**Academic Responsibility:** It is assumed that students at NDSU have the integrity to complete their work on their own. Any student who is found to have acted dishonestly on an exam or assignment will receive an F for the course. Please note that plagiarism will not be tolerated. For more information on plagiarism and how to avoid it see: <http://owl.english.purdue.edu/owl/resource/589/01/>. The policy applied is that of the Code of Academic Responsibility and Conduct as outlined in NDSU University Senate Policy, Section 335: Code of Academic Responsibility and Conduct (<http://www.ndsu.nodak.edu/policy/335.htm>).