NOTE to prospective students: This syllabus is intended to provide students who are considering taking this course an idea of what they will be learning. A more detailed syllabus will be available on the course site for enrolled students and may be more current than this sample syllabus. Summer term courses may be accelerated – please check the Ecampus Schedule of Classes for more information.

CH 332
ORGANIC CHEMISTRY

COURSE CREDIT
(4) This course combines approximately 120 hours of instruction, online activities, and assignments for 4 credits.

PREREQUISITES, CO-REQUISITES AND ENFORCED PREREQUISITES
CH 331 [D-] and one year of general chemistry at OSU (or equivalent from another institution) or instructor approval. CH 130 does not meet this requirement. CH 331 and CH 332 must be taken in order.

COURSE DESCRIPTION:
Service course covering aliphatic and aromatic chemistry. Introduction to nomenclature, mechanism and synthesis.

Before registering, please refer to this website.

Success in this course often depends on the amount of time devoted to studying the material. This is a 4-credit course, and each credit is meant to reflect about 30 hours of effort.
Participation during the entire term is important to success in this class. Students who have not logged in to Canvas by the *second Wednesday of the term* **will be dropped from the class**. Students with extenuating circumstances must email the instructor before this date.

CONTACT INFORMATION:

Instructor: Dr. Daniel Myles daniel.myles@oregonstate.edu

Sample syllabi may not have the most up-to-date information. For accuracy, please check the ECampus Schedule of Classes to see the most

current instructor information. You can search for contact information by name from the OSU Home Page.

LEARNING RESOURCES:

NOTE: For textbook accuracy, please always check the textbook list at the OSU Bookstore website. Sample syllabi may not have the most up-to-date information.

Students can also click the *'OSU Beaver Store'* link associated with the course information in the **Ecampus schedule of classes** for course textbook information and ordering.

COURSE SPECIFIC MEASURABLE STUDENT LEARNING OUTCOMES:

The successful student will:

1. Nomenclature
    a. be able to give IUPAC names of alcohols, ethers, epoxides, aldehydes, ketones, carboxylic acids, esters and substituted benzenes (mono-substituted, di-substituted)
2. Alcohols and ethers
    a. given an alcohol substrate in conjunction with HX be able to predict the product(s), including stereochemical outcome of substitution (S_N1/S_N2), predict and explain the distribution of products and display mechanism via curved arrow formalism
    b. given an alcohol substrate in conjunction with H_2SO_4 be able to predict the product(s), including stereochemical outcome of elimination (E1/E2), predict and explain the distribution of products and display mechanism via curved arrow formalism
    c. given an alcohol substrate in conjunction with PX_3 be able to predict the product(s), including stereochemical outcome of substitution (S_N2), predict and explain the distribution of products and display mechanism via curved arrow formalism
    d. given an alcohol substrate in conjunction with a sulfonyl chloride be able to predict the product(s), including stereochemical outcome of substitution (S_N2), predict and explain the distribution of products and display mechanism via curved arrow formalism
    e. given an alcohol substrate in conjunction with H_2CrO_4/PCC be able to predict the products and predict and explain the distribution of products
    f. given an ether substrate in conjunction with HX be able to predict the product(s), including stereochemical outcome of substitution (S_N1/S_N2), predict and explain the distribution of products and display mechanism via curved arrow formalism
    g. given the reactants be able to predict the products of epoxide opening, predict and explain the distribution of products and display the mechanism via curved arrow formalism under acidic conditions

h. given the reactants be able to predict the products of epoxide opening, predict and explain the distribution of products and display the mechanism via curved arrow formalism under neutral or basic conditions

3. Organometallic compounds
    a. given an acetylide ion/organolithium compound/Grignard reagent in conjunction with a compound that possesses OH/NH_2/ NHR/SH/C≡CH/CO_2H be able to predict the products and predict and explain the distribution of products and display mechanism via curved arrow formalism
    b. given an acetylide ion/organolithium compound/Grignard reagent in conjunction with an epoxide be able to predict the products and predict and explain the distribution of products and display mechanism via curved arrow formalism
4. Aldehydes and ketones
    a. given an aldehyde/ketone substrate in conjunction with a hydride reducing agent be able to predict the products, predict and explain the distribution of products and display mechanism via curved arrow formalism
    b. given an aldehyde/ketone substrate in conjunction with an acetylide ion/organolithium compound/Grignard reagent be able to predict the products, predict and explain the distribution of products and display mechanism via curved arrow formalism
    c. given an aldehyde/ketone substrate in conjunction with hydrogen cyanide be able to predict the products, predict and explain the distribution of products and display mechanism via curved arrow formalism
    d. given an aldehyde/ketone substrate in conjunction with an amine be able to predict the products, predict and explain the distribution of products and display mechanism via curved arrow formalism
    e. given an aldehyde/ketone substrate in conjunction with an alcohol be able to predict the products, predict and explain the distribution of products and display mechanism via curved arrow formalism
    f. be able to use acetals/ketals as protecting groups
5. Carbohydrates
    a. be able to distinguish between simple carbohydrates and complex carbohydrates, between monosaccharides, disaccharides, oligosaccharides and polysaccharides, between aldoses and ketoses, between trioses, tetroses, pentoses, hexoses, etc, and between D sugars and L sugars
    b. be able to name/draw furanoses, pyranoses, furanosides and pyranosides
    c. be able to recognize alditols, aldonic acids and aldaric acids
    d. given a furanose/pyranose/furanoside/pyranoside in conjunction with sodium borohydride be able to predict the products, predict and explain the distribution of products and display mechanism via curved arrow formalism
    e. given a furanose/pyranose/furanoside/pyranoside in conjunction with bromine be able to predict the products, predict and explain the distribution of products

f. given a furanose/pyranose/furanoside/pyranoside in conjunction with Tollens reagent be able to predict the products, predict and explain the distribution of products
g. given a furanose/pyranose/furanoside/pyranoside be able to predict if it will exhibit mutarotation
h. given a furanose/pyranose/furanoside/pyranoside be able to predict if it is a reducing sugar
i. be able to use the Kiliani-Fischer synthesis as means for lengthening the carbon chain of an aldose
j. be able to use the Wohl degradation as a means for shortening the carbon chain of an aldose
k. be able to deduce the structure of an unknown disaccharide

6. Carboxylic acids, esters and related compounds
    a. be able to understand the general structure of carboxylic acids and carboxylic acid derivatives
    b. given an acyl halide in conjunction with a nucleophilic reagent be able to predict the products, predict and explain the distribution of products and display mechanism via curved arrow formalism
    c. given an ester in conjunction with water be able to predict the hydrolysis products, predict and explain the distribution of products and display mechanism via curved arrow formalism
    d. given an ester in conjunction with alcohol be able to predict the transesterified products, predict and explain the distribution of products and display mechanism via curved arrow formalism
    e. given an ester in conjunction with hydroxide ion be able to predict the saponified products, predict and explain the distribution of products and display mechanism via curved arrow formalism
    f. given a carboxylic acid in conjunction with alcohol be able to predict the Fischer esterified products, predict and explain the distribution of products and display mechanism via curved arrow formalism
    g. given a carboxylic acid in conjunction with an amine be able to predict the products, predict and explain the distribution of products and display mechanism via curved arrow formalism
7. Structure determination
    a. be familiar with characteristic infrared (IR) absorption bands
    b. be able to understand the intensity of absorption bands in connection with relative bond polarity
    c. be able to understand the position of an absorption band as it relates to Hooke's law
    d. be able to understand how the position of a particular absorption band is influenced by electron delocalization

e. be able to interpret and recognize the presence or absence of important functional groups provided an IR spectrum
f. be able to understand shielding and deshielding in ^{1}H nuclear magnetic resonance (NMR) spectroscopy
g. be able to recognize chemically and non-chemically equivalent protons
h. be familiar with proton chemical shifts of common functional groups
i. be able to understand both relative and absolute proton ratios and also signal splitting
j. be able to predict and interpret spectral features
k. be able to elucidate structure based on a given proton NMR spectrum

8. Aromaticity and chemistry of benzene
    a. be able to characterize a compound as being aromatic, antiaromatic, or nonaromatic
    b. given benzene in conjunction with nitric and sulfuric acid be able to predict the nitrated product, predict and explain the distribution of products and display mechanism via curved arrow formalism
    c. given benzene in conjunction with a halogen and an iron-based catalyst be able to predict the halogenated product, predict and explain the distribution of products and display mechanism via curved arrow formalism
    d. given benzene in conjunction with sulfuric acid be able to predict the sulfonated product, predict and explain the distribution of products and display mechanism via curved arrow formalism
    e. given benzene in conjunction with an acyl halide and aluminum trihalide be able to predict the acylated product, predict and explain the distribution of products and display mechanism via curved arrow formalism
    f. given benzene in conjunction with an alkyl halide and aluminum trihalide be able to predict the alkylated product, predict and explain the distribution of products and display mechanism via curved arrow formalism
    g. understand electrophilic aromatic substitution reactions of substituted benzenes – effect of substituents on reactivity and orientation
    h. understand the ortho-para ratio

COURSE CONTENT AND POLICIES:

- **Chapter 11: Reactions of Alcohols, Ethers, Epoxides, Amines, & Sulfur Containing Compounds**
- **Chapter 12: Organometallic Compounds**
- **Chapter 14: Infrared Spectroscopy**
- **Chapter 15: NMR Spectroscopy**
- **Chapter 16: Carbonyl Compounds I**
- **Chapter 17: Carbonyl Compounds II**
- **Chapter 18: Carbonyl Compounds III**

- **Chapter 19: Aromaticity – Reactions of Benzene and Substituted Benzenes**
- **Chapter 21: Carbohydrates**

EVALUATION OF STUDENT PERFORMANCE:

Exams: Students will take a 110 minute, proctored* midterm exam during a specific time window in week 5 of the term. Students will take a 110 minute, proctored* final exam during a specific time window during Finals week. *The final exam is comprehensive.*

*Proctoring guidelines and registration for proctored exams are available online at the following link: http://ecampus.oregonstate.edu/services/proctoring/

No make-up midterm exams will be given. If a student misses the midterm exam due to illness (or other excused absence), the final will count for 250 pts.

Grading:

	Maximum Points
Midterm Exam	100
Final Exam	150 (or 250) **
Blackboard Quizzes	60
Final Score	310

** If the % grade of your final exam is higher than the % grade of your midterm exam, then your final exam % grade will be used to replace your midterm exam grade (as a %).

COURSE SITE LOGIN INFORMATION

Information on how to login to your course site can be found **HERE**.

STATEMENT REGARDING STUDENTS WITH DISABILITIES

Oregon State University is committed to student success; however, we do not require students to use accommodations nor will we provide them unless they are requested by the student. The student, as a legal adult, is responsible to request appropriate accommodations. The student must take the lead in applying to Disability Access Services (DAS) and submit requests for accommodations each term through DAS Online. OSU students apply to DAS and request accommodations at our Getting Started with DAS page.

Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are

eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 541-737-4098.

Additionally, Canvas, the learning management system through which this course is offered, provides a vendor statement certifying how the platform is accessible to students with disabilities.

ACADEMIC INTEGRITY AND STUDENT CONDUCT (OSU POLICY)

Students are expected to be honest and ethical in their academic work. Intentional acts of academic dishonesty such as cheating or plagiarism may be penalized by imposing an "F" grade in the course.

Student conduct is governed by the universities policies, as explained in the Office of the Dean of Student Life: Student Conduct and Community Standards. In an academic community, students and faculty, and staff each have responsibility for maintaining an appropriate learning environment, whether online or in the classroom. Students, faculty, and staff have the responsibility to treat each other with understanding, dignity, and respect.

Students are expected to conduct themselves in the course (e.g. on discussion boards, email postings, etc.) in compliance with the university's regulations regarding civility. Students will be expected to treat all others with the same respect as they would want afforded to themselves. Disrespectful behavior (such as harassing behavior, personal insults, inappropriate language) or disruptive behaviors are unacceptable and can result in sanctions as defined by Student Conduct and Community Standards.

For more info on these topics please see:

- Statement of Expectations for Student Conduct
- Student Conduct and Community Standards - Offenses
- Policy On Disruptive Behavior

PLAGIARISM

You are expected to submit your own work in all your assignments, postings to the discussion board, and other communications, and to clearly give credit to the work of others when you use it. Academic dishonesty will result in a grade of "F."

- Statement of Expectations for Student Conduct
- Avoiding Academic Dishonesty

TECHNICAL ASSISTANCE

If you experience computer difficulties, need help downloading a browser or plug-in, assistance logging into the course, or if you experience any errors or problems while in your online course, contact the OSU Help Desk for assistance. You can call (541) 737-

3474, email osuhelpdesk@oregonstate.edu or visit the OSU Computer Helpdesk online.

- **COURSE DEMO**
- **GETTING STARTED**

TUTORING

For information about possible tutoring for this course, please visit our Ecampus NetTutor page. Other resources include:

- Writing Center
- Online Writing Lab

STUDENT EVALUATION OF TEACHING

The online Student Evaluation of Teaching form will be available in week 9 and close at the end of finals week. Students will be sent instructions via ONID by the Office of Academic Programs, Assessment, and Accreditation. Students will log in to "Student Online Services" to respond to the online questionnaire. The results on the form are anonymous and are not tabulated until after grades are posted. Course evaluation results are very important and are used to help improve courses and the learning experience of future students. Results from questions are tabulated anonymously and go directly to instructors and unit heads/supervisors. Unless a comment is "signed," which will associate a name with a comment, student comments on the open-ended questions are anonymous and forwarded to each instructor. "Signed" comments are forwarded to the unit head/supervisor.

REFUND POLICY INFORMATION

Please see the Ecampus website for policy information on refunds and late fees.