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.

COURSE NUMBER (CH411)
COURSE NAME (ADVANCED INORGANIC CHEMISTRY I)

COURSE CREDIT
(3) This course combines approximately 90 hours of instruction, online activities, and assignments for 3 credits.

PREREQUISITES, CO-REQUISITES AND ENFORCED PREREQUISITES
One year of general chemistry. College-level physics is recommended.

COURSE DESCRIPTION:
Fundamental principles of inorganic chemistry including atomic structure, bonding models for molecules and solids, symmetry, acid/base chemistry, oxidation-reduction, and metal-ligand complexes.

CONTACT INFORMATION:
Email: michael.lerner@oregonstate.edu

For more information, contact: Greta Kvinnsland 541-737-6707 or RICH CARTER, 153 GILB, 541-737-2081

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:
• Inorganic Chemistry 6e (Shriver et al) (Required)
• Solutions Manual to accompany text (Optional)
• Practice exams, lecture notes, assigned exercises and problems in the text will be provided on the class website
• There may be other assigned or suggested readings; these will be provided when needed.

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 course is designed to for students to analyze and integrate concepts relevant to inorganic chemistry (these are described in detail below) that are required to understand, read, write, and to perform research in inorganic chemistry.

Chapter 1
• Determine exactly the energies of hydrogenic species, and determine relative energies of non-hydrogenic species using effective nuclear charges; give the electronic configuration of any atom or ion.
• Describe the radial and angular distribution of atomic orbitals.
• Understand the definitions and methods of obtaining atomic radii, ionization enthalpies, electron affinities, electronegativities, and polarizabilities, and explain the periodic trends of these atomic properties.

Chapter 2
• Write a Lewis structure for any molecule, including resonance forms, and assign formal charges and oxidation states.
• Explain qualitatively the relation between bond order, strength, and length, and their trends in the p-block.
• Determine molecular geometries using VSEPR, including deviations from ideal geometries and relate orbital hybridization to common molecular geometries.
• Generate MO diagrams, symmetry labels, and electron configurations for any diatomic molecule, and describe bonding and spectroscopic properties.
• Write qualitative LCAO’s for simple polyatomic molecules; explain and use correlation (Walsh)diagrams for polyatomic molecules.

Chapter 3
• Describe close-packed lattice in terms of A, B, and C hexagonal layers and describe the location, size, and concentration of Oh and Td voids in close packed lattices.
• Sketch and explain common metal and alloy structure types.
• Qualitatively indicate the relation between atomic radii and coordination number.
• Sketch, describe, and relate geometric relations for common ionic lattices, including rocksalt, rutile, spahlerite, wurtzite, fluorite, NiAs, CsCl, and perovskite.
• Define lattice enthalpy, and calculate using the Born-Meyer or Kapustinskii equations.
• Use the Born-Haber approach to estimate reaction enthalpies. Include entropic effects to predict reaction free energies.
• Discuss trends for thermal stabilities and solubilities using Born-Haber analysis.
• Draw and interpret simple DOS diagrams. Define and identify Fermi level, metals, insulators, intrinsic and extrinsic semiconductors. Relate the Arrhenius relation to electronic conduction in semiconductors.

Chapter 4
• Define Bronsted-Lowry acidity; identify B-L acids/bases and discuss the true nature of the acidic species (proton, hydronium, more complex) in aqueous solutions.
• Define, determine, and use Ka, Kb, Kw and pK values and list common strong and weak acids and bases.
• Explain solvent leveling and provide significant examples.
• Write equations that generate polyoxoions and explain structures; use Pauling’s rules to estimate Ka’s for oxoacids.
• Use periodic and oxidation state trends to classify acidity or basicity of oxides.
• Define Lewis acidity, identify Lewis acids and bases and provide and explain examples of Lewis acid/base reactions for p-block elements.
• List common hard or soft Lewis acids/bases; provide and explain consequences of Lewis hard/soft reactions, use Drago-Wayland parameters to predict Lewis reactions and solvation.

Chapter 5
• Explain the use and significance of redox half-reactions. Determine potentials using a Latimer diagram.
• Add together half-reactions potentials and use the Nernst relation to determine the effect of pH on reaction potentials.
• Use Frost diagrams to predict disproportionation, comproportionation, oxidant/reductant strengths, and thermodynamic stabilities in aqueous solution.
• Use Pourbaix diagrams to identify stable species, and predict acid/base and redox reactions.
• Describe and provide examples of ligand effects on the stability of complexes.
• Interpret an Ellingham diagram to explain the reduction of metal ores.

Chapter 6
• Identify point symmetry operations and point groups and use symmetry rules to determine polarity, chirality, and ligand equivalence.
• Use character tables to generate orbital symmetry labels and predict spectroscopically-active vibrational modes.

Chapter 7, 20
• Give examples or identify complexes with coordination numbers 2, 3, 4, 5, and 6 and list common ligands.
• Name and give formulas for transition metal complexes according to IUPAC rules.
• Describe in detail the splitting of d-orbitals in Td, Oh, and square planar molecules using crystal field, ligand field, and MO models.

Chapter 8
• Describe qualitatively several techniques used to characterize inorganic compounds, including XRD, UV-Vis, IR and Raman, NMR and EPR, XPS, GC-MS, and thermal methods.
• Interpret and predict NMR spectra for inorganic compounds.

Chapter 10
• Describe the production and important uses of H2.
• Give examples of the structures or chemistry of molecular hydrides, saline hydrides and metallic hydrides.
• Explain hydrogen bonding and give important examples and consequences.

COURSE CONTENT AND POLICIES:
CH411 will cover introductory concepts required in inorganic chemistry. These include periodicity, bonding, thermochemical concepts, symmetry, redox and acid base concepts, and transition metal complexes.

EVALUATION OF STUDENT PERFORMANCE:
Course grades in CH411 will be based on 2 midterms (100 pts each) and a final exam (200 pts).

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.