This course begins with a review of basic bonding and structural concepts and then moves into descriptive chemistry of transition metal and main group elements. **Descriptive chemistry** is the term applied to the understanding of how compounds react with one another to form new compounds (much in the same manner as pure elements react to form compounds). It is a unified body of information resulting from periodic trends and fundamental chemical concepts and not a collection of unrelated facts and observations. Many students in a class like this one try to memorize everything rather than attempting to understand the underlying principles behind the reactions. With the exception of the periodic table, which everyone should memorize, try to avoid mere memorization and instead identify the reasons why a reaction occurs in a particular manner. If you adopt this approach, you will be better equipped to predict when and how related compounds will react. *Bear in mind that the periodic table is the main tool of the inorganic chemist.* To make educated guesses about chemical reactivity one must understand some basic principles and then apply these principles to the compounds in question.

In this course, we first discuss numerous concepts – many of which you have already encountered – and then apply them to representative examples. Please study the appropriate sections of the text (and other chemistry books that you find helpful) prior to the class session in which the material is discussed. You must be prepared to invest time in this course in order to reap the benefits of a more than superficial comprehension. Reading the text, attending lectures as well as asking questions are prerequisites for success in this course.

Examination questions generally cover topics that are discussed in lecture, are assigned for homework, or are extensions of these topics. Also, note that some of the topics covered in the text will be omitted from my lectures.
HOMEWORK

There will be eleven (11) homework assignments. You may omit one set without losing points. If all are completed, the lowest grade will be deleted. Each homework set will be scaled to 25 points, for a maximum homework grade of 250 pts. Note that only representative problems will be graded.

COURSE POINTS

<table>
<thead>
<tr>
<th>Homework</th>
<th>(10 @ 25 pts/each)</th>
<th>250 pts</th>
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</thead>
<tbody>
<tr>
<td>Mini Exams</td>
<td>(6@50 pts/each)</td>
<td>300 pts</td>
</tr>
<tr>
<td>Final Examination</td>
<td></td>
<td>150 pts</td>
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<tr>
<td>Total</td>
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<td>700 pts</td>
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</table>

SCHEDULE

Problem assignments will be collected by the grader. ONLY SELECTED PROBLEMS WILL BE GRADED.

MINI EXAMS

Mini Exams will be given during the last 30 minutes of class on the designated dates.

GRADING SCHEME

The anticipated course grading scale is indicated below

>85% A
≥75% B
≥65% C
≥55% D
**ADA Statement:** The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Room 126 of the Koldus Building or call 845-1637.

**Aggie Honor Code:** “An Aggie does not lie, cheat, or steal or tolerate those who do.” Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes. For additional information please visit: [www.tamu.edu/aggiehonor/](http://www.tamu.edu/aggiehonor/)
A lecture outline is provided in the following pages. It lists the topics and appropriate pages numbers from the main textbook, Cotton, *et al*. Lectures will adhere to a schedule that is in accord with the pace of the class comprehension.

**CLASS TIME: AND LOCATION:** 1:50 – 2:40 PM, CHAN 2102

<table>
<thead>
<tr>
<th>Week</th>
<th>Chapter: Topics</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:3-25</td>
<td>Independent study and review, as appropriate.</td>
<td></td>
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<tr>
<td>1</td>
<td>Preliminaries/Review</td>
<td>1:3-25</td>
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<tr>
<td>2:35-63</td>
<td>Quantization &amp; quantum numbers: transitions; Atomic H-like orbitals.</td>
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<td>Many-electron atom; The Aufbau principle.</td>
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<td></td>
<td>Periodic trends of atoms: electronegativity; ionization enthalpies; Atomic Radii.</td>
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<tr>
<td>2</td>
<td>Structure and Bonding</td>
<td>3:73-120</td>
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<tr>
<td>Mon, Jan. 21, Holiday</td>
<td></td>
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<tr>
<td></td>
<td>Molecular shape: Hybridization and VSEPR; Bond Lengths and Covalent radii; van der Waals radii;</td>
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<tr>
<td>3:98-111</td>
<td>Delocalized Bonding: Molecular Orbital Theory</td>
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<td></td>
<td>Homonuclear diatomic molecules; Heteronuclear diatomic molecules</td>
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<tr>
<td>3</td>
<td>Polyatomic Molecules</td>
<td>3:111-120</td>
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<tr>
<td>4:125-142</td>
<td>M.O. Construction; Multicenter Bonding in Electron Deficient Molecules</td>
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<tr>
<td><strong>Mini Exam I</strong></td>
<td>30 Minute Mini Exam over Topics in Chapters 1 and 2: Mon, Feb 4</td>
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<tr>
<td>4</td>
<td>Ionic Solids</td>
<td>5:147-162</td>
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<td></td>
<td>Crystal Lattices and Lattice energy; Born-Haber cycle; Geometries of Crystal Lattices; Structures of Ionic Solids</td>
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<td>-Close Packing of spheres; Ionic Radii; Mixed Metal Oxides</td>
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<tr>
<td>5</td>
<td>Chemistry of Selected Anions</td>
<td>6: 165-198</td>
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<tr>
<td></td>
<td>Oxides, Hydroxides, and Alkoxides</td>
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<td>Non-Metal Polyxoanions of N,P,S and Halogens; Transition Metal Polyxoanions.</td>
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<tr>
<td>Week</td>
<td>Page</td>
<td>Content</td>
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<tr>
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</tbody>
</table>
| 6    | 6: 199-211 | **Coordination Chemistry**  
Coordinating Number, Types of ligands; Isomerism in Coordination Compounds; Chiral complexes; Nomenclature; Stability and Reactivity of Coordination Compounds.  
7 | 6:199-211 | Coordination Chemistry continued: Substitution Reactions; Electron – Transferred Reactions; Stereochemical Non- Rigidity.  
23:503-518 | **Bonding in Coordination Complexes of the Transition Metals**  
| 8 | 23:519-537 | **Electronic Spectra of Atoms**  
Spectroscopic Terms: Ligand-field (d-d) Transitions. Charge Transfer Bands (Metal-to-ligand and ligand-to metal) Selection Rules and Intensities; Spectrochemical Series.  
Appendix I | 785-791 | Symmetry in Molecules;  
804 | Symmetry Elements and Operations  
Determination of Point Groups |
| **Spring Break March 10-14 (so skip this week in the numbering scheme)** |
| 9 | 8:241-268 | **The Periodic Table and the Chemistry of the Elements**  
9:273-283 | **The Main Group Elements**  
| **Mini Exam IV** | **30 Minute Mini Exam over Topics in Chapters 23, Appendix I: March 24** |
10  10: 287-302  **Group IA Elements.** Alkali metals
          Beryllium; Magnesium; Binary Compounds; Oxo Salts, Ions and
          Complexes; Summary of Trends.
12: 319-333  **Boron Chemistry**
          Oxygen Compounds; Halides; Hydrides – Boranes.

11  13: 357-365  **Group IIIB Elements**
          Al and Ga; In, TI, and GA; summary of Trends
14: 369-380  **Carbon Group**
          Diamond, Graphite, the Fullerenes and Carbides;
          Chemistry of Carbon with O, N S
15: 383-392  **Group IVB**
          Si, Ge, Sn, Pb
          Multiple Bonding; Isolation and Properties;
          Hydrides; Chlorides; Complex Compounds;
          The Divalent State; Summary of Trends

**Mini Exam V 30 Minute Mini Exam over Topics in Chapter 8, 9, 10, 11, and 12: April 7**

12  16: 399-412  **Nitrogen**
          Multiple Bonds; Hydrides; Oxides; Acids; Halides; Summary of
          Reactions.
17: 417-428  **Group VB: P, As, Sb, Bi**
          The Elements; Hydrides; Halides; Oxohalides; Oxides; Sulfides;
          Oxo Acids.
          Complexes of Group VB Elements:
          P,N Compounds; Double Bonds; Summary of Trends.
18: 435-447  **Oxygen**
          Occurrence, Properties and Allotropes; Ozone
          Ionic Oxides; Covalent or Molecular Oxides

13  **Chemistry of Oxygen Continued**
          Acid-Based Properties; Hydrogen Peroxide; Peroxides; Superoxides;
          Oxygen Compounds Ligands
19: 451-461  **Group VIB: S, Se, Te, Po**
          Occurrence; Hydrides; Halides; Oxides; Acids.
20: 465-478  **The Halogens: F, Cl, Br, I, At**
          Occurrence of the Elements; Halides; Oxides; Interhalogens;
          Organofluorine Compounds.

**Mini Exam VI  30 Minute Mini Exam over Topics in Chapter 13-16: April 21**
Week 14- end of classes
If time permits and we are on schedule
Forefront Topics in Inorganic Chemistry- to be announced

Note that April 29 is the last day of classes. Although it is a Tuesday,
it is a re-defined day and Friday classes are to meet.

FINAL EXAM (EXAM WEEK)
May 2 and 5-7