Welcome to CHEM 3521! This course provides an introduction to quantum mechanics, with applications to problems in atomic structure, chemical bonding and spectroscopy. Much of the terminology, quantum numbers, orbitals, and Morse potentials is at least *qualitatively* familiar to you from previous courses. In this course, we will start exploring these concepts *quantitatively*.

**Learning Outcomes**

A student who successfully completes this course is expected to develop the ability to:

- Apply the principles of quantum mechanics, including elementary operator theory and differential equations, to chemical systems; and
- Demonstrate knowledge of a quantum mechanical treatment of atomic structure and chemical bonding, and atomic and molecular spectroscopy.

**General Information**

**Instructor**
Farooq A. Khan

Phone (678) 839 – 6027 email: fkhan@westga.edu

Office: TLC 2-117 (Department of Chemistry, 2nd Floor, TLC)

**Class time**
Tuesdays and Thursdays 12:30 - 1:45 pm in TLC 2-105

Please also attend a mandatory Workshop (TBD).

**Textbooks**
*Physical Chemistry (Volume 2)* (8th Edition), Atkins and de Paula

*Thirty Years That Shook Physics*, Gamow

**Study Guide**
*ACS Study Guide for Physical Chemistry* for the Final Examination

**Office Hours**

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
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<tbody>
<tr>
<td>Mondays</td>
<td>9:45 am – 12:30 pm</td>
</tr>
<tr>
<td>Tuesdays</td>
<td>11:00 am – 12:00 noon</td>
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<tr>
<td>Wednesdays</td>
<td>9:45 am – 1:30 pm</td>
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<tr>
<td>Thursdays</td>
<td>11:00 am – 12:00 noon 2:00 pm – 3:30 pm</td>
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Additional office hours, by appointment
A word about expectations

It is very likely that you have heard a lot of stories about this course. It is true that the language in this course is in large part mathematical. It is also true that in a first exposure quantum mechanics may seem abstract, and just different from anything you have seen earlier. Having said that, I must point out that quantum mechanics is really “cool” and ultimately underlies all chemical phenomena.

Four words summarize a tried and tested strategy for learning the most in this course. Take your homework seriously. Homework assignments will be given regularly during the semester. Approximately 60% of questions on the examinations will closely resemble these assignments. As a student (which was not that long ago!), I always found it useful to supplement lectures with informal study sessions with my peers. You will be pleasantly surprised to find that a fellow student can clarify a concept or provide cute short-cuts while solving problems.

Let us make a deal. I will attempt to anticipate any difficulties you may have with the underlying mathematics. Y’all do your homework and in-class problem solving seriously.

Examinations

In-class examinations (90 minutes in length) will be given on the following Thursdays:

- September 13
- October 18
- November 15

A take-home examination will be administered in November.

The final examination will be given on Thursday, December 13 (11:00 am – 1:00 pm). It consists of multiple-choice questions, and is prepared by the American Chemical Society.

No make up examinations will be given. In case of an illness or a dire emergency, a student may be excused from one in-class examination, provided the instructor is contacted prior to the examination. If excused, the score for this examination will be the average of all in-class examinations. At the discretion of the instructor, an addendum to an in-class examination may be given in the form of an announced in-class quiz or a take-home assignment, which must be completed by a specified date.
Grades

Your grade will be calculated based on the following components:

**In-class examinations** (3 @ 100 points each)  **300 points**

**Take-home Examination**  **100 points**

**Workshops**  **50 points**

**In-class problem solving**  **50 points**

**ACS Final**  **150 points**

The final may be curved at the discretion of the instructor.

**TOTAL**  **650 points**

**Letter grades**

<table>
<thead>
<tr>
<th>Score</th>
<th>Grade</th>
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<tbody>
<tr>
<td>87% - 100%</td>
<td>A</td>
</tr>
<tr>
<td>75% - 86%</td>
<td>B</td>
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<tr>
<td>60% - 74%</td>
<td>C</td>
</tr>
<tr>
<td>50% - 59%</td>
<td>D</td>
</tr>
<tr>
<td>0% - 49%</td>
<td>F</td>
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**University Policies**

Please refer to the following for academic support, the honor code, email policy, credit hour policy and HB 280 (Campus Carry Policy):

[https://www.westga.edu/administration/vpaa/common-language-course-syllabi.php](https://www.westga.edu/administration/vpaa/common-language-course-syllabi.php)

**Policy on cheating**

Occurrences of cheating are rare. However, cheating by one individual raises questions about fairness for the rest of the class, and indeed, endangers the honor code that governs our examination system. It is after considerable thought and agonizing that I have arrived at the following formula. If an individual cheats on an examination for the first time, he/she will obtain a score of zero for that particular examination. If an individual is caught cheating a second time during the semester, he/she will receive a grade of F for the entire course.