



## SYLLABUS

### A. Course Description

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Language
CHM	448	Solid State & Material Science	4	4	0	0	8	CHM 343	7	English

This course describes introduction to solid-state chemistry, periodicity of the elements, atomic structure, bonding, reactions kinetics and mechanisms, semiconductors, band gap, crystal structures, diffraction, amorphous solids, Chemical equilibrium, chemistry of carbon, polymers.

At the end of this course the student will be able to:

- Recognize the basic physical properties of materials based on knowledge of their atomic composition and chemical bonding.
- Describe the structure of crystalline materials using the nomenclature of Bravais lattices and Miller Indices.
- Reproduce the binary phase diagram to quantitatively describe the compositions, phases and microstructures developed during heat treatments of binary solid systems.
- Recall the principles of nucleation theory and solid state diffusion to solve problems involving kinetics of phase transformations in metal alloy systems
- Predict the crystalline structures from Bravais lattices and Miller Indices data.
- Evaluate the optical and thermal properties of materials.

### B. References: Required Textbook & Internal Website

I shall use

***Introduction to Solid-State Chemistry***, Pearson Custom Publishing, 2009, (ISBN 10: 0-558-36407-1)

**Students are required to purchase the textbook/materials (it is an obligation).** The book contains the lecture notes as well as activities for the students to take part in; the book serves as a workbook. Other references:

***Solid State Chemistry: An Introduction***, Lesley E. Smart, Elaine A. Moore, (4<sup>th</sup> Ed.), by CRC Press, 2012, ISBN 9781439847909.

Google Classroom Webpage: <http://www.imamm.org/>

### C. Topics Outline

**Disclaimer:** this is a very fast-paced course. There will be little time—if any—for review. What follows is an approximate outline of the pace of the course. We may go faster or slower, contingent on the class response. The tentative list of topics to cover:



1. **Introduction to solid-state and materials science** (Classifications of Materials and types of Solids).
2. **The atomic structure** and the electron configurations and the wave- particle Duality
3. **Crystal Structures**, the 14 Bravais Lattice, the closed packing systems, the crowding and coordination numbers of solid crystals, the crystal axes, planes and Miller indexes
4. **X- ray** Diffraction and Braggs' equation.
5. **Band theory of solids**, band gaps and the electrical and thermal conductivity of metals, semiconductors and insulators, magnetic and optical properties of solids, crystal Imperfections, types of crystal defects.

#### D. Exams & Grading System

The semi-official dates of the exams for this course, with all the caveats, that the word “semi-official” entails, can be found here:

- **Midterm 1:** 6<sup>th</sup> or 7<sup>th</sup> week & **Midterm 2:** 11<sup>th</sup> or 12<sup>th</sup> week
- **Quizzes & Homeworks: During the semester**

Your course grade will be based on Final Exam, Midterms, Homework, Quizzes, Participation, Attendance and Project.

<b>Midterm 1:</b> 20 %	<b>Midterm 2:</b> 20 %	<b>Final Exam:</b> 40 %
<b>Quizzes; Homework &amp; Attendance &amp; Participation:</b> 20 %		

#### Grading distribution:

A+: [95, 100], A: [90, 95), B+: [85, 90), B: [80, 85), C+: [75, 80), C: [70, 75), D+: [65, 70), D: [60, 65), F: [0, 60).

#### E. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

[Executive Rules for Study Regulations and Exams](https://www.Examsgoo.gl/ykm7t3)  
[goo.gl/ykm7t3](https://www.Examsgoo.gl/ykm7t3)

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