

## Advanced Physical Chemistry I - Course Syllabus

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**Course Number:** ChemS 218

**Course Title:** Advanced Physical Chemistry I

<b>Academic Semester:</b>	Spring	<b>Academic Year:</b>	2015/ 2016
<b>Semester Start Date:</b>	Jan 24, 2016	<b>Semester End Date:</b>	May 19, 2016

**Class Schedule:** Sunday and Wednesday: 14:30-16:00

**Classroom Number:**

**Instructor(s) Name(s):** Kazuhiro Takanabe  
**Email:** kazuhiro.takanabe@kaust.edu.sa

**Office Location:** Bldg. 3, 4274

**Office Hours:**

### COURSE DESCRIPTION FROM PROGRAM GUIDE

Fundamentals of Photo and Electro catalysis presented with a novel approach for industrial applications.

### COMPREHENSIVE COURSE DESCRIPTION

Advanced class that deals with the essence of heterogeneous catalysis, including electrocatalysis and photocatalysis. The lectures address principle of catalysis to discuss terminology, definition and efficiency. Discussion continues on concept of potential, the solid state physics, preparation and characterization of various classes of solid materials, kinetics, reaction mechanism, and various applications.

### GOALS AND OBJECTIVES

1. To introduce students to concepts and basic principles in heterogeneous catalysis, photocatalysis and electrocatalysis.
2. To enable students to acquire correct and useful knowledge to describe energy system and efficiency.
3. To present a variety of application and usefulness of them.

## REQUIRED KNOWLEDGE

Solid background in physical chemistry. Strong interest in target teaching materials for their own research.

## REFERENCE TEXTS

Spectroscopy in Catalysis Niemantsverdriet Wiley 3rd 2007 978-3-527-31651-9

Molecular Heterogeneous Catalysis van Santen, Neurock Wiley 1st 2006 978-3-527-29662-0

Chemical reaction engineering Levenspiel Wiley 3rd 1998 978-0-471-25424-9

The Microkinetics of Heterogeneous Catalysis Dumesic, et al. ACS 1st 1993 0-8412-2214-2

Modern Physical Organic Chemistry Anslyn, Dougherty Univ. Sci. books 1st 2006 978-1-891389-31-3

Electrochemical Methods: Fundamentals and Applications Bard, Faulkner Wiley 2nd 2001 978-0-471-04372-0

Concepts of Modern Catalysis and Kinetics Chorkendorff, Niemantsverdriet Wiley 2nd 2007 978-3-527-31672-4

Modern Molecular photochemistry of organic molecules Turro, et al. Univ. Sci. books 1st 2010 978-1-891389-25-2

## METHOD OF EVALUATION

Percentages %	Graded content
20% 20% 30% 30%	Attendance + Quiz Report + Presentation Mid-term exam Final exam

## COURSE REQUIREMENTS

### Assignments

Attendance + Quiz: Quiz will be distributed in each class and collected with name which is considered as attendance.

Mid-term and final exams: Students are allowed to bring handouts with notes taken during the lectures. However, no textbook or other materials are brought to the exams. No make-up exams will be given without permission from the instructor.

Report and Presentation: Pickup one article on the topic of electro- or photo-catalyst researches.

- Have the topic/literature checked and approved by the instructor
- Topics on kinetics and/or reaction mechanism are preferred
- Presentation materials are used as a report.
- Presentation is max. 15 min per each
- Deadline for approval of topics, paper submission and date for oral presentation will be notified later.

### **Course Policies**

No exception allowed unless the instructor agrees.

### **NOTE**

The instructor reserves the right to make changes to this syllabus as necessary.