Syllabus for CHM1045 – Modern Physical Organic Chemistry

**Time:** Wed 10:00am - 11:50am starting on Sep 14, 2022  
**Place:** WE 76 (Wetmore Hall-New College, 300 Huron Street)

This course is given in two parts. The first half will be presented by Prof. Ronald Kluger (r.kluger@utoronto.ca) and the second part by Prof. Jik Chin (jik.chin@utoronto.ca). The first half will cover applications of physical organic chemistry as shown below. The second half will cover hands-on approach to computational physical organic chemistry using both laptop and main frame computers as shown below.

**First half topics:**

1-Transition State Theory  
2- Kinetic Theories  
3 - Controversies in Mechanisms for Reactions of Cyclic Phosphates  
4 - Formation of CO2 and the Complexities of Decarboxylation  
5 - Applying Stereochemistry to Testing Mechanisms  
6 - Isotopically Chiral Phosphates  
7 - Carboxylic Participation Mechanisms  
8 - Associative Mechanism for Decarboxylation!  
9 - Formation of Carbanions  
10 - The Role of Reversibility in Slowing Decarboxylation and How It Is Overcome

**Second half topics in computational physical organic chemistry:**

1-Acid/base catalysis  
2-Organocatalysis  
3-Pericyclic reactions  
4-Jacobsen-Katsuki epoxidation  
5-Noyori hydrogenation  
6-Molecular receptors

**Reference books:**

a)-Advanced Organic Chemistry: Part A by Carey and Sundberg 5th ed (available online from UT library)  
b)-Modern Physical Organic Chemistry by Anslyn and Dougherty

**Course evaluation:**

First half: Mid-term test at the end of first half of the course (45%)  
Second half: Student computational project presentation (45%)  
Attendance and participation (10%)  
Medical excuses will be needed if a graded item is missed