**Chem 0303743 (Chemical Kinetics) 3 C.H**

**Course Plan Distribution**

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| **Week No.** | **Topics to be covered** | **Learning resources** |
| **1+2** | **First day:** distribution of course plan and theoretical introduction about the course.  **I. Review of basic undergraduate concepts in chemical kinetics:** elementary reactions with simple rate laws**:** zero-order reactions**;** first-order reactions; second-order reactions; third-order reactions and nth-order reactions. Pseudo-first and second-order kinetics, reactions approaching equilibrium, temperature dependence of rate constants | 1. "Physical Chemistry", by Peter Atkins and Julio de Paula. (e-book), Oxford University Press Inc. New York, 2006, 8th Edition.2. "An Introduction to Chemical Kinetics"byMargaret Robson Wright (e-book) (2004) John Wiley & Sons, Ltd.3. "Chemical Kinetics and Reaction Dynamics" by Santosh K. Upadhyay, (e-book) (2006) Anamaya Publishers. 4. "Chemical Kinetics" Lecture Notesby Dr. Mohammad AL-Suway. |
| **3+4** | **II. Experimental Methods in Chemical Kinetics**: 1.  Classical Methods: i. sampling ii. In situ measurements 2. relaxation techniques. 3. flash photolysis. 4. laser flash photolysis. 5. laser-induced fluorescence. |  |
| **5+6** | **III. The kinetics of complex reactions**:  Parallel elementary reactions; consecutive elementary reactions: concentration with time, rate -determining step, steady-state approximation; Reversible reactions; pre-equilibrium; Relaxation methods; kinetic isotope effect.  **First exam** |  |
| **7+8** | **IV. Complex Reaction Mechanisms:** linear chain reactions: rate laws of linear chain reactions; branched chain reactions: explosions |  |
| **9** | **VI. Photochemistry:** Kinetics of photophysical and photochemical processes |  |
| **10** | **VII. Molecular reaction dynamics:** Collision theory; Diffusion-controlled reactions; The material balance equation. |  |
| **11** | **Transition state theory:** The Eyring equation; Thermodynamic aspects. **Unimolecular reactions:**The Lindemann theory, the Hinshelwood-RRK theory, RRKM theory.  **Second exam** |  |
| **12+13** | **VIII. Reactions in solution:**  Ionic strength effects, the effect of pressure on the rate coefficient, the dynamics of solution reactions, cage reactions, cluster reactions, the solvated electron, electron transfer reactions |  |
| **14** | **Term papers**: literature survey of  recent published papers in various  areas of chemical kinetic and  presentation by students |  |
| **15+16** | **Final exam** |  |