Diponegoro University
Faculty of Science and Mathematics
Undergraduate Program Of Chemistry

Module designation	**Reaction Dynamics (DRX)**
Semester(s) in which the module is taught	6
Person responsible for the module	Dra. Arnellli, MS Yayuk Astuti, Ssi., Ph.D
Language	Indonesian
Relation to curriculum	Compulsory/~~elective~~/~~specialisation~~
Teaching methods	Lecture
Workload (incl. contact hours, self-study hours)	Face to Face = 1x(2x50") Discovery Learning + Cooperative Learning = 1x(2x60"+2x60")
Credit points	2
Required and recommended prerequisites for joining the module	KRX

Module objectives/intended learning outcomes	**Graduate Learning Outcomes:** (S9) Demonstrates an attitude of being responsible for work in his field of expertise independently (KU1) Able to apply logical, critical, systematic, and innovative thinking in the development or implementation of science and technology that pays attention to and uses humanities values by their field of expertise (KU2) Able to demonstrate independent, quality, and measurable performance (KK2) Able to solve science and technology problems in general and straightforward chemical fields such as identification, analysis, isolation, transformation, and synthesis of micro-molecules through the application of knowledge of structure, properties, kinetics, and energetics of molecules and chemical systems, with analytical methods and synthesis in specific chemical fields, as well as the application of relevant technologies (PP1) Mastering the theoretical concepts of structure, properties, changes, kinetics, and energetics of molecules and chemical systems, identification, separation, characterization, transformation, synthesis of micromolecular chemicals, and their application **Course Learning Outcomes:** (MI) Able to describe the properties of gas transport, including phenomenal equations and transport parameters (M2) Able to explain the basic principles of coefficient of viscosity, electrical conductivity and ion mobility in a solution system which is summarized in Molecular motion in a liquid (M3) Able to explain the nature of diffusion in a solution, including thermodynamics review and diffusion equations (M4) Able to relate diffusion and chemical reactions and determine the effect of diffusion on reaction rates (M5) Able to determine the rate law of simple reactions, both differential and integral rate laws (M6) Able to determine reaction order and reaction rate constant with various methods (M7) Able to write Arrhenius equations, explain the effect of temperature on reaction rates and calculate Arrhenius parameters (M8) Able to explain elementary reactions and reaction mechanisms including reactions including elementary reactions and polymerization reactions

Content	1. The integrated rate law for complex reactions: a. Irreversible reaction b. Reversible reaction c. Parallel and sequential reactions d. Autocatalyst reaction and Sn1 & Sn2 reaction 2. Collision theory and transition state theory: a. Collision Rate b. Energy and steric needed c. Thermodynamic aspects d. Kinetic isotope effect 3. Reaction in solution: a. The role of the solvent on the reaction rate b. The reaction between ions in solution c. The reaction between ion-dipole and dipole-dipole 4. Homogeneous catalyst: a. Mechanism and rate of catalytic reaction b. Acid-base catalyst c. Enzyme catalyst d. Electron transfer catalyst 5. Introduction to solid surfaces: a. Surface growth b. Physisorption and chemisorption c. Mechanism of reaction on the solid surface 6. Adsorption and desorption: a. Adsorption isotherm 7. Adsorption and desorption : b. Adsorption and desorption rate 8. Heterogeneous catalyst: a. Heterogeneous catalysis mechanism b. Catalyst activity on the surface 9. Photochemistry: a. Photochemical processes b. Photochemical rate law
Exams and assessment formats	Mid-Semester Exam and Final Exam
Study and examination requirements	Participatory Activities -20% Project Results -30% Cognitive/Task Knowledge -10% Quiz -10% Mid-semester -15% Final exams -15%

Reading list	1. Peter Atkinsa and Julio de Paula, 2014, Arkins' Physical Chemistry, 10th Edition, Oxford: UK 2. K. J. Laidler, Chemical Kinetics, New York, Harper Collins Publisher 3. Wilkinsons, 1980, Chemical Kinetics and Reaction Mechanism, Amsterdam, van nastrand. 4. E. Caliskan S. & S. Gokturk, Adsorption characteristics of sulfamethoxazole and metronidazole on activated carbon, Separation science and technology, 2010, 45: 244-255 5. E. Caliskan S., J. Wang, D. J. L. Coleman & l. Siller, Enhanced removal of nickel (II) ions from aqueous solutions by SDS-functionalized graphene oxide, Separation science and technology, 2016 6. E. C. Salihi & M. Mahramanliohlu, Equilibrium and kinetics adsorption of drugs on bentonite: presence of surface active agents effect, Applied clay science, 2014 7. M. N. Rashed & A. A. El-Amin, Photocatalytic degradation of methyl orange in aqueous TiO2 under different solar irradiation sources, International Journal of Physical Sciences, 2007, 2: 073-081