Course (Unit) Title	**Electrochemistry, Chemical Kinetics and Surface Chemistry**
Course (Unit) Code	CHE302G3
Credit Value	03 (45 hours of lectures and tutorials)
Notional Hours	105 hours of independent learning
Objective/s	• Outline fundamental concepts of electrochemistry • Understand corrosion and its origin • Emphasize on principles and applications of chemical kinetics. • Describe how the collision frequency and kinetic energy affect the rate of a chemical reaction. • Calculate the frequency factor, activation energy for a chemical reaction • Describe the basic principles involved in the chemistry of surfaces
Intended Learning Outcomes	• Apply the fundamental concepts of electrochemistry to solve problems related to electrode potential • Describe different types of corrosion and the course of the corrosion processes • Explain the chemical and physical properties that determine chemical reaction rates • Perform calculations related to rate of reactions • Estimate elementary reaction rate constants based on collision theory and transition state theory • Explain interfacial phenomenon and its significance in chemistry • Analyze the mechanism of adsorption and surface reactions
Contents	**Electrochemistry** • Theory of electrolytes: Activity, activity co-efficient and its determination, ionic atmosphere model, Debye-Huckel equation; ion transport, molar conductivity, variation of molar conductivity with concentration, Debye-Huckel-Onsager equation • Mobility, diffusion and transport number, electrode potential, Nernst equation, types of electrodes, the metal solution interface, electrochemical potential, writing electrodes, cells and potentials, different types of electrochemical cells, junction potential, thermodynamics of cells, over potential, the structure of double layer • Electrochemistry of corrosion, corrosion protection and inhibition, bioelectrochemistry, three electrode system, voltammetric techniques **Chemical Kinetics**

	• Brief review of basic concepts in chemical kinetics: elementary reactions with simple rate laws (zero and first order reactions), rates of reactions; second and higher order reactions, half-life of the reactions and a relationship to rate constant, steady state approximation, complex reactions, reversible, consecutive, simultaneous, chain and photochemical reactions • Determination of order and rate constant: differential method, half-life method, flooding method • Kinetics of catalysis: Enzyme catalyst, Michalies and Menten equation • Arrhenius equation: Temperature dependence of reaction rates, activation energy • Theories of chemical reactions: collision theory, activated complex theory or transition state theory. **Surface Chemistry** • Solid/Gas interface, solid/liquid interface, adsorption, adsorption isotherms, heat of adsorption, surface structure, surface free energy, surface reactions
Teaching and Learning Methods / Activities	Lecture presentation, tutorial discussion, small group assignment and home-work assignments.
Evaluation	In-course Assessments 30% End of Course Examination 70%
Recommended References	• Atkins, P. and de Paula, *Physical Chemistry*, 10th edition, Oxford University Press, 2014 • Bard, A., J. and Faulkner, L., R., *Electrochemical Methods*, John Wiley & Sons, Inc., 2001 • Compton, R., G. and Banks, C., E., *Understanding Voltammetry*, World Scientific Publishing Co. Pte. Ltd., 2007 • Daniels, F. *Chemical Kinetics*, 2nd Edition, Oxford University Press, 2010. • Levine, I. N., *Physical Chemistry*, 6th Edition, Mr Graw Hill Education, 2008 • Cox, B., G., *Modern Liquid Phase Kinetics*, Oxford University Press, 2005. • Wright, M. R., *An introduction to Chemical Kinetics*, John Wiley and Sons Ltd, 2005