

Preamble:

The aim of the course is to create a surface chemical way of thinking when considering biomedical approaches, products and applications. The course will focus on surface and surface chemistry and its interactions with biomacromolecules. This course will highlight the role of interfacial phenomena towards behavior of biomolecules on surfaces. The first half of this course will cover basic physical chemistry of surfaces and interfaces, and common experimental methods for surface characterization. The second part of the course will emphasize interactions of biological systems with surfaces and modified surfaces at the molecular and cellular levels. Lectures will be supplemented with reviews of the journal literature.

Course contents:

Intermolecular forces: van der Waals Forces, Electrical Double layer; Interfaces of biomaterials: wettability, surface tension and surface energy, roughness, hydrophobicity; Techniques of study and characterization of interfaces; Protein-surface interactions: adsorption, kinetics and thermodynamics; Elasticity of adsorbed macro-molecules at interfaces; Aggregation of proteins; Cell adhesion on surfaces; Methods for modification and functionalization of surfaces: Physical modifications, Chemical modifications, Applications of surface engineering towards superhydrophobicity, hydrophilicity, antiadhesion, adhesion and biocompatibility.

Texts/References:

1. J. N. Israelachvili, *Intermolecular and Surface Forces*, 3rd Edn., Academic Press, 2011.
2. W. Norde, *Colloids and Interfaces in Life Sciences and Bionanotechnology*, 2nd Edn., CRC Press, 2011.
3. W. Adamson, and A. P. Gast, *Physical Chemistry of Surfaces*, John Wiley, New York, 1997.
4. W. Hamley, *Introduction to soft matter: synthetic and biological self-assembling materials*, John Wiley & Sons, 2007.
5. J.P. Blitz and V.M. Gun'ko, *Surface chemistry in biomedical and environmental science*, Springer, 2006.