



DRUG DELIVERY: PRINCIPLES AND ENGINEERING

PROF. RACHIT AGARWAL

Department of BioSystems Science and Engineering
IISc Bangalore

INTENDED AUDIENCE : Anyone in bachelors having completed two year

PREREQUISITES : A course in biochemistry, molecular biology, anatomy is recommended

INDUSTRY SUPPORT : All pharmaceuticals, hospitals and biotechnology industries

COURSE OUTLINE :

This course introduces concepts of drug delivery to meet medical challenges. The course is designed to be modular, with each module focusing on the various aspects of drug delivery.

ABOUT INSTRUCTOR :

Prof. Rachit Agarwal Employment .Assistant Professor June 2017 present Centre for Biosystems Science and Engineering, Indian Institute of Science, Bangalore . Post-doctoral Fellow August 2013 May 2017 Andres J. Garcia, Georgia Institute of Technology, Atlanta, Georgia, USA Education . Ph.D. Biomedical Engineering May 2013 University of Texas at Austin, Texas, USA; Dissertation title: Effect of shape on cell internalization of polymeric hydrogel nanoparticles. Doctoral portfolio program in Nanoscience and Nanotechnology May 2013 University of Texas at Austin, Texas, USA . B.Tech and M.Tech (combined degree) - Biotechnology and Biochemical Engineering June 2009 Indian Institute of Technology, Kharagpur, India; Thesis Title: Crystallization and Enzyme Assay of GAPDH from TASAR Silk Worm

COURSE PLAN :

Week 1 :Pharmacokinetics: Bioavailability, Elimination, Therapeutic index

Week 2 :Prodrugs, Controlled release

Week 3 :Polymers: Synthesis, properties, characterization, crystallinity and amorphousness

Week 4 :Biopolymers: Natural and Synthetic, biocompatibility, Biodegradation, commonly used biopolymers

Week 5 :Polymer-Drug conjugates, PEGylation

Week 6 :Diffusion controlled systems, Ficks laws, Reservoir systems, Non-erodible matrix systems, Bio-erodible Systems

Week 7 :Hydrogels: Physical or chemical, pore-size calculation, in-situ crosslinking

Week 8 :Nano and Micro-particles: Dendrimers, Liposomes, Micelles

Week 9 :Metal and polymeric particles, effect of particle shape, charge and elasticity

Week 10 :Protein Adsorption and tissue engineering, Drug delivery in tissue engineering

Week 11 :Implant associated infections, Route specific delivery: Oral, Subcutaneous, Intramuscular, transdermal, inhalation, intravenous

Week 12 :Vaccines, Cancer vaccines, Cell and gene delivery, Smart responsive drug delivery, Targeted drug delivery, Nanotoxicology and market translation