

The core course "**Pharmaceutical sciences**" deals with scientific principles of medicinal chemistry, pharmaceutical biology, pharmaceutical technological operations, delivery systems and pharmaceutical nanotechnology, molecular biopharmacy and health economics, social pharmacy, pharmacoeconomics and pharmacoepidemiology.

Module 1.1: Drug structure and their properties

Drug molecules are taken as a whole that interacts with its target macromolecules based on contributions from individual groups/fragments, which contribute to interactions between drug molecule and its target and triggers further reactions in the body.

Module 1.2. Drug targets and interactions

Module includes a presentation of drug targets, receptors, enzymes, ion channels, DNA, tubular system, biological membranes and examples of a design of drugs acting on selected targets.

Module 1.3: Drug design methodologies

The course deals with rational ligand- and structure-based drug design methodologies. Additionally, the module deals with drug synthesis strategies, safety predictions, toxophoric groups and their bioactivation mechanisms in the early stages of the drug discovery process.

Module 2.1: Biomolecules as targets for diagnosis and therapy

Module enables the understanding of function of important biomolecules in physiological and pathological conditions and gives the opportunity of these molecules to be used as targets for design of new diagnostic and therapeutic tools.

Module 2.2.: Biological and gene medical products

The course is composed of up-to-date topics that cover the R&D, upstream and downstream processing and application of biological and gene medicines. Beside, all requested legislative procedure methods and marketing authorisation system in EU and USA is detailed.

Module 2.3.: Herbal medicines

The module concerns herbal medicines, their quality, safety and efficiency. It combines the knowledge of botany, phytochemistry, pharmacognosy and phytotherapy, regulatory criteria of evaluation of herbal medicines.

Module 3.1.: Pharmacokinetics and its role in drug discovery and development

The following topics will be addressed: preclinical and clinical pharmacokinetic studies, pharmacokinetics of chemical and biological drugs, allometric scaling in pharmacokinetics, pharmacokinetic translational studies, studies on drugs bioavailability, bioequivalence and biosimilarity, bioanalytical methods in pharmacokinetics and regulatory aspects of pharmacokinetic studies.

Module 3.2: Biopharmaceutical analysis of LADME processes

The module involves student in the study of mechanisms and kinetics of the processes; physico-chemical and biological parameters influencing these processes, experimental models of growing complexity for the research of LADME system; biopharmaceutical drug classification and in vitro/in vivo correlation.

Module 3.3. Pharmacokinetic-pharmacodynamic analysis

The course Biopharmaceutical analysis of LADME processes represents the continuation and upgrade of undergraduate course Biopharmacy with pharmacokinetics on the fields of liberation (dissolution), absorption, distribution, presystemic and systemic metabolism and elimination of the drug. The student is involved in the study of mechanisms and kinetics of the processes, physico-chemical and biological parameters influencing these processes,

experimental models of increasing complexity for the research of LADME system, biopharmaceutical drug classification and in vitro/in vivo correlation.

Module 4.1.: Pharmaceutical manufacturing processes

The following topics will be included: preformulation studies on the molecular, particulate and population of particles levels, particles engineering, milling, particle size measurement, powder flow analysis, powder mixing, agglomeration processes, pelletisation, drying processes with spraying, fluid bed drying and lyophilisation, tableting and analysis of compression process, coating processes of particles and tablets, other processes including suspension and emulsions, filtration of liquids and air.

Module 4.2.: Drug delivery systems

The following topics will be introduced: request for the materials included in DDS, DDS for dermal and transdermal application, macro- micro- and nano-emulsions, modified drug release, concepts and evaluations, orodispersible DDS, hydrogels, micro-capsules, DDS based on lipids, parenteral DDS.

Module 4.3.: Pharmaceutical nanotechnology and nanomedicines

Module topics include introduction to nanotechnology and nanomedicine, nanostructured biomimetic materials for nanomedicine, technological procedures for nano drug delivery systems, nanoparticles, nanostructured interfaces and films, nanocarriers for drug targeting and delivery through blood brain barrier, technology of multifunctional carriers (theranostics), nanocarriers for biomacromolecules, experimental methods for characterization on nanoscale, interactions between nanostructured carriers and biological environment, permeation of nanoparticles through biological barriers and distribution in tissues, cells and its organelles, and the latest topics, all in function of design, manufacture and evaluation.

Module 5.1.: Social pharmacy

The following topics will be addressed: pharmacy and public health, healthcare, pharmacy practice development, evidence-based medicine and evidence-based pharmacy practice, quality assurance in healthcare, e-health, structure, process and outcomes research, drug-related problems evaluation, discrete choice models and evaluation of patient preferences, evaluation of humanistic outcomes, qualitative research methods in healthcare and the ethical aspects of research.

Module 5.2.: Health economics

The following topics will be addressed: basics of health economics, modeling and simulations in health economics, therapeutic value and comparative effectiveness, selected topics of pharmacoeconomics, evaluation of humanistic outcomes: EQ-5D, SF-6D, HUI, etc., payment models of health care services, epidemiological data as a source of information in health economic studies, willingness to pay, expected value of perfect information (EVPI), burden of disease, budget impact analysis and health technology assessment.

Module 5.3.: Pharmacoepidemiology

The following topics will be addressed: basic principles of epidemiology and pharmacoepidemiology, research methods, data sources in pharmacoepidemiological research, quality and validity of data, management of bias, confounding and missing data, determination of causation, drug utilization patterns, pharmacovigilance and drug safety evaluation.