



FCT PhD
PROGRAMMES

**FCT PhD Programme
Medicines and Pharmaceutical Innovation (i3DU)**

Course

PHARMACEUTICAL BIOPHYSICS

January 09-11 and 28-29, 2019

Faculty of Pharmacy

Amphitheatre B (9-10 JAN)

Room C.2.5 (11 JAN)

Laboratories (28-29 JAN)

Universidade de Lisboa, Portugal

Organizing committee at iMed.ULisboa/FF

Liana Silva (Coordinator)

Rodrigo F. M. de Almeida (FC/ULisboa)

Luisa Corvo

Teaching staff “Hands-on Workshops”

at iMed.ULisboa/FF: Ana Ester Ventura, Tânia Santos

at FC/ULisboa: Filipa Santos, Joaquim Marquês, Ana Viana

The FCT PhD Programme in Medicines and Pharmaceutical Innovation (i3DU; <http://www.ff.ul.pt/phd3duul/>) trains students in target discovery, drug design, pre-clinical development, and drug safety, bridging the translational gap from discoveries on disease targets and mechanisms into novel diagnostic and therapeutic agents.

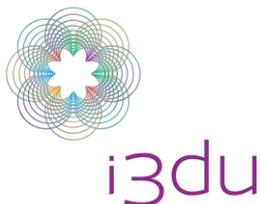
The i3DU Programme offers a training course on **Pharmaceutical Biophysics** that will be held at the Research Institute for Medicines (iMed.ULisboa), Faculty of Pharmacy, Universidade de Lisboa, in Lisbon, 9-11 and 28-29 January 2018.

This course is designed to cover the physicochemical basis of biological processes that influence the pharmacological activity of bioactive compounds and applications of state-of-the-art and emerging biophysical methodologies essential for the characterization of biological and pharmacological processes.

We welcome the participation of external academic and scientific community members. Registration is free but mandatory.

Course Outline

Biophysics is an interdisciplinary science branch that contributes both with the tools and concepts that lead to a deeper understanding of the pathophysiology of diseases and to the discovery of new therapeutic targets. Moreover, advanced biophysical techniques are nowadays indispensable analytical tools for i3DU. Increasing the application of biophysical research instruments at the pharmaceutical industry setting allows faster



identification of drug candidates. By combining high throughput screening biophysical methodologies with the understanding of the molecular mechanisms of drug-targets interaction is pivotal to “*deliver better drugs on a short timeline*”. Awareness that fundamental knowledge on biophysics as well as that emerging biophysical methodologies and specialized equipment might enable a faster bench-to-bedside translation of drug candidates is stimulating the demand for scientific and educational skills on biophysics both at the academia and job market levels.

Goals and Learning Outcomes

This course is designed to i) provide the tools fundamental to understand the physicochemical basis of biological processes that influence the pharmacological activity of bioactive compounds, focusing on biological membranes; ii) to promote the acquisition of competences related to the underlying principles and applications of state-of-the-art and emerging biophysical methodologies essential for the characterization of biological and pharmacological processes.

Students should attain the following learning outcomes:

- acquire specific knowledge, understand and apply the physical principles underlying diverse physiological events
- comprehensive understanding of the concepts and applications of a wide variety of biophysical methodologies
- evaluate the adequacy of different biophysical methodologies to study specific biological events
- critical awareness of methodological strategies to be employed in the characterization of distinct therapeutic agents and their mode of action

PROGRAMME

Cell (and organismal) function depends on a complex network of coordinated events that determine cell biological outcome. It is now recognized that these cellular events are highly dependent on diverse biophysical aspects of cell function, some of which highly important in the context of pharmaceutical sciences.

The course of Pharmaceutical Biophysics will thus cover critical aspects of molecular and cellular biophysics relevant to i3DU, emphasizing on biological membranes as critical players in the pharmacological activity of bioactive compounds, and on well-established and emerging biophysical technologies essential for the characterization of biological and pharmacological processes.



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FCT PhD
PROGRAMMES

9th January 2019

Session I: Introduction to molecular and cellular biophysics

9h15	Welcome address Liana Silva
9h30	Biomembranes - Structure and Function. With a little help from fluorescence Maria João Moreno (FCT/UCoimbra)
10h45	Coffee Break
11h15	Light scattering applications in biotechnology Marco Domingues (IMM/ULisboa)
12h30- 14h00	Lunch break
14h00	The power of X-Ray Crystallography: seeing is believing Ana Luísa Carvalho (FCT/UNL)
15h10	Coffee Break
15h30	Deciphering complex biological mechanisms through single-molecule fluorescence techniques: from ensemble averaging to individual molecules Ana Melo (IST/ULisboa)
16h40	Group discussions/work (i3DU 1st Year PhD students ONLY)

10th January 2019

Session II: Biophysical methodologies applied to pharmaceutical sciences

9h30	"Atomic force microscopy - Biological and biomedical applications" Filomena Carvalho (IMM/ULisboa)
10h45	Coffee Break
11h15	Fluorescence microscopy: basic principles and applications Maria João Sarmiento (J. Heyrovský Institute of Physical Chemistry)



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FCT PhD
PROGRAMMES

12h30- 14h00	Lunch break
14h00	Spectroscopic tools to probe interactions between biomolecules and drug candidates Ana Isabel Tomáz (FC/ULisboa)
15h10	Coffee Break
15h30	Endosomal sorting defects: implication for Alzheimer's disease Claudia Almeida (CEDOC)
16h40	Group discussions/work (i3DU 1st Year PhD students ONLY)

11th January 2018

Session III: The biophysics underlying biological processes

9h30	Lipids, lysosomes and atherogenesis Otilia Vieira (CEDOC/UNL)
10h45	Coffee Break
11h15	Biophysics of ion currents - ion channels; opportunities and applications Pedro Lima (FC/ULisboa)
12h30- 14h	Lunch break
14h00	Insights into regulation of CFTR membrane stability Carlos Farinha (FC/ULisboa)
15h10	Coffee Break
15h30	Biophysical aspects of liposomes design for drug delivery Luisa Corvo (FF/ULisboa)
16h40	Group discussions/work (i3DU 1st Year PhD students ONLY)

28-29 January 2019, *Hands-on Workshops*:

Two full days will be dedicated to experimental workshops, where different biophysical



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FCT PhD PROGRAMMES

methodologies, including confocal microscopy, fluorescence spectroscopy, dynamic

and electrophoretic light scattering, and atomic force microscopy will be introduced.
i3DU 1st Year

PhD students will be organized into four groups, and each group will develop experimental work using the different methodologies. The preliminary data obtained during the workshop can be used to support the written research project (see assessment).

	28 January 2019	29 January 2019
9h30-12h30	Block I	Block III
12h30-14h	Lunch Break	Lunch Break
14h-17h	Block II	Block IV

Group I. Block I, II, III, IV: DLS, Microscopy, Fluorescence spectroscopy, AFM

Group II. Block I, II, III, IV: Microscopy, DLS, AFM, Fluorescence spectroscopy

Group III. Block I, II, III, IV: Fluorescence spectroscopy, AFM, DLS, Microscopy

Group IV. Block I, II, III, IV: AFM, Fluorescence spectroscopy, Microscopy, DLS

Assessment

(i3DU 1st Year PhD students ONLY)

Students' assessment will be based on their lectures' attendance and coursework. Students will be grouped, and their evaluation will be performed based on the originality and scientific quality of a written research project that include the preliminary results obtained during the workshops of the course. The research project should thus be within the theme of the course and include methodologies and strategies to solve an innovative research question.

The following criteria will be used for research project assessment:

- Originality and significance of the research project
- Scientific quality of the proposal
- Clear description of the proposed approach
- Adequacy of the experimental strategy to attain the proposed goals of the project
- Interdisciplinarity of the proposal

Each item contributes 20% to the final coursework grade.



The research project should obey to the following guidelines:

- Contents
 - Title
 - Summary
 - Objectives
 - Research plan and methods
 - Scientific and Social Impact
 - References
- Formatting: max 5 pages, Times New Roman, font size 12, single paragraph, page margins 2cm (top, bottom, left and right)
- Language: English