



MOBILisE

ERA CHAIR



Deliverable D16 (D4.3)

Curricular plan of the

Molecular

Bioengineering

Module



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Executive Summary

The overall strategic objective of MOBILISE is to enhance the fundamental and applied research at INEB/i3S and within the MOBILISE Hub, particularly in the field of Molecular Bioengineering, to world-leading standards. One way to accomplish this goal will be through the offer of advanced training in Molecular Bioengineering to students enrolled in MSc and PhD programmes run by INEB/i3S members. MOBILISE will create a new module that will train a new generation of interdisciplinary bioengineers who will be able to apply Molecular Bioengineering principles and tools to address current and future health challenges.

To leverage this training program, MOBILISE will organise a series of Advanced Training Courses in Molecular Bioengineering which will be open to MSc and PhD students of INEB/i3S and of the MOBILISE Hub and also to external participants, in particular from abroad. Here we detail the structure of the Advanced Courses in Molecular Bioengineering, and identify the target audience. The tentative structure for the first edition of the Advanced Course is also presented.

1. Introduction

To better prepare the new generation of interdisciplinary bioengineers to tackle current and future health challenges, the MOBILiSE project is committed to fill a gap in conventional Bioengineering training programmes by offering Advanced Courses in Molecular Bioengineering, focussed on the application of Molecular Bioengineering concepts for developing innovative tools and therapies to diagnose and treat diseases. This will be achieved through the creation of a new module to be integrated in the Bioengineering MSc and PhD programmes run by INEB/i3S members. This module will benefit from the experience and international connections of the ERA Chair Holder to design an attractive curriculum covering the state-of-the art in the field and bring world-renowned researchers to lecture at the institute, including researchers from the industry. This will, undoubtably, contribute to raising the attractiveness of INEB/i3S and associated postgraduate training programmes at the international level.

A series of Advanced Training Courses will be first organised as a preparation step before the formal creation of the new module. These will allow us to identify trends in the Molecular Bioengineering arena and collect feedback from participants, about what is and what is not working well, to better shape the structure of the new module. Concurrently, MOBILiSE is seeking the recognition of this Advanced Training Course by the University of Porto, necessary for the formal allocation of credits (in the form of ECTS), so it can be included in the curricula of the students.

The Advanced Courses will occur annually and three editions are planned so far, each covering different, but complementary, aspects of Molecular Bioengineering:

- First Edition: Self-assembling peptide hydrogels: molecular design, characterisation and biomedical applications
- Second Edition: Molecularly engineered interfaces: from biosensing to emergent biomedical applications
- Third Edition: Engineering molecules of life: challenges and recent developments

The purpose of this document is to provide the starting structure for the Advanced Courses in Molecular Bioengineering, disclosing the topics to be covered and target audience. A tentative structure for the first edition of the Advanced Course is also presented.

2. Structure of the Advanced Course

The Advanced Courses are devoted to students enrolled in MSc or PhD degrees in areas related to Molecular Bioengineering, but will also welcome the applications of other researchers interested in gaining new knowledge and skills in Molecular Bioengineering. They will entail a combination of theoretical and practical sessions. Their structure and format are presented and described below.

Number of participants and selection: 10-15. To attend the course, applicants are required to submit an application of interest with the selection being made based on the applicant's CV and motivation letter demonstrating the interest/relevance in attending the course.

Duration of the course: 5 days (~30 h, synchronous content)

Assessment: group report (40%) + group presentation (30%) + individual engagement during the lectures (15%) + peer assessment (15%)

Teaching materials: lecture notes, review papers, videos, experimental protocols

Location: i3S | Rua Alfredo Allen, 208 | 4200-135 Porto, Portugal

Table 1. Format for the 5-day practical course with lectures (L) in the morning and practical sessions (Lab) in the afternoon. The tentative content to be covered in the 1st edition is shown.

	Day 1	Day 2	Day3	Day 4	Day 5
Morning	L01 Introduction to self-assembling peptide hydrogels	L03 Peptides for the functionalisation of polymer hydrogels	L05 Rheology & microrheology of 3D hydrogels	L07 Translation of academic research into the clinical and commercial setting	Preparation of reports & presentations
	L02 Hydrogels based on self-assembling dehydropeptides	L04 Characterisation of self-assembling hydrogels	L06 Structural characterisation of peptide hydrogels	L08 Self-assembling peptide hydrogels for long term drug delivery	

Afternoon	Tour of the research facilities & social activity/ team work	Lab 2: Morphological characterisation of peptide hydrogels by SEM (sample preparation)	Lab 4: Rheological characterisation of hydrogels	Analysis of data collected during the lab sessions	Presentations by participants & assessment
	Lab 1: Preparation of self-assembling hydrogels	Lab 3: Scanning electron microscopy (SEM) session for structure visualisation	Lab 5: Preparation of hydrogels for cell culture (sterilisation, experimental design)		

3. Programme for the 1st Edition of the Advanced Course

A tentative programme, with a detailed schedule and proposed lecturers, is presented below for the first edition of the Advanced Course in Molecular Bioengineering. This edition will focus on self-assembling peptide hydrogels.

First Advanced Training Course in Molecular Bioengineering

Self-assembling peptide hydrogels: molecular design, characterisation and biomedical applications

Dates TBC

SCIENTIFIC AND ORGANISING COMMITTEE

Helena Azevedo – INEB/i3S

Cristina Barrias – INEB/i3S

Mariana Bexiga – INEB/i3S

Early Career Researcher (TBC) – INEB/i3S

SCIENTIFIC PROGRAM

Day 1		
09:00 – 10:00	Reception of participants and registration	i3S, Porto, PT
10:00 – 11:00	Welcome address & lecture L01: Introduction to self-assembling peptide hydrogels	Helena Azevedo INEB/i3S, Portugal
11:00 – 11:15	Q&A	
11:45 – 12:30	L02: Self-assembling dehydropeptides: the new kids on the block	Paula Ferreira University of Minho, Portugal
12:30 – 12:45	Q&A	
12:45 – 14:00	<i>Lunch Break</i>	
14:00 – 15:00	Guided tour of the scientific platforms at i3S & team work activity	i3S building
15:00 – 17:30	Lab 1: Preparation of self-assembling peptide hydrogels	Lab (TBC)
18:00	Welcome Cocktail	i3S, Porto, PT
Day 2		
Chairwoman: Cristina Barrias, INEB/i3S		
09:30 – 10:15	L03: Functionalisation of hydrogels with bioactive peptides	Cristina Barrias
10:15 – 10:30	Q&A	INEB/i3S, Portugal
10:45 – 11:30	L04: Advanced methods for the characterisation of supramolecular hydrogels	Jennifer Patterson IMDEA Materials Institute, Spain
11:30 – 11:45	Q&A	
12:00 – 13:30	<i>Lunch Break</i>	
13:30 – 15:00	Lab 2: Sample preparation for scanning electron microscopy (SEM)	Lab TBC
15:30 – 17:30	Lab 3: Morphological examination by SEM	Lab TBC

Day 3		
Chairwoman: Ana Paula Pêgo (INEB/i3S)		
09:30 – 10:15	L03: (Micro)rheology on 3D hydrogels: what stiffness do cells feel in 3D hydrogels?	Manlio Tassieri University of Glasgow, UK
10:15 – 10:30	Q&A	
10:45 – 11:30	L04: Illuminating hydrogel structure by SANS/SAXS methods	Dave Adams University of Glasgow, UK
11:30 – 11:45	Q&A	
12:00 – 13:30	<i>Lunch Break</i>	
13:30 – 15:00	Lab 3: Rheology on hydrogel samples	Lab TBC
15:30 – 17:30	Lab 4: Preparation of gels for cell culture	Lab TBC
Day 4		
Chairman: Bruno Sarmiento (INEB/i3S)		
09:30 – 10:15	L07: Founding and running a company on self-assembling peptide hydrogels: a personal experience	Aline Miller Manchester BIOGEL, UK
10:15 – 10:30	Q&A	
10:45 – 11:30	L08: Long-acting injectable peptide hydrogels for the delivery of drugs	Gary Laverty Queen's University Belfast, UK
11:30 – 11:45	Q&A	
12:30 – 13:30	<i>Lunch Break</i>	
13:30 – 17:30	Data analysis	Room TBC
Day 5		
09:30 – 12:30	Preparation of reports and presentations	Room TBC
12:30 – 14:00	<i>Lunch Break</i>	
14:00 – 17:30	Delivery and assessment of presentations	Room TBC
17:30	Course Closure	Room TBC