

# Augmented-CINCH

## HANDS-ON TRAINING COURSE ON *CHEMICAL DOSIMETRY*

POLITECNICO DI MILANO

14 – 17 SEPTEMBER 2021

### Summary

This document describes the aim of the course, its structure and some logistic and practical issues.

### Introduction

The evaluation of the dose in different application fields, as well as in the everyday life, is of paramount importance. This is particularly true for the medical application of ionising radiation in which small dose uncertainties between planned and delivered dose can lead to impaired clinical outcomes. In this perspective, this course aims at providing a general overview on the role of chemical dosimeters and gel dosimeters with specification on principles, properties and applications. During the on-site part of the course, students will be given the opportunity to increase their practical skills with laboratory equipment for the preparation and analysis of different kinds of chemical dosimeters and gel dosimeters.

### Target

This training course is aimed at students with a background knowledge in Chemistry, Nuclear Physics and Medical Physics, interested in extending their theoretical and practical skills in the chemical dosimetry and gel dosimetry field for medical applications.

## Course Structure

The course is structured in two phases. The first theoretical part is delivered as distance learning course. During this phase material related to more general topics as well as material intended to be preparatory for the topics covered during the on-site course will be distributed. Students will be provided with a self-assessment tool to evaluate their own preparation. In addition, students will be asked to successfully complete the online course on security for the access to the laboratories.

The second part, including theoretical lectures and guided practical experiences of using chemical dosimeters, will take place in Milano, at the Radiochemistry and Radiation Chemistry Laboratories of the Politecnico di Milano. Guided tour to Radiotherapy Unit at Humanitas Gavazzeni, located in Bergamo, is foreseen. Sessions are distributed from Tuesday to Friday, the registration will start on Tuesday at 8:30 and the course will finish on Friday at lunch time.

The estimated workload of the online and on-site phases is 3 h and 28 h, respectively. The total expected effort is thus 31 h.

## Course Content

Basic knowledge of radiation matter interaction and dosimetric quantities are presumed.

The topics to be covered during the online phase – e-learning course on “Fundamentals on chemical dosimetry” – are organized as following:

1. Introduction on Dosimetry: role and needs;
2. Refreshment on:
  - Dosimetric quantities;
  - Dosimeter general principles and features required: absoluteness, accuracy and precision, dose and dose-rate range, energy dependence, stability...
3. Chemical dosimetry:
  - General principles;
  - Radiolysis;
  - Radiolytic yield and dose;
  - Overview on chemical dosimeters;
  - Chemical dosimeters and gel dosimeters for medical applications,
4. Introduction to ImageJ Free software.

During the on-site phase, theoretical presentations and experimental activities will be focused on:

1. Laboratory chemical preparation of:
  - Radiochromic gel dosimeters;
  - Polymer gel dosimeters.
2. Irradiation of samples, both gels and GafChromic films, at the Radiotherapy Unit at Humanitas Gavazzeni (BG) with Radiotherapy LINAC
3. Optical analysis of irradiated dosimeters, both gels and GafChromic films
4. Data analysis (MS Excel or equivalent spreadsheet programs):
  - Use of ImageJ Open Software for images analysis;

- Calibration curve acquisitions – comparison of the gel dosimetric properties;
- Evaluation of isodose curves of a clinical treatment plan using GafChromic films.

The main expected learning outcomes are:

- Understand the basis and the role of dosimetry for medical applications;
- Have a complete overview on dosimeters: principles, features, applications;
- Understand the basic concepts of chemical dosimetry and gel dosimetry;
- Have an overview on cutting-edge applications of radiation chemistry, novel gel dosimeters and radiochemistry;
- Acquire the practical skills concerning chemical laboratory equipment and optical analysis (both 0D and 2D) focused on chemical dosimetry;
- Be able and confident in preparing both radiochromic and polymer gel dosimeters;
- Understand the dosimetric properties, peculiarities and applications of different gel systems;
- Learn the main aspects of optical analysis and MRI;
- Learn the main features of ImageJ Open Software for image analysis.

## **Should I take my laptop computer?**

Yes. All the course material, including lecturers' presentations, will be distributed in electronic format so that participants will be able to follow the sessions from their laptop screens. Furthermore, data analyses and practical exercises, which are crucial for a thorough understanding of the presented concepts, will be carried out on personal computers.

Please download and install the free software ImageJ (<https://imagej.nih.gov/ij/download.html>).

## Economical support

No course fee will be charged to the participants and a budget exists to support travel and accommodation of participants. Visit the [web page](#) to get instruction on how to apply for a grant.

## Venue for the on-site phase

Politecnico di Milano - Campus Bovisa Politecnico  
Department of Energy - Nuclear Engineering Division - CeSNEF  
Radiochemistry and Radiation Chemistry Laboratories,  
Building B18 - Via La Masa, 34 Milano



[www.polimi.it](http://www.polimi.it)

<https://maps.polimi.it/maps/>

The building is at about 200 m from the closest train station named “*Milano Bovisa Politecnico*”, and about 500 m from train station “*Milano Villapizzone*”. The area is served by bus lines 82 and 92.

## Travel information

Milano has an interconnected network of metro, tram, buses ([www.atm.it](http://www.atm.it)) and suburban trains ([www.trenord.it](http://www.trenord.it)). In particular, the Bovisa Campus of Politecnico di Milano is well connected with the city centre and with the main airports by means of train starting from “*Milano Bovisa Politecnico*” station and “*Milano Villapizzone*” station.

Trains for/from Malpensa airport are scheduled every 15 minutes to/from “*Milano Bovisa Politecnico*”.

<http://www.milanomalpensa-airport.com>

<http://www.trenord.it/en/timetable/timetable.aspx>

<https://www.atm.it/it/Pagine/default.aspx>

<https://maps.polimi.it/maps/>

## Accommodation

Through the [booking.com](http://www.booking.com) website it is possible to find different solutions at different prices. For examples:

Broglio 2 Design loft - Via Emilio Broglio, Bovisa, 20158 Milano, Italia

Hotel Sunflower - Piazzale Lugano 10, Bovisa, 20158 Milano, Italia

Bovisa House - Via Antonio Carnevali 116 , Bovisa, 20158 Milano, Italia

Residence Politecnico Bovisa - Via Lambruschini Raffaele 34, Bovisa, 20100 Milano, Italia

Milan Suite Hotel - Via Varesina 124, Certosa, 20156 Milano, Italia

Casa dolce casa - Via Michele Pericle Negrotto 16/6, Bovisa, 20156 Milano, Italia

...and many others.

### Pictures from the first Hand-on Training:



